The following full text is a publisher’s version.

For additional information about this publication click this link.
http://hdl.handle.net/2066/109502

Please be advised that this information was generated on 2017-08-15 and may be subject to change.
Setting and keeping the professional system in motion

Using Intervention Mapping to develop a programme to improve guideline adherence in physical therapy

Geert Rutten
Setting and keeping the professional system in motion
Using Intervention Mapping to develop a programme to improve guideline adherence in physical therapy
For reasons of consistency within this thesis, some terms have been standardized throughout the text. As a consequence the text may differ in this respect from the articles that have been published.

The studies presented in this thesis have been performed at the Scientific Institute for Quality of Healthcare (IQ healthcare). This institute is part of the Nijmegen Centre for Evidence Based Practice (NCEBP), one of the approved research institutes of the Radboud University Nijmegen and the Netherlands School of Primary Care Research (CaRe), acknowledged by the Royal Dutch Academy of Science (KNAW).

Financial support by the Scientific Institute for Quality of Healthcare (IQ healthcare) for the publication of this thesis is gratefully acknowledged.

Nijmegen, 2012

Copyright: John Wiley and Sons (chapter 2)
          American Physical Therapy Association (chapters 3 and 4)
          Elsevier B.V. (chapter 5)

Coverdesign: Bas en Luuk Rutten
Lay-out: Jolanda van Haren
Print: BOXPress BV || Proefschriftmaken.nl

ISBN: 9789076316482
Setting and keeping the professional system in motion
Using Intervention Mapping to develop a programme to improve
guideline adherence in physical therapy

Proefschrift

ter verkrijging van de graad van doctor
aan de Radboud Universiteit Nijmegen
op gezag van de rector magnificus prof mr S C J J Kortmann,
volgens besluit van het college van decanen
in het openbaar te verdedigen op woensdag 30 mei 2012
om 12 30 uur precies

door Gerardus Matheus Joseph Rutten

geboren te Veghel op 2 juni 1962
Promotoren

Prof dr R A B Oostendorp
Prof dr N K de Vries (Universiteit Maastricht)

Copromotor

Dr J Harting (AMC)

Manuscriptcommissie

Prof dr C van Weel
Prof dr A C H Geurts
Prof dr J van der Velden
Prof dr G D E M van der Weijden (Universiteit Maastricht)
Prof dr G Kok (Universiteit Maastricht)
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>Introduction</td>
<td>7</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>Measuring physiotherapists’ guideline adherence by means of clinical</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>vignettes  A validation study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Journal of Evaluation in Clinical Practice 2006, 12(5) 491–500</td>
<td></td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Adherence to clinical practice guidelines for low back pain in physical</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>therapy  Do patients benefit?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Physical Therapy 2010, 90(8) 1111-1122</td>
<td></td>
</tr>
<tr>
<td>Chapter 4</td>
<td>A qualitative application of the diffusion of innovations theory to</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>examine determinants of guideline adherence among physical therapists</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Physical Therapy 2009, 89(3) 221-232</td>
<td></td>
</tr>
<tr>
<td>Chapter 5</td>
<td>A theory-based cross-sectional survey demonstrated the important role</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>of awareness in guideline implementation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Journal of Clinical Epidemiology 2009, 62 167-176</td>
<td></td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Guideline adherence is explained and predicted by various factors on</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>multiple levels  a theory-based longitudinal survey</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Submitted</td>
<td></td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Development of a theory- and evidence-based intervention to enhance</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>implementation of physical therapy guidelines for the management of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lower back pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Submitted</td>
<td></td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Evaluation of the systematically developed theory-based multifaceted</td>
<td>151</td>
</tr>
<tr>
<td></td>
<td>Quality Improvement in Physical Therapy (QUIP) programme  A one-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>group, pretest post-test pilot study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Submitted</td>
<td></td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Discussion</td>
<td>179</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>203</td>
</tr>
<tr>
<td></td>
<td>Samenvatting</td>
<td>213</td>
</tr>
<tr>
<td></td>
<td>Dankwoord</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Curriculum Vitae</td>
<td>229</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction
Introduction

The subject of this thesis is the systematic and theory-based development and pilot testing of an intervention to enhance Dutch physical therapists' adherence to the national evidence-based clinical guidelines for patients with low back pain. The thesis first touches on the measurement of physical therapists' clinical performance and the importance of guideline adherence. It then concentrates on a theory-based, systematic approach to intervention development. Finally, it reports on the pilot testing of the resulting programme to improve quality in physical therapy. This chapter presents the essential background information for the study. It addresses the problem of low back pain, clinical guidelines in physical therapy, difficulties of guideline implementation, and a short introduction to the theory-based, systematic approach to intervention development. This results in a central problem statement. The chapter concludes with an outline of the thesis.

The problem of low back pain

Non-specific low back pain (referred to below as low back pain) is defined as “low back pain without a specified physical cause, e.g. nerve root compression (radicular syndrome), trauma, infection or tumour”.\(^1\) Low back pain can be seen as a largely self-limiting problem, considering the improvements in terms of pain and disability in the first three months after onset.\(^2\) Once the low back pain becomes recurrent or chronic, it is associated with long-term disability and, consequently, with a significant socioeconomic burden: about 80% of health care and social costs related to low back pain are attributed to the 10% of patients with chronic pain and disability.\(^3\) The one-year prevalence of non-specific low back pain in various populations ranges from 22% to 65%,\(^4\) although the one-year prevalence among adults in industrial countries is thought to range from 15% to 45%.\(^5\) The most recent survey of Dutch general practices shows that the prevalence of low back pain in 2009 was 49 per 1,000 patients and the annual incidence was 29 per 1,000 patients.\(^6\) In 2008, about 7 per 1000 patients were referred for physical therapy with a diagnosis of low back pain.\(^7\)

A considerable proportion of the approximately 16,000 Dutch private practice physical therapists\(^8\) regularly treat patients with low back pain, and an average of 20-25% of the patients who visit a physical therapy practice are diagnosed with low back pain.\(^9\) Hence, physical therapists are in an excellent position to contribute to preventing the transition from acute to recurrent or chronic low back pain, and hence, to limiting its negative health and societal consequences. This, however, requires high quality physical therapy care, incorporating not only the clinical expertise of the care provider and the patients' preferences but also the most recent and best available evidence with respect to the prognosis of low back pain, and physical therapy diagnostics and treatment. These aspects have to become part of daily routine.
Clinical guidelines in physical therapy

Clinical guidelines are “systematically developed statements designed to help practitioners and patients to make decisions about appropriate healthcare for specific clinical circumstances”. They are generally considered an important instrument to bridge the gap between scientifically gathered evidence and actual clinical practice. Ideally, recommendations in clinical guidelines are based on high level scientific evidence. Since such evidence is not always available, however, these recommendations are generally based on the “best available evidence” As such, clinical guidelines are meant to improve and support the management and safety of the care process. Important goals of clinical guidelines are a more consistent and higher quality of care and improved cost-effectiveness, ideally resulting in improved health outcomes. As regards physical therapy, enhanced consistency among professionals increases the transparency of care, which is considered an important step towards professionalization and legitimization of the profession of physical therapy in the eyes of external stakeholders.

The concept of evidence-based practice, supported by clinical guidelines, is a common aspect of healthcare today, and guideline development has shown an impressive increase during the last decade. As part of the professionalization process, the Royal Dutch Society for Physical Therapy (KNGF) has set up a national Quality Assurance Programme in the Netherlands, including the development and implementation of clinical guidelines. Since the mid-1990s, this KNGF Quality Assurance Programme has resulted in seventeen disease-specific guidelines, one procedural guideline (on reporting), and two evidence statements.

This thesis centres on the Dutch guidelines for low back pain. Two separate guidelines have been published, one for physical therapists and a complementary one for manual physical therapists. However, due to the similarity of the evidence and recommendations and the complementary character of both guidelines, they can be regarded as one. Therefore, for the purpose of the present thesis, the recommendations from both guidelines were used as a standard for the best available evidence-based physical therapy care. A vital difference from previous practice is the complete application of categories of the International Classification of Functioning, Disabilities and Health (ICF). The guidelines assign lower importance to the management of patients’ physiological functions of body systems and put a stronger emphasis on activities and social participation. The guidelines emphasize an activating approach, in which physical activity is recommended instead of bed rest, active strategies such as exercise therapy are preferably applied, and a hands-off policy is recommended for patients with acute low back pain with a favourable natural course. The guidelines also introduce a behavioural approach aimed at restoring physical activities and social participation for patients with chronic low back pain, which requires an assessment of the psychosocial variables influencing the course of recovery. Furthermore, the guidelines emphasize the importance of using measurement instruments to assess pain intensity and the level of physical functioning, and to make changes in
these domains visible. Although some evidence is available that greater guideline adherence in the treatment of patients with low back pain might be advantageous from a cost perspective, only limited evidence is available for a favourable relation between guideline adherence and health outcomes.

Simultaneous with the development of clinical guidelines, the KNGF adopted a standard method of diffusion of its guidelines, specifically developed for the clinical guidelines for physical therapy in the Netherlands. This method is based on the model developed by Grol et al. for changing the behaviour of health care professionals. For instance, the dissemination and implementation plan of the Dutch physical therapy guidelines for low back pain recognizes that different barriers may be encountered in the consecutive steps of the diffusion process (orientation, insight, acceptance and change), which in turn may require different diffusion strategies. At the time these guidelines were published, strategies for dissemination and implementation included mailing the guidelines to all KNGF members and publishing them in a Dutch professional journal for physical therapists. All guideline documents contained a form that the therapists could use for self-evaluation, two discussion forms to facilitate the use of the guidelines and one recommended instrument to measure patient disability due to low back pain. Currently, all physical therapy guidelines are freely available from the KNGF website, including the additional materials intended to enhance their implementation (www.kngfrichtlijnen.nl)

**Difficulties of guideline implementation**

Despite the attention the KNGF pays to quality improvement in general and guideline implementation in particular, the extent to which Dutch physical therapists adhere to clinical guidelines varies considerably and may be regarded as suboptimal. Various studies of Dutch physical therapy guidelines have demonstrated considerable room for improvement in terms of adherence, requiring additional interventions. Moreover, interventions to enhance guideline adherence are generally only moderately effective. Of two studies of the effectiveness of an active intervention to improve physical therapists' adherence to their guidelines for low back pain, one found an average difference between the intervention and control groups of 13% as regards limiting the number of treatment sessions and of 5% for the provision of adequate information. The other study found only very small differences between the intervention and control groups in the way they handled psychosocial factors.

An important reason for the limited effectiveness of interventions to increase guideline adherence could be the lack of a sound rationale for the choice of such interventions. This may be due to the limited use of theoretical frameworks in efforts to promote guideline adherence. Another reason why programmes to improve guideline implementation might not bring about the intended increased guideline adherence is the strong focus on the individual professional and the failure to include the organizational and wider environmental context.
Finally, the analysis of implementation determinants has mostly been restricted to either qualitative or quantitative research methods, whereas a combination of both is recommended.  

**Diffusion of Innovations Theory**

From a theoretical point of view, non-adherence to clinical guidelines can be regarded as an incomplete diffusion process of an innovation, with innovation defined as “an idea, practice or object that is perceived as new by an individual or other unit of adoption.” We therefore used the stepwise Innovation Decision Process of Rogers’ Diffusion of Innovations Theory as the basis for the present thesis. The theory distinguishes five successive stages. The first two are mental stages and are referred to as the dissemination process. The first dissemination stage, the knowledge stage, requires that the potential users become acquainted with the innovation and develop a sufficient understanding of it. In the subsequent persuasion stage, the potential adopters should develop a positive attitude toward the innovation. The decisive factors for this mostly affective process are the perceived characteristics of the innovation, such as its relative advantage, compatibility, complexity, trialability (the ability for an innovation to be tested), observability (the degree to which the results of an innovation are visible to others) and flexibility. In addition, the perceived consequences, that is, the perceived social or material risks, may play a part in this persuasion stage. The last three stages of the diffusion process are behavioural stages and are called the adoption process. First, potential adopters have to decide whether to adopt or reject the innovation. Activities in this decision stage include gathering further information, trying out the innovation to a limited degree, and trial by others. During the subsequent implementation stage, the diffusion process can be facilitated by positive experiences gained previously and by positive social influences. In contrast, perceived barriers may impede the actual implementation in the confirmation stage, the innovation becomes part of the work routine, which requires that its users receive reinforcement and positive feedback. The progression of an innovation through the five successive stages is further influenced by the characteristics of the social system in which the innovation is to be implemented, the nature of the innovation decision, the communication channels applied, and time.

Rogers' widely used theory covers the entire diffusion process and offers the opportunity to integrate various motivational and affective and theoretical constructs in the different steps of the diffusion process. Moreover, Rogers' recognition of the importance of the social system allows for an inclusion of constructs from organizational theories. For this reason, its application was considered especially helpful in identifying the promoting and impeding determinants throughout the diffusion process. Such a needs assessment makes up the first step of Intervention Mapping.
Intervention Mapping
The method of Intervention Mapping (IM) serves as a blueprint for developing programmes, such as those aiming to optimize guideline adherence amongst physical therapists, on the basis of theoretical, empirical and practical information. Step 1 of IM is a needs assessment. Based on the Precede-Proceed Model, such a needs assessment examines quality of life (e.g. the individual and societal consequences of low back pain), the health problem (e.g. the incidence and duration of low back pain), the related behavioural factors (e.g. a patient’s lifestyle) and environmental factors (e.g. the quality of physical therapy care), and the influential personal and external determinants of these factors (e.g. the physical therapist’s level of motivation and the organizational characteristics of the physical therapy practice). Moreover, it includes the identification of persons that should be targeted in order to change the environment (e.g. the quality manager at the physical therapy practice). Since this thesis focuses on the quality of physical therapy care and adherence to the guidelines for low back pain in particular, this was the central theme in further steps of the IM process.

IM Step 2 continues by stating the behavioural and environmental objectives (e.g. the intended increase in guideline adherence) and formulating performance objectives for the target population (e.g. desired behavioural outcomes for the physical therapists) and the individuals who influence the environment (e.g. desired behavioural outcomes for the quality managers). The next task in Step 2 is to develop matrices for each of the ecological levels specified before (e.g. physical therapist and practice quality manager). These matrices combine the performance objectives with the selected internal determinants (e.g. limited self-evaluation by the physical therapists) and external determinants (e.g. commitment to high quality on the part of the quality managers), in order to produce change objectives. Such change objectives specify precisely what aspects of the behaviour of the actors at the distinct levels need to change (e.g. the physical therapist lists the important psychosocial variables for low back pain; the practice quality manager expresses his confidence in the ability to organize one practice staff meeting every month) in order to accomplish the performance objectives. In Step 3, theoretical methods and practical applications of these methods are selected to fit the determinants and the change objectives specified in Step 2. These methods and applications are then integrated into a coherent programme in Step 4. The two final steps concern the development of a plan to promote the application of the programme and a plan to evaluate it. Although presented as a series of steps, the IM process is iterative rather than linear.

Problem statement
The central problem addressed in this thesis is the non-adherence of Dutch physical therapists to the clinical guidelines for low back pain. The thesis presents a series of studies that include (1) a theory-based needs assessment of the problem of non-adherence, using qualitative and quantitative research methods, (2) the theory-based, systematic development of a programme to
enhance guideline adherence, (3) the pilot evaluation of this programme. As such, the series of studies aimed to tackle the limitations of previous interventions to increase guideline adherence. The central question addressed in this thesis is therefore whether a theory-based, systematically developed programme to enhance guideline adherence would result in better use of the guidelines in physical therapy practice. To make a real difference, the programme should increase the average percentage of adherence to the low back pain guidelines among Dutch physical therapists by at least 25 percentage points.

Outline of the thesis
Chapter 2 describes a study on the validity of clinical vignettes as a means to measure guideline adherence. Chapter 3 tests the hypothesis that guideline-adherent care does indeed increase the effectiveness of physical therapy for patients with low back pain. The next three chapters report on the first step of the IM approach: the needs assessment for which Rogers’ Diffusion of Innovations Theory served as the starting point. Chapter 4 describes a qualitative study of the determinants of guideline adherence, while Chapters 5 and 6 report on two surveys to determine the level of guideline adherence as well as the determinants influencing adherence levels. The cross-sectional survey reported on in Chapter 5 assessed the determinants that explain guideline adherence, while the longitudinal survey in Chapter 6 also examined the determinants that predict adherence. Chapter 7 starts with an overview of determinants, and then reports on the next three steps of the IM approach: the formulation of performance objectives and change objectives, the choice of theory-based methods and their practical applications, and the construction of a programme to enhance guideline adherence that aims to address these determinants. Chapter 8 describes a pilot study to evaluate the potential effectiveness of the programme and the fidelity, acceptability and feasibility of the programme’s implementation. The general discussion in Chapter 9 summarizes and discusses the main findings of the thesis, considers its strengths and limitations, and concludes with its main practical and scientific implications.
References


Chapter 2

Measuring physical therapists’ guideline adherence by means of clinical vignettes: A validation study

Geert Rutten
Janneke Harting
Steven Rutten
Trudy Bekkering
Stef Kremers

Abstract

Rationale, aims and objectives: To assess the criterion validity of paper-and-pencil vignettes to assess guideline adherence by physical therapists in the Netherlands. The evidence-based physical therapy practice guideline for low back pain was used as an example.

Methods: Four vignettes were constructed and pre-tested. Three vignettes were found to represent an adequate case-mix. They described one patient with specific low back pain, one with non-specific low back pain and a normal recovery process and one with non-specific low back pain and a delay in the recovery process. Invited to participate were 113 primary care physical therapists who had joined an randomized controlled trial study 8 months before, in which guideline adherence had been measured by means of semi-structured treatment recording forms. The criterion validity was determined with Spearman's $r$, using Cohen's classification for the behavioural sciences to categorize its effect size.

Results: Of the 72 physical therapists who agreed to participate, 39 completed the questions on the vignettes. In the end, both adherence measures were available for 34 participants, providing 102 vignettes and 268 recording forms. Mean guideline adherence scores were 57% (SD=17) when measured by vignettes and 74% (SD=15) when measured by recording forms. Spearman's $r$ was 0.31 (P=0.036), which, according to Cohen's classification, is a medium effect size.

Conclusion: Vignettes are of acceptable validity, and are an inexpensive and manageable instrument to measure guideline adherence among large groups of physical therapists. Further validation studies could benefit from the use of standardized patients as a gold standard, a more diverse case mix to better reflect real physical therapy practice, and the inclusion of longitudinal vignettes that cover the patients' course of treatment.
Introduction
Practice guidelines play an important role in improving the quality of physical therapists' practice.\(^1\) They create opportunities to systematically apply scientific evidence in practice,\(^2,4\) and to improve and monitor the efficiency and quality of physical therapists' performance.\(^1\) In addition, guidelines are assumed to enhance transparency of practice.\(^1\) To achieve these benefits, a high level of guideline implementation is required. Hence, valid instruments are needed to monitor guideline implementation among sufficiently large samples of physical therapists. However, although professional organizations, health insurance companies and policy makers are showing a growing interest in the quality of physical therapists' performance, such instruments are still lacking.

Various studies of guidelines for low back pain have assessed adherence in different ways. This can be illustrated by the example of the Dutch clinical guideline on physical therapy for patients with nonspecific low back pain.\(^5\) This guideline has been the subject of three studies, each of which used different methods to assess adherence. In a small sample questionnaire survey (n=38), three open-ended items asked whether physical therapists were familiar with the guideline, and if so, whether they used it in their treatment of patients with low back pain.\(^6\) In another survey (n=472), guideline adherence was assessed by a single item, which asked physical therapists to indicate the extent to which they adhered to the guideline recommendations on a 5-point scale, from 'never' to 'always'.\(^7\) In a randomized controlled trial (RCT) evaluating an intervention to increase guideline implementation (n=113), adherence was assessed with semi-structured treatment recording forms. These had to be completed by the physical therapists themselves for each patient with low back pain.\(^8,9\) The three different methods found different levels of adherence. In the first survey, 66% of the respondents confirmed that they were applying the guideline. In the second survey, 36% of the respondents indicated that they were applying the guideline regularly, 22% said they did so usually, and 3% always. In the RCT, full adherence was found in 30% of the treatments before, and in 42% of the treatments after the intervention.

Measurements of practitioners' performance must ultimately rely on measures that are valid, reliable, inexpensive and manageable.\(^10\) Although self-reportage is a practical method to measure practice performance on a large scale, it seems to overestimate guideline adherence.\(^11\) This may be due to social desirability\(^11,12\) and, as demonstrated in health promotion research, to a tendency to overestimate performance in the case of complex behaviours.\(^13-17\) Semi-structured recording forms, although also inexpensive and manageable, might not measure compliance correctly, because they may be inconsistently completed, as they come on top of the practitioners' own treatment records.\(^18\) Moreover, just as with medical record abstractions,\(^10\) it might be problematic to achieve a sufficient case mix (reflecting clinical complexity), which is required in studies of practice quality assessment.\(^10\) Measurement by direct observation is
difficult to apply, especially in large samples. It is expensive and time-consuming, is potentially subject to a Hawthorne effect (practitioners performing better under observation) and there is an ethical problem linked to informed consent. Standardized patients, that is, actors playing the roles of patients avoid the Hawthorne effect and the ethical problem, but this method is also very expensive and time-consuming, as it demands trained actors who have to visit several practitioners. Medical record abstractions have similar restrictions, because they require skilled experts to collect the data. Moreover, they do not guarantee a sufficient case-mix, they are liable to recording bias (doctors recording less than is performed) and, despite having frequently been used in medical quality research, they have been found to underestimate the quality of medical practice.

Vignettes seem to offer a promising alternative for the assessment of practitioners’ performance. They consist of ‘text, images or other forms of stimuli to which research participants are asked to respond’. Vignettes in the form of written case simulations are inexpensive and manageable, and offer the opportunity to manipulate several variables and to ensure a sufficient case-mix. They have been used in a variety of settings, including physical therapy. In spite of this, few studies have been performed to determine their validity and reliability in a doctor’s practice. These few studies have shown that clinical vignettes are a suitable means for measuring clinical performance. Within the physical therapy literature, however, not a single validation study of clinical vignettes could be traced.

To fill this gap, the present study assessed the criterion validity of using clinical vignettes to evaluate Dutch physical therapists’ guideline adherence. Taking the guideline for low back pain as an example, clinical paper-and-pen vignettes, representing a set of case simulations, were developed. Whenever possible, the recommendations for their construction were complied with. Their validity was tested among a sample of physical therapists who had already completed semi-structured treatment recording forms within the RCT referred to above.

Methods
In the ideal situation, the validity of an instrument is compared with a measure that is known as a gold standard. As no such gold standard was available for the present study, we opted for the best adherence measure that was available the semi-structured recording forms developed as part of the RCT. Although their validity is not exactly known, they are assumed to be more valid than self-reportage and also suitable to measure guideline adherence in larger groups of respondents.

Design and population
The sample for the validation study consisted of 113 primary care physical therapists who had participated in an earlier intervention RCT (May 2001–December 2002) that intended to enhance
adherence to the guideline for low back pain (see Figure 1). To assess guideline adherence in this RCT, the physical therapists had been instructed to complete semi-structured treatment recording forms on a biweekly basis for all treatment sessions of all patients included. At the end of this study, 85 physical therapists had completed one or more recording forms.

Figure 1. Study design

In June 2003, all 113 physical therapists who participated in the RCT were invited by telephone to participate in a second study, a survey that used vignettes to assess guideline adherence. Of this original sample, 72 physical therapists agreed to participate. The vignettes were sent to them in July 2003, followed by a reminder 1 month later. After 3 months, 39 of the participants had completed and returned the vignettes. After matching the responses of both studies, recording forms as well as vignettes were found to be available for 34 physical therapists. Only this group was included in the present validation study.

Developing the vignettes
Four vignettes were developed for the survey using the Dutch guideline for low back pain as a framework. This guideline describes the diagnostic and therapeutic actions physical therapists should perform when faced with patients suffering from non-specific low back pain (see Table 1).
This diagnosis has been defined as 'low back pain without a specified physical cause (e.g. nerve root compression, trauma, inflammatory process, tumour)'\(^5\) The most important physiotherapeutic decisions are formulated in terms of activities and participation (ICF–WHO).\(^34\)

In order to link them to real practice situations,\(^26\) the vignettes were derived from case studies from the first author's own practice (see Table 1). Vignette I involved a patient suffering from a lumbar radicular syndrome, which, according to the guideline, is a form of specific low back pain. Vignette II described a patient with non-specific low back pain and a normal recovery process. Vignette III portrayed a patient with non-specific low back pain and an actual delay in the recovery process. Vignette IV concerned a patient with non-specific low back pain and an imminent delay in the recovery process. The four vignettes covered the various guideline aspects and should therefore lead to distinctive additional diagnostics, treatment objectives, treatment strategies, numbers of sessions and information provided (see Table 1). The format of the vignettes (in terms of the length of the case descriptions) corresponded with the recommendations by Peabody et al.\(^10\) and was comparable to formats that have been used in earlier vignette studies.\(^27\ 35\)

To assess adherence to the six most specific guideline recommendations, seven questions were formulated, asking the physical therapists (1) whether they would contact the doctor who had referred the patient to them, (2) whether they thought further diagnostic activities were necessary, (3) what these diagnostics should consist of, (4) what treatment objectives they would formulate, (5) what treatment strategies they would choose, (6) how many treatment sessions they were expecting to offer, and (7) what information they would provide to the patient (for details, see Table 1).

The vignettes were reviewed\(^20\ 26\) by two experts on the guideline for low back pain, who assessed their content and the criteria for determining guideline adherence, and by two communication experts, who assessed factors like readability and comprehensibility. The experts recommended the use of answering cues for the questions about treatment objectives and information provision. These answering cues were formulated, and, after a further review by the experts, added to the vignettes.

**Pre-testing the vignettes**

Two versions of all four vignettes were pre-tested\(^26\) among a separate group of 35 primary care physical therapists, of whom 17 completed the version with only open-ended questions, and the other 18 the version with the answering cues. The participants were asked to evaluate the completeness of the information provided, the representativeness of the vignettes for daily practice, and the readability and comprehensibility of the vignettes.\(^36\ 37\) In addition, the pretest provided information about the time that was needed to answer the questions on the vignettes.
Table 1. Guideline recommendations, operationalization, scoring criteria and compliance rates for recording forms and vignettes

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Recording forms</th>
<th>Paper-and-pencil vignettes</th>
<th>Scoring (points)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operationalization</td>
<td>Scoring</td>
<td>Operationalization</td>
</tr>
<tr>
<td>1. Contact doctor in case of specific low back pain</td>
<td>None</td>
<td>1 Question</td>
<td>5-point scale</td>
</tr>
<tr>
<td>2. Additional diagnostics</td>
<td>None</td>
<td>2 Questions</td>
<td>1 dichotomous yes/no</td>
</tr>
<tr>
<td>a) Use questionnaires to assess daily functioning</td>
<td>2 Questions</td>
<td>Final objectives</td>
<td>3 out of 6 answering cues</td>
</tr>
<tr>
<td>b) Assess psychosocial factors that influence recovery process</td>
<td>1 Question</td>
<td>Short-term objectives</td>
<td>5 out of 6 answering cues</td>
</tr>
<tr>
<td>3. Treatment objectives</td>
<td>4 objectives out of 15 answering cues</td>
<td>Open-ended</td>
<td>35 40 40</td>
</tr>
<tr>
<td>a) Enhance knowledge and insight</td>
<td>Unlimited choice of X strategies within 4 categories</td>
<td>1 Question</td>
<td>4 objectives out of 15 answering cues</td>
</tr>
<tr>
<td>b) Improve activities and social participation</td>
<td>1 Question</td>
<td>Open-ended</td>
<td>4 10 10</td>
</tr>
<tr>
<td>c) Improve relevant physiological functions</td>
<td>1 Question</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>25</td>
</tr>
<tr>
<td>d) Improve coping strategies</td>
<td>1 Question</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>25</td>
</tr>
<tr>
<td>4. Treatment strategies</td>
<td>4 topics out of 12 answering cues</td>
<td>1 Question</td>
<td>14 40 40</td>
</tr>
<tr>
<td>a) Provide information and advice</td>
<td>1 Question</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>25</td>
</tr>
<tr>
<td>b) Train physiological functions and activities</td>
<td>Open-ended, self recording</td>
<td>5 answering categories</td>
<td>1-3/4-6/7-9/10-12/12</td>
</tr>
<tr>
<td>5. Number of sessions ≤ 3</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>5 answering categories</td>
</tr>
<tr>
<td>6. Provide the following information</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
<tr>
<td>a) Stay active</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
<tr>
<td>b) Pain does not always mean tissue damage</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
<tr>
<td>c) Low back pain has a favourable prognosis</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
<tr>
<td>d) Practice sports on a regular basis</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
<tr>
<td>e) Perform exercises on a regular basis</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
<tr>
<td>f) Restrict work to actual capacity</td>
<td>Unlimited choice of 32 topics within 9 categories</td>
<td>1 Question</td>
<td>4 topics out of 12 answering cues</td>
</tr>
</tbody>
</table>

Overall adherence 74% (SD=15) 57% (SD=17)

*l = specific low back pain, II = on-specific low back pain, normal recovery, III = non-specific low back pain, actual delay in recovery, IV = nonspecific low back pain, imminent delay in recovery.

The participants found the information provided sufficient and thought that the vignettes were a good representation of daily practice, although some linguistic errors and unclear formulations were noted. The physical therapists saw no difference between vignette III, with the actual delay in the recovery process, and vignette IV with the imminent delay. Nor were there any striking differences in the answers on these two vignettes. Answering the questions on a vignette with answering cues took between 1 and 5 minutes, while a vignette with open-ended questions took between 1 and >10 minutes.
As a result of the pre-test, the contents of vignettes III and IV were reconsidered. We found no clear differences in the guideline recommendations for patients with an actual or imminent delay in their recovery process. Therefore, it was decided to omit vignette IV. With regard to the other three vignettes, we opted for the version with answering cues, because completing the open-ended questions was found to be too time-consuming for the physical therapists, and also more difficult to score for the research team. Finally, the comments of the pre-testers were used to adapt the remaining vignettes.

Scoring the vignettes
All three vignettes were supplied with the same seven questions. To enable statistical analysis of the data, each question was assigned a weighted numeric score (see Table 1). Per vignette, this score depended on the specific recommendations the guideline provided for the particular case described. For vignette I, the only applicable recommendation was to contact the doctor who had referred the patient. The most important recommendation in the guideline applying to vignette II is to limit the number of treatment sessions. Other applicable recommendations are enhancing patients' knowledge and insight and providing the advice to stay active. For vignette III, the recommendations are somewhat less specific. They largely duplicate those of vignette II, except that some additional diagnostics are required and that the main objectives should be to enhance activities and social participation. There is no recommendation to limit the number of treatment sessions.

Answers that matched the above recommendations were given the weighted scores, whereas answers that contravened the recommendations were given no points at all. For each vignette, a percentage of guideline adherence was calculated by dividing the actual score by the maximum possible score, and multiplying the result by 100. In addition, for each physical therapist, a mean percentage of overall guideline adherence was calculated by adding up the three percentages per vignette and dividing the total by three. The numeric scores assignment and adherence calculation procedure were also reviewed by guideline experts.

Developing the treatment recording forms
The treatment recording forms had been developed for the RCT to record the main physiotherapeutic decisions regarding patients with nonspecific low back pain. In the RCT, adherence was assessed on the basis of four instead of six guideline recommendations: (1) focusing treatment objectives on the restoration of daily functioning; (2) applying predominantly active treatment strategies while limiting the use of passive interventions; (3) limiting the number of sessions in the case of a normal recovery process; and (4) providing adequate information and advice (for more details, see Table 1).8,9
Scoring the treatment recording forms
In the RCT, recording forms were scored by experts on the basis of the four guideline recommendations. Two experts independently assessed the recording forms. If these reviewers disagreed, they tried to reach consensus through deliberation. In the case of persistent disagreement, a third expert made the final decision.\(^8,9\) Adherence to the recommendations resulted in 25 points for each of the four, non-adherence in 0 points, which resulted in a 0, 25, 50, 75 or 100% adherence per recording form. For physical therapists who completed more than one form, a mean adherence score was calculated by adding the percentages per form and dividing this total by the number of forms they had sent in.

Statistical analysis
Descriptive statistics were used to calculate the percentage of guideline adherence for both the vignettes and the semi-structured recording forms. Because of the small sample size (n≤50), normality was checked for with the Shapiro–Wilks test (two-tailed,\(\alpha=0.05\)). As the test result was not significant (\(P=0.137\)), Spearman’s rank correlation (\(r_s\)) was used\(^3^3\) to assess the criterion validity for both the mean adherence score for the three vignettes and the individual adherence scores for each vignette. Because of the expected positive correlation, one-tailed analyses were used, with \(\alpha=0.05\). Cohen’s classification for behavioural sciences was applied as a criterion for the effect size of the correlation: \(r_s = 0.10\), small; \(r_s = 0.30\), medium; \(r_s = 0.50\), large.\(^3^8\) In line with Vorst,\(^3^9\) Spearman’s correlation should at least have a medium effect size to represent an acceptable criterion validity. All analyses were run in SPSS 11 for Windows.

Results
Characteristics of the participants
The 34 participating physical therapists returned a total of 102 vignettes and 268 recording forms. The mean age of the respondents was 43.2 years (SD=7.6), and 22 (65%) of them were male. They all had been continuously practising for the past 5 years and 25 (73%) of them were practising full-time at the time they completed the vignettes. Their professional experience varied from between 5 and 10 years to 31 years, with 16 physical therapists (47%) having worked for 16–25 years. All respondents were primary care physical therapists, 26 (73%) had their own practice, and 8 were employees.

Adherence
The respondents’ mean guideline adherence according to the vignettes was 57% (SD=17), with a minimum of 31% and a maximum of 74%. Their mean adherence score for the recording forms was 74% (SD=15), ranging from 25% to 92% (see Table 1).
Validity

Spearman's $r_s$ for the mean vignette adherence score and the mean recording form adherence score was 0.31 ($P=0.036$). The correlations between the adherence scores for the individual vignettes and the mean recording form adherence score were $r_s = 0.15$ ($P=0.198$) for vignette I with the specific low back pain, $r_s = 0.17$ ($P=0.168$) for vignette II with the nonspecific low back pain and the normal recovery process and $r_s = 0.16$ ($P=0.175$) for vignette III with the non-specific low back pain and the delayed recovery process (see Table 2).

Table 2: Spearmans' correlation coefficients for adherence scores for paper-and-pencil vignettes

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean adherence score</td>
<td>$r_s$</td>
<td>0.312</td>
<td>0.150</td>
<td>0.170</td>
</tr>
<tr>
<td>Recording forms</td>
<td>($P$)</td>
<td>0.036</td>
<td>0.198</td>
<td>0.168</td>
</tr>
</tbody>
</table>

Discussion

This study assessed the criterion validity of clinical paper-and-pencil vignettes for the measurement of guideline adherence in physical therapy, using the Dutch guideline for low back pain as an example. Three vignettes, representing a set of case simulations for low back pain, were developed in a process meeting most of the recommendations for their construction, in that they reflected clinical complexity, used evidence-based scoring criteria, measured both necessary and unnecessary care, were linked to real practice situations, were examined by experts and were pre-tested among the target group, and in that their external validity had been considered. The criterion validity was assessed within a small but largely representative convenience sample of Dutch physical therapists, by comparing the mean compliance scores on the clinical vignettes (57%) with the mean compliance scores on semi-structured recording forms (74%), which had been used in a previous study among the same population. This resulted in a Spearman's correlation ($r_s$) of 0.31.

Although an $r_s$ of 0.31 seems rather low, according to Cohen's classification, it should be categorized as a medium effect size in behavioural science. In addition, Guilford & Fruchter state that for behavioural science 'the validity coefficient ($r$ with criterion) of a single test may be expected in the range from 0.00 to 0.60, with most indices in the lower half of that range', whereas Cohen (pp. 78–83) refers to Ghiselli to indicate that a validity coefficient of 0.50 is 'the upper limit of predictive effectiveness'. Although the validity of the semistructured recording forms was unknown and these forms can definitely not be perceived as a gold standard, we conclude, given the above criteria and in line with Vorst, that the vignettes should be classified as meeting the minimum requirement for acceptable criterion validity.
Other validation studies of vignettes have found criterion validity values up to $r = 0.65$. These studies typically made use of standardized patients as a gold standard. They compared clinical paper-and-pencil vignettes of these standardized patients with either the medical records of their actual treatment or with these patients' own reports of their actual visit. Sandvik found no difference in the number of actions the doctors actually performed and the actions they claimed to perform on the basis of the vignettes. Peabody et al. concluded that 'vignettes are a valid and comprehensive method that directly focuses on the process of care provided in actual clinical practice.' The close correspondence in these studies between the patients portrayed in the vignettes and the standardized patients who actually consulted the doctors may have contributed greatly to the high correlations found, compared with that in the present study. However, the same similarity makes it more difficult to generalize the data, a commonly expressed criticism of paper-and-pencil vignettes. In the present study, the patients described in the vignettes were in no way related to the patients for whom the semi-structured recording forms had been completed. This may have decreased the criterion validity, but may also have increased the generalizability of the present results. Nevertheless, a further validation of the present vignettes could certainly benefit from the use of standardized patients.

In contrast to the mean vignette adherence score, the correlations between the adherence scores for the individual vignettes and the mean recording forms adherence score were quite low. This seems to stress the necessity of using an adequate case-mix when constructing clinical vignettes. Although the case-mix used in the present study adequately cover the guideline recommendations, future validation studies should nevertheless consider portraying a greater variety of patients. Such a more diverse case-mix might better reflect real practice, and thus enhance the collective validity.

Furthermore, the positive correlation that was found for the adherence score on vignette 1 (specific low back pain) was rather unexpected, as the recording form study was supposed to have included only patients with non-specific low back pain. However, after inclusion, some of the patients may have been re-diagnosed as having specific low back pain, which may have led to the positive correlation with vignette 1. On the other hand, this positive association might also reflect a general tendency of guideline adherence.

Another notable finding is the difference in guideline adherence between the recording form study (74%) and the clinical vignette study (57%). This may be partly due to the time span of 7–8 months between the two measurements, which is considerably longer than in other vignette validation studies. It is possible that the physical therapists had indeed changed their actual behaviour, that is, lowered their adherence to the guideline, during this period of time. On the other hand, the difference in adherence rates may also be a result of differences in measurement properties.
The adherence rate found in the recording form study seems to be rather high compared with what was found by other adherence studies. The rather leading formulations used in the recording forms may have induced physical therapists to follow the guideline recommendations more strictly than they would normally have done, resulting in overestimation of guideline adherence. The fact that the recording form study applied only four instead of six guideline recommendations to assess compliance may have been an additional source of overestimation.

Although most of the recommendations for the development of vignettes were met, some open-ended questions were changed to questions with answering cues, in response to the experts’ advice. According to Sandvik, the use of answering cues in vignettes could result in an overestimation of guideline adherence. In the pre-test used in present study, however, the addition of answering cues turned out to considerably reduce the time physical therapists needed to complete the vignettes. Also, the answering cues were found to substantially facilitate the scoring procedure for the research team, as the open-ended questions proved to be sensitive to various interpretation biases. In our opinion, it is doubtful whether open-ended questions that require complex answers measure the physical therapists’ guideline adherence or their recording skills. In that case, the use of answering cues may be preferable.

Finally, although paper-and-pencil vignettes seem to be a promising method to measure guideline adherence among large samples of physical therapists, the method lacks the option to follow the course of treatment. This shortcoming might be solved by the use of ‘longitudinal vignettes’ that describe patients during the course of treatment and recovery. Peabody et al. demonstrated the benefits of computerized vignettes in this respect. Therefore, further research into the validity of vignettes in physical therapy should take the use of such computerized vignettes into consideration.

In sum, this first validation study of clinical paper-and-pen vignettes to measure guideline adherence in physical therapy practice revealed that, given an adequate case-mix, vignettes are of an acceptable validity, and represent an inexpensive and manageable instrument that can be used among large groups of physical therapists.

Further validation studies could benefit from the use of standardized patients as a gold standard, a more diverse case mix to better reflect real physical therapy practice, and the inclusion of longitudinal vignettes that cover the patients’ course of treatment. The experiences of the present study may be used as a valuable starting-point for these purposes.
References


3. de Visser D, Elvers H, Oostendorp RAB. Vakbekwaam en wetenschappelijk verantwoord handelen, haalbaar of ... (Acting professionally and evidence based, is it achievable or . .) Issue 2001;(2):2–4.


Chapter 3

Adherence to clinical practice guidelines for low back pain in physical therapy: Do patients benefit?

Geert Rutten
Saskia Degen
Erik Hendriks
Jozé Braspenning
Janneke Harting
Rob Oostendorp

Published in: Phys Ther 2010; 90: 1111-1122.
Abstract

Background: Various guidelines for the management of low back pain have been developed to enhance the effectiveness and efficiency of care. Evidence that guideline-adherent care results in better health outcomes, however, is not conclusive.

Objective: The main objective of this study was to assess whether a higher percentage of adherence to the Dutch physical and manual therapy guidelines for low back pain is related to improved outcomes. The study further explored whether this relationship differs for the individual steps of the process of care and for distinct subgroups of patients.

Design: This was an observational prospective cohort study (2005–2006) in the Netherlands that included a sample of 61 private practice therapists and 145 patients.

Methods: Therapists recorded the process of care and the number of treatment sessions in Web-based patient files. Guideline adherence was assessed using quality indicators. Physical functioning was measured by the Dutch version of the Quebec Back Pain and Disability Scale, and average pain was measured with a visual analog scale. Relationships between the percentage of guideline adherence and outcomes of care were evaluated with regression analyses.

Results: Higher percentages of adherence were associated with fewer functional limitations (β=-0.21, P=.023) and fewer treatment sessions (β=-0.27, P=.005).

Limitations: The relatively small self-selected sample might limit external validity, but it is not expected that the small sample greatly influenced the internal validity of the study. Larger samples are required to enable adequate subgroup analyses.

Conclusions: The results indicate that higher percentages of guideline adherence are related to better improvement of physical functioning and to a lower utilization of care. A proper assessment of the relationship between the process of physical therapy care and outcomes may require a comprehensive set of process indicators to measure guideline adherence.
Introduction
Low back pain can be seen as a largely self-limiting problem, considering the improvements in pain and disability in the first 3 months after onset. Once the back pain becomes recurrent or chronic, it is associated with long-term disability and, consequently, with a significant socioeconomic burden: about 80% of health care and social costs related to low back pain are attributed to the 10% of patients with chronic pain and disability. The management of low back pain in primary care varies substantially among medical and health care professionals within a country, as well as among countries. Various guidelines for the management of low back pain have been developed to enhance the effectiveness and efficiency of care. Because these guidelines are based on a combination of evidence and consensus among experts, it is assumed that guideline adherence will improve the quality of care. However, a review of studies in professions allied to medicine showed only limited evidence for a favourable relationship between guideline adherence and health outcomes and could not draw firm conclusions due to the poor methods of the studies. Another review that assessed the effectiveness of tailored interventions to change physicians’ performance and the effects on health outcomes found no consistency in the results and concluded that the effect remained uncertain. Despite these findings, there is some evidence that greater guideline adherence in the treatment of patients with low back pain might be advantageous from a cost perspective.

The number of studies examining the relationship between guideline adherence and clinical outcomes so far has been limited. In addition, previous studies used a limited number of criteria to evaluate the management of low back pain by physical therapists, for instance, 4 criteria focusing on treatment aim, number of sessions, use of active interventions, and providing adequate advice or the single criterion of whether an activating treatment is applied. However, the comprehensiveness of the physical therapy process of care for patients with low back pain generally leads to a large number of guideline recommendations. Translation of these guideline recommendations into a set of quality indicators makes the various aspects of the process of care measurable and, therefore, might yield a more valid impression of routine physical therapist practice. Consequently, using a set of quality indicators might enable a more legitimate assessment of the relationship between guideline adherence and the effectiveness and utilization of care.

The main objective of the present study was to assess whether a higher percentage of adherence to the recommendations of the Dutch physical therapy guideline for nonspecific low back pain and the Dutch manual therapy guideline for nonspecific low back pain (subsequently referred to as low back pain) is related to improved outcomes of care. As the primary focus of the guidelines is to restore physical functioning and social participation, we expected that a higher percentage of adherence to the guideline recommendations, in the short term, would be especially associated with improved physical functioning and, to a lesser extent, with a decrease in pain.
The second objective was to explore whether this relationship was equal for different subgroups of patients. Because another focal point of the guidelines is the role of psychosocial factors that could impede patients' recovery process, we hypothesized that in particular patients with chronic low back pain would benefit from higher levels of guideline-adherent care. The final objective was to explore to what extent the level of adherence to the individual steps in the process of care, distinguished in the guidelines, differed in their relationship to health-related outcomes.

Method

Study design and study sample

Data were collected in an observational prospective cohort study from September 2005 to February 2006. Private practices in the south of the Netherlands were invited to participate if they had a contract with the commissioning health insurance company, had a minimum of 2,000 treatment sessions a year, and employed at least 3 physical therapists. Invitations were sent to 442 eligible practices (Figure). After attending a general information meeting, during which the aim and design of the study were explained and a Web-based patient documentation system (Web-based EPD) was demonstrated, 233 physical therapists and manual physical therapists from 122 practices were preregistered for participation. Therapists were eligible for participation if they were willing to include at least 5 consecutive patients in the study during the enrolment period. They were instructed to ask the first patient of each week to participate and to encourage the patients to complete the questionnaires used to measure the health-related outcomes.

Of the 98 physical therapists who started to record the care provided to patients, 77 produced 231 complete patient records. The final sample consisted of 61 physical therapists and 145 patients for whom a complete patient record was available and who additionally completed the outcome questionnaires at baseline (i.e., before treatment) and after treatment. Reasons for non-response and dropout are listed in the Figure. Patients who enrolled in the study had been referred for physical therapy intervention by a general practitioner or a medical specialist due to a primary or recurrent episode of low back pain. No rigorous inclusion criteria concerning the low back pain were applied in order to include a group of patients who reflected the nonspecific low back pain population in daily practice. The patients were diagnosed with nonspecific low back pain by the physical therapists. Nonspecific low back pain is defined as low back pain without a specified physical cause (e.g., nerve root compression, trauma, infection, tumour). Patients were included only if they were able to read and understand Dutch. Patients received verbal and written information on all aspects of the study and gave written consent at their inclusion.
Invited to participate
442 physical therapy practices

Pre-registered
233 physical therapists (100%)

Started recording patients
98 therapists (42.1%)

Completed recording patients
77 therapists (33.0%)
231 patient records

Study sample
(completed patient records and completed outcome measures)
61 therapists (26.2%)
145 patients

Nonresponse
Not interested
320 physical therapy practices

Nonresponse
Not started
- Lack of time
- Other priorities
- Software problems

Physical therapist dropouts
Not completed / not eligible
- Time investment too costly
- Problems using web-based system
- Forgot to record patients
- Included patients with specific low back pain

Patient dropouts
No outcome measurement
- Physical therapist decided not to use measurement instruments
- Physical therapist forgot posttreatment measurement
- Patient did not complete posttreatment measurement

Study sample
(completed patient records and completed outcome measures)
61 therapists (26.2%)
145 patients

Flow chart of participants' responses and reasons for nonresponse and drop out
**Measurement**

The use of quality indicators to measure the performance of health care professionals is a common approach in various medical disciplines.\(^{18,19}\) We, therefore, developed a set of quality indicators to measure the percentage of guideline adherence for the present study. Quality indicators have been defined as measurable elements of practice performance for which there is evidence or consensus that they can be used to assess the quality, and thus change the quality, of care provided.\(^{20}\) They are related to structures, processes, or outcomes of care.\(^{21}\) The present study focused on process and outcome indicators, which were based on the recommendations for each of the steps of the diagnostic and treatment process of care as described in the Dutch physical therapy and manual therapy guidelines for low back pain (see Appendix 1. The set was developed in an iterative consensus procedure (for a detailed description, see Appendix 2). The application of such a procedure is expected to result in a set of indicators with content validity.\(^{14}\) Various quality requirements, such as relevance, reliability, and feasibility, were taken into account.\(^{14,16}\)

Process indicators were directly derived from a Web-based EPD, which was developed for this purpose (see Appendix 2) because the quality of ordinary patient registration generally is poor.\(^{22,23}\) The EPD replaced the usual patient file of the participating physical therapists. During the patients' visits, the therapists recorded their actual proceedings for the diagnostic and treatment process (see Appendix 1). Algorithms that followed the decision process of the guidelines were formulated for every indicator in order to transform the data on the process of care recorded in the EPD into indicator scores.\(^{14}\) One point was scored for each process indicator that was adhered to. The overall percentage of guideline adherence and the percentages of adherence for the various steps of the therapeutic process were calculated using the "patient average method".\(^{24}\) In this method, the percentage of indicators that are successfully met for each patient are computed. These scores then are averaged across all patients. The automated scoring procedure, implemented through the Web-based EPD, was assumed to avoid issues of intraobserver and interobserver reliability.\(^{14}\)

The outcome indicator of physical functioning was measured by means of the Dutch version of the Quebec Back Pain and Disability Scale (QBPDS), a 20-item self-report questionnaire with a score ranging from 0 to 100.\(^{25}\) A higher score on the QBPDS means more limitations. The QBPDS has construct validity (\(r=.80-.91\) with the Roland Disability Questionnaire) and test-retest reliability (intraclass correlation coefficient=.90) for patients with chronic low back pain.\(^ {25}\) Average pain was measured with a visual analog scale (VAS),\(^ {26}\) which scored the level of pain in millimeters, with 0 mm for no pain and 100 mm for unbearable pain. The VAS has construct validity (\(r=.91\) with a numerical pain rating scale)\(^ {27}\) and high test-retest reliability (intraclass correlation coefficient=.97).\(^ {28}\) The number of treatment sessions was scored as reported in the Web-based EPD.
Demographic variables of the physical therapists, such as age, sex, practice experience, and work situation, were recorded in the EPD. The same was done with the patients' age, sex, employment situation, educational level, and living conditions. Because the transition from acute to persistent low back pain is supposed to be influenced by psychosocial factors such as coping and catastrophizing, the Pain Coping and Cognition List (PCCL) was included in the EPD. The PCCL is a 42-item self-report questionnaire, in Dutch, developed to assess pain coping, internal and external pain control perceptions, and catastrophizing. The score per subscale ranges from 1 to 6. A higher score on a subscale means a higher extent of pain coping, internal or external pain control perceptions, or catastrophizing. The internal consistency of the 4 subscales is high (Cronbach's alpha=.80-.84). Based on correlations with various other measurement instruments for these constructs (r≥.30), the PCCL shows acceptable validity.

Data analysis
Descriptive statistics were used to assess the percentage of overall adherence and the percentage of adherence for each step of the diagnostic and treatment processes. The effectiveness of the treatment was assessed by comparing the pretreatment and posttreatment scores for the outcome indicators using a paired-samples t test.

The relationship between the percentage of guideline adherence and outcome indicators was determined with multiple linear regression analyses. To avoid overfitting of the model due to the relatively small sample, we applied the full model approach, meaning that all independent variables were entered in the model and that no exclusion of variables was allowed on the basis of statistical calculations. To avoid bias due to regression to the mean, instead of using change scores as dependent variables, the use of analysis of covariance has been recommended. In analysis of covariance, posttreatment scores are included as dependent variables and pretreatment scores are entered as covariates.

The percentage of guideline adherence was entered as the main independent variable. The pretreatment scores on 2 of the outcome variables, the QBPDS and the VAS, were included as covariates, along with other variables that have repeatedly been identified as prognostic factors for health outcomes, persistent disability, or the transition from acute to persistent disability due to low back pain, that is: the duration of the current episode of low back pain (<1 week, >5 years), the extent of catastrophizing, the patient's age, and having a paid job (yes/no). Because clinical expertise has been shown to be related to better diagnostic and treatment success, the extent of the therapist's practice experience (<5 years, >30 years) also was included. As recommended in the guidelines, we also added the psychosocial variables of external pain control perceptions and coping. A similar procedure was followed for the number of treatment sessions as the third outcome variable. Based on previous findings, external pain control perceptions, coping, and having a paid job were excluded from the model, and having
received previous physical therapy treatment (yes/no), the patient's sex, and the therapist's working hours (full-time, part-time) were included.

The association between the percentage adherence to the various steps of the care process and the outcome indicators was explored in regression analyses for every step separately. Posttreatment scores on the outcome indicators were used as the dependent variable, and the percentages of guideline adherence for each of the steps as the independent variable. The pretreatment scores on health-related outcomes were entered as a covariate in the analyses. The limited number of cases in the subgroups made us use nonparametric statistics to further explore the association between the percentage of overall guideline adherence and the outcome indicators for the subgroups of patients with acute (6 weeks), subacute (6-12 weeks), and chronic (12 weeks) low back pain. Thus, our analyses were based on the median percentage of guideline adherence, and we used Spearman correlations instead of multiple linear regression analyses to assess the relationship between the percentage of guideline adherence and the absolute change scores of the health outcomes. All statistical analyses were performed using SPSS version 15 for Windows. Cohen's classification for the behavioural sciences was used as a criterion for the effect size of the correlation $r_s = .10$ is small, $r_s = .30$ is medium, and $r_s = .50$ is large.

Role of the funding source
The study was funded by CZ, a health insurance company in the Netherlands.

Results
Responses and characteristics of participants
The physical therapists (n=61) were an average of 42 years of age, 67% were male, and 66% owned their practice. The median practice experience was 16 to 20 years. The mean age of the patients (n=145) was 48 years, 51% were male, and 57% had a lower-to-average educational level. They were diagnosed by the physical therapists as having acute (50.4%), subacute (23.3%), or chronic (24.8%) low back pain. The remaining 1.5% of the patients could not be classified.

Adherence
The mean overall guideline adherence was 67.2% (Table 1), meaning that, on average, physical therapists had positive scores on nearly 17 of the 25 indicators per patient. Adherence rates were less than 55% in 8.8% of the cases and higher than 75% in 34.3% of the cases. The percentage of adherence ranged from 2.2% to 99.3% for the individual steps of the diagnostic process and from 47.5% to 88.1% for the individual steps of the therapeutic process. We did not find higher percentages of adherence for those steps of the care process that included indicators with higher levels of evidence.
Table 1. Individual quality indicators per step of the process of care, their level of evidence, and the mean percentage of adherence for the entire therapeutic process and for the individual steps

<table>
<thead>
<tr>
<th>Entire therapeutic process</th>
<th>Level of evidence&lt;sup&gt;a&lt;/sup&gt;</th>
<th>% Adherence (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phases of therapeutic process individual steps (no. of indicators)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Referral (1)</td>
<td>IV</td>
<td>2.2 (14.7)</td>
</tr>
<tr>
<td>Contact physician if information on referral is lacking (e.g. reason for referral, medical examination data, indication for physical therapy or manual therapy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 History taking (7)</td>
<td>IV</td>
<td>60.5 (10.1)</td>
</tr>
<tr>
<td>Assessment of patient's specific request for help</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Use of ICF&lt;sup&gt;b&lt;/sup&gt;</td>
<td>III</td>
<td></td>
</tr>
<tr>
<td>Use of measurement instrument</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>Assessment of low back pain course</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Assessment of &quot;yellow flags&quot; and coping strategies</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Presence of &quot;red flags&quot;</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Assessment of supplementary treatment</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>3 Patient profile (2)</td>
<td>II</td>
<td>99.3 (6.0)</td>
</tr>
<tr>
<td>Assessment of patient profile</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>Contact physician in case of contra-indications</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>4 Examination objectives (1)</td>
<td>IV</td>
<td>32.8 (47.1)</td>
</tr>
<tr>
<td>Examination objectives in agreement with patient profile</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>5 Examination (1)</td>
<td>II-IV</td>
<td>45.5 (50.0)</td>
</tr>
<tr>
<td>Examination performed in agreement with objectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Analysis (3)</td>
<td>IV</td>
<td>91.5 (14.6)</td>
</tr>
<tr>
<td>Assessment of indication for physical therapy</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Indication of prognosis</td>
<td>III</td>
<td></td>
</tr>
<tr>
<td>Referral to physician in case of insufficient results or if no results are expected</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Treatment phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Treatment plan (2)</td>
<td>III</td>
<td>47.5 (33.4)</td>
</tr>
<tr>
<td>Treatment plan in agreement with patient profile</td>
<td>III</td>
<td></td>
</tr>
<tr>
<td>Patient participation in treatment plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Treatment (2)</td>
<td>I-II</td>
<td>55.1 (38.0)</td>
</tr>
<tr>
<td>Treatment strategies in agreement with patient profile</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>No of sessions in agreement with patient profile</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>9 Evaluation (4)</td>
<td>IV</td>
<td>88.1 (19.9)</td>
</tr>
<tr>
<td>Regular/systematic evaluation of treatment objectives</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Adjustment of treatment objectives, if necessary,</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>contact physician in case of insufficient results</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>final evaluation on the basis of treatment objectives (with measurement instruments)</td>
<td>IV(II)</td>
<td></td>
</tr>
<tr>
<td>10 Closure (2)</td>
<td>IV</td>
<td>73.4 (31.5)</td>
</tr>
<tr>
<td>Written report to referring physician</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Arrangement of aftercare</td>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Level I = systematic review or > 2 high-quality randomized controlled trials (RCTs), level II = 2 high-quality RCTs, level III = 1 high-quality noncontrolled study, level IV = expert opinion

<sup>b</sup> ICF = International Classification of Functioning, Disability and Health
Table 2. Association between outcome indicators and percentage of guideline adherence with correction for other potentially influential factors

<table>
<thead>
<tr>
<th>Dependent/independent variables</th>
<th>QBPD5 (R² = 21.2%)</th>
<th>VAS average pain (R² = 7.2%)</th>
<th>Number of treatment sessions (R² = 18.7%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>β</td>
<td>p</td>
</tr>
<tr>
<td>Constant</td>
<td>10.85</td>
<td>-0.21 **</td>
<td>0.023</td>
</tr>
<tr>
<td>Percentage guideline-adherence</td>
<td>-0.35</td>
<td>-0.21 **</td>
<td>0.65, -0.05</td>
</tr>
<tr>
<td>at baseline (0-100)</td>
<td>0.21</td>
<td>0.22 **</td>
<td>0.01, 0.41</td>
</tr>
<tr>
<td>QBPDS at baseline (0-100)</td>
<td>0.01</td>
<td>0.02</td>
<td>-0.13, 0.16</td>
</tr>
<tr>
<td>VAS-pain at baseline (0-100)</td>
<td>0.68</td>
<td>0.08</td>
<td>-0.82, 2.18</td>
</tr>
<tr>
<td>Practice experience PT (&lt;5 y ; &gt;30 y)</td>
<td>0.34</td>
<td>0.05</td>
<td>-1.00, 1.68</td>
</tr>
<tr>
<td>Duration of current LBP-episode (&lt;1 week; &gt;5 y)</td>
<td>0.13</td>
<td>0.13</td>
<td>-0.13, 0.40</td>
</tr>
<tr>
<td>Patient's age</td>
<td>3.02</td>
<td>0.17</td>
<td>0.105</td>
</tr>
<tr>
<td>Catastrophizing (1-6)</td>
<td>-0.84</td>
<td>-0.03</td>
<td>0.827</td>
</tr>
<tr>
<td>Paid job (yes/no)</td>
<td>0.70</td>
<td>0.04</td>
<td>0.682</td>
</tr>
<tr>
<td>External pain control perception (1-6)</td>
<td>1.75</td>
<td>0.10</td>
<td>0.297</td>
</tr>
</tbody>
</table>

* PT = physical therapist, QBPDS = Quebec Back Pain and Disability Scale, VAS = visual analogue scale, LBP = low back pain, 95% CI=95% confidence interval.

** ρ < .10; ** ρ < 0.05; *** ρ < .01
Outcome indicators
The differences between pretreatment and posttreatment scores for both of the health-related outcomes were statistically significant. The mean pretreatment and posttreatment scores for the QBPDS were 40.5 and 21.3, respectively, and the VAS scores for average pain were 56.9 and 22.9, respectively. The utilization of care was expressed by a mean number of treatment sessions of 6.70 (SD=3.2).

Associations between process and outcome indicators
Across the entire study sample, a higher percentage of guideline adherent care was negatively related to the posttreatment score on the QBPDS (P=.02; Table 2). That is, a higher percentage of guideline adherence resulted in fewer limitations in functioning after the treatment episode. No such association was observed for VAS scores for average pain (P=.50). A higher percentage of guideline adherence was negatively related to the number of treatment sessions (P=.00), indicating that a higher level of guideline-adherent care was associated with lower utilization.

In terms of the individual steps of the process of care, higher percentages of adherence for analysis (P=.04) and evaluation (P=.00; Table 3) were related to fewer limitations in functioning posttreatment. No such associations were observed for VAS scores for average pain. Higher adherence rates for treatment plan (P=.05), treatment (P=.00), and evaluation (P=.01) were associated with lower utilization.

Table 3. Associations between percentage of adherence to the individual steps of the process of care and outcome indicators

<table>
<thead>
<tr>
<th>Steps of the process</th>
<th>Outcome indicators</th>
<th>( \beta )</th>
<th>( \beta )</th>
<th>( \beta )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>QBPDS</td>
<td>VAS average pain(^a)</td>
<td>No. of sessions</td>
<td></td>
</tr>
<tr>
<td>Diagnostic phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Referral</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>History taking</td>
<td>-0.16*</td>
<td>-0.08</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Patient profile</td>
<td>0.02</td>
<td>0.08</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Examination objectives</td>
<td>-0.03</td>
<td>-0.06</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>-0.05</td>
<td>0.03</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Analysis</td>
<td>-0.17**</td>
<td>-0.01</td>
<td>-0.02</td>
<td></td>
</tr>
<tr>
<td>Treatment phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment plan</td>
<td>0.01</td>
<td>-0.11</td>
<td>-0.02**</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>-0.08</td>
<td>0.01</td>
<td>-0.03*</td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>-0.30***</td>
<td>-0.11</td>
<td>-0.03**</td>
<td></td>
</tr>
<tr>
<td>Closure</td>
<td>-0.03</td>
<td>0.00</td>
<td>0.02*</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Regression coefficients (\( \beta \)) corrected for baseline scores on outcome indicators. QBPDS=Quebec Back Pain and Disability Scale, VAS=visual analog scale. \( * p < .10, ** p < .05, *** p < .01, ^* p < .001 \)
We found no difference in the median percentage of guideline adherence (68%; Table 4) among the 3 subgroups of patients with acute (n=69), subacute (n=32), and chronic (n=34) low back pain. The relationship between the percentage of guideline adherence and outcome indicators was strongest for patients with chronic low back pain, showing a medium to large negative correlation with the posttreatment scores on the QBPDS ($r_s=-.38; P<.05$), the VAS scores for average pain ($r_s=-.45; P<.01$), and the number of treatment sessions ($r_s=-.37; P<.05$). For the subgroup with acute low back pain, we found only a medium negative correlation ($r_s=-.30; P<.05$) between the percentage of guideline adherence and the number of visits. All negative correlations indicate that higher percentages of guideline adherence were associated with fewer limitations in functioning, lower levels of pain posttreatment, or fewer visits. For the subgroup with subacute low back pain, no significant correlations were found.

<table>
<thead>
<tr>
<th>Subgroups</th>
<th>Age (Mean, SD)</th>
<th>Gender (%male)</th>
<th>Employment status (% paid job)</th>
<th>Median % Adherence</th>
<th>Correlation of % adherence and difference scores on outcome indicators</th>
<th>QBPDS</th>
<th>VAS average pain</th>
<th>No. of sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute low back pain (&lt; 6 weeks) n = 69</td>
<td>46.3 (15.7)</td>
<td>60</td>
<td>62</td>
<td>68</td>
<td>$-.20$</td>
<td>$-.06$</td>
<td>$-.30^*$</td>
<td></td>
</tr>
<tr>
<td>Sub-acute low back pain (6 - 12 weeks) n = 32</td>
<td>48.2 (12.5)</td>
<td>42</td>
<td>66</td>
<td>68</td>
<td>$-.15$</td>
<td>$-.14$</td>
<td>$-.28$</td>
<td></td>
</tr>
<tr>
<td>Chronic low back pain (&gt; 12 weeks) n = 34</td>
<td>51.4 (12.3)</td>
<td>44</td>
<td>44</td>
<td>68</td>
<td>$-.38^*$</td>
<td>$-.45^{**}$</td>
<td>$-.37^*$</td>
<td></td>
</tr>
</tbody>
</table>

*Number of patients for subgroups do not add up to number of total group due to missing information.
QBPDS=Quebec Back Pain and Disability Scale, VAS=visual analog scale. * $p < .05$; ** $p < .01$

Discussion
This study examined the association between adherence to the Dutch physical therapy and manual therapy guidelines for low back pain and 3 short-term outcomes: the patient’s physical functioning, level of pain, and the number of treatment sessions per episode of care. The average rate of overall guideline adherence was 67%, and higher percentages of adherence were associated with more favourable posttreatment scores on physical functioning (i.e., greater effectiveness of care) and fewer treatment sessions (i.e., lower utilization of care). It seems reasonable, therefore, to conclude that higher adherence rates contributed to greater efficiency of care. No such association was found between the percentage of guideline adherence and the level of pain. Further explorations indicated that the individual steps of the process of care might differ in their importance for the effectiveness and efficiency of care. Finally, our results suggest that the relationship between guideline adherence rates and treatment outcomes may be different for the different subgroups of patients with low back pain.
This study demonstrates that a higher percentage of adherence to the Dutch guidelines for low back pain is associated with better clinical outcomes. This finding may be attributed to the more comprehensive set of process indicators we used to measure guideline adherence compared with a previous study that also examined this relationship. The set of indicators was informed by all guideline recommendations and processed by means of an iterative consensus procedure with experts and practicing physical therapists to achieve content validity. As a consequence, these indicators may be considered to yield a more detailed and adequate reflection of the complex process of delivering guideline-adherent care. Less detailed assessments in the past may have concealed the actual relationship between physical therapists’ practical performance and health-related outcomes. The use of quality indicators additionally enabled the demonstration of differences in the percentage of adherence to recommendations in the individual steps of the physical therapy process described in the Dutch guidelines, as well as the possibility that these individual steps may not have the same importance for either the effectiveness or the efficiency of care.

A second, and perhaps even more important, explanation for our positive findings may be the relatively high average percentage of adherence (67%) in our study compared with other studies. In this perspective, it can be argued that guideline adherence rates should exceed a certain threshold before guideline adherence can result in improved health-related outcomes. This view is supported by a US study that focused on the relationship to the use of an activating treatment, which is a consistent recommendation in guidelines for low back pain. The US study set the threshold for guideline-adherent care at 75% and observed a larger improvement in terms of pain and disability for patients with low back pain whose care was found to exceed this threshold.

In addition, it can be argued that larger differences in guideline adherence rates are needed to identify a relationship with health-related outcomes. This view is in accordance with the findings of a previous Dutch randomized clinical trial that did not find a difference in improvement of physical functioning or pain between patients cared for by 2 groups of physical therapists who showed a moderate difference of 12% in guideline adherence. The sample size in the present study, however, did not allow us to perform the analyses needed to corroborate these explanations.

In our study, the posttreatment scores for physical functioning and average pain were explained only to a limited extent, despite the inclusion of both the percentage of guideline adherence and the various factors that have been found to be associated with health outcomes of patients with low back pain. First, this finding might be due to the fact that low back pain is a complex problem, with many factors not within the direct reach of physical therapy treatment, thus influencing its onset and prognosis. Second, different patient categories may seriously confound the
assessment of the relationship between guideline adherence rates and health-related outcomes for patients with low back pain. Our subgroup analysis suggested that patients with chronic low back pain may benefit more from guideline-adherent care than patients with acute or subacute low back pain. One explanation for this finding may be the active approach used in the guidelines, which has been shown to be more effective for patients with chronic low back pain.49 Another explanation is that acute low back pain, due to its more favourable natural course,1,50 may have favourable treatment results, irrespective of the focus of the physical therapy approach. However, the internal validity of our subgroup analysis is limited due to potential confounding from uncontrolled covariates. Larger samples are needed to enable the more sophisticated analyses required to properly assess the relationship between guideline adherence and patient outcomes for various subgroups of patients with low back pain.

The favourable association we found between the percentage of guideline adherence and the utilization of care confirms the findings of previous studies.11,13 However, as observed previously,10 the mean number of treatment sessions for patients with acute low back pain still exceeded the recommendation in the guidelines of 2 or 3 treatment sessions that include coaching and advice.6,51 This recommendation was based on the estimation that a large percentage of patients with low back pain would recover spontaneously in 4 to 6 weeks.52 More recent research, however, has demonstrated a less favourable prognosis for low back pain.1,50,53 Consequently, the current recommendation might be too optimistic and may be taken into reconsideration during the current revision of the guidelines.

Two limitations of the study should be discussed. First, the participating therapists were a self-selected sample. Despite an instruction meeting, the availability of a help desk, and an e-mail and telephone reminder, there was a considerable nonresponse and dropout rate: a number of physical therapists did not start recording or did not complete the records they started. Compared with the national data,54 male participants, therapists working full-time, and practice owners were overrepresented in our final sample. Therefore, the external validity of the study may be limited. However, none of these demographic factors were associated with the outcome indicators, and therapists who only recorded the care process did not differ in terms of their average percentage of adherence from physical therapists whose patients also completed all outcome questionnaires. Concerning our primary objective of examining the association between the percentage of guideline adherence and 3 short-term outcomes of care, it seems reasonable, therefore, to assume that the selectivity of the final sample did not greatly influence the internal validity of our study.

Second, apart from the self-selected sample, the external validity of the study may be limited due to the relatively small sample size. A major reason for the low participation rate was the use of a rather extensive EPD. Despite the systematic, iterative consensus procedure we used to assess
the relevance and validity of the set of quality indicators, a full Delphi procedure might further reduce the number of indicators without losing content validity. A reduced number of indicators, in turn, could improve the feasibility of the set, allowing for a more user-friendly EPD that would be more suitable for daily practice. Because a major barrier to start recording the care provided to patients appeared to be the fact that (Web-based) EPDs are not yet standard procedure in private practice physical therapy in the Netherlands, such more convenient EPDs, in turn, may contribute substantially to the larger study samples that are needed to further explore the relationship between guideline adherence rates and health-related outcomes of care.

Keeping in mind these limitations, some practical implications can be suggested. In order to improve the effectiveness and efficiency of care, physical therapists might put effort into improving the steps of the process that relate most strongly to patient outcomes. Our findings indicate that they should primarily engage in a regular evaluation; that is, they should frequently monitor the results of their treatment on health-related outcomes and, if necessary, adjust their treatment objectives or treatment strategies. Second, therapists should plan and implement a treatment that suits the applicable patient profile. In consultation with the patient, they should base their treatment plan and treatment strategies on the findings from the diagnostic phase: whether the low back pain is subacute, acute, or chronic; whether its course is normal or delayed; and whether any delay is associated with psychosocial factors. For instance, patients with acute low back pain and a normal course mostly require only adequate information and advice during a limited number of sessions, whereas patients with chronic low back pain with a delayed course in the presence of psychosocial factors may benefit most from an activating approach and strategies aimed at changing inadequate cognitions and coping strategies during a longer treatment episode. Further recommendations for practice improvement require more profound analyses that yield a better understanding of the relationships between patient outcomes and the individual steps of the process of care. Such analyses, however, require studies with larger samples sizes.

Conclusions
In this study, a higher percentage of adherence to the Dutch physical therapy and manual therapy guidelines for low back pain was related to a better treatment effect with respect to physical functioning and lower utilization of care. Additionally, our findings imply that not every step in the process of care is of equal importance for the effectiveness and the efficiency of care. Larger samples are required to adequately test hypotheses about differences in the relationship between guideline adherence rates and health-related outcomes of care for various subgroups of patients with low back pain. A proper assessment of the relationship between the process of physical therapy care and health-related outcomes may require a comprehensive set of process indicators to measure guideline adherence rates, as only such a set may yield the required valid impression of routine physical therapist practice.
References


### Referral

Reasons for referral, demand of the patient, course of functioning, information from which contraindications for MT can be derived

### History taking

<table>
<thead>
<tr>
<th>Complaints /demand</th>
<th>Present status</th>
<th>Duration of complaints</th>
<th>Coping with complaints</th>
<th>Natural course</th>
<th>Contraindications for MT</th>
</tr>
</thead>
</table>

### Profile Classification

**Patient Profile**  
1a acute, normal course  
1b acute, deviating course  
2a subacute, no “yellow flags”  
3a chronic, coping adequately with complaints  

**Patient Profile**  
2b subacute, “yellow flags”  
3b chronic, coping inadequately with complaints

### Examination objectives

Choosing examination objectives that are in line with the patients’ profile

### Profile examination

**Profile 1a, 1b, 2a, 3a**  
- Inspection, observation posture and movements  
  Primarily functional examination  
  - Joints  
    - Thoracic, lumbar and lumbosacral vertebral column  
    - Pelvis and hips  
  - Muscles  
  - Nerves  
  - Skin  
  Secondarily examination of activities, exploratory neurological examination, if necessary

**Profile 2b, 3b**  
- Inspection, observation of posture and movements  
  Primarily examination of activities  
  Secondarily functional examination  
  - Joints  
  - Muscles  
  - Nerves  
  - Skin

### Analysis

<table>
<thead>
<tr>
<th>Findings consistent/provocative</th>
<th>Indication for MPT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;red flags&quot; b</td>
<td>yes</td>
</tr>
<tr>
<td>&quot;yellow flags&quot;</td>
<td>no</td>
</tr>
<tr>
<td>Contraindications</td>
<td>no</td>
</tr>
</tbody>
</table>

### Indication for MPT?

- Manipulative (strict sense) MT
- Nonmanipulative (general) MT
- Treatment according to KNGF physical therapy guideline for low back pain
- Limited number of supervisory sessions to enhance the patient's knowledge and understanding

**Profile 1b, 2a, 3a**
- Manual therapy in a strict sense (manipulative MT) aimed at restoring joint function and improvement of activities

**Profile 2b, 2c**
- Manual therapy in general sense (nonmanipulative MT) aimed at behavioral factors in relation to the functional status and the gradual increase of activities and participation
- Supported/followed by MT in a strict sense, if appropriate

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Profile 1a</th>
<th>Profile 1b, 2a, 3a</th>
<th>Profile 2b, 3b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enhancing knowledge/understanding (reassure/explain how to cope with complaints)</td>
<td>Decrease of impairments in artrogenous, muscular, and neurogenous functions.</td>
<td>Enhancing knowledge/understanding</td>
</tr>
<tr>
<td></td>
<td>Decrease of impairments in artrogenous, muscular, and neurogenous functions.</td>
<td>Attain the presymptomatic level of activities and social participation</td>
<td>Promoting adequate coping</td>
</tr>
<tr>
<td></td>
<td>Attain the presymptomatic level of activities and social participation</td>
<td></td>
<td>Improving the relevant functions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Increasing activities and social participation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actions</th>
<th>Profile 1a</th>
<th>Profile 1b, 2a, 3a</th>
<th>Profile 2b, 3b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Providing information / giving advice</td>
<td>Providing information / giving advice</td>
<td>Providing information/ giving advice</td>
</tr>
<tr>
<td></td>
<td>Providing information / giving advice</td>
<td>Inducing joint movements</td>
<td>Exercising and regulating functions and activities</td>
</tr>
<tr>
<td></td>
<td>Inducing joint movements</td>
<td>Exercising and regulating functions and activities</td>
<td>Encouraging participation</td>
</tr>
<tr>
<td></td>
<td>Exercising and regulating functions and activities</td>
<td>Encouraging participation</td>
<td>Inducing joint movements, if appropriate</td>
</tr>
<tr>
<td></td>
<td>Encouraging participation</td>
<td>Inducing joint movements, if appropriate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Profile 1a</th>
<th>Profile 1b, 2a, 3a</th>
<th>Profile 2b, 3b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A checkup, if appropriate</td>
<td>Evaluation of the treatment effect on the basis of observed changes and measurement instruments (VAS; PSFS; QBPDS)</td>
<td>Evaluation of the treatment effect on the basis of observed changes and measurement instruments (VAS, PSFS; QBPDS)</td>
</tr>
</tbody>
</table>

| Aftercare and Closing | Making aftercare arrangements and writing a report for the physician |

*VAS= visual analogue scale, PSFS=Patient-Specific Functional Scale, QBPDS=Quebec Back Pain and Disability Scale

*in case of red flags or contraindications, the referring physician has to be consulted.
Appendix 2: Development of the quality indicators and the web-based recording form (EPD)

Development of the quality indicators
The Dutch physical therapy and manual therapy guidelines for low back pain distinguish between a diagnostic phase and a treatment phase in the process of care. Every phase includes several steps, each covered by a number of recommendations (see Appendix 1). These recommendations were extracted by 2 members of the research team working independently (G.M.R. and S.D.). Differences were discussed, if necessary with a third member of the team (R.A.O.), until consensus had been reached. Because it seems fair to expect that physical therapists are more inclined to follow up recommendations with higher levels of evidence, the recommendations were compared with the latest European guidelines for low back pain1, 2 and rated according to a Dutch classification system for levels of evidence (Tab. 1).3

Next, the recommendations where rephrased in terms of process and outcome indicators. Process indicators, derived from guidelines, are generally phrased as the percentage of patients for whom a certain recommendation was adhered to (eg. the percentage of patients for whom the patient's specific request for help was assessed). Subsequently, these indicators were sent to 5 experts and 20 physical therapists to assess their relevance for the quality of physical therapy care on a 5-point scale from very relevant to irrelevant.

Subsequently, the research team drew up criteria for adherence to each of the indicators, again based on the recommendations in the guidelines. Finally, the results of this procedure were discussed in a consensus meeting with the experts. This resulted in 25 process indicators with accompanying criteria (Tab. 1). This procedure is expected to result in a set of quality indicators with content validity. As regards feasibility, it was decided that an indicator would only be categorized as infeasible if it had missing values in more than 25% of the cases.5

Development of the EPD
To enable measurement by means of quality indicators, in cooperation with an information technology company, we (G.M.R., S.D., R.A.O.) developed an EPD that improved the quality of the patient files. For this purpose, the guidelines were specifically used to organize the structure of the EPD in a diagnostic and a treatment phase, each with its individual steps (Tab. 1). The quality indicators guided the formulation of the questions in the EPD, which the physical therapist used to record the findings during the diagnostic phase, the actions taken during the treatment phase, and the findings of the evaluation at the end of the process of care. The practice experience in physical therapy of the developers (4-40 years) helped us to enhance user friendliness of the EPD.

Algorithms were formulated to translate the information gathered during the process of care into adherence scores with the indicators. This process enabled a direct export from the data of the recording forms into a database with quality indicators. The record form also contained demographic variables, such as patients’ age and sex and questions about work, education and living situation. On the basis of the literature about success factors for implementation of an EPD, we added free writing space in which physical therapists could make additional notes of their process of care in their own words.6 The EPD was shaped in such a way that physical therapists could use it as a replacement for their patient record and complete it during the process of care (for a brief demonstration see https://www.fysiodesk.nl/presentatie/)

References

The article states that “higher percentage of adherence to the Dutch guidelines for low back pain is associated with better clinical outcomes.” This statement has spawned other overgeneralizations, such as the podcast statement. In fact, the descriptive study is much more complicated, with some outcome measures (particularly pain) and some groups demonstrating no significant difference. The abstract does not provide any detail about the negative results, so the article lends itself to spawning headlines.

There are many reasons why structured, well-thought-through patient care may result in improved patient outcomes. It is a complicated subject that is not served well by simplistic statements. I had a hard time following the paper in places, especially related to the outcomes. I kept looking for absolute differences in outcome measures for clinical significance. I recommend that the editors and authors read the article by Boutron et al. Although the article deals with incongruity between negative results of randomized trials and the discussion/conclusions, some of the information applies to papers such as the one in PTJ that have mixed results.

Simplistic reporting of complicated findings does not serve this clinical profession. However, descriptive studies such as this one provide important professional information (albeit difficult to interpret) despite the adherence by some people to randomized controlled trials.

Murray Maitland
M. Maitland is Associate Professor at the University of Washington.

References

Author Response

We thank Dr Maitland for his response to our publication. He addresses the problem of “distorted presentation” of the findings of our study, suggesting that we did not pay sufficient attention to the lack of an association between guideline adherence and pain relief and the fact that some subgroups did not show significant associations between guideline adherence and outcomes. We agree with Dr Maitland that studying relationships between the process of care and treatment outcomes in observational studies is complicated. However, our study tried to shed some light on this subject, and it highlights the influence of guideline-adherent care.
Dr Maitland focuses his response on the phrase in our discussion that a “higher percentage of adherence to the Dutch guidelines for low back pain is associated with better clinical outcomes”. Without any further qualification, this would be a conclusion that, in accordance with the paper by Boutron et al., could be defined as a “distorted presentation” of the primary results. However, we clearly refine this conclusion to a favourable relationship between higher levels of guideline adherence and better physical functioning after treatment and lower utilization of care. As hypothesized in our introduction, the absence of an association between guideline adherent care and pain was not unexpected, given the guideline’s focus on improving physical functioning. Consequently, this finding has been dealt with as a secondary outcome. Other secondary outcomes, such as those resulting from the subgroup analysis, have been presented as explorations, and conclusions about these findings have been formulated in a tentative way. These subgroup explorations aimed to yield a more detailed insight into patients who might benefit most from guideline adherent care. Therefore, it is our opinion that this subgroup analysis, instead of undermining our conclusions, adds value to the findings for the complete sample.

Dr Maitland, furthermore, rightly emphasizes the importance of clinical significance. The clinical significance of our findings has been taken into account based on comparisons to findings of van der Roer et al. By reporting the changes in mean scores on the health outcomes, we provide the reader with the opportunity to assess absolute differences and, hence, clinical significance.

Considering the foregoing, in our opinion, our conclusions are no more than a straightforward reflection of the findings of our study.

References
Chapter 4

A qualitative application of the diffusion of innovations theory to examine determinants of guideline adherence among physical therapists

Janneke Harting
Geert Rutten
Steven Rutten
Stef Kremers

Published in: Phys Ther 2009; 89: 221–232.
Abstract

Background: Evidence-based practice has become a major issue in physical therapy. Many evidence-based guidelines, however, are not used extensively after dissemination, and interventions aimed at increasing guideline adherence often have limited effects.

Objective: As a prerequisite for changing this situation, the aims of this study were to gain an in-depth understanding of the determinants of guideline adherence among physical therapists in the Netherlands and to evaluate the opportunities of a theoretical framework in this respect.

Design and Methods. This observational study consisted of 3 focus group interviews (n=12, 10, and 8) between November 2002 and January 2003. Physical therapists were asked to discuss their opinions about and experiences with the Dutch guidelines for low back pain. Data were analyzed qualitatively using a directed approach to content analysis. Both the interview route and the analysis of the interviews were informed by Rogers’ Diffusion of Innovations Theory.

Results: Our study yielded in-depth insights into the various determinants of guideline adherence. Overall, the participants had rather unfavourable opinions about issues related to the dissemination of the guidelines (first phase of the diffusion process) and provided relatively little information on the subsequent adoption process (second phase of the diffusion process). The theoretical framework appeared to be a useful tool to properly structure the focus group interviews, to systematically analyze the data collected, and to determine that supplementary interviews would be necessary to cover the entire diffusion process.

Conclusions: Our findings indicated that the diffusion process of guidelines among physical therapists was not yet completed. The use of theory can provide added value to guideline implementation studies.
Introduction
Evidence-based practice has become a major issue in physical therapy.\textsuperscript{1,2} Evidence-based practice has been defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients."\textsuperscript{3(p2)} Over the past 2 decades, physical therapists increasingly have been encouraged to take an evidence-based approach.\textsuperscript{1,4} Although most physical therapists have a favourable attitude to the use of evidence in practice, they also encounter several barriers to evidence-based practice.\textsuperscript{1,5} As a means of enhancing evidence-based physical therapy, clinical practice guidelines have become a familiar part of physical therapist practice.\textsuperscript{6} Such guidelines thus create an ideal opportunity to systematically bring scientific evidence into practice.\textsuperscript{7} Therefore, clinical practice guidelines are a promising and effective tool for improving the quality of care.\textsuperscript{8,9}

Many guidelines, however, are not extensively used after dissemination.\textsuperscript{10–12} With regard to the further adoption and implementation of guidelines, it has been suggested that it is important to acknowledge the complexity of clinical behaviour and especially the role of motivational determinants, such as opinions, values, and vested interests.\textsuperscript{13} Many interventions aimed at changing behaviour have been pursued in the absence of clear information about the reasons why practitioners did not exhibit the preferred behaviour.\textsuperscript{14} Consequently, such interventions may have lacked a rationale for the choice of their content and, therefore, produced only small to moderate effects.\textsuperscript{11,15–17} More research into the details of actual implementation is needed to better understand the critical determinants of change in practice, and such research preferably should be systematic and theory based.\textsuperscript{11,15} This article reports on one of the first steps in such a planned approach,\textsuperscript{18} that of theory-based focus group interviews amongst Dutch physical therapists with regard to the national guidelines for the treatment of people with low back pain.

The Dutch physical therapy guidelines for low back pain were developed by the Central Guideline Project (CGP) under the auspices of the Royal Dutch Society of Physiotherapy (referred to below as "the Society") in collaboration with the Dutch Institute of Allied Health Care.\textsuperscript{19} The guidelines describe the diagnostic and therapeutic actions that physical therapists should perform when faced with patients with nonspecific low back pain (Figure 1). This diagnosis is defined as "low back pain without a specified physical cause, e.g. nerve root compression (radicular syndrome), trauma, infection or tumour."\textsuperscript{19(p83)} The essential physical therapy decisions recommended by the guidelines are based on the best available scientific evidence. A vital difference from previous practice is the lower importance assigned to the management of patients’ impairments. Instead, the guidelines emphasize an activating approach, in which physical activity is advised instead of bed rest, active strategies such as exercise therapy and training are applied, and a hands-off policy is recommended for patients with acute low back pain. The guidelines also introduce a behavioural approach aimed at restoring activities and social participation for patients with chronic low back pain.
Figure 1. Recommendations of Dutch physical therapy guidelines for low back pain

1. Contact physician in case of specific low back pain

2. Additional diagnostics
   a. Use questionnaires to assess daily functioning
   b. Assess psychosocial factors that influence recovery process

3. Treatment objectives
   a. Enhance knowledge and insight
   b. Improve activities and social participation
   c. Improve relevant physiological functions
   d. Improve coping strategies

4. Treatment strategies
   a. Provide information and advice
   b. Train physiological functions and activities

5. Number of sessions
   a. ≤3 in case of normal recovery process

6. Provide the following information
   a. Stay active
   b. Pain does not always mean tissue damage
   c. Low back pain has a favorable prognosis
   d. Practice sports on a regular basis
   e. Perform exercises on a regular basis
   f. Restrict work to actual capacity

The guidelines are composed of several parts: a summary, an extensive description of preferred procedures and available evidence, and recommended measurement instruments (Figure 2).

Figure 2. Contents of the Dutch guidelines for nonspecific low back pain

1. A 2-page summary of the main issues of the guidelines for daily use: "the card"
2. A booklet that provides.
   a. A description of the recommendations for the diagnostic and therapeutic process when treating patients with nonspecific low back pain
   b. An extensive description of the best available evidence and an explanation of the process of developing the guidelines
3. Three recommended measurement instruments.
   a. Visual analogue scale for pain
   b. Quebec Back Pain Disability Scale (QBPDS)
   c. Dutch version of the Patient-Specific Functional Scale

As the implementation of the guidelines was recognized to be the “Achilles heel” of the project, the CGP decided to apply a cultural-political strategy for their development. Such a strategy acknowledges that physical therapists, as relatively autonomous professionals, should be regarded as active partners in the developments and innovations in their field. In addition, the CGP chose to design a stepwise diffusion plan for the dissemination and adoption of the
A qualitative application of the diffusion of innovations theory

guidelines.20 Such a plan recognizes that the consecutive steps of the diffusion process may present different barriers, which, in turn, may require different diffusion strategies (Figure 3). Despite these deliberately selected development and diffusion efforts, adherence to the Dutch physical therapy guidelines for low back pain recently was found to be still only moderate.12,21,22

Figure 3. Diffusion plan of the Dutch physical therapy guidelines for nonspecific low back pain19

<table>
<thead>
<tr>
<th>Diffusion steps</th>
<th>Likely barriers</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>• Not familiar with</td>
<td>• Publications in physical therapy journals</td>
</tr>
<tr>
<td></td>
<td>• No interest</td>
<td>• Permanent topic at professional conferences</td>
</tr>
<tr>
<td>Insight</td>
<td>• No knowledge or understanding</td>
<td>• Guideline examination form (individual)</td>
</tr>
<tr>
<td></td>
<td>• Not aware of own performance</td>
<td>• Thematic meetings (work groups)</td>
</tr>
<tr>
<td>Acceptance</td>
<td>• Negative attitude</td>
<td>• Thematic meetings (work groups)</td>
</tr>
<tr>
<td></td>
<td>• Not ready to change</td>
<td>• Discussing guideline (work groups)</td>
</tr>
<tr>
<td>Change</td>
<td>• Not starting the implementation</td>
<td>• Guideline examination form (individual)</td>
</tr>
<tr>
<td></td>
<td>• Not continuing the implementation</td>
<td>• Discussion guideline (work groups)</td>
</tr>
</tbody>
</table>

This article reports on a qualitative study to gain an in-depth understanding of the determinants of adherence to the guidelines for low back pain among physical therapists in the Netherlands. Because Dutch physical therapists were assumed to perceive the then-recently developed guidelines, with their change in treatment strategies, as an innovation, we adopted the stepwise Innovation Decision Process of Rogers' Diffusion of Innovations Theory as the basis for the present study.23,24 Rogers' widely used theory covers the entire diffusion process and offers the opportunity to integrate various theoretical constructs in the different steps of the diffusion process.25 Its application, therefore, was considered especially helpful in examining the progression of the diffusion process of low back pain guidelines and in identifying the potential promoting and impeding determinants throughout the diffusion process.

Rogers' Innovation Decision Process23 distinguishes 5 successive stages (Figure 4).26 The first 2 are mental stages and are referred to as the “dissemination process”. The first dissemination stage, the “knowledge stage”, requires that the potential users become acquainted with the innovation and develop an adequate understanding of it. In the subsequent “persuasion stage”, the potential adopters have to develop a positive attitude toward the innovation.23,27 The decisive factors for this mostly affective process are the perceived characteristics of the innovation, such as its relative advantage, compatibility, complexity, “trialability” (the ability to test an innovation), observability (the degree to which the results of an innovation are visible to others), and flexibility.23,28 In addition, the perceived consequences, that is, the perceived social or material risks, may play a part in this persuasion stage.23,27,29
Figure 4. Theoretical framework based on Rogers' Innovation Decision Process

**Situational factors**
- previous practice
- felt needs/problems
- innovativeness
- norms of social system

**Nature of innovation decision**
- optional decision
- collective decision
- authority decision
  - source/origin

**INNOVATION DECISION PROCESS**

**DISSEMINATION PROCESS**

1. **Knowledge stage (recognition)**
   - acquainted with
     - attention
     - interest
   - understanding of
     - aim
     - content
     - use

2. **Persuasion stage (rationale/motives)**
   - positive attitude
   - positive social influence
   - risk reduction
   - guideline characteristics
     - relative advantage
     - compatibility
     - complexity
     - trialability
     - observability
     - communicability

**ADOPTION PROCESS**

3. **Decision stage (adopt/reject)**
   - increased skills
   - increased self-efficacy
     - gathering further information
     - partial try-out
     - trial by others

4. **Implementation stage (actual use)**
   - more competencies
   - commitment
     - positive experiences
     - positive social influences
     - perceived barriers

5. **Confirmation stage (maintenance)**
   - reinforcement
   - feedback

**Communication channels**
- target group
- source
- aim
- message
- medium

**Facilitators**
- implementation plans
- management structures
- linkage system
- change agents
- opinion leaders
- networks
- structural norms
- cultural norms
- competing innovations
- innovation champions
A qualitative application of the diffusion of innovations theory

The last 3 stages of the diffusion process are behavioural stages and are called the “adoption process”. First, potential adopters have to decide whether to adopt or reject the innovation. Activities in this “decision stage” include gathering further information, trying out the innovation to a limited degree, and trial by others. During the subsequent “implementation stage”, the diffusion process can be facilitated by positive experiences gained previously and by positive social influences. In contrast, perceived barriers may impede the actual implementation. In the “confirmation stage”, the innovation becomes part of the work routine, requiring that its users receive reinforcement and positive feedback. The progression of an innovation through the 5 successive stages is further influenced by situational factors, the nature of the innovation decision, the communication channels applied, and the facilitators involved (Figure 4).

In the present study, Rogers’ theory informed both the focus group meetings and the analysis of the interviews. This report concentrates on the 5 consecutive stages of the diffusion process, as described above and depicted in Figure 4. For a more extensive outline of Rogers’ Innovation Decision Process, readers are referred to the primary source. The results of this study may contribute to subsequent implementation studies, the debate on evidence-based medicine, and recent developments in the use of theory in implementation research.

Method

Focus group interviews

The focus group interview route was constructed in accordance with the theoretical framework (Figure 4). The semistructured route consisted of a topic list, meant to ensure that the main issues with regard to the 5 steps of the innovation decision process would be discussed, and included follow-up probes to elicit more detailed information. To avoid prejudiced interpretation on the part of the researchers and to stimulate a free discussion among the focus group participants, the questions were formulated in an open and inviting way. For example, to explore the topic of “persuasion stage”, the question could read “We are highly interested in your opinions on the guidelines”, while the follow-up prompt of “perceived complexity” could be addressed by a query such as “We have not heard anything on the user-friendliness of the guidelines yet”. Another example is the question “What could you tell each other about the way you apply the guidelines in your practice?” to investigate the topic of “implementation stage” and the query “While you are applying the guidelines, we are interested in whether you also come across any obstacles” to address the follow-up prompt of “perceived barriers”. An Appendix showing a complete focus group interview route is available.

To obtain a representative sample of physical therapists, the interviews were conducted during meetings of peer consultation groups (PCGs), as these meetings at the time were obligatory for members of the Society and because practice guidelines were one of the subjects that the Society had recommended them to discuss. The sampling procedure started at the Society’s
Department of Staff Training. The head of the department provided telephone numbers of the 3 regional PCG coordinators who covered the southern part of the Netherlands (which was chosen for logistic reasons). Two of these coordinators asked for additional authorization by the Society, which was regarded as conflicting with the independent nature of the study. The third regional coordinator provided us with telephone numbers of the 7 local PCG chairs within his region. Four of these local PCG chairs were willing to participate but were unable to organize a PCG meeting in time. Three PCGs were willing to participate as well as able to devote one of their meetings to discussing practice guidelines within the time frame of the study.

The focus group interviews took place between November 2002 and January 2003, and the first, second, and third interviews involved 12, 10, and 8 physical therapists, respectively. The total sample consisted of both men (n=21) and women (n=9) and covered a wide range in terms of age (25–62 years) and number of years of work experience (5–30 years). The interviews were conducted by 2 members of the research team (GMJR and STJR), who were both practicing physical therapists. Being experienced physical therapists as well as experienced lecturers in physical therapy, both interviewers were assumed to possess the skills and abilities to lead focus groups effectively. They alternately acted as chair and observer. The observer recorded the interview on audiotape, prepared minutes of the meeting, and took notes about more general aspects of the discussion, such as the atmosphere, group dynamics, and emotions expressed. The interviews were conducted at the location where the PCGs usually met and lasted 75 to 90 minutes. As no new information was obtained during the third interview, the focus group procedure was regarded as completed (theoretical saturation).

Data analysis
The audiotaped focus group interviews were transcribed verbatim and imported as text documents in the NVivo 2.0 qualitative analysis programme. We performed a qualitative content analysis with a directed approach. Such an approach is appropriate if existing theory and prior research about a phenomenon (e.g., the diffusion of physical therapy guidelines) are incomplete or would benefit from further description. Our structured analysis was based on a prestructured coding scheme. Such a coding scheme serves to classify large amounts of text into a predefined number of categories that represent similar meanings. Our coding scheme had been composed so as to reflect the most salient aspects of Rogers' 5 diffusion of innovation stages. The initial codes thus mirrored the topics (e.g., “persuasion stage” and “implementation stage”) and prompts (e.g., “perceived complexity” and “barriers”) of the focus group interview route, while the entire coding scheme looked similar to the framework shown in Figure 4. Additional flexible codes were used to label other prominent topics that emerged during the analysis. The directed approach to content analysis, therefore, could serve to conceptually validate or extend the theoretical framework used.

* QSR International Pty Ltd, 28 Hoghton St, Southport, United Kingdom PR9 OPA
A qualitative application of the diffusion of innovations theory

The initial coding was done by the first author (JH), as she was experienced in directed qualitative content analysis and had a behavioural science background and physical therapy background but had not been present during the focus groups interviews. The interviewers (GMJR and STJR), both of whom have a Master of Public Health degree, thoroughly checked the first coding for its exhaustiveness and appropriateness by verifying whether all instances of a particular theoretical construct had been identified and correctly categorized. Disagreements were discussed by comparing the text passages with the operational definitions of the various constructs until consensus was reached. In the end, all flexible codes were integrated in the original code tree that represented Rogers’ Innovation Decision Process.

Results

General observations

All 3 focus group interviews were characterized by a pleasant and open atmosphere. The debate was often quite lively, and sometimes feelings even ran high. Although the interviews elicited a wide variety of opinions, the common tendency among the respondents was to dismiss practice guidelines in general and the guideline for low back pain in particular.

Knowledge stage

ACQUAINTED WITH INNOVATION. All but one of the focus group members had received the guidelines by mail, but most of them had not felt much inclined to pay much attention to it.

Yes, that is how they were sent to me, without any explanation or whatever. So I briefly glanced through the guidelines and then put them aside. Who cares? And I left it at that.

We received a whole set of guidelines at once. I think there were 4 of them, and you do not read all 4 of them immediately, and once you put them aside, they stay aside.

Likewise, most physical therapists had not taken a warm interest in the guidelines. For instance, one therapist commented, “No, I read the essence, the card, for instance”. Another therapist, commenting on the content of the guidelines, stated, “I did not read it. I thought the term ‘nonspecific’ was already dubious, so I did not read any further”. Another reason was the large size of the guidelines (e.g., “Such a huge heap, such a bundle of paper, such a bundle of characters”). This way of presenting information did not fit in well with the respondents’ more practical learning attitude. According to one therapist, “That is because we have been educated to do things. So if you give this group a pile of papers, who will read them? I think nobody will.”

UNDERSTANDING OF INNOVATION. The perceived aims of the guidelines were related to standardization and quality of care.
It turned out that the aim of the guideline was to create a bit more uniformity in practical procedures. In other words, it should not be possible that one physical therapist uses one approach and the other a different one. That lack of consistency is not good for the profession.

Few data were provided on the different sections of the guidelines and their actual content. Most physical therapists regarded the guidelines as a package of general information that could be interpreted in various ways (e.g., “What actually is nonspecific low back pain?”) For some therapists, the distinction between specific and nonspecific low back pain was an eye-opener. Others felt it mostly related to their own skillfulness. As one respondent stated, “To me, ‘nonspecific’ stands for ‘I don’t know,’ meaning that I should have the patient checked by a colleague or that he should be examined by a good orthopedist or neurologist.” A commonly shared idea was, however, that nonspecific low back pain “includes such a variety of disorders that they cannot be captured within one single guideline. You will often try to make a specific case for you and your patient, and different physical therapists may not come up with exactly the same diagnosis.”

The respondents disagreed about the intended use of the guidelines, especially about the extent to which they should be seen as obligatory.

Although they are called “guidelines,” they want all of us to adhere to them. You’re supposed to do what the guidelines prescribe, for all patients.

Of course, it is not necessary to follow the guidelines exactly. It is more like this is roughly the approach, regardless of the background you have.

As long as you have good reasons to do so, you are free to work in your own way, because that is more effective than what is prescribed, or because you have another objective in mind, then there should be no problem.

Persuasion stage
In addition to the characteristics of the guidelines, whose influence had been predicted by the literature, a commonly expressed doubt concerned the credibility of the guidelines. This was partly due to the perceived lack of evidence of the effectiveness of the various physical therapy interventions.

More effectiveness research should first be done with regard to physical therapy interventions. That could then be used for the guidelines.

There is a lot that helps for sure. Take, for instance, massage—it is not proven that it is not effective, is it?

Other therapists doubted the credibility of the available evidence.
The way it is described in the guidelines, that is not the way it works. You’re actually expected to do no more than coaching, and then it [the pain] should spontaneously disappear. But in practice, it simply does not spontaneously fade away.

Some of the participants, however, felt more confident.

If the Society assures you that the guidelines are evidence-based, then you, as a practicing physical therapist, can assume that that is correct. Otherwise, you could just close down the whole club [the Society].

Some of the focus group members saw advantages for the profession. The guidelines, for instance, are “good for the uniformity of care” and give “a global overview of treatment options”. Others reported more personal benefits (e.g., “I think it is a great advantage that you start thinking again about what you are actually doing ... that you can see what the state of the art is and how you should act”). The majority, however, saw mainly disadvantages for their practical work (e.g., “If you work according to the guidelines, you are constrained in your performance, and that is neither good for the physical therapist nor good for the patient”). One commonly agreed-upon exception was made: “If there were a guarantee that applying the guidelines for low back pain would speed up the patients’ recovery processes, yes, then I would act in accordance with them”.

Most physical therapists saw problems regarding the compatibility of the guidelines. These problems were related to the patients; the therapists’ autonomy, experience and education; and other, competing guidelines.

I have a lot of trouble with them [the guidelines], because each patient is different. Their treatment should be tailored to their specific characteristics. And indeed, all patients wish to be treated in a different way.

What would be left of your independence, your own competence, your own practical experience?

I completed my education only 5 years ago, and I learned things that the guidelines say I shouldn’t do. Am I to conclude then that my training was useless?

It simply does not fit in with the way I normally work.

The main problem is that the regional or hospital guidelines, which physical therapists are expected to adhere to, are not in line with the national guidelines, or the other way around.

The guidelines for low back pain were regarded as quite complex, mainly because of the syndrome they addressed.

The guidelines say, if you don’t know the cause, then it is nonspecific. But I regard it more as a lack of knowledge on my part.
When you do some additional courses, such as manual therapy, you notice that you become more able to identify specific problems.

Yes, is your nonspecific the same nonspecific as in the guideline?

One participant concluded, “Only specific low back problems can be included in guidelines, resulting in a whole lot of small guidelines. So, they [the present guidelines] should definitely be split up”.

Although some physical therapists stated that “anything can be tried”, most of them felt that the trialability of the guidelines was limited. This had to do with the way the guidelines had been presented.

*If they had made them somewhat easier, or if they had been explained in a lecture, then it would have been much easier, much more practical.*

*That is what you are used to in courses. There you pick up some practical things, which you think you can apply. But these guidelines are just presented very, very badly.*

The interviews offered little information with regard to the observability of positive effects, even though such observability was expected to stimulate guideline adherence. One therapist stated, “If others had better results when working in accordance with the guideline, then I would start working in the same way”. The same would hold in case current practice did not show favourable effects. A therapist stated, “If you are getting poor results, then it becomes interesting to see what your neighbour is doing, especially if he has better results”.

The majority of the physical therapists regarded the flexibility of the guidelines as minimal: much too restrictive, much too standardized, and a coercive protocol from which deviations were not allowed. This also related to the diversity of patients. One respondent stated, “Three patients with low back pain, who are similar according to the guidelines, can get 3 completely different treatments from me. And then the guidelines would force you to use the same approach, because guidelines can’t make that distinction”. Other participants perceived more freedom. One therapist responded, “But of course, I’m free to take or leave these things, to look at whether they suit my own ideas of how to approach my patients”. Yet, a broadly shared opinion was that the guidelines “should be more like a framework with more freedom of choice”.

Several, mostly negative, consequences were discussed. There were, for instance, some concerns about the future of the profession.

*You throw away part of your job.*

*No evidence base available for physical therapy? Then no guidelines! Otherwise, you destroy the whole profession.*
A qualitative application of the diffusion of innovations theory

Other respondents foresaw a shortage of physical therapists. As one participant commented, “I already know some physical therapists who have quit their job because they do not like all this”. In addition, several practice requirements were anticipated.

*My practice would have to be completely reconstructed.*

*A psychologist needed, extensive training equipment needed. And who is going to pay for that?*

Some participants were already complaining about financial compensations that did not materialize. One respondent commented, “So, we are supposed to be engaged in quality of care, but we’re still waiting for the money”. In addition, most physical therapists thought that there would be financial consequences, in which their fees would come to depend on whether they adhered to the guidelines. One therapist remarked, “I think the insurance companies are going to use them [the guidelines]. That is rather threatening”. Other therapists, however, questioned the legitimacy of this consequence. One therapist stated, “We are all certified physical therapists, who also take part in advanced courses. And all that is suddenly regarded as worthless, because we have to work in accordance with the guidelines?”

**Decision stage**

No clear statements were made about the decision to adopt or reject the guidelines, but the physical therapists mentioned several actions they should or would engage in during this stage. For instance, gathering further information with regard to the content of the guidelines was presumed to activate the adoption decision. According to one therapist, “That would at least allow you to consider more carefully whether it appeals to you”. The physical therapists clearly differed, however, in their efforts to gain new knowledge or to acquire new skills, although they basically felt the required competencies should be present.

*Because the guidelines were written for us. If, on average, we did not possess the knowledge and skills, then “those” who produced the guidelines should say that you were only allowed to apply them after you had taken some additional courses.*

Not many physical therapists reported partially trying out the guidelines. A participant stated, “Now and then I apply parts of it”. Neither did the participants provide much confirmation of trial by others. As one participant noted, “In my opinion, less than 50% of the colleagues have ever read these guidelines, let alone worked with them. Where do you find people who have experience with them?” They even seriously doubted the reports of their colleagues claiming to apply the guidelines. One participant responded, “My experience is that therapists say they adhere to the guidelines, although they still all work in different ways”.

Implementation stage
None of the participants had applied the guidelines regularly or completely. They had implemented them not at all or only partly, or they had used them in a somewhat different way than originally intended.

I have never, ever treated one patient in accordance with the guidelines.
I use small parts, or I find I'm already doing the things that are recommended, and then I think “Gosh, I am not doing so badly”
Well, I wouldn’t say I really use them not as such
It demands a very rigorous strategy That is not what I do I read the guidelines, and I agree with them, but I do not use them strictly as they are intended
Well, if I have a very difficult patient, with whom i’m not making any progress, then perhaps yes

Little practical experience with the guidelines was reported. Some of the experience they had was positive (e.g., “I started to pay somewhat more attention to the social participation aspect”), whereas some of the experience they had was negative (e.g., “Then you hear stories [from patients], such as, ‘I'd rather go to a sports masseur, at least then I will be massaged’—so all at once you’ve turned into a bad physical therapist”).

Several sources of social influence were mentioned, such as conflicts of interest with patients.

To patients the story of nonspecificity is often hard to sell
The patients mostly want to go back to the level of impairments

Although the guidelines seem to be the cause of this problem, they also can be used to solve it

In the case of disagreement between physical therapist and patient about the treatment policy, you can always turn to the guidelines, and you can argue while showing them these national guidelines

A second type of social influence came from colleagues.

Within a group practice, I think it is important that there are agreements about the implementation of certain procedures At least you should ensure that your treatments are in accordance with the same principle used within the practice What other practices do, that’s their business, of course

It became only partly clear to what extent the physical therapists knew how to use the guideline. One therapist stated, “I do not know exactly what the requirements are” Although some physical therapists expected to possess the required knowledge and skills, others thought that “the
psychological skills are lacking. We have not been trained to do that, and then suddenly it appears in a guideline as a treatment strategy. However, to some extent, and subconsciously, you definitely do these things in a correct way.”

Notwithstanding the low level of guideline implementation, the participants perceived a variety of barriers.

*The problem is the time* If you do something new, then at first you lack sufficient skills You are not fast enough

*The way our office is built is not suitable*

*Measurement instruments are not available*

*We’re not familiar with those instruments*

One respondent, quite cynically, commented, “I have them [the guidelines] all within reach, and then a patient comes in, and then I tell my secretary, ‘Please, keep the guidelines at hand’ ”

*Confirmation stage*

Little information was provided about the confirmation stage. Overall, the respondents showed little commitment to the guidelines (e.g., “We do not feel committed to them”) However, they felt that positive reinforcement by certain facilitators could help to increase their commitment in the future, for instance, by the insurance companies, but especially by their own professional organization. One participant remarked, “Political support It would be nice if the Society gave us the idea that there is support on the road toward working in accordance with the guidelines”.

*Discussion*

Our theory-based focus group study on the diffusion of the Dutch physical therapy guidelines for low back pain yielded in-depth insights into the various determinants of guideline adherence. Despite the variety of opinions expressed, most of the participating physical therapists had rather unfavourable opinions about issues related to the dissemination process and provided relatively little information on the subsequent adoption process. Although all but one of the participants had possessed a recent copy of the guidelines for more than a year, none of them had applied the guidelines regularly or fully. These findings indicate that, notwithstanding the carefully considered development strategy and stepwise implementation plan, the diffusion of the guidelines among our participants had not actually reached the stages of implementation and maintenance.
Two recent Dutch surveys also showed that the diffusion process had not been completed yet.\textsuperscript{12,21} In one of the surveys, this was attributed to discrepancies between current practice and the recommendations in the guidelines.\textsuperscript{12} Physical therapists perceived several barriers to guideline implementation, including a lack of knowledge or skills and the need for substantial structural changes relating to practice organization, staff, and equipment.\textsuperscript{12} The rather unfavourable attitude identified in our study, reflected by opinions about the characteristics of the guidelines in the persuasion stage, contrasts not only with the findings of a Dutch survey,\textsuperscript{12} but also with the positive attitude toward evidence-based practice that was found in surveys in Spain,\textsuperscript{41} the United States,\textsuperscript{5} and Australia.\textsuperscript{1} Such differences among countries in the attitudes of physical therapists might be attributable to differences in the contents of the various national guidelines, which may reflect either a more biomedically oriented culture (e.g., United States) or a more biopsychosocially oriented culture (e.g., the Netherlands), making them more or less acceptable for individual therapists. The observed discrepancies could, however, also stem from the fact that participants generally tend to be more open and critical in qualitative studies\textsuperscript{42} or from the development of a negative group norm during focus group interviews.\textsuperscript{38} Such a tendency to express negative feelings as a result of certain group dynamics may have resulted in a negative bias.\textsuperscript{38} Another explanation could be that we selected a nonrepresentative sample of PCG groups, with unfavourable opinions. As attending PCG group meetings was obligatory, however, our sample of physical therapists can be assumed to be representative. In fact, our sample also included critical members, who can be assumed to be more reluctant to take part in voluntary surveys.

The relatively low level of guideline adherence and the commonly shared unfavourable opinions that were reported in this study seem to be related to perceived differences between the evidence-based guidelines and "the art of caregiving" as an inherent part of physical therapist practice.\textsuperscript{43} Although guidelines were associated with uniformity of care, the individuality of each patient was considered to reflect the importance of intuition and creativity in daily practice. This perceived inconsistency coincides with current debates in the literature about evidence-based medicine versus commonsense medicine and the integration of scientific evidence and clinical expertise.\textsuperscript{32,33} Although the Dutch physical therapy guidelines for nonspecific low back pain are not intended as a "cookbook" but as a guide,\textsuperscript{19} our participants nevertheless perceived them as rigid recommendations. Such rigidity has been challenged as being at odds with individual patient needs and practitioner preferences, not allowing for any individual variation, and as being used as a standard against which clinicians may be judged without outside variables being taken into account.\textsuperscript{44} Indeed, the use of guidelines as a simplistic algorithm has been acknowledged to have a potentially harmful effect on professionalism, which may do injustice to the complexity of medicine and the parallel and iterative thought processes assumed to be inherent in clinical judgment.\textsuperscript{8} Our findings imply that the implementation and adoption processes of guidelines may benefit from strategies that are able to convince physical therapists of the intended judicious use
of guidelines. Such strategies, for instance, may be derived from theories on information processing, which suggest discussion as a method to change knowledge, and from theories on attitude change, which indicate that message repetition is important in this respect, as is the provision of information tailored to the individual physical therapist's perceptions and behaviourspecific beliefs.45

The theoretical framework that served as the foundation of our study enabled us to properly structure the focus group interviews, to produce a systematic and detailed analysis of the data collected, and to assign the various determinants to the consecutive stages of the diffusion process. The theory-based approach allowed us first of all to recognize that, due to the relatively non-adherent sample, the information we obtained did not cover the entire diffusion process.23 The participants provided relatively little information on the determinants of the decision, implementation, and confirmation stages. This means that the theoretical saturation we observed after 3 focus group interviews applied only to the first 2 stages of the diffusion process and that a better understanding of the other 3 stages would require additional interviews with physical therapists with higher levels of adherence.

A second, somewhat related finding is the lack of information about communication channels and facilitators. Both aspects may be related to the organizational level rather than the individual level,23,46 whereas the interviews concentrated on individual motivational determinants. Supplementary interviews, therefore, should take the organizational determinants into account as well.41,47–49

Third, the analysis revealed a new perceived characteristic of the guidelines in the persuasion stage, in addition to those predicted as being important by the original theory, namely the perceived credibility of the guidelines. Although empirical findings indicate that users want guidelines to be scientifically justifiable50 and that the scientific evidence should be straightforward and not conflicting,51 we came across only one framework of guideline adherence determinants that acknowledged that the potential adopters actually have to perceive them as credible, by identifying lack of agreement with the interpretation of evidence as a potential barrier.17

Several limitations should be mentioned. First, due to the limited space available in scientific journals, we had to restrict our report to only one part of Rogers' Diffusion of Innovations Theory. Reporting on the application of the entire theory, including the situational factors and the characteristics of the innovation decision, would have done more justice to the complex picture of guideline adherence. Second, the various theoretical concepts related to the successive stages of the diffusion process are not mutually exclusive. This overlap complicated the analysis of the focus group interviews considerably. Third, the trustworthiness of the results may be threatened
by the use of theory and by a certain subjectivity on the part of the researchers.\textsuperscript{39} This, for instance, may have made it more likely to find evidence that is supportive rather than nonsupportive for the theory and to have blinded the researchers to contextual aspects of the diffusion process. In addition to the measures we already applied to prevent such biases, the trustworthiness of the study could have been increased further by the use of an audit process.\textsuperscript{39}

As a final limitation, the actual level of guideline adherence by the physical therapists who participated in the focus group interviews was subjectively assessed. Despite the low levels of adoption and implementation that could be inferred from the physical therapists' statements, most of them nevertheless had explicit and clear-cut opinions about the guidelines. These opinions, however, reflected several misconceptions with regard to the content, the aim, and the use of the guidelines, such as the exact meaning of nonspecific low back pain and the idea that the guidelines were meant as rigid treatment instructions. Thus, it could be questioned to what extent the determinants identified in our study are indeed related to actual guideline adherence.

Our theory-based qualitative study has offered the in-depth understanding of determinants of guideline adherence that is seen as the necessary start of a planned approach to develop effective interventions to increase evidence-based practice in physical therapy.\textsuperscript{11, 15, 18} The detailed information we collected served as valuable input for a follow-up survey to gain further insight into the association between the qualitatively identified determinants and the actual level of guideline adherence among a representative sample of Dutch physical therapists.\textsuperscript{26} That survey, in turn, offered some of the necessary foundations for the choice of potentially effective methods and strategies to enhance guideline implementation in physical therapy, as well as other health care disciplines, therefore, may benefit from adopting our approach while taking into account the limitations we discussed above. For a complete inventory of possible determinants of guideline adherence, it is especially recommended to apply a purposeful sampling strategy\textsuperscript{37} to guarantee that the focus group interviews include physical therapists from each of the various stages of the diffusion process. Such a sampling strategy, in turn, could profit from the use of objective measures of guideline adherence, such clinical vignettes.\textsuperscript{22, 52}

\textit{Conclusion}

We believe that the application of a theoretical framework offers an important advantage over other qualitative examinations of determinants of guideline adherence. Although the benefits of applying theory in implementation studies have been questioned,\textsuperscript{53} we believe that our results illustrate the added value of such an approach. The limitations we encountered with regard to our approach, however, also support the view that applying theory in this field remains a challenging exercise.\textsuperscript{34}
A qualitative application of the diffusion of innovations theory

References

40 Gibbs GR. Qualitative Data Analysis: Explorations With NVivo. Maidenhead, Berkshire, United Kingdom: Open University Press, 2002
43 Haynes RB. What kind of evidence is it that evidence-based medicine advocates want health care providers and consumer to pay attention to? BMC Health Serv Res 2002;2:3.
Researchers intending to organize focus group interviews are highly recommended to study some methodological literature on the subject (e.g., Morgan and Krueger). This literature will show, for instance, that focus group interviews are not just games of questions and answers, but a matter of eliciting a free and open discussion among the participants. Most such discussions do not remain restricted to the topic or the prompt outlined by the discussion leaders, but rather will flare out in all possible directions. An outline for a focus group interview, therefore, should be used in a flexible way, functioning as a framework to enable the interviewers to trace the topics discussed, see which topics are new or would need supplementary attention, and acknowledge which prompts could be applied to obtain valuable additional information. The sample questions below, therefore, are meant only as indicative. Competent focus group leaders do not need such specific or detailed questions, as their competence allows them to rely on the list of topics and prompts (e.g., Polit and Beck). In our study, the outline was meant to serve as a checklist to enable the discussion leaders to gather the information that the theoretical framework predicted to be important and to arrive at a comprehensive understanding of the area under consideration. As focus group interviews typically provide an overwhelming amount of information and rarely offer his information in a well-organized manner, the list of topics and prompts again may serve to properly analyze the collected data (e.g., Hsieh and Shannon and Gibbs).

**GENERAL INTRODUCTION**

Introduction of discussion leaders/researchers

- Explain main aim of the study: understanding reasons for guideline (non)adherence
- Emphasize independence of researchers: no affiliation whatsoever with Society or insurance companies
- Underline confidentiality of data analysis and reporting: no negative consequences for participants

**INNOVATION DECISION PROCESS**

**Situational factors**

- previous practice: How suitable do you perceive the guidelines to be, given to be the way you previously were used to dealing with this category of patients?
- felt needs/problems: To what extent do you perceive the guidelines as helpful or as a solution for any problems you probably encountered in the past?
- innovativeness: Some therapists told us that they think the guidelines perfectly fit into their affinity with innovation, their tendency to adapt their way of performance to the latest insights. What about your opinions?
- norm of social system: We would also like to know whether or not you think that guidelines typically belong in physical therapist practice.

**Nature of the Innovation decision**

- optional decision
- collective decision
- authority decision
- source/origin: We have the idea that different therapists have different opinions on how the guidelines have been introduced. Who do you think decided about that introduction? And to what extent do you think you had an influence?

**DISSEMINATION PROCESS**

**Knowledge stage (recognition)**

- acquainted with: By the way, to what extent are you familiar with the guidelines?
- attention paid... did you pay attention to the guidelines?
- interest in... did you actually read the guidelines?
- Understanding of Other therapists told us that they had some difficulties in understanding... [see prompts below]. What, in fact, are your ideas about that?
- aim... what the guidelines actually are meant for.
- content... the content/message of the guidelines.
- use... how the guidelines should be applied.
Persuasion stage (rationale/motives) We are highly interested in your opinions on the guidelines.

Positive attitude
So there seems to be a tendency to dismiss (endorse) the guidelines. But we can also imagine that you see some useful or pleasant (unhelpful or annoying) aspects. What about that?

Positive social influence
Have you any idea to what extent your colleagues (your patients) expect you to work in agreement with the guidelines? And to what extent does their opinion matter to you?

Risk reduction
It has been suggested that guidelines can help therapists to feel more confident or to reduce the level of uncertainty they sometimes experience. What can you tell each other about that kind of reassurance? Or do guidelines perhaps have the opposite effect?

Guideline characteristics
How do you perceive the guidelines? What specific features could you distinguish? And what are your opinions about that?

Relative advantage
Do you also perceive any surplus value of the guideline?

Compatibility
To what extent do you think the guidelines match your current way of practicing?

Complexity
We have not heard anything on the user-friendliness of the guidelines yet.

Trialability
Some therapists told us that they can easily switch from previous practice to trying out the guidelines and back to previous practice again. How easy or difficult are those switches in your opinion?

Observability
We are curious about whether you, your patients, or the referring physicians see any positive results of applying the guidelines.

Communicability
How easy or how difficult is it for you to explain the guidelines to your patients, your colleagues, or the referring physicians?

Decision stage (adopt/reject)
How about your current state of mind: to what extent would you say you have adopted or rejected the guidelines? What can you remember about your decision to adopt or reject the guidelines?

Increased skills
What can you tell each other about the skills needed to actually apply the guidelines? Do you perceive any changes in your ability to work in conformity with the guidelines?

Increased self-efficacy
To what extent do you feel confident about applying the guidelines? Other therapists told us that they felt more confident because ... [see prompts below]. What about your experiences in this respect?

gathering further information
... they looked for additional information on how to apply the guidelines.

Partial tryout
... they started to attempt certain recommendations of the guidelines.

Trial by others
... they knew some of their colleagues who examined the applicability of the guidelines.

Implementation stage (actual use)
What could you tell each other about the way you currently apply the guidelines in your practice?

More competencies
Which competencies do or did you notice (users) or expect (non-users) to contribute to the actual application of the guidelines?

Commitment
Some therapists say that they somehow feel that they have become committed to applying the guidelines. How do you feel about that?

Positive experiences
What are your experiences so far with the application of the guidelines? Do certain experiences encourage or discourage the use of the guidelines?

Positive social influences
Are you aware of ideas or reactions of people around you that may help or hinder you in applying the guidelines?

Perceived barriers
While you are applying the guidelines, we are interested in whether you also come across any obstacles.
5. Conformation stage (maintenance)  | It is well known that to continue to perform newly acquired behavior, most people need some kind of support, such as ... [see prompts below]. Could you tell us a bit more about the support you sense (users) or should need (non-users)?

<table>
<thead>
<tr>
<th>Facilitators</th>
<th>Are you aware of other kinds of positive or negative influences on the way you deal with the guidelines? You could for instance think of . . . [see prompts below].</th>
</tr>
</thead>
<tbody>
<tr>
<td>implementation plans</td>
<td>... certain planning activities.</td>
</tr>
<tr>
<td>management structures</td>
<td>... the way your work or practice is organized.</td>
</tr>
<tr>
<td>linkage system</td>
<td>... contacts with other professionals.</td>
</tr>
<tr>
<td>networks</td>
<td>... your broader work environment.</td>
</tr>
<tr>
<td>structural norms</td>
<td>... explicit rules or obligations to apply the guidelines.</td>
</tr>
<tr>
<td>cultural norms</td>
<td>... implicit rules or expectations about applying guidelines.</td>
</tr>
<tr>
<td>competing innovations</td>
<td>... other developments in physical therapy.</td>
</tr>
<tr>
<td>innovation champions</td>
<td>... certain influential persons.</td>
</tr>
<tr>
<td>change agents</td>
<td></td>
</tr>
<tr>
<td>opinion leaders</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 5

A theory-based cross-sectional survey demonstrated the important role of awareness in guideline implementation

Geert Rutten
Stef Kremers
Steven Rutten
Janneke Harting

Abstract

Objective. To assess physical therapists' adherence to the Dutch guidelines for nonspecific low back pain, the motivational determinants related to guideline adherence, and the role of physical therapists' awareness of their performance in this respect.

Study Design & Setting. This was a cross-sectional survey among a random sample of 1,500 private practice physical therapists in the Netherlands. The actual guideline adherence was measured by means of validated clinical vignettes and self-reported adherence by asking the physical therapists to report their own level of adherence. The assessment of motivational determinants was based on a theoretical framework.

Results. The response rate was 31.5% (n=472). The average guideline adherence rate was 50.4% (SD=16.8). Only 38.5% of the physical therapists had realistic perceptions of their personal performance. Awareness levels seriously interfered with the relationship between motivational determinants and actual guideline adherence. Actual adherence was mainly related to the perceived relative advantages and awareness of adherence to the perceived social norm.

Conclusion. The moderating role of awareness in this study confirms the view that motivational determinants of a particular behaviour can only be accurately assessed if people hold realistic perceptions of that behaviour. Our approach illustrates the added value of a theory-based approach in guideline implementation studies.
Introduction
Practice guidelines play an important role in improving the quality of care. They create opportunities to systematically bring scientific evidence into practice, as well as to improve and control the quality and efficiency of practitioners' performance, and to increase the transparency of practice. These effects can only be achieved if such guidelines are sufficiently implemented. However, adherence with clinical practice guidelines generally appears to be only moderate. As regards the Dutch guidelines for low back pain, physical therapists in the Netherlands are no exception in this respect.

A variety of interventions have been applied to enhance adherence to clinical guidelines. However, several systematic reviews have concluded that most of these interventions had only modest to moderate effects. Because one explanation for this limited effectiveness could be the lack of a coherent theoretical framework, the application of behavioural and organizational theories has been advocated. The explicit use of theories is not only supposed to offer potential advantages, such as providing a process by which to inform the development of interventions, but it has also been considered methodologically challenging. Although the use of theory in guideline implementation research appears to be increasing, it has thus far been rather limited.

A second possible explanation for the modest to moderate effects of adherence enhancing interventions might be serious deficits in the assessment of adherence determinants. Although the prevailing models for the development of adherence improving programmes stress the importance of such an assessment, most surveys of adherence-impeding or adherence-promoting factors have only been based on qualitative methods among small groups of practitioners. Quantitative methods applied to larger groups of health care professionals are needed to determine the objective relation between perceived adherence determinants and actual guideline adherence and to quantify their relative importance. Except for some recent and promising examples, so far such methods have hardly been applied. The absence of such a quantifying validation procedure may also explain why most interventions lack a clear rationale for the choice of their content.

A third reason why interventions generally do not bring about the intended increase of guideline adherence could be health care workers' misperceptions about their adherence to evidence-based treatment recommendations. Such misperceptions have been observed before. Nevertheless, the concept of awareness of personal performance has thus far not received much attention in studies concerning guideline implementation. Yet, it is especially in complex behaviours, among which adhering to clinical guidelines can be classified, that awareness of personal performance has been observed to be rather limited. Being or becoming aware has therefore been suggested as an important factor in the assessment of behavioural
determinants, for instance because of its potential moderating role in the relationship between determinants of adherence and actual guideline adherence.\(^{37}\)

The present cross-sectional survey intended to measure physical therapists’ adherence to the Dutch guidelines for nonspecific low back pain, to quantitatively assess the determinants related to guideline adherence, and to examine the role of physical therapists’ awareness of their performance in this respect. For that purpose, a framework was developed that integrated several theoretical perspectives on the complex matter of guideline adherence. This framework was expected to be a helpful instrument in the systematic approach of our study.

**Method**

**Theoretical framework**

The study was based on the results of a literature study followed by a number of focus group interviews (unpublished manuscript). These had been performed to tailor the content of the present questionnaire specifically to the physiotherapeutic profession and to the guidelines for low back pain. Both the focus group interviews and the present cross-sectional survey were based on a theoretical framework (Figure 1: Guideline Implementation Determinant framework-GUIDE).

Because we intended to study the complex matter of guideline adherence from several perspectives we developed a theoretical framework that combined various models and theories. As the application of clinical guidelines, which generally involves a change of physical therapy practice, can be regarded as an innovation, Rogers’ Diffusion Theory\(^ {38}\) functioned as the central model in this framework. Rogers’ theory describes the stepwise Innovation Decision Process that an innovation normally follows to become disseminated and adopted on a large scale and in the long run. Simultaneously, the potential adopters of an innovation, in our case the physical therapists, are assumed to gradually change their behaviour accordingly. Such a process of behavioural change is described for instance by the Precaution Adoption Process Model\(^ {39}\). This model was integrated in the framework, specifically because of the attention it pays to ‘awareness’ as a first step in behaviour change, which in this case has been interpreted as ‘being aware of one’s own behaviour’.

Both stage models, in turn, predict that in the subsequent steps of the diffusion process different determinants are of importance, requiring the applications of various behavioural and motivational theories. As adoption of an innovation may also require organizational changes,\(^ {26,38,40}\) the theoretical framework for this study was supplemented with some theory-based aspects of organizational change.\(^ {38,41}\) A further specification of the theoretical constructs included in the framework is given in the description of the questionnaire.
A theory-based survey demonstrated the role of awareness in guideline implementation.

Figure 1. GUIDeline Implementation Determinants framework (GUIDE) – based on Rogers\textsuperscript{38} and Weinstein\textsuperscript{39}

**Situational factors**
- previous practice
- felt needs/problems
- innovativeness
- norms of social system

**Nature of innovation decision**
- optional decision
- collective decision
- authority decision source/origin

---

**INNOVATION DECISION PROCESS**

**1. Knowledge stage (recognition)**
- acquainted with
  - attention
  - interest
- understanding of
  - aim
  - content
  - use

**2. Persuasion stage (rationale/motives)**
- positive attitude
- positive social influence
- risk reduction
- guideline characteristics
  - relative advantage
  - compatibility
  - complexity
  - trialability
  - observability
  - communicability

---

**DISSEMINATION PROCESS**

**3. Decision stage (adopt/reject)**
- increased skills
- increased self-efficacy
  - gathering further information
  - partial try-out
  - trial by others

**4. Implementation stage (actual use)**
- more competencies
- commitment
  - positive experiences
  - positive social influences
  - perceived barriers

**5. Confirmation stage (maintenance)**
- reinforcement
- feedback

---

**Communication channels**
- target group
- source
- aim
- message
- medium

**Facilitators**
- implementation plans
- management structures
- linkage system
- change agents
- opinion leaders
- networks
- structural norms
- cultural norms
- competing innovations
- innovation champions

---

Awareness being aware of one's own behaviour
Design and population

The present study took place 3 years after the Royal Dutch Society of Physiotherapy (RDSP) had distributed the guidelines among their members by post. A random sample of 1,500 physical therapists was selected from the private practice membership records of the RDSP (n=12,000). These records represent 90% of all private practice physical therapists in the Netherlands. An expected response of 30% was calculated to provide a sufficient number of cases to statistically establish a relationship between the determinants and guideline adherence. The cross-sectional survey involved sending the included physical therapists a paper-and-pencil questionnaire with a stamped addressed envelope in September 2003. This was followed by a reminder 1 month later. By the end of the data collection period, which lasted until December 15, 2003, 498 physical therapists had returned the questionnaire. Of these, 26 were incomplete, which reduced the effective response to 472 (31.5%).

Measurement instruments

Background variables

The questionnaire assessed several demographic variables (age and gender) and work-related variables (part-time or full-time employment, number of years and continuity of work experience, executive or managerial position, and membership of professional organization).

Determinants

The questionnaire of the determinants of guideline adherence was based on the GUIDE framework (see Figure 1). The exact wording of the individual items (five-point scales) was guided by statements made during the preceding focus group interviews (for further specification, see the Appendix). This resulted in 18 scales of behavioural and organizational determinants. A post-survey reliability analysis demonstrated these scales to have sufficient internal consistency (0.65≤Cronbach’s α≤0.86).

With regard to the knowledge stage, the physical therapists' level of acquaintance with the guidelines was assessed by the amount of attention they had paid to the guidelines, and their level of understanding of the perceived aim of the guidelines. As regards the persuasion stage, the physical therapists' attitudes, perceived social influences and perceived risks of applying the guidelines were examined. The physical therapists' attitudes were assessed by their perceptions of the characteristics of the guidelines, including their relative advantage, compatibility, complexity, observability, trialability, and the extent to which the physical therapists thought that the guidelines could be communicated. The perceived social influence was assessed as perceived social norm, social support, and social pressure with regard to the application of practice guidelines. The possible unfavourable consequences of guideline adherence were operationalized as perceived negative influences on social relationships and as the perceived risks in terms of a variety of potential losses. As regards the decision stage, the
physical therapists’ self-efficacy expectations were assessed. With regard to the implementation stage, the physical therapists were asked about their level of commitment and the behavioural and organizational barriers they perceived. In the confirmation stage, influences on the maintenance of guideline adherence were measured as facilitating factors, like reinforcement and feedback, and financial incentives to adhere to the guidelines.

Guideline adherence
As an overall perception of adherence, self-reported guideline adherence was assessed by one single item asking the physical therapists to what extent they thought they were applying the guidelines for low back pain: never, sometimes, regularly, mostly, or always.

Actual guideline adherence was measured by validated clinical paper-and-pencil vignettes. Three vignettes were found to represent an adequate case mix. They described one patient with specific low back pain, one with nonspecific low back pain and a normal course of the recovery process, and one with nonspecific low back pain and a delayed recovery process. Based on the literature, expert opinions and a pretest among 35 practicing physical therapists, six essential guideline recommendations were identified: contacting the referring doctor in the case of specific low back pain, applying additional diagnostics, formulating sound treatment objectives, choosing the right treatment strategies, limiting the number of treatment sessions, and providing the necessary information. The level of adherence to these individual recommendations was used to calculate the percentage of adherence per vignette and per therapist. Subsequently, the mean percentage of overall adherence to the guidelines was established.

Awareness
By analogy to definitions in the field of physical activity and diet, the level of awareness among the physical therapists’ of their personal adherence to the guidelines was determined by dividing the measures of actual and self-reported adherence into three categories. For actual adherence, rates from 0% to 33.3% were classified as low, those from 33.4% to 66.6% as moderate, and those from 66.7% to 100% as high adherence. For self-reported adherence, the answering options ‘never’ and ‘sometimes’ were classified as low adherence, the option ‘regularly’ as moderate adherence, and the options ‘mostly’ and ‘always’ as high adherence. Subsequently, crosstabulations of actual and self-reported adherence categories were applied to assess the levels of awareness. Physical therapists who were classified in the same category for both adherence measures were qualified as realistic estimators, meaning that they were properly aware of their own degree of guideline adherence. Physical therapists who scored higher on self-reported adherence than on actual adherence were qualified as overestimators. Conversely, physical therapists who scored lower on self-reported adherence than on actual adherence were qualified as underestimators.
**Statistical analyses**

Descriptive statistics were used for the demographic variables, the work-related variables, the determinants of guideline adherences, and the levels of self-reported adherence and actual guideline adherence. Pearson's correlation coefficient was used to determine the relation between the determinants and each of the adherence measures, and for the correspondence between the two adherence measures themselves. The relationship between the determinants (independent variables) and self-reported adherence and actual guideline adherence (dependent variables) was examined in two multiple linear regression analyses. To determine the influence of awareness on this relationship, the regression analysis with actual guideline adherence as the dependent variable was repeated for the subgroup of physical therapists with realistic perceptions of their own performance. Finally, the influence of the determinants (independent variables) on the awareness level, that is, the odds of overestimating and underestimating personal performance (dependent variables) was examined in two multiple logistic regression analyses. In all regression analyses, the demographic variables and work-related variables were entered blockwise. Because of the expected correlations, a stepwise procedure (Pin=0.05, Pout=0.10) was used to include the determinants in the next block. Determinants with low correlations with the dependent variables \([-0.20 \leq p \leq 0.20]\) were omitted from the regression analyses.

**Results**

**Characteristics of the respondents**

The respondents were on average 42.3 years old (SD=8.9) and 49.3% (n=232) were women. Forty-two percent of the participants (n=196) had 16-25 years of working experience, whereas 39% had worked less than 16 years, and 19% more than 25 years. Fifty-six percent (n=261) were working full time, and 95% (n=472) had been practicing continuously during the past 5 years. About 98% (n=454) were private practice physical therapists, 59% of whom were practice owners.

**Self-reported adherence and actual guideline adherence**

With regard to self-reported adherence to the Dutch physical therapy guidelines for low back pain, almost 10.4% of the physical therapists indicated that they never applied the guidelines, 29% indicated that they applied them sometimes, 36.2% regularly, 21.5% mostly, and 3.2% always. The mean percentage of actual adherence to the recommendations in the guidelines was 50.4% (SD=16.8). The correlation between self-reported adherence and actual adherence was \(r=0.14\) (\(P=0.002\)).
Determinants of adherence
The physical therapists indicated to have paid more than average attention, and to have sufficient knowledge about the guidelines (Table 1) They expected guideline adherent care to have a relative advantage compared to their current practice and they were positive about the trialability, communicability, and compatibility of the guidelines. The therapists did not think the guidelines were complex, but they also anticipated the observability of the results of guideline adherent treatment to be limited.

Table 1. Mean values of determinants and correlations with self-reported and actual adherence to guidelines

<table>
<thead>
<tr>
<th></th>
<th>Mean* (SD)</th>
<th>Self-reported adherence (perceptions)</th>
<th>Actual adherence (vignette scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention paid</td>
<td>3.48 (0.89)</td>
<td>0.46**</td>
<td>0.15**</td>
</tr>
<tr>
<td>Knowledge</td>
<td>4.06 (0.50)</td>
<td>0.23**</td>
<td>0.17**</td>
</tr>
<tr>
<td><strong>Persuasion stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative advantage</td>
<td>3.50 (0.75)</td>
<td>0.53**</td>
<td>0.21**</td>
</tr>
<tr>
<td>Compatibility</td>
<td>3.21 (0.65)</td>
<td>0.49**</td>
<td>0.16**</td>
</tr>
<tr>
<td>Complexity</td>
<td>2.32 (0.61)</td>
<td>-0.36**</td>
<td>-0.12**</td>
</tr>
<tr>
<td>Observability</td>
<td>2.55 (0.79)</td>
<td>0.35**</td>
<td>0.11*</td>
</tr>
<tr>
<td>Trialability</td>
<td>3.66 (0.86)</td>
<td>0.10*</td>
<td>0.05</td>
</tr>
<tr>
<td>Communicability</td>
<td>3.63 (0.83)</td>
<td>0.29**</td>
<td>0.10*</td>
</tr>
<tr>
<td><strong>Social influence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social norm</td>
<td>2.68 (1.06)</td>
<td>0.54**</td>
<td>0.10*</td>
</tr>
<tr>
<td>Social support</td>
<td>3.32 (1.34)</td>
<td>0.42**</td>
<td>0.12**</td>
</tr>
<tr>
<td>Social pressure</td>
<td>1.77 (0.87)</td>
<td>-0.16**</td>
<td>-0.10*</td>
</tr>
<tr>
<td><strong>Perceived risks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influence on social relations</td>
<td>2.29 (0.82)</td>
<td>-0.43**</td>
<td>-0.16**</td>
</tr>
<tr>
<td>Potential losses</td>
<td>2.30 (0.69)</td>
<td>-0.44**</td>
<td>-0.16**</td>
</tr>
<tr>
<td><strong>Decision stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>3.71 (0.86)</td>
<td>0.31**</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Implementation stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment</td>
<td>3.16 (0.57)</td>
<td>0.28**</td>
<td>0.11*</td>
</tr>
<tr>
<td>Barriers</td>
<td>2.60 (0.72)</td>
<td>-0.25**</td>
<td>-0.04</td>
</tr>
<tr>
<td><strong>Confirmation stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial incentives</td>
<td>3.25 (1.45)</td>
<td>0.35**</td>
<td>0.09</td>
</tr>
<tr>
<td>Facilitators</td>
<td>3.49 (0.64)</td>
<td>0.24**</td>
<td>0.07</td>
</tr>
</tbody>
</table>

The perceived social norm was not in favour of the guidelines, and on average, the therapists experienced some social support and hardly any social pressure regarding their use of the guidelines. The physical therapists did not expect that adhering to the guidelines would negatively influence their social relationships, or would lead to other potential losses.

Self-efficacy expectations concerning their adherence to the guidelines were rather high. Their commitment to the guidelines was slightly positive and most barriers were perceived as being of minor importance. The mean scores for the facilitating factors and the financial incentives indicated that these were expected to increase guideline adherence.
Table 2. Determinants of self-reported adherence and actual adherence for the total group and for the physical therapists with realistic estimations of their adherence

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Self-reported adherence (perceptions)</th>
<th>Actual adherence for total group (vignette scores)</th>
<th>Actual adherence for realistic estimators (vignette scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>P</td>
<td>CI</td>
</tr>
<tr>
<td><strong>Block 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demographic variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention paid</td>
<td>0.30</td>
<td>0.000***</td>
<td>0.22 to 0.39</td>
</tr>
<tr>
<td>Relative advantage</td>
<td>0.27</td>
<td>0.000***</td>
<td>0.14 to 0.40</td>
</tr>
<tr>
<td>Social norm</td>
<td>0.28</td>
<td>0.000***</td>
<td>0.21 to 0.35</td>
</tr>
<tr>
<td>Potential losses</td>
<td>-0.23</td>
<td>0.000***</td>
<td>-0.34 to -0.11</td>
</tr>
<tr>
<td>Financial incentives</td>
<td>0.06</td>
<td>0.028*</td>
<td>0.01 to 0.11</td>
</tr>
<tr>
<td><strong>Total R²</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05; *** = p < 0.001
A theory-based survey demonstrated the role of awareness in guideline implementation. The stepwise regression procedure with self-reported adherence as the dependent variable resulted in an explained variance of 48.4% for the determinants entered in block 2 (Table 2). Self-reported adherence to the guidelines was especially higher if therapists expected the social norm to be more in favour of the guidelines. Self-reported adherence was also higher among therapists who paid more attention to the guidelines, saw more advantages compared to their current working methods, were financially compensated for being adherent, and perceived fewer potential losses from applying the guidelines.

The stepwise procedure with actual adherence as the dependent variable resulted in an explained variance for the determinants of 56%. The more attention respondents paid to the guidelines and the higher the perceived relative advantage, the greater was their adherence to the guidelines.

**Role of awareness**

Realistic perceptions of guideline adherence were found in 38.5% (n=180) of the physical therapists (Table 3). Consequently, 61.5% had misperceptions about their adherence: 25.2% were overestimators (n=118) and 36.4% were underestimators (n=170).

![Table 3. Estimation of adherence to guidelines](image)

For the subgroup of realistic estimators, the stepwise regression procedure with actual adherence as the dependent variable resulted in an explained variance for the determinants of 25.2% (see Table 2). The best predictor of better actual adherence was a higher perceived relative advantage. Guideline adherence was also higher if physical therapists had paid more attention to the guidelines and perceived fewer supportive facilitators.

Overestimation of personal adherence, in turn (Table 4) was related to the perceived social norm toward guideline adherence (OR=1.73) and the perceived potential losses resulting from applying...
the guidelines (OR=0.62). Underestimation was also explained by the perceived social norm toward guideline adherence (OR=0.67), the amount of attention paid (OR=0.67), and perceived compatibility with current practice (OR=0.56).

**Table 4. Logistic regression of overestimation and underestimation**

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Block 1</th>
<th>Block 2</th>
<th>Demographic variables</th>
<th>Attention paid</th>
<th>Compatibility</th>
<th>Social norm</th>
<th>Potential losses</th>
<th>Nagelkerke total R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>CI(OR)</td>
<td>R²-change</td>
<td>OR</td>
<td>CI(OR)</td>
<td>R²-change</td>
<td>OR</td>
<td>CI(OR)</td>
</tr>
<tr>
<td>Overestimation (1)/realistic estimation (0)</td>
<td>1.726</td>
<td>1.33-2.231</td>
<td></td>
<td>0.672</td>
<td>0.505-0.895</td>
<td>0.024</td>
<td>0.157</td>
<td>0.177</td>
</tr>
<tr>
<td>Underestimation (1)/realistic estimation (0)</td>
<td>0.619</td>
<td>0.411-0.934</td>
<td></td>
<td>0.665</td>
<td>0.511-0.865</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

The findings of the present study indicate that awareness of adherence may be a key factor in the implementation of practice guidelines. More than 60% of the physical therapists in this study had misperceptions about their personal adherence to the guidelines for low back pain, and this awareness of personal performance turned out to interfere with the relationship between determinants of adherence and actual guideline adherence. This was illustrated by an increase of nearly 20% in the explained variance of actual guideline adherence for physical therapists who were aware of their adherence compared to all physical therapists irrespective of their level of awareness.

Thus far, awareness of personal performance has not received much attention in studies to explain suboptimal guideline adherence. Although feedback on behaviour and self-reflection have been acknowledged as valuable intervention components to improve awareness of one’s own working methods as a prerequisite to increase guideline adherence, none of the recent overviews of possible determinants of guideline adherence mentions awareness as a potentially influential factor. Because determinants that are assessed on the basis of misperceptions may not be the best predictors of actual adherence, and consequently offer no valid basis for intervention development, our findings may at least partly explain the limited explanatory power of other determinant studies of actual guideline adherence, and the modest to moderate effectiveness of previous interventions to enhance guideline adherence.
Misperceptions about adherence to evidence-based treatment recommendations have been observed before.\textsuperscript{30-33} For instance, one study found that clinicians tended to overestimate their adherence to hypertension treatment guidelines in terms of the number of patients who were prescribed guideline-concordant medication (self-reported 75\% vs. actual 67\%) and who met the guideline-recommended blood pressure levels (self-reported 68\% vs. actual 43\%).\textsuperscript{33} Another study observed that physicians generally overestimated their level of adherence to a set of quality criteria for the treatment of upper respiratory infection and high serum cholesterol.\textsuperscript{32} Moreover, both studies found nonsignificant or small correlations between most of the self-reported and actual adherence measures.\textsuperscript{32,33} Likewise, in the present study, this correlation was negligible. The misperceptions demonstrated in both other studies, however, involved overestimations of personal performance,\textsuperscript{32,33} whereas in our study, more physical therapists underestimated their level of guideline adherence (36.4\% vs. 25.2\%). This may be because of psychometric differences between the two adherence measures, with actual adherence being measured as the percentage of adherence with various guideline recommendations (clinical vignettes) and self-reported adherence as the perceived frequency with which guidelines were applied (single item).

The fact that we found the relationship between determinants and self-reported adherence to differ from that between determinants and actual behavioural measures is consistent with previous research findings.\textsuperscript{55} This difference may be because of the fact that both the determinants and the self-reported adherence are perceptions. In line with our findings, earlier research also found the perceived subjective norm to be related to self-reported behaviour and not to actual behaviour.\textsuperscript{55} Typically, the contribution of the subjective norm to the explanation of behaviour is small,\textsuperscript{43,56} indicating that the concept may be of little importance to most behaviours.\textsuperscript{56} Because the present study found that having misperceptions about actual guideline adherence was best explained by the subjective norm, our findings indicate that a complex behaviour-like guideline adherence seems under attitudinal control for people who hold correct perceptions of their performance, but that awareness of personal performance itself seems more under normative control. This might also explain why the use of social influence strategies\textsuperscript{57} has so far not proved very successful in improving guideline adherence.\textsuperscript{12} Our study suggests that these strategies may be more valuable in improving awareness of personal performance.

For physical therapists who had realistic perceptions of their own performance, adherence was explained by the perceived relative advantage of applying the guidelines (R2-change 18\%) and by the amount of attention they had paid to them (R2-change 5\%). The few comparable studies available found partly different explaining or predicting variables for the actual implementation of evidence-based practice recommendations.\textsuperscript{22,24,32} The small percentages of explained variance and low correlations between determinants and actual behaviour in these studies, however, correspond with the results of our analysis for the whole group of physical therapists irrespective
of their awareness state. The differences among the studies in terms of determinants that were actually found to correlate with objective measures of behaviour may be attributed to various differences in study samples, study designs, operationalizations, and recommended behaviours.

The present study had several limitations. First, the cross-sectional nature of our survey only allowed us to assess the determinants that explain current adherence, not to examine the determinants that predict future adherence, which would require a longitudinal follow-up. Second, the adequacy of clinical vignettes as a measurement instrument for actual guideline adherence has been the subject of discussion. Vignettes would measure attitudes and perceptions rather than actual behaviour. Recent studies, however, have also demonstrated the validity of vignettes for the measurement of clinicians' performance. Although the validity of the clinical vignettes that we used to measure actual guideline adherence has been found to be acceptable, more valid measurement instruments may be desirable. Third, self-reported adherence was measured with a single item. As physical therapists tend to vary in adherence to specific guideline recommendations, they may consequently differ in awareness levels for these sub-behaviours. More detailed self-reports could therefore provide a better understanding of the physical therapists' misperceptions. However, such more concrete self-reports are also recommended as a more valid measure of actual behaviour, instead of resulting in the overall perception of adherence in which we were explicitly interested. Additionally, we have good indications from our qualitative work that physical therapists tend to form their opinions about adherence on overall perceptions, rather than on detailed self-reflection. Fourth, as recommended by Armitage and Conner, we operationalized the perceived social norm by more than one item. We did not, however, separately examine the physical therapists' motivation to comply on the basis of Ajzen and Fishbein's guidelines, although other studies have shown that this may indeed be a sensible supplementary approach in guideline adherence research. The same may hold for the addition of patients as potentially important referent group. Finally, the response rate of just over 30% indicates that the physical therapists in the present study formed a self-selected sample. Given the relatively positive scores for adherence determinants in comparison to the more critical views expressed during the preceding focus group interviews (unpublished manuscript), the present sample can be assumed to represent mainly physical therapists who are rather committed to the use of guidelines. Further studies may benefit from more representative samples.

An important advantage of the present study is that it was one of the first theory-based surveys in the field of guideline implementation. Although the benefits of applying a coherent theoretical framework have been questioned, we are of the opinion that our results prove the added value of such an approach. The present study is the first to demonstrate that awareness of personal performance may be an important moderator of the relationship between motivational determinants and behaviour. This result confirms the view that, in general, the determinants of a
A theory-based survey demonstrated the role of awareness in guideline implementation. Particular behaviour can only be accurately assessed if people hold realistic perceptions of the behaviour involved. This may have serious consequences for future determinant studies of behaviour in general and of guideline adherence in particular. Both should at least include measures of self-reported and actual behaviour to allow for the determination of awareness of personal performance. With regard to the subsequent development of interventions, our findings additionally indicate that it may be better to segment the target group into realistic estimators on the one hand and overestimators and underestimators on the other. Finally, our findings raise doubts about the validity of most of the prevailing theoretical models to explain and predict behaviour. As has recently been suggested, these might be improved by adding awareness as a moderator of the relationship between motivational determinants and actual behaviour.
References

A theory-based survey demonstrated the role of awareness in guideline implementation.


59 Gould D. Using vignettes to collect data for nursing research studies: how valid are the findings? J Clin Nurs 1996;5:207–12.


Chapter 6

Guideline adherence is explained and predicted by various factors on multiple levels: a theory-based longitudinal survey

Geert Rutten
Janneke Harting
Kay Bartholomew
Rob Oostendorp
Nanne de Vries

Submitted.
Abstract

Objective: To assess which individual and organizational determinants explain and predict physical therapists' adherence to the guidelines for low back pain and to assess the influence of self-awareness.


Methods: With a time interval of 6 months, determinants of adherence were measured twice with a questionnaire that also used four clinical vignettes to measure guideline adherence. Multiple regression analysis was used to assess the relation between determinants and adherence.

Results: The response was 24.6% (n=394). Average guideline adherence was 45.6% (SD= 7.8) at baseline and 46.3% (SD= 8.8) at follow-up. For physical therapists who had realistic perceptions of their personal performance (41.5%), guideline adherence was explained for 31.4% and predicted for 41.1% by previous adherence, individual and organizational determinants. For overestimators of their performance (42.6%), adherence was explained to a substantially lower extent than for underestimators (23.1%). Determinants differed by subgroup. The self-selected sample might limit the external validity of the results.

Conclusion: Guideline adherence is a multilevel phenomenon. Future determinant studies might benefit from systematic and theory-based approaches and should assess explaining and predicting determinants of guideline adherence. Implementation of clinical guidelines requires a multilevel programme.
Introduction
Clinical practice guidelines are an important means to bring scientific evidence closer to practice and improve the quality of health care, but adherence appears to be only moderate. To date, programs to enhance guideline adherence have had limited success. This has been attributed to the finding that the implementation promotion approaches have had limited theoretical bases, and a strong focus on the individual professional alone instead of also considering organizational and broader environmental contexts. Additionally, quantitative techniques are needed to determine the objective relationship between determinants of adherence and actual guideline adherence and to quantify their relative importance. In quality of care research, the number of studies that fulfill these conditions is limited. We found cross-sectional studies that assessed adherence determinants at the individual professional and organizational levels, but only few examples of longitudinal designs required to assess predictors of adherence.

In a previous study, we examined the association of predominantly motivational determinants with adherence to the Dutch physiotherapy guideline for low back pain. The cross-sectional analysis showed that awareness of personal performance might act as a moderator of the relationship between determinants and adherence. For physical therapists who made adequate estimations of their personal adherence (referred to as realists), 25% of guideline adherence was explained by relative advantage, attention paid to the guideline and perceived negative consequences, such as patients being dissatisfied. The moderate amount of variance explained suggested the need for further research, including determinants that describe environmental influences such as practice and professional organization characteristics. Also, the cross-sectional approach did not reveal any determinants that predicted adherence.

The purpose of this report is to present results of a theory-based longitudinal study to assess motivational, affective and organizational determinants that explain and predict adherence to the Dutch physiotherapy guidelines for low back pain (see Appendix 1 the theoretical framework). We expected 1) that this approach would substantially enhance the percentage explained variance of guideline adherence, 2) that determinants explaining adherence would differ from those predicting adherence, and 3) that awareness of individual adherence would moderate the relationship between determinants and adherence.

Method
Design
We performed a longitudinal survey with baseline measurement taken in November 2007 (T0) and follow-up measurement in May 2008 (T1). During both measurement rounds, questionnaires were mailed and followed by two mailed reminder letters (2 and 4 weeks). The second reminder again included a second copy of the questionnaire.
Participants

Based on previous experiences, the expected response rate was 30% at baseline and 75% at follow up. To guarantee a number of 10-15 cases per determinant to enable the assessment of a relationship between the determinants and adherence, a sample of 400 physical therapists was required at T1. Therefore, we randomly sampled 1,600 physical therapists from the private practice membership record of the Royal Dutch Physiotherapy Association in the Netherlands (n=15,000). These records represent approximately 90% of the private practice physical therapists in the Netherlands.

Outcome measures

Determinants and guideline adherence

The questionnaire assessed demographic variables (age and gender) and work-related variables (part-time or full-time employment, years of working experience, executive or managerial position) of the physical therapists.

The theoretical framework, built on Rogers’ Diffusions of Innovations Theory, served as the basis for the development of the determinant questionnaire. After baseline measurement, we performed a factor analysis resulting in 36 scales of motivational, affective and organizational determinants, with an internal consistency (Cronbach’s α) varying from 0.56 to 0.89. It also distinguished 14 individual items predominantly related to the practice and professional organizational level. In view of literature reports and findings from previous focus group interviews, we decided to include these 14 items in the analysis (Table 1, see Appendix 2 description of the determinants).

To assess guideline adherence, we used four longitudinal paper-and-pencil clinical vignettes (see Appendix 3. explanation of the vignettes). These were based on validated, cross-sectional vignettes, which were expected to present a case mix sufficient to cover the main subgroups of patients with low back pain (patient profiles) described in the guidelines. The vignettes described a patient with low back pain and a normal course of recovery, a patient with a delayed course but without psychosocial factors influencing the course of recovery, and a patient with a delayed course and the presence of psychosocial factors. The fourth vignette presented a patient with low back pain due to an underlying, serious disease (red flag).

Text in the vignettes was presented in separate blocks, describing the course of recovery. Each text block was followed by questions. The answers were scored on a set of 12 quality indicators. We scored individual physical therapists on the percentage of quality indicators present for each vignette, calculated by the number of indicators met divided by the total number of indicators. Subsequently, we calculated a mean, overall percentage of adherence for each participant.
Awareness of personal guideline adherence

Because of the proposed moderating role of personal performance awareness in the relationship between guideline adherence and determinants, therapists were divided into subgroups of awareness, similar to those in previous studies. We measured perceived adherence with one self-report item including a five point scale (1 = not at all to 5 = almost completely) on the extent to which physical therapists thought they followed the guidelines when treating patients with low back pain. We assigned the therapists to three subgroups of actual adherence (low = 0.0%–33.3%; moderate = 33.4–66.6%; high = 66.7%–100%) and of self-reported adherence (low = not at all to slightly, moderate = average, high = largely to completely), and we classified them as overestimators (higher on self-reported than actual adherence), underestimators (lower on self-reported than actual adherence) and realistic estimators (self-reported reflected actual adherence).

Data analyses

Descriptive statistics were calculated for the demographic variables, the work-related variables, the determinants of guideline adherence, and the level of self-reported adherence at baseline. Descriptive statistics for individual quality indicators and overall guideline adherence were calculated at baseline and at follow up. Cases with more than 10% missing variables (n=12) were omitted from further analyses.

To observe its influence on the relationship between guideline adherence and determinants, we assessed the determinants for the three subgroups of personal performance awareness separately. Due to the extensive number of 50 potential determinants, we preselected determinants for inclusion in the various regression models to ensure a minimal of 10-15 cases per determinant. Selection was based on bivariate correlation analyses of guideline adherence and on inter-correlations of the determinants. This process yielded an acceptable distribution of cognitive, affective and organizational determinants in the initial regression models.

For determinants that explained adherence, we performed multiple regression analyses to examine the relationship between determinants (independent variables) and adherence at baseline (dependent variable). For the assessment of predictive determinants of adherence, we used actual adherence at follow-up as the dependent variable and actual adherence at baseline as a covariate in the model. To avoid overfitting in regression analyses through stepwise analyses with low α values, we used a full model approach with all applicable determinants included. Subsequently, we omitted one-by-one determinants with a p value ≥ 0.50, beginning with the determinant with the highest p value. After omission, if we observed no influence on the other B-values, we retained the decision to omit the variable from the model (nonautomated backward selection). A liberal p value < 0.50 increases the chances of identifying true predictors, thus limiting the bias in selected coefficients.
Results

Characteristics of the participants
Response rates to the questionnaire were 28.7% (n=459) at baseline and 85.8% (n=394, 24.6% of total sample) of the baseline respondents at follow up (Figure 1). On average, the respondents were 43.2 years old (SD=10.5), and 43.7% were female. Thirty-three percent (n=131) had more than 25 years of practice experience, 31% (n=121) had 16–25 years, and 36% (n=144) had less than 16 years. Sixty-three percent (n=251) worked full time, 53% (n=207) were practice owners, and the other 47% (n=181; 6 missing values) were employees.

Figure 1. Response and reasons for non-response and loss to follow-up

Received baseline questionnaire
1600 physical therapists randomly selected

- Not interested -1141 physical therapists

Completed baseline questionnaire
459 physical therapists (28.7%)

- Not eligible -more than 10% missing values

Received follow-up questionnaire
442 physical therapists (27.6%)

- Drop out/not eligible -didn’t complete the questionnaire -more than 10% missing values

Study sample (eligible baseline and follow-up questionnaire)
394 physical therapists (24.6% of total, 85.8% of baseline)

Determinants
Although many determinants scored around average (3.0 ± 0.5, see Table 1), a substantial number of determinants scored outside these bounds. As prior conditions, physical therapists indicated regular reflection on their work, and they perceived guidelines to be mainly a decision of policy makers.

For the Knowledge Stage, more attention than average was paid to the guideline for low back pain, and for the Persuasion Stage, communicability of the guideline was perceived slightly
positive and complexity was limited. As for Decision Stage variables, behavioural self-efficacy expectations about discussing psychosocial factors and explaining the hands-off approach to the patient were high. Potential losses (negative side effects) due to the guideline were perceived as rather low.

Table 1. Operationalization of behavioural and organizational determinants of guideline adherence

<table>
<thead>
<tr>
<th>Diffusion stage</th>
<th>N_items</th>
<th>α</th>
<th>Mean* (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>evaluation of work</td>
<td>1</td>
<td>-</td>
<td>6.02 (1.14)</td>
<td>frequency of reflection on work</td>
</tr>
<tr>
<td>changeability</td>
<td>1</td>
<td>-</td>
<td>2.74 (0.72)</td>
<td>ease of changing way of working</td>
</tr>
<tr>
<td>Innovation decision</td>
<td>3</td>
<td>-</td>
<td>3.41 (1.01)</td>
<td>of majority of professional group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>3.46 (1.25)</td>
<td>of individual physical therapist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>3.62 (1.09)</td>
<td>decision of policy makers</td>
</tr>
<tr>
<td>Knowledge stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>attention paid</td>
<td>2</td>
<td>0.70</td>
<td>3.58 (0.78)</td>
<td>amount of attention paid; how thoroughly read</td>
</tr>
<tr>
<td>Persuasion stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>relative advantage</td>
<td>6</td>
<td>0.85</td>
<td>3.43 (0.76)</td>
<td>provide more knowledge; guidelines are a good thing; guideline is efficient, is a useful tool to reflect on my work; leads to higher transparency of my work; improves structure of physiotherapy practice</td>
</tr>
<tr>
<td>credibility of evidence</td>
<td>2</td>
<td>0.76</td>
<td>3.26 (0.84)</td>
<td>evidence is questionable; there is insufficient evidence</td>
</tr>
<tr>
<td>credibility of the recommendations</td>
<td>3</td>
<td>0.71</td>
<td>3.02 (0.87)</td>
<td>recommendation for hands off policy with acute low back pain is questionable; distort the natural course of acute low back pain; focus too strong on psychosocial factors</td>
</tr>
<tr>
<td>compatibility</td>
<td>4</td>
<td>0.70</td>
<td>2.95 (0.76)</td>
<td>insufficient attention for the domain of body functions; too much tailored to primary care guidelines; too evidence-based; matches my current way of working</td>
</tr>
<tr>
<td>flexibility</td>
<td>5</td>
<td>0.87</td>
<td>3.39 (0.79)</td>
<td>provides sufficient possibility to deviate; sufficient room for personal interpretation; sufficient room for arbitration; provides sufficient room for autonomy; causes too much uniformity</td>
</tr>
<tr>
<td>communicability</td>
<td>3</td>
<td>0.82</td>
<td>3.77 (0.83)</td>
<td>easy to explain to patients, to colleagues, to referring physicians</td>
</tr>
<tr>
<td>complexity</td>
<td>5</td>
<td>0.80</td>
<td>2.12 (0.67)</td>
<td>easy to understand; hard to read; very comprehensible; too complicated; too many incomprehensible words in text</td>
</tr>
<tr>
<td>visibility of results</td>
<td>4</td>
<td>0.89</td>
<td>2.66 (0.87)</td>
<td>provides better treatment results; results of adherence are visible to patient; are visible to colleagues; are visible to referring physician</td>
</tr>
<tr>
<td>Affective factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pride and confidence</td>
<td>6</td>
<td>0.86</td>
<td>2.83 (0.82)</td>
<td>confirms capability; improved way of working; has distinguished our practice; makes me feel good about the quality of my work; makes me feel more secure towards my patient; towards other disciplines with limited information about how to deal with psychosocial factors; with hands off policy for acute low back pain; with indistinct recommendations for chronic low back pain; with ignoring patient’s intelligence; with insufficient consideration with patient’s wishes; because it yields unjust feelings of expertise</td>
</tr>
<tr>
<td>feeling uncomfortable</td>
<td>6</td>
<td>0.81</td>
<td>2.94 (0.79)</td>
<td></td>
</tr>
</tbody>
</table>
### Diffusion stage

<table>
<thead>
<tr>
<th>Decision stage</th>
<th>N&lt;sub&gt;items&lt;/sub&gt;</th>
<th>α</th>
<th>Mean&lt;sup&gt;a&lt;/sup&gt; (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>gathering information&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3</td>
<td>--</td>
<td>2.65 (1.51)</td>
<td>through the internet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>--</td>
<td>2.75 (1.64)</td>
<td>through my deliberation group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>--</td>
<td>2.95 (1.54)</td>
<td>by following training</td>
</tr>
<tr>
<td>self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use of questionnaires&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.71</td>
<td>3.48 (0.69)</td>
<td>to apply questionnaires correctly; to make the patient complete questionnaires if he finds it aggravating; know how to apply questionnaires; to apply questionnaires even if it costs a lot of trouble; about my skills to use questionnaires</td>
</tr>
<tr>
<td>behavioural&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>--</td>
<td>4.13 (0.84)</td>
<td>to discuss psychosocial factors with patient;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>--</td>
<td>3.79 (1.04)</td>
<td>to explain hands off policy to patient</td>
</tr>
<tr>
<td>tensional&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>0.82</td>
<td>3.17 (1.00)</td>
<td>to apply guideline within the given time for a treatment session; to apply the guideline within the current compensation structure</td>
</tr>
<tr>
<td>social&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.84</td>
<td>3.49 (0.81)</td>
<td>to apply the guideline if the patient prefers non adherent care; if my employer prefers non adherent care; if the referring physician proposes non adherent care; if the patient’s environment does not support guideline adherent care; if colleagues in my practice would not apply the guideline</td>
</tr>
<tr>
<td>potential losses&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.85</td>
<td>2.24 (0.83)</td>
<td>lose the joy in my work; lose respect from my colleagues; patient’s will be dissatisfied; will leave my profession earlier; disrupts the relation with my patients</td>
</tr>
</tbody>
</table>

### Implementation stage

#### Individual factors

<table>
<thead>
<tr>
<th></th>
<th>N&lt;sub&gt;items&lt;/sub&gt;</th>
<th>α</th>
<th>Mean&lt;sup&gt;a&lt;/sup&gt; (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>perceived behaviour of others&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.65 (0.94)</td>
<td>most of my colleagues do not apply the guideline</td>
</tr>
<tr>
<td>social norm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>patient&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.35 (1.06)</td>
<td>most of my patients expect non adherent care</td>
</tr>
<tr>
<td>colleagues and physicians&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>0.72</td>
<td>2.71 (0.95)</td>
<td>colleagues expect me to apply the guideline; referring physicians expect me to apply the guideline</td>
</tr>
<tr>
<td>motivation to comply patient&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>4.07 (0.97)</td>
<td>important that my patient agrees with my treatment</td>
</tr>
<tr>
<td>colleagues and physicians&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3</td>
<td>0.58</td>
<td>3.02 (0.76)</td>
<td>important to comply with my colleagues; the opinion of my best colleagues is important to me; important what the referring physician expects from me</td>
</tr>
<tr>
<td>commitment&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.75</td>
<td>3.61 (0.69)</td>
<td>expert colleagues are involved in guideline development; representative colleagues are involved in guideline development; guidelines are pretested; are judged by expert physicians; I know how a guideline is developed know which are adequate reasons to deviate from the guideline; where the emphasis of diagnostics and treatment should be; how to assess yellow flags; when it is allowed to deviate from the guideline</td>
</tr>
<tr>
<td>how to knowledge&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4</td>
<td>0.73</td>
<td>3.82 (0.66)</td>
<td>insufficient knowledge; skills</td>
</tr>
<tr>
<td>barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>professional&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>0.81</td>
<td>1.96 (0.76)</td>
<td>insufficient knowledge; skills</td>
</tr>
<tr>
<td>logistic&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.81</td>
<td>2.93 (0.86)</td>
<td>insufficient compensation; change costs too much time; insufficient time per session; physical therapy budget of patient; too much paper work</td>
</tr>
<tr>
<td>structural&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.44 (1.03)</td>
<td>does not fit into market directed care</td>
</tr>
</tbody>
</table>
Guideline adherence is explained and predicted by various factors on multiple levels

<table>
<thead>
<tr>
<th>Diffusion stage</th>
<th>N_{items}</th>
<th>α</th>
<th>Mean' (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>skills</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4</td>
<td>0.82</td>
<td>4.00 (0.71)</td>
<td>sufficient skills to address psychosocial factors, to interpret questionnaires about psychosocial factors, to deliberate well with my patient other general protocol, other local protocol</td>
</tr>
<tr>
<td>competing performance&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>0.69</td>
<td>2.11 (0.98)</td>
<td>loose autonomy, position of physical therapy compared to other disciplines, the role of physical therapy in case of chronic low back pain</td>
</tr>
<tr>
<td>uncertainty about position&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3</td>
<td>0.76</td>
<td>2.71 (0.94)</td>
<td></td>
</tr>
</tbody>
</table>

**Practice organization factors**

<table>
<thead>
<tr>
<th>Practice organization factors</th>
<th>N_{items}</th>
<th>α</th>
<th>Mean' (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>supportive management</td>
<td>1</td>
<td>--</td>
<td>2.94 (0.99)</td>
<td>frequency of practice deliberation meetings and the role of the guideline in it</td>
</tr>
<tr>
<td>structural deliberation&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.68 (1.22)</td>
<td>practice arrangements about treatment of patients with low back pain</td>
</tr>
<tr>
<td>practice arrangements&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.12 (1.34)</td>
<td>arrangements with other disciplines</td>
</tr>
<tr>
<td>availability of materials&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3</td>
<td>0.79</td>
<td>3.82 (1.03)</td>
<td>guideline available in the practice, questionnaires available, manuals for questionnaires available</td>
</tr>
<tr>
<td>practice structure</td>
<td>1</td>
<td>--</td>
<td>2.73 (1.60)</td>
<td>separate room for patients to complete questionnaires</td>
</tr>
<tr>
<td>separate room available&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.12 (1.34)</td>
<td>arrangements with other disciplines</td>
</tr>
<tr>
<td>arrangements&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.73 (1.60)</td>
<td>culture to deliver top quality of care, practice is known for its activating approach, open atmosphere with mutual respect</td>
</tr>
<tr>
<td>practice culture&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3</td>
<td>0.65</td>
<td>4.25 (0.70)</td>
<td></td>
</tr>
</tbody>
</table>

**Professional organization factors**

<table>
<thead>
<tr>
<th>Professional organization factors</th>
<th>N_{items}</th>
<th>α</th>
<th>Mean' (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>restructuring practice field</td>
<td>2</td>
<td>0.82</td>
<td>3.54 (1.04)</td>
<td>well organised multidisciplinary care would improve guideline adherence, development of multidisciplinary guidelines would improve guideline adherence</td>
</tr>
<tr>
<td>multidisciplinary care&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>0.58</td>
<td>3.92 (0.93)</td>
<td>an electronic patient record would improve adherence, a different compensation system would facilitate guideline adherence</td>
</tr>
<tr>
<td>availability of means&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.50 (1.03)</td>
<td>would improve guideline adherence</td>
</tr>
<tr>
<td>market oriented care&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>2.47 (1.06)</td>
<td>majority is reluctant to be transparent about their quality of care</td>
</tr>
<tr>
<td>culture of professional group transparency&lt;sup&gt;c&lt;/sup&gt;</td>
<td>6</td>
<td>0.81</td>
<td>3.30 (0.76)</td>
<td>attached to current way of working, costs little effort, know my position, easy to communicate with physicians, provides no risks, is a good way of working</td>
</tr>
<tr>
<td>technical/cultural resistance&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>3.91 (0.98)</td>
<td>guideline should leave space for local arrangements and protocols</td>
</tr>
</tbody>
</table>

**Confirmation stage**

<table>
<thead>
<tr>
<th>Individual factors</th>
<th>N_{items}</th>
<th>α</th>
<th>Mean' (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>compatibility with other routines&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
<td>--</td>
<td>3.91 (0.98)</td>
<td>guideline should leave space for local arrangements and protocols</td>
</tr>
<tr>
<td>reinforcement support&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4</td>
<td>0.74</td>
<td>3.65 (0.84)</td>
<td>regular reminder, accreditation of guideline concordant courses, attention to guideline during physical therapy education, patients well informed about the guideline obliges the use of guidelines, make it part of a quality hallmark, audit the use of guidelines, patients showing approval, if it makes insurance companies prefer our practice about delivered quality of care, about costs, about treatment results</td>
</tr>
<tr>
<td>pressure&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.85</td>
<td>3.03 (0.95)</td>
<td></td>
</tr>
<tr>
<td>feedback&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3</td>
<td>0.87</td>
<td>3.61 (0.87)</td>
<td></td>
</tr>
</tbody>
</table>

**Practice organization factors**

| Integration in practice routines<sup>d</sup> | 1 | -- | 3.40 (1.23) | practice provides opportunities for retraining |
### Diffusion stage

<table>
<thead>
<tr>
<th>Professional organization factors</th>
<th>$N_{items}$</th>
<th>$\alpha$</th>
<th>Mean$^a$ (SD)</th>
<th>Item specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>compatible with professional organization’s objectives$^a$</td>
<td>2</td>
<td>0.80</td>
<td>3.95 (0.90)</td>
<td>evident position in quality policy; important role in professionalization of the profession</td>
</tr>
<tr>
<td>integration in professional organization’s routines$^b$</td>
<td>4</td>
<td>0.71</td>
<td>2.85 (0.68)</td>
<td>should provide sufficient information about recommended questionnaires; sufficient time; sufficient money; sufficient courses</td>
</tr>
<tr>
<td>organization of the professional group structure$^b$</td>
<td>3</td>
<td>0.56</td>
<td>2.96 (0.96)</td>
<td>deliberation groups are useful; facilitates guideline implementation; deliberation groups provided me with information</td>
</tr>
<tr>
<td>activities$^c$</td>
<td>3</td>
<td>0.61</td>
<td>2.68 (0.65)</td>
<td>sufficient cooperation of professional organizations; sufficient nationwide discussion; more attention during the yearly national professional conference</td>
</tr>
</tbody>
</table>

$^a$ five-point scale ranging from no attention (1) to very much attention (5)

$^b$ five-point scale ranging from completely disagree (1) to completely agree (5)

$^c$ five-point scale ranging from completely agree (1) to completely disagree (5)

$^d$ seven-point scale ranging from never (1) to during every treatment session (7)

$^e$ five-point scale ranging from very easy (1) to very difficult (5)

$^f$ domains of the International Classification of Functioning, Disability and Health (WHO, 2001)

$^g$ five point scale from never (1) to monthly in which the guidelines are on the agenda (5)

Concerning the Implementation Stage individual professional level, the perceived social norm of the patient did not favour the guideline, and the physical therapists’ motivation to comply with the patient was very high. Therapists expressed commitment to the guideline, and they were positive about their knowledge and skills, which were not perceived as a barrier to guideline application. Neither did they perceive the guideline as a barrier to market-oriented care. At the practice organization level, deliberation meetings were held occasionally or regularly (but not monthly); materials for guideline application were available, and the practice culture was perceived as very supportive. Practice arrangements with other disciplines were only modestly available. The professional organization could play an important role in guideline use by organizing multidisciplinary care arrangements or guidelines and by making resources and training available. The culture of the professional group was perceived as somewhat reluctant to being transparent about the quality of care.

For the Continuation Stage, continued use of guidelines would be facilitated if they left room for local arrangements and protocols. Supportive reinforcement and feedback about physical therapists’ performance and results was expected to be more effective than pressure. Finally, if the professional organization gave guidelines a prominent position in its quality policy, physical therapists’ might be more likely to continue their use.

### Adherence

At 45%, overall guideline adherence was considered moderate (Table 2). No substantial difference in average adherence rates was observed between baseline and follow up. Physical
therapists showed high adherence rates for assessing red flags (98%), and they correctly referred patients to physicians in those cases (98%). They also made after-care arrangements (86%) and reported back to the physician (82%).

Moderate adherence rates were observed for the correct choice of the patient profile (64%) and the choice of applicable treatment strategies (38%).

Physical therapists showed rather low adherence rates to apply completely the International Classification of Functioning, Disability and Health (ICF) categories during the examination (9%), to choose applicable examination (4%) and treatment objectives (30%), and to limit the number of sessions (3 or 4) in cases of acute low back pain with a favourable natural course (31%). Finally, their adherence was low for providing adequate advice (6%) and applying measurement instruments (11%).

Table 2. Overall percentage adherence and scores on individual quality Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mean (SD) baseline</th>
<th>Mean (SD) follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>overall adherence</td>
<td>45.6 (7.8)</td>
<td>46.3 (8.8)</td>
</tr>
<tr>
<td>ind_1: assessment of red flags</td>
<td>97.5 (8.2)</td>
<td>98.4 (6.6)</td>
</tr>
<tr>
<td>ind_2: assessment of the health problem in all ICF-subsets</td>
<td>8.7 (15.9)</td>
<td>7.7 (15.1)</td>
</tr>
<tr>
<td>ind_3: choice of the patient profile</td>
<td>63.1 (24.6)</td>
<td>64.8 (25.0)</td>
</tr>
<tr>
<td>ind_4: reference to physician on the basis of the patient profile</td>
<td>97.7 (7.5)</td>
<td>98.3 (6.3)</td>
</tr>
<tr>
<td>ind_5: choice of applicable examination objectives</td>
<td>4.4 (11.8)</td>
<td>6.0 (13.1)</td>
</tr>
<tr>
<td>ind_6: choice of the treatment objectives</td>
<td>30.4 (26.9)</td>
<td>29.3 (25.4)</td>
</tr>
<tr>
<td>ind_7: treatment strategies applied</td>
<td>38.7 (30.6)</td>
<td>38.3 (30.4)</td>
</tr>
<tr>
<td>ind_8: number of sessions in case of acute low back pain</td>
<td>31.5 (46.5)</td>
<td>30.4 (46.1)</td>
</tr>
<tr>
<td>ind_9: providing with adequate advice</td>
<td>6.9 (15.0)</td>
<td>5.6 (12.7)</td>
</tr>
<tr>
<td>ind_10: applied questionnaires</td>
<td>11.5 (22.5)</td>
<td>10.7 (19.9)</td>
</tr>
<tr>
<td>ind_11: aftercare arranged</td>
<td>86.6 (25.9)</td>
<td>86.4 (26.7)</td>
</tr>
<tr>
<td>ind_12: reporting back to physician</td>
<td>81.4 (36.9)</td>
<td>82.6 (35.7)</td>
</tr>
</tbody>
</table>

Awareness of personal performance
Of all respondents, 41.5% (n=159) made adequate estimations about their personal guideline adherence, 42.6% (n=163) overestimated their adherence and 23.1% (n=61) underestimated their adherence.

Determinants explaining adherence
For the realistic estimators, the regression model explained 31.4% of the variance (Table 3). Considering a p value < .05, the two determinants that explained higher adherence rates were: attention paid to the guideline at the individual professional level (ΔR² = 22.2%) and the perception that guidelines play an important role in the professional organization’s quality policy and in the professionalization of physical therapists at the professional organizational level (ΔR² = 5.6%). At the practice level (ΔR² = 2.0%), we found no factors related to guideline adherence.
Table 3. Determinants explaining guideline adherence for realistic estimators, overestimators and underestimators

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>Realistic estimators (n=159)</th>
<th>Overestimators (n=163)</th>
<th>Underestimators (n=61)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>β</td>
<td>P</td>
</tr>
<tr>
<td>Demographic variables</td>
<td>.490</td>
<td>.218</td>
<td>.698</td>
</tr>
<tr>
<td>Individual professional variables</td>
<td>22.2%</td>
<td>14.3%</td>
<td>22.6%</td>
</tr>
<tr>
<td>Collective decision</td>
<td>-0.933</td>
<td>-0.112</td>
<td>.183</td>
</tr>
<tr>
<td>Individual decision</td>
<td>-1.377</td>
<td>-0.118</td>
<td>.204</td>
</tr>
<tr>
<td>Regular evaluation</td>
<td>2.928</td>
<td>0.232</td>
<td>.003**</td>
</tr>
<tr>
<td>Attention paid</td>
<td>1.898</td>
<td>0.149</td>
<td>.118</td>
</tr>
<tr>
<td>Credibility of</td>
<td>1.898</td>
<td>0.149</td>
<td>.118</td>
</tr>
<tr>
<td>recommendations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatibility with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>routines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential losses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient expects non</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>adherent care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social norm of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>colleagues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barriers to use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>measurement instruments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncertainty about</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>position in treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of LBP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guideline makes LBP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>complicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guideline is too</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent variables</td>
<td>B</td>
<td>β</td>
<td>P</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Practice organization variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliberation meetings</td>
<td>1.074</td>
<td>0.116</td>
<td>.130</td>
</tr>
<tr>
<td>in practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice uses facilitating software</td>
<td>0.772</td>
<td>0.092</td>
<td>.249</td>
</tr>
<tr>
<td>Materials available in practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supportive culture in practice</td>
<td>-0.753</td>
<td>-0.062</td>
<td>.450</td>
</tr>
<tr>
<td>Practice provides opportunity for retraining</td>
<td>1.393</td>
<td>0.270</td>
<td>.027*</td>
</tr>
<tr>
<td><strong>Professional organization variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market oriented care facilitates guideline adherence</td>
<td>-2.299</td>
<td>-0.346</td>
<td>.005**</td>
</tr>
<tr>
<td>Guideline adherent care fits prof. org. objectives</td>
<td>2.755</td>
<td>0.276</td>
<td>.001**</td>
</tr>
<tr>
<td>Prof. org. provides support</td>
<td>1.200</td>
<td>0.110</td>
<td>.175</td>
</tr>
</tbody>
</table>

*LBP = low back pain

*p < .10; * p < .05; ** p < .01
Table 4. Determinants predicting guideline adherence for adequate estimators, overestimators and underestimators

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Adequate estimators (n=159)</th>
<th>Overestimators (n=163)</th>
<th>Underestimators (n=61)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>β</td>
<td>P</td>
</tr>
<tr>
<td>Demographic variables</td>
<td>1.4%</td>
<td>.551</td>
<td></td>
</tr>
<tr>
<td>Previous adherence</td>
<td>31.4%</td>
<td></td>
<td>.409</td>
</tr>
<tr>
<td>Individual professional variables</td>
<td>6.9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Adequate estimators (n=159)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>B</th>
<th>β</th>
<th>P</th>
<th>95% CI for B</th>
<th>R² for B change</th>
<th>Overestimators (n=163)</th>
<th>B</th>
<th>β</th>
<th>P</th>
<th>95% CI for B</th>
<th>R² for B change</th>
<th>Underestimators (n=61)</th>
<th>B</th>
<th>β</th>
<th>P</th>
<th>95% CI for B</th>
<th>R² for B change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline makes LBP*</td>
<td>-0.514</td>
<td>-0.065</td>
<td>.437</td>
<td>-1.819, 0.791</td>
<td></td>
<td>-1.015</td>
<td>-0.118</td>
<td>.082*</td>
<td>.132</td>
<td>-2.162, 0.132</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice organization variables</td>
<td>.09%</td>
<td>5.0%</td>
<td>8.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliberation meetings</td>
<td>-0.623</td>
<td>-0.076</td>
<td>.296</td>
<td>-1.799, 0.553</td>
<td></td>
<td>1.907</td>
<td>0.242</td>
<td>.001**</td>
<td>2.998</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient time for</td>
<td>0.494</td>
<td>0.072</td>
<td>.316</td>
<td>-0.476, 1.465</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supportive culture in practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional organization variables</td>
<td>.05%</td>
<td>5.4%</td>
<td>17.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing multi-</td>
<td>0.961</td>
<td>0.128</td>
<td>.107</td>
<td>-0.210, 2.132</td>
<td></td>
<td>1.826</td>
<td>0.250</td>
<td>.025*</td>
<td>3.418</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>disciplinary structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market oriented care</td>
<td>-2.526</td>
<td>0.333</td>
<td>.007**</td>
<td>-4.320, -0.732</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>facilitates guideline adherence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback about results</td>
<td>0.724</td>
<td>0.080</td>
<td>.303</td>
<td>-0.660, 2.107</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prof org provides</td>
<td>1.202</td>
<td>0.144</td>
<td>.058*</td>
<td>-.043, 2.447</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>means</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guideline adherent care fits prof org objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prof org provides</td>
<td>-0.691</td>
<td>-0.090</td>
<td>.231</td>
<td>-1.826, 0.445</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total R²</td>
<td>41.1%</td>
<td>43.6%</td>
<td>45.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*LBP = low back pain

*p < .10, *p < .05, **p < .01
For the overestimators (R² = 19.3%), regular self-evaluation concerning the results and the process of care was related to higher guideline adherence on the individual professional level (ΔR² = 14.3%) and uncertainty caused by the guideline concerning the position of physical therapists treating patients with low back pain was associated with lower adherence rates. We observed no contributing factors on practice (ΔR² = 0.3%) or professional organizational levels (ΔR² = 1.6%) for this subgroup.

For the underestimators (R² = 42.6%) at the individual professional level (ΔR² = 22.6%), attention paid to the guideline contributed to higher adherence rates. At the practice level (ΔR² = 7.0%), the opportunity for retraining was associated with higher guideline adherence, and at the professional organization level (ΔR² = 10.5%) a stronger idea of market-oriented care was associated with lower guideline adherence.

Determinants predicting adherence

Previous guideline adherence contributed most to the prediction of higher adherence for all subgroups (Table 4). The prediction model of the realistic estimators explained guideline adherence for 41.1%. On the individual professional level (ΔR² = 6.9%), feelings of discomfort that resulted from delivering guideline-adherent care contributed to lower adherence rates. Contributions of the determinants on the practice (ΔR² = 0.09%) and professional organizational level (ΔR² = 0.05%) were negligible.

The explained variance of the prediction model of the overestimators was 43.6%. For the individual professional level (ΔR² = 7.3%), visibility of the results of guideline-adherent care contributed to better guideline adherence. At the practice level (ΔR² = 5.0%), holding regular deliberation meetings increased higher adherence rates. We found no contributing factors for the professional organization level (ΔR² = 5.4%).

For the underestimators (R² = 45.7%), besides previous adherence the final model included no factors at the individual professional level. At the practice level (ΔR² = 8.9%), having a supportive practice culture was the best predictor of higher adherence rates, and for the professional organization (ΔR² = 17.5%), having multidisciplinary structures contributed to higher adherence rates. Higher perceptions of market-oriented care contributed to lower guideline adherence.

Discussion

Our theory-based approach to variable specification and measurement shows that analyses of physical therapists' adherence to their guidelines for low back pain is a complex phenomenon, which is influenced by determinants on various levels, including the individual professional and the practice and professional organizations. It also shows that this approach has the potential to better explain adherence to clinical practice guidelines. We observed that determinants that
Guideline adherence is explained and predicted by various factors on multiple levels

Explain adherence differ from those that predict adherence and that previous guideline adherence is the strongest predicting factor. Furthermore, we found that determinants that explain or predict adherence differ by personal performance awareness subgroup.

We observed that determinants on various levels influence guideline adherence. This finding is consistent with previous reports that quality of health care requires an effort at multiple levels.\textsuperscript{6,7} Nonetheless, the explained variance in the realist subgroup in our cross-sectional analysis did not substantially increase, compared with our previous cross-sectional, primarily individual level motivational determinant study.\textsuperscript{14} One explanation could be that patient-related factors play a crucial role in guideline adherence. In this study, patient influences were restricted to the perceived preferences of the patient and the professionals’ motivations to comply with these preferences, which was scored very high. Previous studies found especially strong influences from disease- and treatment-related patient factors.\textsuperscript{25,26} Consequently, not including these patient-related factors in our study might have limited the explained variance of guideline adherence.

A second explanation might be the long-term influence of practice organizational determinants, which could limit their influence in cross-sectional analyses. The influence of organizational determinants on guideline we found provides further confirmation of the assertion that structural support at the organizational level is required to improve guideline adherence.\textsuperscript{6,7} The more consistent pattern of prediction than of explanation at baseline for practice organization factors for the subgroups in our study, is consistent with previous findings, which show that organizational factors have a facilitating role, influencing performance of individual professionals over time.\textsuperscript{27,28}

To our knowledge, our study is the first to show that determinants that explain guideline adherence differ from those that predict adherence. This finding has consequences for the development of programmes designed to improve guideline adherence.\textsuperscript{3,29} To date, problem analyses done before programme development have merely been based on literature review and qualitative techniques\textsuperscript{30,31} or on cross-sectional quantitative approaches.\textsuperscript{10,32} Combining a qualitative determinant analysis and a determinants assessment that both explains and predicts adherence, resulted in a broad understanding of profession-specific guideline implementation problems and the relevance of specific determinants for the short- and longer term. This analysis might, therefore, provide a better rationale for the development of an intervention to improve guideline adherence.

The results of this study suggest that awareness of personal performance moderates the relationship between guideline adherence and individual and organizational determinants. Previous studies have also observed misperceptions of personal performance,\textsuperscript{33-35} and observed
low correlations between self-reported and actual adherence. However, we found no reports that assessed self-awareness subgroups in the study of health care quality. These differences among the subgroups suggest the possible need for interventions that target the groups specifically. Better insight in the different relevant determinants per subgroup enhanced the opportunity to tailor programs and thereby improve guideline adherence.

Using a longitudinal analysis in this study enabled us to assess the influence of previous adherence. The inclusion of previous adherence substantially enhanced the explained variance by individual professional factors, also in comparison with previous studies in quality of health care. Individual professional level determinants such as age and gender, working time, experience and specialization in these studies contributed 12% or less to explaining guideline adherence, compared to more than 30% in our study. However, previous adherence appeared to substantially decrease the contribution of other determinants. This might be due to the habitual nature of previous adherence, limiting the influence of other psychosocial factors.

We recognize that in the 6-month period between the two measurements, the average guideline adherence did not change. Nonetheless, on the individual professional level there were limited positive and negative adherence differences. Consequently, for the participants who performed slightly worse at 6 months, determinants explained a decrease instead of an increase in adherence. Further, our longitudinal analysis was based on a single measurement of determinants as well as guideline adherence. Longitudinal analyses with repeated measures provide greater power to detect effects. However, it was our opinion that repeating determinant and adherence measurements would have been burdensome for the participating physical therapists. Finding easier ways to assess guideline adherence and its determinants quantitatively might enhance the opportunity to apply more powerful analyses to predictors of guideline adherence. In our assessment of determinants predicting adherence, we included previous adherence as a covariate in the longitudinal analyses. This may have obscured the predicting role of determinants that explained adherence in the cross-sectional analyses. This means that the predicting determinants we identified may be additional to rather than different from the cross-sectional determinants. Additional explorative analyses, however, did only partly confirm this assumption. Another limitation was that the explained variances in this study were based on analyses using $p < 0.50$. Consequently, more variables stayed in the models thus enhancing the explained variance. However, performing the analyses with $p < 0.05$ reduced the explained variance with 6.8%, in the worst case. This still resulted in substantially higher explained variances than other studies.

The adequacy of clinical vignettes as a measurement instrument for actual guideline adherence has been the subject of discussion. Vignettes are reported to measure attitudes and perceptions or intentions rather than actual behaviour. However, some studies have demonstrated the
validity of vignettes to measure clinicians’ performance. Nevertheless, more valid and easily applicable measurement instruments may be desirable. Electronic health records with integrated quality indicators might be promising in this respect. Finally, the response rate of 29% at baseline indicates that the participants are a self-selected sample. Compared with national data, there were no differences in mean age and work experience. However, at 43%, female physical therapists were under-represented, compared with the national number of 50%. Since female therapists in the Netherlands generally work part-time, this also caused an under-representation of part-time working physical therapists. These findings indicate that there might be some selection in the sample, limiting the external validity of the results. Since these variables did not show any influence in our analyses, we do not expect that this selection had consequences for the internal validity of our study.

Conclusion and recommendations
Guideline adherence is a complex phenomenon influenced by the individual professional, the practice organization and the broader environment, such as the professional organization. Problem analyses preceding the development of programs to improve guideline adherence might, therefore, benefit from a framework based on a combination of theories, including the behavioural change of the individual professional as well as organizational and environmental change. These analyses should include cross-sectional as well as longitudinal approaches and might benefit from the distinction of adherence-awareness subgroups. Moreover it could be beneficial to include patient-related factors. Such a problem analysis is expected to provide a sound rationale for the development of multilevel programs tailored to the therapist’s state of adherence-awareness in order to increase adherence to clinical guidelines. These programmes should also consider the impact of previous adherence.
References

Guideline adherence is explained and predicted by various factors on multiple levels

Appendix 1: Theoretical framework

The previously developed GUIDE framework\(^1\) was applied as the theoretical basis for this study. The core of the framework, Rogers' Diffusion of Innovations Theory, describes the process of adopting an innovation and suggests a five-stage behavioral change process for the individual professional.\(^2\) *knowledge*, in which individuals get acquainted with an innovation and gain understanding about its characteristics; *persuasion*, in which they consider pros and cons; *decision*, in which they decide whether or not they are going to apply the innovation; *implementation*, in which they begin using the innovation; and *continuation*, in which they continue to use the innovation. The theory emphasizes that, at every stage, different determinants are influential, and it also suggests the influence of *prior conditions*, such as previous practice and innovativeness. The role of awareness of personal performance in relation to guideline adherence in the GUIDE framework was derived from Weinstein's Precaution Adoption Process Model.\(^3\)

For this study we expanded the original GUIDE framework to include affective and organizational determinants. We selected the affective determinants from Social Cognitive Theory\(^4\) and Attribution Theory\(^5\) and organizational determinants from the General Model of Planned Change\(^6\). We also conducted four focus group interviews of physical therapists\(^7\) to identify profession-specific affective determinants and factors on the levels of practice and professional organization, for which items should be included in a subsequent longitudinal questionnaire survey.

References

7. Rutten GM, Harting J. Results of NVivo analysis of focus group interviews for the GIPhT study. Nijmegen: Radboud University Nijmegen Medical Centre, Scientific Institute for Quality of Healthcare, 2007
Appendix 2: Additional description of the determinants of guideline adherence

With regards to prior conditions, the frequency of self-evaluation,\(^1\,^2\) changeability\(^3\) of the physical therapist, and to whom the physical therapists attributed the innovation decision\(^4\) were assessed. The Knowledge Stage variable was the amount of attention paid to the guideline.\(^4\) For the Persuasion Stage, we included attitudes indicated by perceived guideline characteristics,\(^4,\,^5\) the affective variables pride and confidence in the guidelines, and feelings of discomfort caused by applying the guidelines.\(^2,\,^6,\,^7\) Decision Stage variables were ways physical therapists gathered new information about the guidelines, self efficacy expectations towards the application of health-outcome questionnaires, behavioral, tensional and social self-efficacy expectations for the use of the guidelines,\(^4,\,^7,\,^8\) and potential losses (perceived risks) from using the guidelines.\(^2,\,^9\)

Implementation Stage individual professional level variables, perceived social influence, i.e. social norm, social support and social pressure,\(^2,\,^{10}\) commitment,\(^11,\,^{12}\) procedural (how-to) knowledge,\(^4\) perceived barriers\(^4,\,^{12,\,^{13}}\) and skills to apply the guidelines,\(^2,\,^{11}\) were measured. Finally, the perceived influence of competing protocols\(^1\) and the perceived consequences for their position in the treatment of patients with low back pain were assessed.\(^13\)

For the Implementation Stage practice organization level, variables related to supportive management (e.g., presence of structural deliberation meetings and practice arrangements), practice structure (e.g., presence of inter-disciplinary arrangements) and practice culture\(^2,\,^{3,\,^{13-15}}\) were measured.

Implementation Stage professional organization variables were structure of the practice field (e.g., the influence of well-organized multidisciplinary care, the availability of means to facilitate implementation) and the culture of the professional group (e.g., attitude towards transparency about quality and the presence of technical and cultural resistance).\(^13,\,^{16}\)

Continuation Stage individual professional level variables were compatibility with other routines,\(^1\) the availability and perceived influence of reinforcing activities and feedback.\(^2,\,^3\) On the organizational level, the opportunity for retraining (practice level)\(^2\) and the perceived attitude, routines and organization of the professional organization with regard to guidelines were assessed.\(^17\)

References
Appendix 3: Additional explanation of the vignettes to assess guideline adherence

We assessed the choices physical therapists (PTs) made during the course of examination and treatment to indicate actual guideline adherence. We used four longitudinal paper-and-pencil clinical vignettes, which were based on validated, cross-sectional vignettes, and expected to present a case mix sufficient to cover the main subgroups of patients with low back pain described in the guideline. These subgroups are indicated in the guideline as patient profiles, and are leading for further decisions during the PT process of care. The vignettes described a patient with low back pain and a normal course of recovery, a patient with a delayed course but without psychosocial factors influencing the course of recovery, and a patient with a delayed course and the presence of psychosocial factors. The fourth vignette presented a patient with low back pain due to an underlying, serious disease (red flag). We pretested the vignettes with five practicing PTs to determine how well the vignettes represented daily practice and their readability and comprehensibility. Then, we adjusted the cases based on the feedback.

Text in the vignettes was presented in separate blocks, describing the course of recovery. Each text block was followed by questions. The answers were scored on a set of 12 quality indicators, which were a selection of 25 indicators developed in a previous study. We made the selection based on an iterated consensus procedure that was conducted with 14 indicators, preselected by the researchers (GR and JH) for their content validity, to measure adherence to the guidelines. The expert group for this procedure (n=9) consisted of practicing PTs, guideline developers, health scientists, experts on indicator development and application, and representatives from a national organization for patient interests and from the Royal Dutch Society for Physical Therapy. The remaining 12 quality indicators reflected the main recommendations of the guideline. We scored individual PTs on the percentage of quality indicators present for each vignette, calculated by the number of indicators met divided by the total number of indicators. Subsequently, we calculated a mean, overall percentage of adherence for each participant.

References
Chapter 7

Development of a theory- and evidence-based intervention to enhance implementation of physical therapy guidelines for the management of lower back pain

Geert Rutten
Janneke Harting
Kay Bartholomew
Jozé Braspenning
Rob van Dolder
Erik Hendriks
Marcel Heijmans
Stef Kremers
Piet Kuhlman
Roland van Peppen
Steven Rutten
Philip van der Wees
Nanne de Vries
Rob Oostendorp

Submitted.
Abstract

Background. Adherence to clinical guidelines is limited, and interventions to enhance guideline adherence have been only moderately effective. Optimal interventions should include different methods and applications of change related to different (types) of determinants of the behaviour of interest. The aim of our manuscript is to demonstrate how the framework of Intervention Mapping (IM) may serve as a tool in this respect.

Methods We applied IM on the problem of non-adherence of Dutch physical therapists to the clinical guidelines of low back pain. In Step 1, we conducted a needs assessment. In Step 2, we formulated programme objectives (e.g., increase guideline adherence), performance objectives (e.g., assess personal performance) and change objectives (e.g., express confidence in applying guideline adherent care). In Step 3, we chose theory-based methods of change and practical applications to deliver these methods. In Step 4, we combined the results of the previous steps into an intervention programme. In Step 5 and 6, we developed a plan for the adoption, implementation and sustainability of the programme as well as an evaluation plan.

Results: The needs assessment (Step 1 and 2) revealed that our intervention should be aimed at the physical therapists and the quality managers responsible for practice management. Step 2 and 3 made clear that self-regulation could serve as the core theory of the intervention, combined with other behavioural and organizational theories. Step 4 resulted in a multilevel intervention programme, allowing for interaction and emphasizing collective goal setting. The programme combined a variety of practical applications (e.g., knowledge transfer, meet-the-expert session, discussion and feedback). These were deducted from different theory-based methods (e.g., conscious raising, modelling, active learning) and aimed at changing the salient determinants. The plan for adoption, implementation and sustainability (Step 5) incorporated the wider environment, such as the professional association. The evaluation plan (Step 6) included an effect and a process evaluation addressing the programme, performance and change objectives as well as the various programme components specified.

Conclusions. We conclude that, although not being without difficulties, applying the framework of Intervention Mapping may provide the required rationale for intervention programmes in the field of guideline implementation.
Development of a theory- and evidence-based intervention

Background

Adherence to clinical practice guidelines is limited, and interventions to enhance guideline adherence have been only moderately effective. For instance, an extensive review in 2004 of implementation interventions found 5-15% improvement of the application of evidence-based practices. These findings are comparable to systematic review findings regarding improvements in guideline adherence in allied health care and physical therapy. An important reason for this limited effectiveness could be the lack of a sound rationale based on a coherent theoretical framework for the choice of intervention-methods. Such a rationale should preferably include a comprehensive analysis of influential determinants (i.e. barriers to and facilitators of implementation) and a deliberate selection of theoretical methods and strategies of change in relation to these determinants. Despite the increased attention for the application of behavioural and organizational theories in implementation science, only few examples of interventions that have been systematically developed on such a solid empirical and theoretical basis are available.

Non-specific low back pain constitutes a serious public health problem associated with a significant socioeconomic burden. The professional performance of physical therapists is expected to contribute to the prevention and/or reduction of this problem (Figure 1). To support physical therapists in their management of patients with low back pain, the Royal Dutch Association for Physical Therapy has developed national clinical guidelines. The main features of the guidelines are: 1. The application of the International Classification of Functioning, Disability and Health (ICF); 2. The identification and application of patient profiles that include duration, course and presence or absence of psychosocial factors influencing the course of recovery; 3. A hands-off approach with a limited number of treatment sessions in case of acute low back pain; and 4. A behavioural approach aimed at restoring physical activities and social participation in case of sub-acute or chronic low back pain. Additional behaviours recommended to the physical therapists are clinical reasoning, assessment and management of psychosocial factors, and adequate documentation including the use of health outcome measurement instruments. Based on the best available evidence, complying with the specific recommendations with regard to the diagnostic and therapeutic process is expected to contribute to the effectiveness and efficiency of physical therapy care. Although previous studies especially support the assumption that greater adherence to guidelines for low back pain might be advantageous from a cost perspective, a recent study also found that higher percentages of guideline adherence were related to better improvement of physical functioning.

The aim of our study was to apply Intervention Mapping (IM), a framework for developing programmes on a foundation of theoretical, empirical and practical information, to the problem of adherence of Dutch physical therapists to the national guidelines for low back pain. IM has been used to develop effective health promotion programmes for smoking prevention and...
smoking cessation\textsuperscript{24, 25}, cancer screening,\textsuperscript{26} leg ulcer management\textsuperscript{27} and obesity prevention,\textsuperscript{28} for example. This report demonstrates how this framework for systematic intervention development may contribute to the creation of a solid rationale for the choice of interventions in implementation science.

**Methods**

*Intervention Mapping*

Intervention Mapping guided our identification of health behaviours and their determinants, development of intervention objectives, selection of methods and practical applications for inducing change in determinants and behaviour, and creation of plans for programme implementation and evaluation. For this programme we used the following steps of IM:

1. **Needs assessment** In IM Step 1, based on the specific recommendations of the guidelines for low back pain, we first developed a set of indicators to operationalize adherence to the guidelines.\textsuperscript{21, 29} Next, we took the limited adherence of physical therapists in the Netherlands to the Dutch guidelines for low back pain as the point of departure,\textsuperscript{3, 19, 21, 30} to perform an extensive problem analysis. In order to assess the determinants of behavioural and environmental factors influencing guideline adherence, we conducted two literature reviews and a series of theory-based qualitative (focus group interviews) and quantitative studies (cross-sectional and longitudinal surveys).\textsuperscript{30, 33} We used the Precede Model\textsuperscript{34} to develop a logic model of the problem before beginning to create the intervention programme. This logic model highlighted the central roles for the physical therapists and the practice quality managers (who were also physical therapists).

2. **Matrices of change objectives** In step 2, we stated the behavioural and environmental objectives (e.g., the increase in guideline adherence) and formulated performance objectives for the target population (e.g., the behavioural steps to be performed by the physical therapists, such as completely applying the ICF) and the individuals who influence the environment (e.g., the behavioural steps to be performed by the quality managers, such as deciding to start a quality improvement project). As a second task, we identified the most important determinants (resulting from the needs assessment in Step 1) to influence performance objectives of physical therapists and quality managers. As a final task, we developed separate matrices of change objectives for the physical therapists and quality managers. The matrices combine the performance objectives and their determinants (e.g., limited self-evaluation for the physical therapists and commitment to high quality for the quality managers) to formulate change objectives, which specify who and what will change as a result of the intervention.

3. **Theory-informed methods and practical applications** In Step 3, based on the change objectives in Step 2, we selected theory-informed intervention methods and practical applications to change the determinants of the target behaviours. An intervention method is a defined process by which theories postulate and empirical research provides evidence for how
change may occur in the behaviour of individuals, groups, or social structures, whereas a practical application is the way a method is delivered to match the context of the priority population.

4. Intervention programme. In Step 4, we organized the methods and applications into a coherent programme with a description of the programme components, their scope and sequence, the completed programme materials, and the programme protocols. This step requires pretesting of all programme components.

5. Implementation Plan. In Step 5, we created an initial plan for the adoption, implementation, and sustainability of the programme.

6. Evaluation plan. In Step 6, we developed a plan to pilot test and evaluate the process and effect of the intervention programme. We addressed the performance objectives, change objectives, methods and practical applications, and the programme components previously specified in Step 1 to 4.

**Intervention Mapping Process**

A small project team performed the needs assessment, formulated the performance objectives and prepared concept matrices of change objectives (combining the performance objectives and the determinants). A larger advisory group reviewed the results of the needs assessment and discussed the concept matrices. The advisory group comprised experts on systematic programme development, theories used in behaviour and organizational change interventions, implementation research and practice guideline development. The advisory group included the leader of the Dutch physical therapy guidelines programme, a member of the Royal Dutch Association for Physical Therapy responsible for quality policy, practicing physical therapists, and a representative of an interest group on patient and healthcare provider communication. Additionally, the project team extensively consulted an expert in the use of the intervention mapping framework.

For IM step four, the development of the intervention programme, the project team sought expertise of two experienced trainers with expertise in physical therapy practice and education, quality improvement projects and management. The project team provided the trainers with programme, performance, and change objectives, as well as with the selected theory-informed methods of change and the practical applications. The project team also composed four case descriptions of patients with low back pain that addressed various performance objectives and could be used for training and discussion in the programme. The trainers integrated these elements into a coherent and feasible programme. The project team reviewed concept versions of the programme for concordance with the performance and change objectives and with the selected methods and practical applications. Subsequently, taking into account the time and financial limits, the trainers, in cooperation with the project team, adjusted the programme into its final version, including a time schedule.
The initial plan for the adoption, implementation and sustainability of the programme and the evaluation plan for the pilot test of the programme were developed by the project team only.

Results

**Step 1 Needs assessment**

The findings of the needs assessment were integrated into a comprehensive logic model of the problem of low back pain (see Figure 1). Based on the guidelines, we described adherence with 12 individual indicators. These covered:

1. Assessment of the presence of warning signs ("red flags") that suggest that physician referral may be warranted,
2. Application of the ICF,
3. Assessment of a patient profile,
4. The referral of the patient to a physician if needed,
5. Formulation of examination objectives in agreement with the patient profile,
6. Formulation of treatment objectives in agreement with the patient profile,
7. Decision-making regarding treatment strategies in agreement with patient profile,
8. Decision-making on the (maximum) number of treatment sessions,
9. Provision of adequate patient information,
10. Application of measurement instruments,
11. Arrangement of aftercare, and
12. Formulation of a written report to the referring physician.

Cognitive and affective determinants that influenced the therapist's guideline adherence were knowledge, self-evaluation, self-efficacy expectations, anticipated losses (such as loss of professional autonomy), negative feelings, and perceived guideline characteristics (such as the guidelines' relative advantage and complexity). Determinants in the environment were distinguished at four levels: the physical therapist, guidelines, practice management, and the professional association. At the level of the therapist, influences included adverse social norm and perceived barriers. The guidelines were judged by some to lack credibility, to be incomprehensible, and to hamper clinical reasoning. Practice management characteristics included inaccurate quality management, unfavourable practice culture, and lack of monitoring. The professional association was seen as not providing sufficient facilitation and lacking a clear and consistent policy with regards guideline implementation.

The problem analysis additionally pointed out that different determinants were related to guideline adherence depending on whether physical therapists realistically estimated their adherence to the guidelines. Under-estimators appeared to be particularly sensitive to environmental influences, at the level of the practice as well as that of the professional...
Development of a theory- and evidence-based intervention

association. Over-estimators seemed to be more inclined to follow their own lead based on regular evaluations of their work and the results of their treatment, as well as on arrangements made during deliberation meetings at the practice. Adherence by the realists was related to the amount of attention they had paid to the guideline and feelings of discomfort due to the guideline. They saw the professional association as having a responsibility, but compared to over- and under-estimators, their previous adherence most strongly predicted guideline adherence.

The only behavioural factor in the logic model of the problem that was expected to affect guideline adherence, was patient demands for non-adherent physical therapy care. These demands were related to patients' inadequate understanding of the natural course of the low back pain syndrome, inappropriate expectations of the physical therapy treatment, and insufficient information about the role of psychosocial factors.

**Step 2 Matrices of change objectives**

*Considerations*

Based on the needs assessment, the short time frame, and the need to bring about measureable changes in adherence, the project team chose to focus the intervention on two interacting practice levels: physical therapists and quality managers. Next, we based the development of performance objectives for the therapists and quality managers on four considerations (See Figure 1):  

1. The effect of the practice level (quality manager behaviour) on physical therapist adherence,
2. The 12 quality indicators reflecting guideline adherence,
3. The problem analysis findings of the importance of clinical reasoning, dealing with psychosocial factors, and using measurement instruments and recording patient data; and
4. A guiding theory of self-regulation of individual and organizational learning, and in particular the steps of self-reflection, self-judgment, goal setting, planning and self-action.  

The choice for self-regulation theory was based on the assumption that therapists and quality managers should take responsibility for their own quality of care and on the identification of awareness of personal adherence as an important factor in guideline adherence.
Figure 1. Logic model of non-specific low back pain: overview of influential determinants of adherence

<table>
<thead>
<tr>
<th>Internal determinants Patient</th>
<th>Internal determinants Therapist</th>
<th>Behavioral factors</th>
<th>Health and Quality of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Inappropriate expectations about PT care</td>
<td>- Previous practice of non-adherence</td>
<td>- Patient demanding non-adherent physical therapy care</td>
<td>- Non-specific low back pain</td>
</tr>
<tr>
<td>- Insufficiently informed</td>
<td>- Lack of attention paid to the guideline</td>
<td>- Patient's non-adherence to physical therapy recommendations</td>
<td>- Recurrence and chronification of pain</td>
</tr>
<tr>
<td>- Lack of understanding of low back pain syndrome</td>
<td>- Lack of knowledge and skills</td>
<td>- Patient's lack of physical activity</td>
<td>- Limitations in activities</td>
</tr>
<tr>
<td></td>
<td>- Limited self-evaluation</td>
<td>- Patient's inadequate way of coping with acute low back pain</td>
<td>- Recurrent sick leave and loss of work</td>
</tr>
<tr>
<td></td>
<td>- High motivation to comply with social norm</td>
<td></td>
<td>- Loss of social activities</td>
</tr>
<tr>
<td></td>
<td>- Low (tensional) self-efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Expected potential losses due to adherence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not feeling pride</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Feeling uncomfortable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Feeling uncertain about position</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Low commitment towards guidelines</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived guideline characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low relative advantages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low flexibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low visibility of the results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low compatibility with current practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low communicability of the guideline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External determinants Therapist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INDICATORS OF ADHERENCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Red flags</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Application of ICF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Patient profile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Referral if needed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Examination objective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Treatment objectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Treatment strategies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Number of sessions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Adequate information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Measurement instruments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Aftercare</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Themes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical reasoning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement instruments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient recording</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factors in italic font were not addressed in the intervention</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Performance objectives

All performance objectives are listed in Table 1; examples are included in this section. With regard to overall guideline adherence, a performance objective for physical therapists was to view the guidelines as a valuable quality tool. In relation to self-regulation, the physical therapists were to regularly reflect on the content of their work, to judge their actual performance and to react on the basis of that assessment. Examples of performance objectives for clinical reasoning were choosing the correct patient profile, applying questionnaires, and applying the hands-off approach in case of acute low back pain with a favourable natural course. Furthermore, physical therapists were expected to assess psychosocial factors, to integrate them in the treatment plan, and to actually address them during the treatment of the patient.

Table 1. Performance objectives for physical therapist and practice quality managers

<table>
<thead>
<tr>
<th>Individual physical therapist</th>
</tr>
</thead>
</table>
| **Overall guideline adherence** | 1 See the guideline as a valuable quality tool  
2 Decide to make an effort to improve their adherence to the GL  
3 Keep patient records that contain sufficient information to enable reflection on the quality of their work |
| **Self regulation and goal setting** | Set goals and make plans, using self-monitoring, self-judgement, self-reaction, self-evaluation and maintenance of procedure  
4a Improve the quality of their work by means of self regulation  
4b Regularly reflect on the content of their work (self monitoring)  
4c Judge their personal performance  
4d React on the basis of their judgement  
4e Evaluate the effect of their action  
4f Maintain this procedure |
| **Clinical reasoning diagnostics** | 5a Correctly and completely assess the patients' complaints in all the subsets of the ICF  
5b Categorize the patient correctly on the basis of duration of the episode, course and the presence of psychosocial variables (choose the correct patient profile)  
5c Choose adequate examination objectives and examination strategies  
5d Apply questionnaires |
| **Clinical reasoning questionnaires** | |
| **Clinical reasoning treatment plan** | 6a Choose applicable treatment objectives and treatment strategies  
6b Apply the hands off approach in case of acute LBP with a normal course  
6c Apply a limited number of treatment sessions (max 4) in case of acute LBP with a normal course  
6d Provide adequate advice to the patient  
6e Formulate sound arguments when they diverge from the guidelines' recommendations |
| **Psychosocial (PS) factors** | 7a Assess psychosocial factors  
7b Integrate PS factors in the treatment plan and decide about how to deal with these factors  
7c Address PS factors in the treatment of the patient with LBP |
| **Practice quality manager** | 1 Decide to start a quality improvement project  
2 Plan and make preparations for a quality improvement project  
2 1 Provide the necessary materials and means for optimal quality of care  
2 2 Involve experts for quality improvement project if applicable  
2 3 Develop or maintains a practice culture of openness and mutual respect |
3. Manage the quality improvement project
   3.1 Bring the available materials to the attention of colleagues
   3.2 Guard the open practice culture
   3.3 Bring the possibility of deliberation / cooperation with other relevant disciplines to the
      attention of colleagues
   3.4 Support colleagues in their deliberation / cooperation with other relevant disciplines
   3.4 Assure the possibility for retraining
4. Evaluate the quality improvement project
5. Take care of continuation

Quality managers were expected to initiate a quality improvement project in their practice and to
plan, prepare, manage and evaluate and continue the project. Planning, preparing and managing
the quality improvement project should include establishing a practice structure (e.g. materials
and means) and a practice culture (e.g. deliberation and cooperation) that facilitate guideline
adherence. If needed, quality managers were expected to involve experts for quality
management in their quality improvement project.

*Influential determinants*

The most important factors influencing physical therapists' performance objectives were paying
attention to the guidelines, knowing guideline content, feeling comfortable and certain about
guideline adherent care, perceiving guideline characteristics positively, expecting positive
outcomes of guideline adherence, having sufficient self-efficacy and skills to apply guideline
adherent care, having a positive social norm with regard to adhering to the guidelines and
experiencing little motivation to comply with patients who prefer non-adherent care. The
determinants regarded as most relevant to the behaviour of quality managers were having
knowledge of quality management, showing commitment and a positive attitude towards high
quality care, experiencing positive social influences with respect to quality management, having
sufficient self-efficacy and skills with regard to general management tasks and specific
monitoring tasks, and having sufficient motivation and advocacy skills.

*Change objectives*

Combining performance objectives with determinants resulted in two matrices with change
objectives, which were the specific targets for the intervention. Excerpts of the matrices are
included in Tables 2 and 3, and examples of change objectives are included in this section. For
instance, for the physical therapist (Table 2), to decide to make an effort to improve adherence
to the guidelines, social norms and self-efficacy were important determinants. Related to these
determinants, the change objectives read: “Recognize that patients are not extremely negative
about the hands off policy or the activating approach” and “Express confidence in applying
guideline adherent care even when the patient prefers non adherent care”. At the practice
management level (Table 3), we made change objectives for knowledge, self-efficacy/skills of
general management and monitoring and motivation and advocacy skills, in order to enable
quality managers to plan and prepare a quality improvement project.
<table>
<thead>
<tr>
<th>Determinants</th>
<th>Attention</th>
<th>Knowledge</th>
<th>Affective factors</th>
<th>Attitude / Guideline characteristics</th>
<th>Outcome expectations</th>
<th>Social norm</th>
<th>Self-efficacy / Motivation to comply</th>
<th>General Self-efficacy / Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance objectives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall adherence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Decide to make an effort to improve their adherence to the GL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Self-regulation and goal setting</strong></td>
<td>ATE4.1 Discuss the components of Self Regulation Theory</td>
<td>K4.1 Explain the principles of self regulation with respect to the quality of their work</td>
<td>AF4.1 Recognize the affective reactions the GL evokes in them</td>
<td>ATT4.1 Express the importance they attach to the GL (quality tool; evidence based practice)</td>
<td>OE4.1 Acknowledge the importance of self reflection / self regulation to improve the quality of care</td>
<td>SN4.1 Acknowledge that the professional association approves of using the GL</td>
<td>SE4.1 Describe a plan for dealing with feelings of discomfort due to self-monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determinants Performance objectives</td>
<td>Attention</td>
<td>Knowledge</td>
<td>Affective factors</td>
<td>Attitude / Guideline characteristics</td>
<td>Outcome expectations</td>
<td>Social norm</td>
<td>Self-efficacy / Motivation to comply</td>
<td>General Self-efficacy / Skills</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>------------------</td>
<td>--------------------------------------</td>
<td>----------------------</td>
<td>------------</td>
<td>------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Determinants Performance objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaires</td>
<td>ATE5d.1</td>
<td>K5d.1</td>
<td>AFSd.1 Recognize why questionnaires evoke feelings of discomfort</td>
<td>ATT5d.1 Express the belief that questionnaires support diagnostics; prognostics; effectiveness assessment; and communication with the patient</td>
<td>OE5d.1 Expect that self-regulatory strategies will result in better guideline adherence and patient outcomes</td>
<td>SNSd.1 Adduce arguments for the application of questionnaires</td>
<td>OE5d.2 Recognize how questionnaires can be beneficial for patient motivation / satisfaction</td>
<td>SE5d.1 Express confidence in the application of questionnaires despite the available time</td>
</tr>
<tr>
<td>5d.apply questionnaires</td>
<td>Explain the various purposes of questionnaires described in the GL</td>
<td>Distinguish the purposes for which questionnaires can be applied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>K5d.2 Give their interpretation of the questionnaires in the GL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>K5d.3 Describe the situations in which questionnaire use is purposeful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determinants</td>
<td>Performance objectives</td>
<td>Attention</td>
<td>Knowledge</td>
<td>Affective factors</td>
<td>Attitude / Guideline characteristics</td>
<td>Outcome expectations</td>
<td>Social norm</td>
<td>Self-efficacy / Motivation to comply</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>------------------</td>
<td>--------------------------------------</td>
<td>---------------------</td>
<td>------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td>7a. PTs assess psychosocial factors</td>
<td>ATE7a.1 Seek information on Define the PS factors which are known to impede recovery or play a role in transition to chronic LBP</td>
<td>K7a.1 Name the PS factors that have proven to impede recovery or play a role in transition to chronic LBP and how they do that</td>
<td>ATT7a.1 Acknowledge the importance of the assessment of PS factors</td>
<td>OE7a.1 Describe why the assessment of PS factors is important for the efficiency and effectiveness of care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GL = guideline
<table>
<thead>
<tr>
<th>Performance objective</th>
<th>Determinant</th>
<th>Knowledge</th>
<th>Commitment / Attitude</th>
<th>Social influence (social norm / social support)</th>
<th>Self efficacy / Skills General Management</th>
<th>Self-efficacy / skills Monitoring</th>
<th>Motivation / Advocacy Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Plan and make preparations for a quality improvement project</td>
<td>K2.1 Name and explain the steps of a quality improvement plan</td>
<td>CA2.1 Demonstrate conviction to bring quality improvement / GL adherence to the attention of colleagues</td>
<td>CA2.2 Express the importance of assessing the individual ideas about / needs for quality improvement with colleagues</td>
<td>SI2.1 Describe optimal quality of care as the practice standard</td>
<td>SES2.1 Express confidence in developing and preparing for a quality improvement project</td>
<td>MO2.1 Express confidence in the ability to identify and use (an) opinion leader(s) in the practice (if applicable)</td>
<td>MA2.1 Demonstrate ability to deliberate with colleagues about the 'desired future vision' to motivate the change</td>
</tr>
<tr>
<td>2.1 Provide the necessary materials and means for optimal quality of care</td>
<td></td>
<td></td>
<td></td>
<td>SI2.2 Emphasize the importance of transparency of quality for patients and health insurance companies</td>
<td>SES2.2 Demonstrate skills in developing a quality improvement plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SI2.3 Show engagement in making quality improvement a collective objective in the practice</td>
<td>SES2.3 Demonstrate the ability to decide when and how to start the quality improvement project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SES2.2 Demonstrate skills in developing a quality improvement plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MO2.2 Describe how the quality of practice will be assessed and evaluated</td>
<td>MA2.3 Express confidence to deliberate with colleagues about the time investment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MA2.4 Show skills to help colleagues to determine (self-) incentives</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MA2.5 Demonstrate skills to persuade colleagues to engage in quality improvement activities</td>
</tr>
<tr>
<td>Determinant</td>
<td>Knowledge</td>
<td>Commitment / Attitude</td>
<td>Social influence (social norm / social support)</td>
<td>Self efficacy / Skills General Management</td>
<td>Self-efficacy / skills Monitoring</td>
<td>Motivation / Advocacy Skills</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>-----------------------</td>
<td>-----------------------------------------------</td>
<td>------------------------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>2.2 Involve experts for quality improvement projects if applicable (e.g. by consulting experts and making arrangement)</td>
<td></td>
<td></td>
<td></td>
<td>SES2.4 Express confidence and describe how to consult experts for quality improvement projects if applicable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 Develop or maintain a practice culture of openness and mutual respect</td>
<td>K2.3 Express importance of open and respectful team climate</td>
<td></td>
<td></td>
<td>SES2.5 Demonstrate how to make arrangements with delegates/experts for their support concerning the quality improvement project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Manage the quality improvement project</td>
<td></td>
<td>CA3.1 Show enthusiasm about the quality improvement project</td>
<td>Si3.1 Engage in coaching and supporting (problem analysis; counseling) colleagues in case of problems or resistance</td>
<td>SES3.1 Explain how he is going to manage the quality improvement project</td>
<td>MO3.1 Demonstrate how monitoring of the quality improvement by means of the monitoring materials (patient record audits and feedback; EPD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance objective</td>
<td>Determinant</td>
<td>Knowledge</td>
<td>Commitment / Attitude</td>
<td>Social influence (social norm / social support)</td>
<td>Self efficacy / Skills</td>
<td>Self-efficacy / skills</td>
<td>Motivation / Advocacy Skills</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
<td>-----------</td>
<td>-----------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------</td>
<td>------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>3.4 Supports colleagues in their deliberation / cooperation with other relevant disciplines</td>
<td>3.4 Assures the possibility for retraining</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This resulted in change objectives such as: “Name and explain the steps of a quality improvement plan”, “Express confidence in developing and preparing for a quality improvement project” and “Demonstrate skills in the ability to involve colleagues in the setting of attainable goals”

**Steps 3 and 4 Theory-based methods, practical applications, and programme delivery**

**Considerations**

The project team proposed a course as the primary intervention component, as it would allow for peer education and for interaction between physical therapists and quality managers. Also, by participating in a course, the physical therapists and quality managers would break with their daily context and routines, a disruption which was expected to help them change habitual behaviour. Cost considerations were a final reason to opt for a course instead of an intervention on the work-site.

As indicated in the methods section above, we matched appropriate theory-based change methods to change objectives (IM step 3) before thinking about how the programme would be delivered (IM step 4). However, at this point we present the outcome of Steps 3 and 4 together. We expect it to be easier for the reader to understand the theoretical methods and their practical applications, which are rather abstract concepts, in the context of programme delivery. The programme and its theoretical methods are described in Table 4. We begin by describing programme delivery and, subsequently, we give a few examples of how theory-based change methods were applied.

**The programme**

The programme (Table 4) comprised six meetings: four three-hour sessions for physical therapists and quality managers together and two three-hour sessions for quality managers separately. The extensive opportunity for interaction created by the joint presence of physical therapists and quality managers on four sessions was expected to reinforce the quality improvement process. During the four three-hour sessions, the individual physical therapists assessed personal adherence to the guidelines by comparing a patient record with the recommendations in the guidelines. Subsequently, they chose and considered an implementation strategy for three specific, measureable, acceptable and realistic objectives for personal improvement (SMART). Trainers challenged the physical therapists to implement one of their objectives and to evaluate what had changed in their process of care. Finally, they had to think about how they would maintain their actions. All this resulted in a Personal Development Plan (PDP). The PDP contained points for individual quality improvement, goals already achieved during the programme and goals still to achieve, intended strategies, and a plan for sustainability. Additionally, the physical therapists chose three collective goals with the colleagues and the quality manager from their practice.
On practice level, during two separate sessions, trainers taught quality managers how to use a management scan (the INK Quick Scan) to assess issues related to improvement of five organizational domains: leadership, strategy, management of means, people management, and process-management. Trainers also showed the managers how to assess the organizational change culture with the Personal Change Style questionnaire and on how to perform a Strengths, Weaknesses, Opportunities and Threats analysis (SWOT). In addition, the quality managers were taught a strategy to select applicable change activities for their practice, and they were challenged to make a risk assessment and a cost analyses for the change process. Finally, they made a plan for continuation of their quality management. Trainers asked the quality managers to find 'quick wins', goals that are attainable in a short time with relatively low effort. Using the activities in the course, participants developed a Practice Quality Improvement Plan (PQIP) containing quality improvement goals, intended results, outcomes of the organizational analyses performed during the programme, chosen strategies, requirements, possible barriers and an estimation of expenses.

Finally, the programme made use of the most current draft revision of the Dutch physical therapy guideline for low back pain (unpublished manuscript). The user-friendly revised guideline was less comprehensive and more comprehensible than the previous document. To explicitly support clinical reasoning, the guideline links recommendations to findings from evaluation steps in the process of care, for example 'If you find it is recommended to ' The course also provided a patient information leaflet about guideline adherent care to support physical therapists' management of patient's expectations about treatment.

**Methods and strategies**

As indicated in the method section, we chose self-regulation of individual and organizational learning as core theory of the intervention. From the Transtheoretical Model, we also selected the construct of consciousness raising to improve physical therapists' attention and awareness and to help them recognize the gap between perceived and actual guideline adherence, which is an important first step of improving quality of care. From Active Learning theory and Social Cognitive theory (SCT), we used knowledge transfer followed by discussion and feedback for the main topics of the guidelines and for the results of homework instructions and small group work sessions. From SCT we also used vicarious learning and modelling by a 'meet the expert session'. From Goal Setting theory, we asked physical therapists to formulate goals that were challenging, moderately complex, specific, measurable, realistic and acceptable. In addition, participants added specific plans (implementation intentions) for carrying out their goals to increase the likelihood of goal attainment. We used active information processing from the Elaboration Likelihood model in small-group work with colleagues from the practice and in assignments with colleagues from other practices.
Table 4. Overview of the QUality Improvement In Physical therapy (QUIP) programme

<table>
<thead>
<tr>
<th>POs / COs</th>
<th>Theoretical Methods and Practical applications</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>session 1: general session with managers and PTs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td>Consciousness raising / Self reflection</td>
<td>• Assesment of Personal way of Working by comparing a record of a patient with anamnesis with the recommendations in the guidelines. Choose 5 items to improve.</td>
</tr>
<tr>
<td></td>
<td>• Preparatory homework</td>
<td>• Introduction to the objectives of the course. Brief introduction to the INK-management model and the Kleurenmodel van de Caluwé, which measures change culture, and introduction to the SWOT analysis.</td>
</tr>
<tr>
<td></td>
<td>Knowledge transfer</td>
<td>• What do the results of the Quick Scan-INK and the Personal Change Style questionnaire tell us.</td>
</tr>
<tr>
<td></td>
<td>• Lectures</td>
<td>• Complete Personal Change Style questionnaire.</td>
</tr>
<tr>
<td></td>
<td>• Individual Task</td>
<td>• PQM and PTs select max 3 collective goals from their personal improvement goals.</td>
</tr>
<tr>
<td></td>
<td>Reflection on organization / Goal setting</td>
<td>• Perform a Quick Scan-INK (briefly introduced) of the practice which results in a view on the stage of development of the practice.</td>
</tr>
<tr>
<td></td>
<td>• Small group work with colleagues from practice</td>
<td>• Organize the information of all assessments for the development of the Practice Quality Improvement plan.</td>
</tr>
<tr>
<td></td>
<td>Attitude building / Active learning</td>
<td>• Quality management and guidelines - positioning the guideline in quality management.</td>
</tr>
<tr>
<td></td>
<td>• Plenary sessions with discussion and feedback</td>
<td>• Deliberating the results of the group work and receive feedback and guidance.</td>
</tr>
<tr>
<td>PQM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>POW / PQM decides to start a quality improvement project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POW/PQM plans and makes preparations for a quality improvement project</td>
<td></td>
</tr>
<tr>
<td><strong>session 2a: managers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PQM</td>
<td>Knowledge transfer / Management Skills</td>
<td>• Start with steps 1-3 of the Practice Quality Improvement plan, and select three major issues for improvement. Consider 2 actions for quality improvement (Quick Wins) which you could perform in the next two weeks. Read the INK philosophy on the website.</td>
</tr>
<tr>
<td></td>
<td>• Preparatory homework</td>
<td>• Outcomes of the Quick Scan-INK are presented and discussed. Explanation of the underlying philosophy.</td>
</tr>
<tr>
<td></td>
<td>Consciousness raising / Organizational reflection / Knowledge transfer</td>
<td>• Explanation of assessments with the INK-model; the Kleurenmodel van de Caluwé, the SWOT-analysis,</td>
</tr>
<tr>
<td></td>
<td>• Lectures / Plenary session</td>
<td>• Feedback on and recommendations for the temporary Practice Quality Improvement plan. Deliberation with PQMs of other practices.</td>
</tr>
<tr>
<td></td>
<td>Active learning / Guided practice</td>
<td></td>
</tr>
<tr>
<td>POs / COs</td>
<td>Theoretical Methods and Practical applications</td>
<td>Actions</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>session 2b: general session with managers and PTs</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| PT                                            | **Goal setting / Skills training**                     | - Start with the first three steps of the PDP. Select three out of five personal improvement goals and consider a plan for action  
|                                               | - Implement objectives and examination strategies      | - Deliberate about and give feedback on each other's PDP so far. Refine the three goals and make at least one of them (specific) M(earable) A(ccountable) R(еalistic) T(ime-specific)  
|                                               | - Choose adequate examination objectives and examination strategies | - Deliberation and feedback on the SMART goal – how SMART is it?  
|                                               | - Choose adequate examination objectives and examination strategies | - Diagnostics and use of questionnaires for patients with low back pain  
|                                               | - Adequately apply questionnaires                       | - A case description (Profile 2) is used for deliberation and discussion about the diagnostics and the use of questionnaires  
|                                               | - Start with the first three steps of the PDP          | - How do we apply and interpret questionnaires we use in the practice. Set a SMART collective goal for the use of questionnaires in the practice  
|                                               | - Select three out of five personal improvement goals and consider a plan for action | - Deliberation and feedback on the SMART goal – how SMART is it?  
|                                               | - Deliberate about and give feedback on each other's PDP so far | - Diagnostics and use of questionnaires for patients with low back pain  
|                                               | - Refine the three goals and make at least one of them (specific) M(earable) A(ccountable) R(еalistic) T(ime-specific) | - A case description (Profile 2) is used for deliberation and discussion about the diagnostics and the use of questionnaires  
|                                                                                     | - Check for possible Quick Wins | - How do we apply and interpret questionnaires we use in the practice. Set a SMART collective goal for the use of questionnaires in the practice  
|                                                                                     | - Discuss and find applicable strategies for your practice and prioritize them | - Use the method of Creative Problem Solving for this purpose  
|                                                                                     | - Presentation of the strategies and feedback          | - Presentation of the strategies and feedback  
| **session 3a: managers**                      | **Management skills training**                         | - Write step 4-6 of the PQIP and review step 1-3. Makes changes if applicable. Be alert on possible Quick Wins  
|                                               | - Prepare for PQIP                                     | - Feedback on, deliberation with and suggestions of colleagues about the analysis in the PQIP  
|                                               | - Complete step 5 of the PQIP (process the feedback)  | - Strategies for quality improvement linked to the outcomes of the Personal Change Style questionnaire. Brief explanation of Creative Problem Solving  
|                                               | - Refine the analysis in the PQIP by means of deliberation and suggestions | - Refine the analysis in the PQIP by means of deliberation and suggestions  
|                                               | - Prioritize the strategies for your practice          | - Discuss and find applicable strategies for your practice and prioritize them. Use the method of Creative Problem Solving for this purpose  
|                                                                                     | - Presentation of the strategies and feedback          | - Presentation of the strategies and feedback  
| **session 3b: general session with managers and PT's** |
| PT                                            | **Self reflection / Skills training**                  | - Complete step 5 of the PDP (process the feedback) Use the form for Clinical reasoning and apply it to one of your patients in practice where psychosocial factors are apparent  
|                                               | - Prepare for PQIP                                     | - PQM. Refine the collective objectives and make arrangements for implementation  
|                                               | - Complete step 5 of the PDP (process the feedback)  | - Treatment plan and treatment, dealing with psychosocial factors that impede recovery  
|                                               | - Refine the analysis in the PQIP by means of deliberation and suggestions | - Discuss and find applicable strategies for your practice and prioritize them. Use the method of Creative Problem Solving for this purpose  
|                                               | - Prioritize the strategies for your practice          | - Presentation of the strategies and feedback  
|                                               | - Presentation of the strategies and feedback          | - Presentation of the strategies and feedback  
|                                               | - Complete step 5 of the PDP (process the feedback)  | - Complete step 5 of the PDP (process the feedback) Use the form for Clinical reasoning and apply it to one of your patients in practice where psychosocial factors are apparent  
|                                               | - Refine the analysis in the PQIP by means of deliberation and suggestions | - Discuss and find applicable strategies for your practice and prioritize them. Use the method of Creative Problem Solving for this purpose  
|                                               | - Prioritize the strategies for your practice          | - Presentation of the strategies and feedback  
|                                               | - Presentation of the strategies and feedback          | - Presentation of the strategies and feedback  

<table>
<thead>
<tr>
<th>Active learning</th>
<th>The prepared ‘cases’ are used for discussion about what a PT can do with psychosocial factors.</th>
<th>The prepared ‘cases’ are used for discussion about what a PT can do with psychosocial factors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal setting</td>
<td>Deliberate about which factors are applicable for our practice and which are the most important factors? How do we deal with these factors and should this be changed?</td>
<td>Deliberate about which factors are applicable for our practice and which are the most important factors? How do we deal with these factors and should this be changed?</td>
</tr>
<tr>
<td></td>
<td>Demonstration, followed by an interactive session about how to diagnose and deal with psychosocial factors.</td>
<td>Demonstration, followed by an interactive session about how to diagnose and deal with psychosocial factors.</td>
</tr>
</tbody>
</table>

**PQM**
- manages the quality improvement project

**session 4: general session with managers and PTs**

<table>
<thead>
<tr>
<th>PQM</th>
<th>(Management) skills training</th>
<th>PT</th>
<th>Active learning / Peer support / Management skills training</th>
<th>Active learning</th>
<th>Active learning</th>
<th>PQM: Complete the PQIP - change strategies; risk analyses; cost calculation</th>
<th>PQM: Complete the PQIP - change strategies; risk analyses; cost calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preparatory homework</td>
<td></td>
<td>PQM: Small work group with colleagues from other practice</td>
<td>PT individual task</td>
<td>Plenary debate</td>
<td>PT. Complete the PDP - what did you change so far; did you reach your goal(s); how will you sustain in your quality improvement activities.</td>
<td>PT. Complete the PDP - what did you change so far; did you reach your goal(s); how will you sustain in your quality improvement activities.</td>
</tr>
<tr>
<td></td>
<td>Plenary session</td>
<td></td>
<td>Plenary session</td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Deliberate about the various PQIPs. Is there anything you can use in another PQIP? Discuss how you plan to sustain in your quality management.</td>
<td>Deliberate about the various PQIPs. Is there anything you can use in another PQIP? Discuss how you plan to sustain in your quality management.</td>
</tr>
<tr>
<td></td>
<td>Plenary debate</td>
<td></td>
<td>Plenary session</td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Which changes in the practice have been made until now? How were they measured? How will the quality management be sustained?</td>
<td>Which changes in the practice have been made until now? How were they measured? How will the quality management be sustained?</td>
</tr>
<tr>
<td></td>
<td>Plenary session</td>
<td></td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Prepare a debate about your PDP.</td>
<td>Prepare a debate about your PDP.</td>
</tr>
<tr>
<td></td>
<td>Plenary debate</td>
<td></td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Which results can be derived from the PDPs?</td>
<td>Which results can be derived from the PDPs?</td>
</tr>
<tr>
<td></td>
<td>Plenary debate</td>
<td></td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Plenary debate</td>
<td>Closure: Evaluation and possible follow up arrangements</td>
<td>Closure: Evaluation and possible follow up arrangements</td>
</tr>
</tbody>
</table>
For managers, we selected knowledge transfer, a basic construct of Learning theories that stands for the exchange of knowledge from one person to another, by lectures with discussion. We also selected active learning strategies derived from Social Constructivism\textsuperscript{52,53} and SCT\textsuperscript{47} such as guided practice and plenary presentation with discussion and feedback. Also, the managers worked in small groups to engender social (peer) support. To implement the method of guided practice (from SCT), we asked therapists to complete homework in the practice, and we gave them feedback on the assignment during the next training session.

**Step 5. Adoption, implementation and sustainability plan**

Considerations

From the beginning of the IM process, we paid attention to capacity for the adoption, implementation and sustainability including the programme's practical acceptability and feasibility throughout development of the programme. Our intention to create a programme that would be useable by practices was reflected by the composition of the advisory board for the study. The board included practicing physical therapists as well as representatives of organizations concerned with guideline development, patient interests and quality of the physical therapy profession. Board members were primary resources for the development of an adoption, implementation and sustainability plan.

Adoption, implementation and sustainability plan

The four components of the plan to facilitate adoption, implementation and sustainability were directed at the following levels: (1) the policy of the professional association; (2) the patient perspective; (3) the guideline revision process, and (4) the embedding of professional training in regular nationwide training programmes. For component 1, the project team planned a series of meetings with policy advisors of the professional association. Performance objectives in this respect included "Brings the quality policy to the decision agenda of the professional association and to the political agenda of health insurance companies" and "Writes a policy plan". Examples of change objectives were. "Show skills to deliberate about the intended policy instrument to be implemented by the association" and "Express commitment to bring incentives for quality management at the practice level to the attention of health insurance companies". For component 2, the project team planned a consultation with experts about the development of patient information. Performance objectives for the patients included. "Anticipates the physical therapist to address psychosocial factors". Examples of change objectives were. "Describe type of low back pain were hands-off treatment is applicable" and "Acknowledge the possible contribution of psychosocial issues to low back pain". For component 3, the project team planned to participate in the current revision process of the guidelines for low back pain. Provisional performance objectives concerned the improvement of the visibility of the process of clinical reasoning and of the instructiveness of how to deal with psychosocial factors. With regard to the equalization of the intervention programme with existing
and future professional training for physical therapists and quality managers, we planned a consultation with representatives of the Dutch Institute of Allied Healthcare, the national expertise centre of allied health care, and a leading professional training institution for allied healthcare in the Netherlands. As this was only meant as a first exploration of opportunities, at that time no specific performance and change objectives were formulated. Finally, during the entire IM procedure, the project team continuously considered the practical acceptability and feasibility of the intervention programme.

**Step 6. Evaluation plan**

*Considerations*

The evaluation plan concerned the pilot test of the quality improvement programme. Aims of the evaluation were to assess the potential effectiveness of the programme as well as to evaluate the fidelity, acceptability and feasibility of the programme's implementation in an accompanying process evaluation. A full description of the effect and process evaluation is available elsewhere. In this section, we present a brief overview.

*Evaluation plan*

For the effect evaluation, we planned a one-group pre-test post-test study (n=8 practices, including 30 physical therapists of whom 8 were also the quality manager of the practice). We measured guideline adherence using clinical vignettes that addressed the 12 indicators reflecting the guideline's main recommendations. Clinical reasoning was measured by assessing the consistency of physical therapists' choices over separate quality indicators (e.g. if the therapist finds psychosocial factors that influence the course of recovery, then he should integrate them in his treatment plan). To measure the changes in awareness of personal performance, subgroups of adequate estimators, over-estimators and under-estimators were determined comparing actual and perceived adherence. Changes in practice quality management were additionally measured with observations, group interviews, and document analyses, with a focus on self-regulation, the commitment to quality management, the transfer of what was learned to the practice, patient recording, the presence of regular deliberation meetings, facilitation of questionnaire use, the presence of a monitoring structure and structures for sustainability.

The process evaluation was an observational study. As regards the fidelity of the implementation, we formulated research questions with regard to the themes addressed, the methods and applications actually applied, and the determinants dealt with. Related fidelity issues were the quality of the delivery of the programme components and the extent to which the physical therapists and the quality managers actually participated in the various modules of the intervention programme. Research questions concerning the acceptability of the programme addressed the materials that were used and the participants' evaluation of the intervention. With regard to the feasibility of the intervention programme, evaluation questions addressed potential
barriers, such as time and financial limitations. Measurement instruments for the process evaluation included observations, group interviews, document analysis, field notes and a general evaluation questionnaire.

Discussion

This manuscript demonstrates how the framework of Intervention Mapping (IM) may serve as a tool for developing, implementing and evaluating interventions to improve guideline adherence. A systematic needs assessment (Step 1) lays the foundation for a logic model of the guideline implementation problem. This logic model is a useful starting point for the formulation of programme, performance and change objectives (Step 2), that specify who and what should change as a result of the intervention. The matrices of change objectives direct the selection of theory-informed intervention methods and practical applications (Step 3). These methods and applications define how change may occur in the behaviour of the different target persons (e.g. professionals, quality managers, policy officers), and, additionally, indicate appropriate ways of delivery. Combining the various objectives, theory-based methods and practical applications (Step 4), results in a guideline implementation programme that connects different methods and strategies of change to different (types of) determinants of the behaviours of interest. In doing so, IM provides the required sound rationale for the intervention programme. The products resulting from Step 1 to 4, may also serve as a constructive guide in the development of an adoption, implementation and sustainability plan as well as an evaluation plan.

Applying IM, however, comes with some difficulties. A first problem may arise after the needs assessment (Step 1). A comprehensive needs assessment, such as the one performed in our study, can make selecting the most important determinants and specifying the most salient change objectives complicated. Several selection procedures have been described by other researchers, but to our knowledge no consensus exists about the procedure of preference. A second challenge is related to the selection of theory-based methods and practical applications (Step 3). Although a plethora of theories postulate how change in behaviour may occur, the empirical evidence for the underlying assumptions is still under development. A third trouble arises while developing the intervention programme (Step 4). Preferably, this programme should sufficiently address all selected determinants for optimal change. In our experience, this may be at odds with the requirements regarding the acceptability and feasibility of the programme. This tension may result in ineffective programmes that are either too ambitious or too superficial. A fourth difficulty is that, although described as being stepwise, applying IM in programme development is actually a vastly iterative process. This means that programme developers have to be flexible in alternating between the various steps, as decisions in earlier steps may have serious consequences in later steps, and vice versa. This may hamper the transparency of the IM process itself as well as reports of that process.
A final challenge of applying IM is that implementation problems involve multiple agents at multiple layers of the care system. In our study (see also Figure 1), we developed an intervention for an environmental factor (physical therapists' non-adherence to the guidelines) of a health and quality of life problem (individuals with non-specific low back pain). Our needs assessment, which consisted of a series of studies to assess the internal and external determinants of the behaviour of the physical therapists, revealed several factors related to inadequate quality management in the practice that negatively influenced physical therapists' guideline adherence. Because the agent responsible for practice quality management is the quality manager, an intervention programme should include changing the behaviour of this agent. From an IM perspective, we should have positioned practice quality management, and thus the practice quality manager, as an environmental factor of the health problem, that is, similar to the position of the physical therapist. However, we classified quality management as an environmental factor of the physical therapist. The focus on the improvement of guideline adherence of physical therapists made us select some determinants for the practice quality manager which were rather external determinants of the physical therapist. As a consequence, the formulation of change objectives related to these determinants for the practice quality managers was confounded. In the end, we could only formulate change objectives for a limited number of salient determinants related to the various performance objectives of this agent. This hampered us in selecting theoretical methods and practical strategies of change for the quality manager. We would like to emphasize that, if applied for the development of multilevel interventions, which will probably expand in quality of health care research, users of the IM framework should make sure that they relate the environmental factors and their agents at the various levels directly to the health problem. This will more clearly guide the correct formulation of performance objectives, determinants and change objectives for environmental agents in all the applicable layers.

Conclusions
We conclude that, despite the difficulties we encountered, applying the framework of Intervention Mapping may provide the required sound rationale for the development, implementation and evaluation of intervention programmes in the field of guideline implementation.
References


33. Rutten GM, Harting J, Bartholomew LK, Oostendorp RAB, de Vries NK. Guideline adherence is explained and predicted by various factors on multiple levels: a theory-based longitudinal survey. submitted for publication.


56. Koekkoek B, van Meijel B, Schene A, Hutschemaekers G. Development of an intervention program to increase effective behaviours by patients and clinicians in psychiatric services: Intervention Mapping study. BMC Health Serv Res 2010;10:293.


Chapter 8

Evaluation of the systematically developed theory-based multifaceted Quality Improvement in Physical Therapy (QUIP) programme: A one-group, pretest post-test pilot study

Geert Rutten
Janneke Harting
Kay Bartholomew
Angelique Schlief
Rob Oostendorp
Nanne de Vries

Submitted.
Abstract

*Background:* Guideline adherence in physical therapy is far from optimal, which has consequences for the effectiveness and efficiency of physical therapy care. Programmes to enhance guideline adherence have, so far, been relatively ineffective. We systematically developed a theory-based Quality Improvement in Physical Therapy (QUIP) programme aimed at the individual performance level (practicing physical therapists) and the practice organization level (practice quality manager). The aim of the study was to pilot test the multilevel QUIP programme’s effectiveness and the fidelity, acceptability and feasibility of its implementation.

*Methods:* A one-group, pre-test, post-test pilot study (n=8 practices; n=32 physical therapists, 8 of whom were also practice quality managers) done between September and December 2009. Guideline adherence was measured using clinical vignettes that addressed 12 quality indicators reflecting the guidelines’ main recommendations. Determinants of adherence were measured using quantitative methods (questionnaires). Delivery of the programme and management changes were assessed using qualitative methods (observations, group interviews, and document analyses). Changes in adherence and determinants were tested in paired samples T-tests and expressed in effect sizes (Cohen’s d).

*Results:* Overall adherence did not change (3.1%; \( p=.138 \)). Adherence to 3 quality indicators improved (8%, 24%, 43%; \( .000 \leq p \leq .023 \)). Adherence to one quality indicator decreased (−15.7%; \( p=.004 \)), as did realistic appraisal of personal performance (−29.2%). Scores on various determinants of individual performance improved (\( .000 \leq p \leq .047 \)) and changes at practice organizational level were observed (\( .000 \leq p \leq .012 \)). Favourable changes were associated with collective goal setting (by physical therapists and practice quality managers), the programme’s multilevel and interactive approach, and the application of self-regulation. Unfavourable findings were associated with programme deficits, including insufficient time to monitor individual progress and distinct programme subjects, and incomplete programme implementation. However, results should be interpreted, taking the rudimentary design of the study into account.

*Conclusion:* The QUIP programme has the potential to change physical therapy practice but needs considerable revision to induce the ongoing quality improvement process that is required to optimize overall guideline adherence.
Background
Although clinical guidelines are seen as bridge between evidence and practice,\textsuperscript{1,2} their uptake in routine practical performance has been limited.\textsuperscript{3,4} This incomplete implementation is attributed to factors related to individual professionals,\textsuperscript{5,6} organizational issues,\textsuperscript{7,8} patients,\textsuperscript{9,10} and guideline quality.\textsuperscript{11} Programmes to enhance guideline adherence have had limited effect. An extensive 2004 review of implementation interventions found 5–15% improved application of evidence-based practices, but multifaceted interventions performed no better than single-focus interventions.\textsuperscript{4} These findings were comparable to adherence improvement found in a systematic review in allied health care literature\textsuperscript{12} and, except for some self-reported improvements,\textsuperscript{13} with the effectiveness of physical therapy guideline implementation interventions\textsuperscript{14,15}.

There are several reasons proposed for the modest effectiveness of implementation interventions. First, the underlying problem may be poorly described. Often problem analysis in implementation research depends on either qualitative or quantitative methods, where a combination is recommended.\textsuperscript{16} A second reason is the limited application of theoretical frameworks in implementation research, including problems with selecting applicable theoretical constructs relevant to the implementation intervention’s design.\textsuperscript{4,17} Together, this suggests a lack of a rationale for the mechanism of change in an intervention.\textsuperscript{4,18} Finally, there has been a narrow intervention focus on individual professionals instead of combining it with efforts to change organizational or broader environmental and cultural factors.\textsuperscript{19–21}

Taking the modest effectiveness into consideration, we systematically developed a theory-based intervention, in which these issues were taken into account. The goal of this Quality Improvement in Physical Therapy ( QUIP) programme was to improve physical therapists’ adherence to the Dutch guidelines for low back pain,\textsuperscript{22,23} since this was the most prevalent diagnosis in Dutch private practice physical therapy.\textsuperscript{24} In addition, adherence of Dutch physical therapists to these guidelines had repeatedly been shown to be limited (42%-67%),\textsuperscript{14,25,26} while previous studies indicated that higher adherence rates were related to better treatment results.\textsuperscript{26,27} In our preparatory problem analysis, we combined the Precede stages of the Precede-Proceed model\textsuperscript{28} with Rogers’ Diffusion of Innovations theory\textsuperscript{29} to assess motivational, affective and organizational determinants of guideline adherence.\textsuperscript{30,31} The results suggested that determinants at five levels contributed to lack of guideline adherence: individual professional, practice management, professional organization, patient and guidelines.

To develop the QUIP programme, we applied Intervention Mapping (IM),\textsuperscript{32} a systematic approach to link theoretical methods and their practical applications of change to influential determinants. We focused on three levels: individual physical therapists, practice quality managers, and Dutch guidelines for low back pain, which were under revision at that time. Involved in the IM process were experts in the fields of IM, physical therapy, practice management, guideline development
and implementation science, as well as two facilitators with experience in individual and organizational quality improvement in physical therapy, who also operated as instructors of the programme.

Our problem analysis pointed out that, for physical therapists, important subjects to improve were awareness of personal performance, clinical reasoning, applying the categories of the International Classification of Functioning, Disability and Health, managing psychosocial factors, maintaining complete patient records, and using measurement instruments (health outcome questionnaires). It was important for practice quality managers to improve monitoring of both organizational aspects of the practice and the performance of the individual physical therapists. This would require changes in practice structure and culture, including holding deliberation meetings, assuring availability of materials and resources (personal and material) for quality improvement, effectively using an electronic patient record, formulating collective quality objectives, and creating or maintaining an atmosphere of openness and respect. With regard to low back pain guidelines, issues to improve were comprehensiveness, user friendliness and ability to support clinical reasoning.

This paper describes the pilot study of the QUIP programme. The study comprised an effect evaluation, to assess the potential of the programme to improve guideline adherence and its determinants, and a process evaluation, to evaluate the programme’s implementation feasibility, acceptability and fidelity. The process evaluation findings additionally served the interpretation of the outcomes of the effect evaluation.

**Methods**

**Intervention**

The QUIP programme had three objectives (Figure 1 Programme theory): to teach physical therapists a method to improve or maintain their quality of care, to give practice quality managers tools to accomplish quality management, and to make physical therapists and practice quality managers aware that quality of care requires team effort and to help them achieve it (for a detailed description of the intervention, see http://www.gvo.unimaas.nl/medewerkers/index-medewerkers.htm). Because of the current trend in Dutch physical therapy practices towards quality certification, we decided to frame the programme as targeting quality improvement rather than guideline implementation. Presenting guideline implementation as a means for quality improvement was also expected to mitigate the resistance that the term 'guidelines' evoked in our problem analysis.

Since physical therapists and practice quality managers were expected to take responsibility for their own quality of care, self-regulation of individual and organizational learning was chosen as the main theoretical framework for the programme. The core steps of self-regulation are self-
reflection, self-judgment, goal setting, planning and self-action. Self-regulation is an ongoing process during which various levels of an organization provide antecedents and reinforcements within and between levels. Self-regulation was also applicable since our previous studies revealed that personal adherence awareness could act as a moderator in the relationship between guideline adherence and determinants. That is, this relation differed for subgroups of physical therapists who adequately estimated, overestimated or underestimated their personal guideline adherence. One of the aims of the programme was to reduce these misperceptions, since they may hamper the motivation to engage in a process to improve guideline adherence.

The programme consisted of six meetings: four 3-hour sessions for physical therapists and practice quality managers together and two 3-hour sessions for practice quality managers alone. The extensive opportunity for interaction created by the presence of both physical therapists and practice quality managers (who were also physical therapists) in four sessions was expected to reinforce the quality improvement process. During the four joint sessions, individual physical therapists assessed their personal adherence to the guidelines by comparing a patient record with the recommendations in the guidelines. Subsequently, each chose three points for individual improvement, which had to be specific, measurable, acceptable, realistic and time specific (SMART). Next, they considered and chose their own strategies to implement these objectives. Then, they were challenged to implement one of their objectives and to evaluate what had changed in their care process. Finally, they were asked to think about how they would maintain their actions. All this resulted in a personal development plan (PDP). The PDP contained points for individual quality improvement, already achieved goals during the programme and unachieved goals, intended strategies, and a maintenance plan. Additionally, the physical therapists chose three collective goals with the colleagues and the practice quality managers from their practices.

Various methods and strategies were used to bring the physical therapists from self-reflection to their final evaluation and maintenance plan. We used self-monitoring by means of a reflection on a personal patient record. For information transfer, physical therapists attended brief lectures followed by deliberation and discussion and small group work. Vicarious learning and modelling was applied by a Meet the Expert session. We used guided practice in homework instruction, which was discussed and upon which participants received peer and expert feedback.

During two, extra separate sessions, practice quality managers were taught how to use a management scan (INK Quick Scan) to assess improvement points for five organizational domains: leadership, strategy, means management, people management, and process management. The practice quality managers were also instructed on how to assess the organizational change culture using the Personal Change Style questionnaire and how to perform a strengths, weaknesses, opportunities and threats (SWOT) analysis. These
instruments were chosen for practical convenience and ease of use rather than by scientific stringency. Additionally, practice quality managers were taught a strategy to select applicable change activities for their practice. They were challenged to make a risk assessment and a cost analysis for the change process. Finally, they planned how they would maintain their quality management. During the course, they were encouraged to find quick wins, goals that could be met in a short time and with relatively little effort. The process that was followed during the course resulted in a Practice Quality Improvement Plan (PQIP). This PQIP consisted of quality improvement goals, intended results, outcomes of the organizational analyses performed during the programme, chosen strategies, requirements, possible barriers and an expense estimate.

Since quality manager is a relatively new role in private practice physical therapy in the Netherlands, information transfer was used to a larger extent than for the individual physical therapists. There was much room for deliberation and discussion and small group work in which practice quality managers exchanged information and experiences. Guided practice comprised plenary presentation of plans and activities with discussion and peer and expert feedback.

Finally, the programme made use of the most current draft revision of the Dutch physical therapy guideline for low back pain (unpublished manuscript). The revised guideline was less comprehensive and was more comprehensible and user friendly to practitioners. Redundant text was removed to the separate explanation and justification document that accompanied the guideline. To explicitly support clinical reasoning, recommendations were directly linked to findings of a previous step in the process of care leading to recommendations such as “if you find...the guideline recommends to...”. As a means of additional support, physical therapists were provided with a patient information leaflet about guideline-adherent care as a means to manage patient expectations about physical therapy.

Design and recruitment

The potential effects of the QUIP programme were evaluated in a single group, pre-test, post-test design. The process evaluation was an observational study guided by questions (Table 1) based on the programme theory (Figure 1). We used a purposeful sampling approach, which intends to include (groups of) participants that are expected to be informative for the study purpose. This approach is especially useful for pilot studies of newly developed interventions. For pragmatic reasons, such as the opportunity for sufficient interaction and attention for individual participants during the programme, we intended to include no more than 8 practices, including 40 physical therapists 8 of whom would also be practice quality managers. Inclusion criteria required that the practices have an initial quality management structure with a (starting) practice quality manager and at least five physical therapists.
Figure 1. Programme theory of the Quality Improvement in Physical Therapy (QUIP) programme

PRACTICE ORGANIZATION LEVEL: PRACTICE MANAGER

- Practice quality management
- Commitment
  - Structure: deliberation meetings, materials/resources, electronic patient record
  - Culture: collective objectives, openness/respect
- Monitoring
  - Practice organization
  - Individual performance
- Quality improvement practice organization

INDIVIDUAL PERFORMANCE LEVEL: PRACTISING PHYSICAL THERAPIST

- Individual self-regulation: self-observation, self-evaluation, self-reaction
- Patient recording
- Clinical reasoning
- Guideline adherent care [indicators]
  1 Red flags
  2 Application of ICF
  3 Patient profile
  4 Referral if needed
  5 Examination objectives
  6 Treatment objectives
  7 Treatment strategies
  8 Number of sessions
  9 Adequate information
  10 Measurement instruments
  11 Aftercare
  12 Report
- Psychosocial factors
- Questionnaires

Quality improvement individual performance
Table 1. Overview of the topics, questions and methods of the effect and process evaluation

<table>
<thead>
<tr>
<th>Measurement instrument</th>
<th>Clinical Vignettes with quality indicators (completed by)</th>
<th>Self report questionnaire (Participants)</th>
<th>Observations with coding sheet (GR, JH)</th>
<th>Group interviews (GR, JH, AS)</th>
<th>Document analysis of PDP’s and PQIP’s (Participants)</th>
<th>Field notes (GR, JH, AS)</th>
<th>General evaluation questionnaire (Participants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline adherence</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual and organizational determinants</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fidelity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content of the intervention</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Which important subjects from the analyses are addressed in the intervention?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Which methods and applications are actually applied (PT and PQM)?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Which determinants are addressed during the intervention?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Execution of the Intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Are methods and applications applied as intended (why not)?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. How is the extent of participation to the individual modules of the intervention?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. How do participants judge the concept of the revised guideline?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Do PTs apply the patient information leaflet and why/why not?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Do the participants evaluate the intervention as acceptable (tailored to personal level; sufficient interaction; providing new and useful knowledge and skills)?</td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td>❘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Measurement instrument</td>
<td>Clinical Vignettes</td>
<td>Self report with quality indicators</td>
<td>Observations with coding sheet</td>
<td>Group interviews</td>
<td>Document analysis of PDP’s and PQIP’s</td>
<td>Field notes</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>--------------------</td>
<td>------------------------------------</td>
<td>-------------------------------</td>
<td>------------------</td>
<td>---------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>9. How do the participants value the intervention and its individual applications?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. How do the participants value the trainers of the intervention?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Does the intervention evoke higher commitment to quality management (PQP, monitoring of this PQP, sustaining the quality management)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Feasibility**

<table>
<thead>
<tr>
<th>Question</th>
<th>Measurement instrument</th>
<th>Clinical Vignettes</th>
<th>Self report with quality indicators</th>
<th>Observations with coding sheet</th>
<th>Group interviews</th>
<th>Document analysis of PDP’s and PQIP’s</th>
<th>Field notes</th>
<th>General evaluation questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Is the implementation of the intervention in its current form feasible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. If not, what should change to enhance the feasibility of the programme?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
However, in order to learn more about the effectiveness in various levels of management, we preferably included practices with a variation in their quality management structure. For logistic convenience, the practices were predominantly located in the southern part of the Netherlands.

In spring 2009, we approached two national private practice networks that encompass 150 practices and that demand a quality certification from their members. Quality certification, which is increasingly required by health insurance companies in Dutch private practice physical therapy, concerns mainly the management structure of a practice. By selecting these practices we anticipated on the near future in Dutch private practice physical therapy.

The network managers contacted all practices by email that announced the study and explained its purpose as well as the conditions for participation. The email message included a registration form. Fifteen practices showed interest. Two weeks later, the researchers telephoned practices to invite them to participate and to further explain the study purpose and requirements for participation. Based on these phone calls, 8 practices were willing and eligible to participate. All the participants signed for informed consent before they enrolled in the study.

**Data collection and measurements**

**Effect evaluation**

Guideline adherence of individual physical therapists was measured with four previously developed clinical vignettes (see Table 1). The clinical vignettes were developed in an iterative process with an expert team, and were pretested before use. They were based on validated vignettes from a previous study, which showed to have acceptable validity (Spearman's $r_s = 31$) to measure physical therapists' guideline adherence. The vignettes covered 12 quality indicators based on guideline recommendations and represented patients with non-specific low back pain and a favourable natural course, a delayed course without psychosocial factors, and a delayed course with psychosocial factors and a patient with specific low back pain. The scores on the individual quality indicators per vignette were used to calculate an overall percentage score per indicator per therapist. Subsequently, the mean overall percentage adherence was established by calculating the average score of the 12 indicators.

**Clinical reasoning** was measured by assessing the consistency of physical therapists' choices over three separate quality indicators (see Table 2) concerning the handling of psychosocial factors. Consistency in choices was operationalized as the presence of the "conditional argument" (if-then connective) which is an important component of human reasoning. The overall consistency measure was determined by calculating the average of the three consistency indicator scores.
Changes in *individual level determinants* (see Table 3) were measured using a self-report questionnaire developed in an earlier stage of the study. For every determinant, the questionnaire contained one or more items using a five-point Likert scale (1=completely disagree to 5=completely agree). The individual as well as organizational level determinants resulted from a factor analysis. Cronbach’s α ranged from 0.58 to 0.87 for the different determinant scales.

*Organizational level determinants* were partly measured using the questionnaire for individual physical therapists. Changes in the organization were also assessed with qualitative methods: observation, group interviews, field notes and document analyses. In addition to the questionnaire, we focused on self regulation, commitment to quality management, transfer of learned information to the practice, patient recording, presence of regular deliberation meetings, facilitation of questionnaire use, presence of a monitoring structure, and structures for maintenance.

To measure *changes in awareness* of personal performance, subgroups of adequate estimators, overestimators and underestimators were determined by comparing actual and perceived adherence. Perceived adherence was measured by asking the physical therapists to what extent they applied the guidelines to their treatment of patients with low back pain (1=not at all to 5=almost completely).

The clinical vignettes as well as the determinants questionnaire were completed by the physical therapists and the practice quality managers one week before the start of the intervention (last week of August 2009), and within two weeks after finishing the intervention (second/third week of December 2009).

**Process evaluation**
Applying the principle of triangulation, we used both quantitative and qualitative process evaluation methods (Table 1). During every programme session, two members of the research team (GR and JH) were present for observation. The observers used a coding sheet to check off the change objectives, determinants, and the planned methods and strategies that were addressed. They independently made notes about the quality of delivery of the programme components.

Six participant group interviews were conducted by two members of the research team (GR and JH or AS) within 3 weeks after the programme ended. Two interviews, one after two sessions and one immediately after the final programme session, were conducted with the instructors who executed the programme. Guided by the evaluation questions, one of the researchers performed the interview and the other took notes. Visiting the practice locations for the interviews also
provided the researchers the opportunity to observe changes in practice management and to make field notes.

Documents to be evaluated were the PDPs and the PQIPs that were written by the physical therapists and the practice quality managers as an assignment of the programme. Finally, after the last session, the participants completed a general course evaluation questionnaire to assess perceptions of content quality, trainers, location, organization and overall judgement of the course (1=extremely bad to 10=excellent).

**Analysis**

**Effect analysis**
For the physical therapists, descriptive statistics revealed mean scores and changes in pre- and post-intervention means for overall adherence, clinical reasoning indicators by means of choice consistency, perceived adherence and individual level determinants.

For organizational level determinants, we compared pre- and post-intervention means of the organizational items in the questionnaire for the individual physical therapists. In addition, we assessed organizational changes by means of qualitative content analysis with an open coding approach, finding patterns in the observation, interviews, and field notes.

Due to the small sample size, we combined paired sample t-tests with Cohen's d to express the changes in adherence and individual and organizational determinants in effect sizes. In accordance with recommendations on the use of effect sizes for correlated designs, in this study, Cohen's d was computed using original means and standard deviations pre- and post-intervention. Effect sizes were categorized as small (≤ 0.32), medium (0.33-0.55) or large (≥ 0.56). Since we aimed to assess the potential effectiveness of our programme, we chose a less restrictive level of α = 0.05.

For change in personal adherence awareness, we compared the percentages of the awareness subgroups. Cross tabs were used to distinguish the percentages of the three adherence subgroups at baseline and at follow up. The statistical software SPSS15 for Windows was used for all quantitative analyses.

**Process analysis**
The researchers that had collected the data, first combined the findings for each method separately. The coding sheets and observational notes were assembled in the week after each programme session. In the week following each interview, all interview notes and practice observations were processed. The PDPs and PQIPs were evaluated by for their completeness and the plan's attainability by judging the capability of physical therapists and practice quality.
manager to set effective individual and collective quality improvement goals and by assessing the presence of an explicit plan for continuing quality improvement activity after the intervention's end. Descriptive statistics revealed the average participants' perceptions of the course.

Next, one researcher (GR) performed a qualitative content analysis of all observations, interviews, documents, and field notes, using a combination of a template and comparative method of data analysis. This researcher searched for patterns in the findings of each method and subsequently between methods, and grouped the findings by research question related to fidelity, acceptability and feasibility (Table 1). These summarized findings were discussed with a second researcher (JH) until consensus was reached about their interpretation.

Results
Characteristics of the participating physical therapists
Thirty-one physical therapists from 8 practices participated. In every practice, one of the participants was the practice quality manager. One practice (including 4 physical therapists) decided to withdraw during the programme; 7 practices including 27 physical therapists completed the course.

The average age of the participants was 39 years (range 24 to 56), 55% were female (n=15), and participants averaged 15.5 years of work experience (SD=9.86). On the average, practice quality manager had 0.35 FTE (range 0.1–0.5) available for quality management.

One participant did not complete the vignettes at the start of the programme, one did not complete the determinant questionnaire and the vignettes after the programme, and one completed the determinant questionnaire too late for data analysis. In the end, 24 vignette pre-test and post-test measurements and 25 determinant questionnaires were available for analysis.

Effectiveness
Adherence
Overall guideline adherence did not change (3%; p=.138, effective size (ES)=0.35; Table 2). For the individual quality indicators, we observed improvements in the use of measurement instruments (p=.000, ES=1.22), in consistency in choosing treatment objectives involving psychosocial factors (p=.005, ES=0.81), and for overall consistency in handling psychosocial factors (p=.023, ES=0.49). The choice of the correct patient profile decreased (p=.004, E =-0.81). Finally, the limitation of the number of treatment sessions in case of a favourable natural course showed a tendency to improve (p = .056, ES=0.51). The other quality indicators showed no changes.
Awareness

The proportion of over-estimators increased substantially from 41.7% to 78.9% after the programme. The percentage of realistic estimators decreased from 41.7% to 12.5% and that of underestimators from 16.6% to 8.3% after the programme.

Table 2. Changes in percentage of adherence after the Quality Improvement in Physical Therapy programme

<table>
<thead>
<tr>
<th>Quality indicators</th>
<th>Pretest Mean (SD)</th>
<th>Post-test Mean (SD)</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall adherence</td>
<td>51.5 (8.7)</td>
<td>54.6 (9.0)</td>
<td>-1.535</td>
<td>23</td>
<td>.138</td>
<td>0.35(^b)</td>
</tr>
<tr>
<td>1. Assessment of red flags</td>
<td>93.5 (11.2)</td>
<td>89.6 (14.6)</td>
<td>1.164</td>
<td>22</td>
<td>.257</td>
<td>-0.30(^a)</td>
</tr>
<tr>
<td>2. Application of ICF</td>
<td>5.5 (12.7)</td>
<td>8.3 (14.7)</td>
<td>-0.700</td>
<td>23</td>
<td>.491</td>
<td>0.20(^b)</td>
</tr>
<tr>
<td>3. Correct patient profile</td>
<td>55.9 (19.2)</td>
<td>40.2 (19.6)</td>
<td>3.296</td>
<td>19</td>
<td>.004**</td>
<td>-0.81(^c)</td>
</tr>
<tr>
<td>4. Referral if needed</td>
<td>95.8 (9.5)</td>
<td>97.9 (7.1)</td>
<td>-0.811</td>
<td>23</td>
<td>.426</td>
<td>0.25(^a)</td>
</tr>
<tr>
<td>5. Applicable examination objectives</td>
<td>4.2 (11.3)</td>
<td>9.7 (23.0)</td>
<td>-1.072</td>
<td>23</td>
<td>.295</td>
<td>0.30(^a)</td>
</tr>
<tr>
<td>6. Applicable treatment objectives</td>
<td>38.9 (27.2)</td>
<td>30.6 (29.3)</td>
<td>1.661</td>
<td>23</td>
<td>.110</td>
<td>-0.29(^a)</td>
</tr>
<tr>
<td>7. Applicable treatment strategies</td>
<td>30.6 (21.8)</td>
<td>37.5 (22.6)</td>
<td>-1.415</td>
<td>23</td>
<td>.170</td>
<td>0.32(^a)</td>
</tr>
<tr>
<td>8. Limit number of sessions if course is favourable</td>
<td>41.7 (50.4)</td>
<td>66.7 (48.1)</td>
<td>-2.015</td>
<td>23</td>
<td>.056(^a)</td>
<td>0.51(^b)</td>
</tr>
<tr>
<td>9. Adequate information</td>
<td>11.1 (18.8)</td>
<td>19.4 (27.7)</td>
<td>-1.238</td>
<td>23</td>
<td>.228</td>
<td>0.35(^b)</td>
</tr>
<tr>
<td>10. Complete evaluation</td>
<td>27.8 (40.1)</td>
<td>44.4 (38.9)</td>
<td>-1.313</td>
<td>23</td>
<td>.202</td>
<td>0.42(^b)</td>
</tr>
<tr>
<td>10a. Used measurement instruments</td>
<td>38.9 (44.7)</td>
<td>81.9 (21.9)</td>
<td>-4.251</td>
<td>23</td>
<td>.000**</td>
<td>1.22(^c)</td>
</tr>
<tr>
<td>11. Aftercare arranged</td>
<td>84.7 (26.0)</td>
<td>90.3 (25.0)</td>
<td>-1.072</td>
<td>23</td>
<td>.295</td>
<td>0.22(^a)</td>
</tr>
<tr>
<td>12. Report to physician</td>
<td>91.7 (28.2)</td>
<td>93.1 (24.0)</td>
<td>-0.272</td>
<td>23</td>
<td>.788</td>
<td>0.05(^a)</td>
</tr>
</tbody>
</table>

Consistency with regards to psychosocial factors

| Consistency with regards to psychosocial factors                                  | Overall consistency in handling influential psychosocial factors | 59.7 (16.3) | 68.1 (18.0) | -2.432 | 23 | .023**| 0.49\(^b\) |
| a. Choosing examination objectives about psychosocial factors                    | 58.3 (26.5)       | 56.9 (36.1)         | 0.189 | 23 | .852  | -0.04\(^a\) |
| b. Choosing treatment objectives which involve psychosocial factors              | 33.3 (26.0)       | 56.9 (31.8)         | -3.093 | 23 | .005**| 0.81\(^c\) |
| c. Choosing to provide information about psychosocial factors                     | 87.5 (19.2)       | 90.3 (15.5)         | -0.624 | 23 | .539  | 0.16\(^a\) |

\(^a\) small effect size (≤ 0.32); \(^b\) medium effect size (0.33 - 0.55); \(^c\) large effect size (≥ 0.56) \(^d\)

** p < .01; * p < .05; * * p < .10

Individual level determinants

Improvements were found for various determinants at the individual level (.000 ≤ p ≤ .047, 0.43 ≤ ES ≤ 1.17; Table 3). Physical therapists paid more attention to the guideline and found the guideline more compatible with patient demands. They expressed more pride and confidence and less discomfort when they applied the guideline. Their self-efficacy expectations towards using questionnaires to overcome barriers and to deal with social pressure increased. They had increased positive perceptions about the social norms of their colleagues and felt more certain
about their position in treating patients with low back pain. They also perceived the guideline as more flexible and the results of guideline-adherent care as more visible. Their self-efficacy expectations to deal with psychosocial factors increased, and they showed higher motivation to comply with colleagues. For other determinants at the individual level, no changes were observed.

**Management changes**

Three organizational level determinants improved. Practices managers organized more deliberation meetings (p=.012; ES=0.61), made more practice arrangements about the treatment of patients with low back pain (p=.003; ES=0.67), and better organized the handling of measurement instruments in their practices (p=.000, ES=0.90, see Table 3)

Our qualitative analyses revealed that, with respect to changes in management structure, participants indicated that ‘following the programme had put things in motion’ The practice quality managers schedule showed more deliberation meetings to discuss plans for low back pain patients. Participants of practices with lower baseline management levels expressed that the management had moved toward a better-structured process, and practice quality managers of practices with a higher baseline management level showed the results of their application of the newly learned management tools into their practices. The management scan (INK Quick Scan) for organization assessment was used in two practices. Moreover, we observed that practices had organized space and trained staff to help patients to complete questionnaires

As regards involvement of staff in quality management, all participants expressed increased awareness that improving quality of care is a team effort Employees reported feeling greater involvement in practice policy Self-regulation was reflected in that physical therapists could introduce a topic in the meetings and together with the managers could decide whether a quality improvement activity was necessary.

**Table 3. Changes in scores on influential determinants of adherence after the Quality Improvement in Physical Therapy programme (1 = disagree to 5 = agree)**

<table>
<thead>
<tr>
<th>Determinant</th>
<th>N&lt;sub&gt;items&lt;/sub&gt;</th>
<th>α</th>
<th>Pretest Mean (SD) n=25</th>
<th>Post-test Mean (SD) n=25</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Effect size Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived adherence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention paid to the guideline</td>
<td>2</td>
<td>0.70</td>
<td>3.3 (0.6)</td>
<td>4.0 (0.5)</td>
<td>4.07</td>
<td>24</td>
<td>0.00**</td>
<td>1.17c</td>
</tr>
<tr>
<td>Compatibility with way of working</td>
<td>4</td>
<td>0.70</td>
<td>3.3 (0.6)</td>
<td>3.5 (0.6)</td>
<td>1.34</td>
<td>24</td>
<td>0.19</td>
<td>0.33&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Compatibility with patient demands</td>
<td>3</td>
<td>0.78</td>
<td>3.2 (0.8)</td>
<td>3.6 (0.5)</td>
<td>3.07</td>
<td>24</td>
<td>0.04**</td>
<td>0.60&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Flexibility of the guideline</td>
<td>5</td>
<td>0.87</td>
<td>3.5 (0.6)</td>
<td>3.8 (0.5)</td>
<td>2.12</td>
<td>24</td>
<td>0.05*</td>
<td>0.54&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Communicability of the guideline</td>
<td>3</td>
<td>0.82</td>
<td>4.0 (0.6)</td>
<td>4.2 (0.5)</td>
<td>1.45</td>
<td>24</td>
<td>0.15</td>
<td>0.36&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Visibility of results of the guideline</td>
<td>4</td>
<td>0.89</td>
<td>2.9 (0.8)</td>
<td>3.3 (0.8)</td>
<td>2.52</td>
<td>24</td>
<td>0.019*</td>
<td>0.50&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
### Chapter 8

<table>
<thead>
<tr>
<th>Pretest Post-test t df p Effect size</th>
<th>N</th>
<th>α</th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feeling pride / confidence</strong></td>
<td>6</td>
<td>0.86</td>
<td>3.0 (0.7)</td>
<td>3.6 (0.6)</td>
<td>-4.688</td>
</tr>
<tr>
<td><strong>Feeling uncomfortable</strong></td>
<td>6</td>
<td>0.81</td>
<td>3.0 (0.6)</td>
<td>2.5 (0.5)</td>
<td>3.594</td>
</tr>
<tr>
<td><strong>Self-efficacy to apply questionnaires</strong> (behavioural SE)</td>
<td>5</td>
<td>0.71</td>
<td>3.5 (0.6)</td>
<td>4.0 (0.5)</td>
<td>-4.804</td>
</tr>
<tr>
<td><strong>Self-efficacy to overcome barriers</strong> (tensional SE)</td>
<td>2</td>
<td>0.82</td>
<td>3.0 (0.8)</td>
<td>3.6 (0.8)</td>
<td>-3.343</td>
</tr>
<tr>
<td><strong>Self-efficacy towards perceived social pressure</strong> (social SE)</td>
<td>5</td>
<td>0.84</td>
<td>3.6 (0.5)</td>
<td>3.9 (0.5)</td>
<td>-2.031</td>
</tr>
<tr>
<td><strong>Self-efficacy to explain hands off policy to patients</strong></td>
<td>1</td>
<td>--</td>
<td>3.8 (0.7)</td>
<td>4.2 (0.6)</td>
<td>1.995</td>
</tr>
<tr>
<td><strong>Self-efficacy to deal with psychosocial factors</strong></td>
<td>1</td>
<td>--</td>
<td>3.5 (1.0)</td>
<td>3.9 (0.7)</td>
<td>-2.089</td>
</tr>
<tr>
<td><strong>Potential losses</strong></td>
<td>5</td>
<td>0.85</td>
<td>2.0 (0.6)</td>
<td>1.7 (0.7)</td>
<td>1.815</td>
</tr>
<tr>
<td><strong>Social norm of colleagues</strong></td>
<td>2</td>
<td>0.72</td>
<td>2.8 (0.8)</td>
<td>3.4 (0.8)</td>
<td>-3.055</td>
</tr>
<tr>
<td><strong>Social norm: perceived behaviour of peers</strong></td>
<td>1</td>
<td>--</td>
<td>2.9 (1.2)</td>
<td>3.3 (1.2)</td>
<td>-1.809</td>
</tr>
<tr>
<td><strong>Motivation to comply with colleagues</strong></td>
<td>3</td>
<td>0.58</td>
<td>3.1 (0.7)</td>
<td>3.4 (0.7)</td>
<td>-2.413</td>
</tr>
<tr>
<td><strong>Social norm of patient</strong></td>
<td>1</td>
<td>--</td>
<td>2.7 (1.1)</td>
<td>2.8 (0.8)</td>
<td>-0.146</td>
</tr>
<tr>
<td><strong>Motivation to comply with patient</strong></td>
<td>1</td>
<td>--</td>
<td>4.1 (0.7)</td>
<td>4.0 (0.8)</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Barriers logistic</strong></td>
<td>5</td>
<td>0.81</td>
<td>2.6 (0.7)</td>
<td>2.3 (0.9)</td>
<td>1.394</td>
</tr>
<tr>
<td><strong>Barriers working part time</strong></td>
<td>1</td>
<td>--</td>
<td>1.5 (0.8)</td>
<td>1.4 (0.7)</td>
<td>0.225</td>
</tr>
<tr>
<td><strong>Barriers market directed care</strong></td>
<td>1</td>
<td>--</td>
<td>2.2 (1.0)</td>
<td>2.0 (1.1)</td>
<td>1.238</td>
</tr>
<tr>
<td><strong>Incompatibility other guidelines</strong></td>
<td>2</td>
<td>0.69</td>
<td>2.0 (0.7)</td>
<td>1.8 (0.7)</td>
<td>1.429</td>
</tr>
<tr>
<td><strong>Feeling uncertain about position</strong></td>
<td>3</td>
<td>0.76</td>
<td>2.4 (0.6)</td>
<td>1.9 (0.6)</td>
<td>2.850</td>
</tr>
</tbody>
</table>

#### Practice level

<table>
<thead>
<tr>
<th>Pr</th>
<th>Me</th>
<th>Co</th>
<th>Pr</th>
<th>Me</th>
<th>Co</th>
<th>Me</th>
<th>Co</th>
<th>Me</th>
<th>Co</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular deliberative meetings</td>
<td>1</td>
<td>--</td>
<td>3.4 (1.0)</td>
<td>3.9 (0.6)</td>
<td>2.701</td>
<td>24</td>
<td>.012*</td>
<td>0.61c</td>
<td></td>
</tr>
<tr>
<td>Practice arrangements about treatment of patients with low back pain</td>
<td>1</td>
<td>--</td>
<td>2.6 (1.4)</td>
<td>3.5 (1.3)</td>
<td>3.366</td>
<td>24</td>
<td>.003**</td>
<td>0.67c</td>
<td></td>
</tr>
<tr>
<td>Guideline is part of practices routine</td>
<td>1</td>
<td>--</td>
<td>3.0 (0.9)</td>
<td>3.3 (1.1)</td>
<td>4.572</td>
<td>24</td>
<td>.29</td>
<td>0.30c</td>
<td></td>
</tr>
<tr>
<td>Arrangements with other disciplines</td>
<td>2</td>
<td>0.82</td>
<td>2.3 (1.1)</td>
<td>2.6 (1.3)</td>
<td>1.664</td>
<td>23</td>
<td>.110</td>
<td>0.25c</td>
<td></td>
</tr>
<tr>
<td>Culture of education / training</td>
<td>1</td>
<td>--</td>
<td>4.3 (0.7)</td>
<td>4.2 (0.7)</td>
<td>0.527</td>
<td>24</td>
<td>.603</td>
<td>0.14a</td>
<td></td>
</tr>
<tr>
<td>Handling measurement instruments</td>
<td>1</td>
<td>--</td>
<td>2.4 (0.9)</td>
<td>3.3 (1.1)</td>
<td>4.028</td>
<td>24</td>
<td>.000**</td>
<td>0.90c</td>
<td></td>
</tr>
<tr>
<td>Availability guidelines / instruments</td>
<td>3</td>
<td>0.79</td>
<td>4.2 (0.6)</td>
<td>4.6 (0.5)</td>
<td>1.372</td>
<td>24</td>
<td>.183</td>
<td>0.20a</td>
<td></td>
</tr>
<tr>
<td>Supportive practice culture</td>
<td>3</td>
<td>0.65</td>
<td>4.4 (0.5)</td>
<td>4.4 (0.5)</td>
<td>0.249</td>
<td>24</td>
<td>.805</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

1 = not at all to 5 = almost completely; lower post test score means improvement; ** p < .01; * p < .05
a small effect size (< 0.32); b medium effect size (0.33 – 0.55); c large effect size (≥ 0.56).

For sustainability individual practices introduced other organizational and cultural management innovations. Some showed how they implemented a buddy system in which two colleagues checked each other’s patient files for guideline adherence; we also observed rearrangements of electronic patient records to facilitate guideline adherence, and some implemented electronic patient records if not already in use. Others showed schedules of regular patient file checks by
the practice quality manager or explained that they arranged additional in-service training, such as dealing with psychosocial factors. Also, some practices were already expanding the approach to other guidelines.

**Process evaluation**

**Fidelity Content of the programme**

The programme’s emphasis for the individual physical therapists was on the use of measurement instruments and the psychosocial factors, both identified by the practices as high-priority goals. Correct application of the International Classification of Functioning, Disability and Health (ICF) in the diagnostic process was not clearly present in the programme. All physical therapists went through the steps of self-regulation, although sometimes rather implicitly. Most self-assessments involved only general estimations of personal guideline adherence.

Contrary to the other tools to assist practice quality managers in their change management, attention to the management scan (INK Quick scan) remained limited. There was ample opportunity for interaction in which the steps the managers made and problems they encountered were discussed and advice for implementation in the practice was provided. Advice about their leadership capacities was limited.

All determinants for individual physical therapists and managers were addressed during the programme and all theoretical methods were applied. The presence of both physical therapists and practice quality managers during four of six sessions created extensive interaction, enabling them to work together on their quality improvement plans and improving commitment.

**Fidelity Execution of the programme**

Programme instructors competently delivered the methods and practical applications, albeit, due to time limitations, briefly for most. This resulted in some deficits in both programme delivery and learning, including little feedback on individual physical therapists’ homework, superficial reflection by physical therapists on their personal adherence, inadequate effort on homework assignments, little discussion of the PDPs in the plenary session, limited attention for practice quality manager skills methods, and little discussion of the issue of maintenance. Furthermore, changes in the programme were required because of the unexpected low knowledge levels of the physical therapists on some themes, such as red flags (signs and symptoms of serious diseases), application of measurement instruments and psychosocial factors. In addition, small group work sessions of individual physical therapists with peers required greater guidance to keep participants focused.
Acceptability: Materials
The revised guideline was positively judged even though its recommendations were largely similar to the former version. The revision was unanimously found to be less normative, more flexible, less extensive and easier to understand and apply. The patient leaflet had only been used by one practice, despite the judgment of all practices that the content was supportive and useful.

Acceptability: General
Of the seven practices that completed the course, six were unanimously very positive about the programme (score 8 out of 10). In one practice, the opinions differed, varying from fair (6 out of 10) to very positive (8 out of 10). One practice dropped out. Although neither their pre-intervention adherence scores nor our observations showed better performance compared with other practices, managers explained the practice was already engaged in a quality improvement process and did not learn anything new. One of the practice's two practice quality managers also indicated, however, to lack leadership skills, which may also have been a reason they dropped out. The other manager judged the programme as more suitable for practices with lower performance levels.

The physical therapists' assessments of the course instructors were very positive, as were assessments of the interactive small group sessions with colleagues from the practice, the plenary discussions, presentations with peer and expert feedback, and the Meet the Expert session. Small group sessions with peers from other practices were highly appreciated by the managers, who learned from exchanging experiences, but to a lesser extent by individual physical therapists.

Feasibility
Problems with feasibility of the programme in its current form included available time to pay sufficient attention to several parts of the programme (for instance giving feedback on the PDPs), variability in completion of homework assignments, and underestimation of the needed remediation of the knowledge level for some issues. In addition, application of the self-regulation process (theoretical core) and sound clinical reasoning (basic professional skill) was not yet well implemented. This appeared to require more explicit instruction and guidance. Although all practices made progress, the plan for continuing the programme components as a normal part of practice would deserve greater attention and monitoring.

Additionally, the programme lacked sufficient attention to goal setting skills, and leadership skills of the quality managers should be addressed. The programme would benefit from an extra session to include the issues mentioned above. Moreover, a six-month, follow-up session would allow monitoring and would support maintenance of the quality improvement process.
Discussion

Summary
This pilot study examined the potential effectiveness of the systematically developed, theory-based Quality Improvement in Physical Therapy (QUIP) programme, aimed at individual physical therapists and practice quality managers, to enhance adherence to the Dutch guidelines for low back pain. The study also examined the fidelity, acceptability and feasibility of the programme’s implementation.

For individual physical therapists, overall guideline adherence showed no improvement, but significant changes were observed for some individual quality indicators, concerning the use of measurement instruments and handling psychosocial factors. The increased attention to psychosocial factors was, however, associated with a large decrease in choosing correct patient profiles. For practice quality managers, a combination of quantitative and qualitative data showed that the programme helped structure practice quality management, provided tools to perform quality management, and supported the implementation of changes to improve quality of care for patients with low back pain. The results also suggest that the programme brought about favourable changes in motivational and affective determinants of guideline adherence at the individual performance level as well as organizational determinants at the practice quality management level.

Findings of our process evaluation suggest that the improvements may be associated with the multilevel approach of the QUIP programme, the formulation of individual performance and collective practice quality improvement goals, and physical therapists and practice quality managers collaborating to choose quality improvement strategies. The substantial opportunity for interaction between practice quality managers from different practices and between practice quality managers and physical therapists from the same practice appeared to be a benefit. The short time span of the programme, however, hampered engagement of participants at all steps of the process of self-regulation, which served as the programme’s core strategy of change, and allowed detailed attention to only a limited number of important subjects. Although the programme was judged as highly acceptable, it would need substantial changes to make it more feasible and more effective over a broader range of guideline recommendations.

Behaviour change among health care providers
Despite the absence of an increase of overall adherence (3%), we observed improvements in individual quality indicators (e.g., use of measurement instruments (40%), choosing treatment objectives including psychosocial factors (24%), consistency in handling psychosocial factors (8%)). Mostly, improvements found in implementation research among health care providers are 5-15%. Of two randomized clinical trials (RCTs) in physical therapy that also looked at adherence to guidelines for low back pain, one found an average difference of 13% for treatment session...
limitations between the intervention and the control group.\textsuperscript{14} The second low back pain study found only small differences between the intervention and the control group in handling psychosocial factors.\textsuperscript{15} A third RCT examined the improvement of physical therapists' adherence to guidelines for the treatment of patients with whiplash injury.\textsuperscript{13} This study found 13\% self-reported improvement in physical therapists application of functional outcome questionnaires in the intervention group and 31\% for the ability to identify psychosocial factors.\textsuperscript{13} In all three studies, the interventions were also multifaceted but were directed only at the individual physical therapists level. Taking into account the limitations of the study design (see below), the changes observed in our pilot study may indicate that the programme has the potential to improve adherence to individual guideline recommendations to a somewhat greater extent.

The promising results from the individual quality indicators might be due to the fact that the intervention focused on both the individual physical therapists and the management levels. Including the individual, organizational and environmental level in guideline implementation interventions has been recommended.\textsuperscript{19-51} Moreover, Stevens' and Beurskens' study on improving the use of measurement instruments in physical therapy concluded that interventions should aim at the individual professional level as well as practice and professional organizational levels.\textsuperscript{52} This was confirmed by our problem analysis that revealed five levels of intervention, three of which, individual physical therapist, practice organization and guideline, were addressed by the QUIP programme.

Second, the programme's multilevel approach provided positive experiences for practice quality managers and their physical therapists during the interactive sessions, enhancing commitment and showing that engaging in a quality improvement process together need not be burdensome or time consuming. In previous studies, staff involvement in decision making was found to be beneficial to quality of care improvement.\textsuperscript{53-55} Moreover, interaction between the levels in an organization is one of the core factors of organizational self-regulation.\textsuperscript{37} This interaction may have enhanced feelings of peer and superior support, which have been recognized as important factors influencing guideline adherence.\textsuperscript{55} Further, practice quality manager - physical therapist interaction resulted in collective goals based on individually chosen quality improvement priorities. Goal setting is seen as a key factor in self-regulation and task performance.\textsuperscript{53}

The use of Intervention Mapping (IM) resulted in a programme specifically targeting the determinants that were found to be of importance in our comprehensive determinant analysis, which included both qualitative and quantitative methods.\textsuperscript{30,31} IM is a systematic process that guides programme developers to find applicable methods and their practical applications for changing motivational, affective and organizational determinants. Because educational strategies alone have had limited effects,\textsuperscript{38} the QUIP programme combined these strategies with various theoretical behaviour change methods, including self-monitoring, goal setting, modelling, peer
and expert feedback and guided practice. This powerful mix of behaviour change methods may have contributed to the effects on many of the determinants and some quality indicators.

In our programme we chose for meetings outside the practice instead of an on-site intervention. On site interventions, such as educational outreach visits, have demonstrated small to modest effects on the change of professional performance. Our choice for meetings with more than one practice simultaneously was mainly driven by three reasons. First, we wanted to create the opportunity for interaction, which is identified as a factor that may increase the effect of educational meetings. Second, we preferred to take the physical therapists out of their daily context, since their habitual working environment provides cues for habitual performance. Third, we considered the costs of the programme, taking into account its implementation on a larger scale. Given the number of almost 5000 physical therapy practices in the Netherlands, an on-site programme would have been difficult to manage and very cost expensive.

The negligible effect on overall guideline adherence (3%) may be of limited clinical importance. Overall adherence in our study was the result of a combination of 12 quality indicators. An explanation may be that all 12 quality indicators were used to calculate the average level of adherence. One of the properties of quality indicators is their potential for improvement. Since 4 of the 12 indicators had high baseline scores (≥ 85%), their improvement potential was low, limiting their opportunity to contribute to the overall increase of guideline adherence. A second and perhaps even more important explanation may be that the time limitation of the programme forced physical therapists to prioritize, set goals and choose implementation strategies for a limited number of subjects. Although this approach revealed promising results, the findings indicate that physical therapists, as well as other health care professionals, might only be able to implement recommendations of guidelines one by one, or in small numbers simultaneously. Restricting effects to a limited number of quality indicators is in accord with other guideline adherence or quality improvement studies. As a consequence, complete guideline implementation has to be viewed as a stepwise process that requires an ongoing effort.

Adverse effects
We first observed a decrease in the choice of the correct patient profile. Due to recent insights into the development of chronic pain, patient profiles in the revised low back pain guideline, which were used in our study, now describe three subgroups based on the natural course of the low back pain in the previous three weeks. They distinguish normal course low back pain from delayed course low back pain with absence or presence of psychosocial factors causing the delay. Instead of three weeks, the original guidelines distinguish between a normal and delayed course based in the previous six weeks. Analysis of our data at follow up revealed that the attention given to psychosocial factors during the programme probably caused physical therapists to interpret the cases described in the vignettes predominantly as the profiles for which these
factors are applicable, irrespective of the course of recovery. Although the guidelines recommend assessing psychosocial factors only for delayed course low back pain, recent research has emphasized the importance of early assessment and management of psychosocial factors because of their predictive value for chronic low back pain development. This may indicate that the validity of profiles within the guideline is at stake and that psychosocial factors should, indeed, be assessed regardless of the course of recovery.

We also observed a strong increase in over-estimation and a decrease in adequate estimations of personal performance. Over-estimation of personal performance might decrease the willingness to improve quality of care since over-estimators think they are doing well. This finding emphasizes the importance of thorough self-reflection, a basic part of the self-regulation process, and feedback on personal performance, mentioned before as prerequisite to increase guideline adherence. However, our process evaluation revealed that physical therapists mainly evaluated their personal guideline adherence on a general impression of their way of working instead of the required thorough comparison of patient files with guideline recommendations. Improving the self-evaluation process would be one of the first adjustments of the QUIP programme.

**Study limitations**
The potential effectiveness of the programme should be interpreted with caution. This is due to several limitations with regard to the internal validity of the study. The first is the one-group, pretest-post-test design of the study. The absence of a randomization procedure and a control group makes this design vulnerable to many forms of bias, such as the Hawthorne effect, maturation, and testing or history effects, herewith reducing its suitability to draw sound conclusions about the programme's effectiveness. However, comparison of our results to those of repeated measurements with similar vignettes in our problem analysis among almost 400 physical therapists 18 months earlier (change of indicator scores ranged from 0.25 to 1.70%), suggest a limited risk for maturation concerning the improvement of guideline adherence. A second limitation concerns the assessment of the effectiveness of the programme with many individual t-tests. This may result in an overestimation of the effect due to alpha-inflation. However, since our objective was to assess the potency of the programme to improve guideline adherence and adherence determinants, we preferred this more lenient alpha level in the spirit of discovery. Nevertheless, a more sophisticated analysis in a larger sample will probably reveal a smaller effect. Third, the effect sizes we present to express the strength of the effectiveness of our programme should be interpreted with caution. Although, in accordance to recommendations in the literature, we present them together with significance levels, effect sizes in small samples can be rather unstable. A fourth limitation was that one practice dropped out during the course of the program. Although their baseline adherence levels were no better than those of the other participants they indicated to learn nothing new. Unfortunately, they
were not inclined to complete the questionnaire and vignettes after the programme, which made it impossible to assess how their withdrawal influenced our results.

Also, the dual role of the practice quality managers, who were also physical therapist may have affected the results of the study. It is possible that practice quality managers, due to their extra sessions or due to a higher motivation increased their guideline adherence to a larger extent than the physical therapists. However, this duality reflects the actual situation in Dutch private practice physical therapy, and for quality improvement this may even be beneficial, as the practice quality manager could serve as a change agent and a role model for his physical therapists.

Another limitation concerning internal validity may be that guideline adherence as well as its determinants were measured with self report measurement instruments, which may have caused an overestimation of determinants as well as guideline adherence. However, to our knowledge no other way to investigate behavioural determinants in larger groups of professionals is available. Moreover, since we used the same measurement instruments at baseline as well as after the intervention, both measurements will probably include the same systematic measurement error. Consequently, we expect that the observed changes in determinants and guideline adherence reflect actual changes. Besides, practice performance (including guideline adherence) is a difficult feature to measure in quality of care research, and standardized patients (actors playing the roles of patients) are considered the gold standard. However, using standardized patients is expensive and time-consuming, and so we used clinical vignettes. Although it has been reported that clinical vignettes measure attitudes and perceptions rather than actual performance, they have shown acceptable levels of validity in measuring clinicians' performance. New opportunities are under development, such as electronic patient records with quality indicators that measure the process of care. However, usability of such records is still too limited for routine practice.

A final limitation for internal validity that also reduces external validity of the study results, concerns the small self selected sample. Although age and gender of the individual participants did not substantially deviate from the national data, the small and self-selected group of practices limited the external validity of the results. In addition, we included practices that were in the possession of a quality certification or had made a start with a quality certification process, which means that the practice had at least an initial quality management structure. Such practices may be more motivated to engage in efforts to improve their quality of care. Consequently, our results cannot be generalized to practices that lack such a structure. However, this pilot study was performed to assess potential effectiveness of the implementation programme and to determine the need for revision before testing it in a randomized, controlled trial. The process evaluation provided insight into the mechanisms that might explain why the
programme was effective at some points but not at others. This information gives us the opportunity to improve the programme before further testing its effectiveness.

Finally, we did not assess the duration of the effects of our programme. This pilot intended to assess the potential effectiveness of our multilevel approach on physical therapists’ guideline adherence. Such an approach is new in this profession. Therefore, we first wanted to find out whether it was effective at all, before testing its sustainability.

**Conclusion**

Although overall guideline adherence did not improve, changes on individual quality indicators suggest that a systematically developed, theory-based programme to enhance adherence to the Dutch physical therapy guidelines for low back pain has the potential to improve the quality of physical therapy care for patients with low back pain. The integrated approach of individual physical therapists and their practice quality managers seems to benefit positive performance change. However, more sophisticated designs are required to draw sound conclusions about the effectiveness of the programme. The self-regulation approach was suitable when it begins and ends with thorough self-reflection on personal performance and when continuity of the process is guaranteed. Interactive, small group sessions with the practice, modelling and plenary deliberation with peer and expert feedback appear to be the most suitable strategies. However, the programme should allow sufficient time for attention to individual subjects and strategies. Moreover, the programme needs a follow-up session to assess and support sustainability.
References
9. Leentjens AF, Burgers JS. [What factors are important for the successful implementation of guidelines?]. Tijdsschr Psychiatr 2008;50:329–35


40. INK Quick Scan [http://www.ink.nl/nl/p4d9c5f5f1a5fd/ink-quickscan.html]


46. Kwaliteit van meetinstrumenten voor studiehouding en studievaardigheid [Quality of instruments to measure study-attitude and study-skills] [http://www.ou.nl/open/lds97/kwaliteit_meetinstrumenten.htm#Resultaten]


74. Gould D. Using vignettes to collect data for nursing research studies. how valid are the findings? J Clin Nurs 1996;5:207–12.


Chapter 9

General discussion
Introduction
This thesis aimed to investigate the use of a theory-based and systematic approach covering both
development and implementation of a programme to increase the adherence of Dutch physical
therapists to their professional guidelines for low back pain This approach was expected to yield
a programme with the potential of achieving a 25% improvement in adherence

The first section of this general discussion summarizes the main findings of the study as a whole,
while the subsequent sections discuss some major issues encountered during the study The first
of these reflects on the use of the method of Intervention Mapping, including the consequences
of conducting an extensive problem analysis The next section elaborates on the complicated role
of personal adherence awareness in programmes to improve guideline adherence The role of
previous adherence, or habitual performance, is then debated, followed by reflections on the
application of Rogers' Diffusion of Innovations theory in our effort to improve guideline
adherence Some limitations of the study are also discussed The final section presents practical
and scientific implications of the findings

Main results
Chapter 1 describes the problem definition Low back pain is a highly prevalent health problem
with serious individual and societal consequences, especially when it becomes chronic Physical
therapy is expected to have the potential to contribute to the prevention of chronic low back
pain Clinical guidelines for low back pain treatment include recommendations for physical
therapy care based on the best available evidence However, the use of these guidelines in
practice is limited, and there is as yet no proof that better guideline adherence results in better
outcomes In addition, the effectiveness of interventions to improve overall adherence to these
guidelines is only moderate The study reported on in Chapter 2 assessed the validity of clinical
vignettes for the measurement of physical therapists' adherence to the Dutch guidelines for low
back pain The conclusion was that, given an adequate case-mix, clinical vignettes can be used
with acceptable validity, and represent an inexpensive and manageable instrument that can be
used among large groups of physical therapists to measure their adherence to the guidelines The
study presented in Chapter 3 investigated the relation between guideline adherence and the
effectiveness and efficiency of physical therapy treatment It found that a higher percentage of
adherence to the Dutch physical therapy guidelines for low back pain was related to a better
treatment effect in terms of physical functioning and lower use of care facilities

Chapters 4, 5 and 6 are all part of the problem analysis A qualitative assessment of motivational
determinants of guideline adherence revealed that the physical therapists had rather
unfavourable opinions about the guideline (Chapter 4) Categorization of the findings in terms of
the stages of our theoretical framework, which was based on Rogers' Diffusion of Innovations
theory, showed that most physical therapists participating in the interviews were in the early
phases of diffusion. The determinants of adherence were mainly related to the dissemination phase of the implementation process, but the interviews yielded relatively little information related to the subsequent adoption phase. A cross-sectional assessment of the relation between motivational determinants and guideline adherence was then used to compare self-reported and actual guideline adherence (Chapter 5). This revealed three subgroups, distinguished by their degree of awareness of their own adherence to the guidelines: physical therapists who had accurate perceptions about their adherence to the guidelines (realists), those who over-estimated (overestimators) and those who underestimated (underestimators) their adherence. Since the explained variance for the total group was only 6.7%, while that for the realists was 31.2%, the study indicated that this personal adherence awareness influences the relation between determinants and guideline adherence. Since more than 50% of the physical therapists had misperceptions about their adherence, this seemed an important factor to take into account when assessing determinants of adherence and in the development of interventions to improve adherence. The study also showed that relative advantage (e.g., the perception that guideline-adherent care results in better treatment effects) is the most important motivational determinant of guideline adherence. We added organizational factors to this determinant analysis and performed a cross-sectional as well as a longitudinal analysis of the relation between determinants and guideline adherence, distinguishing between the subgroups of personal adherence awareness (Chapter 6). The study showed that guideline implementation is a process influenced by determinants at more than one level, including those of the individual professional, the practice organization and other environmental factors, such as the professional association, the patient and the guideline itself. However, despite the inclusion of this broader array of determinants compared to our earlier cross-sectional study, the explained variance did not improve. In the cross-sectional analysis, most of the adherence was explained by individual professional determinants, such as the amount of attention paid to the guideline, regular evaluation of performance and results and uncertainty about the role of physical therapy in the recommended treatment of patients with low back pain. The study also showed that determinants explaining adherence differ from those predicting adherence. The inclusion of previous adherence, which was the strongest predictor of guideline adherence in the longitudinal analysis, resulted in a substantial increase of the proportion of variance explained. Finally, the study revealed that determinants differed for the three awareness subgroups. Among the underestimators in particular, guideline adherence appeared to be influenced by organizational determinants.

Chapter 7 presents the use of the systematic and theory-based method of Intervention Mapping (IM) to develop a programme to improve the implementation of the Dutch physical therapy guidelines for low back pain. In IM step 1, we conducted an extensive needs assessment. In IM step 2, we formulated programme objectives, performance objectives and change objectives, specifying who and what will change as a result of the intervention. In step 3, we chose theory-
informed methods of change and practical applications of these methods. In step 4, the results of the previous steps were combined into the intervention programme. In step 5 and 6, we developed a plan for implementation and a plan to evaluate the programme.

The needs assessment (Step 1) revealed that our intervention should preferably be aimed at the physical therapists and the quality manager of the practice. Step 2 and 3 made clear that self-regulation could serve as the core theory of the intervention, but that the additional constructs of other behavioural and organizational theories were required. Step 4 resulted in a multilevel intervention programme, allowing for interaction between physical therapists and quality managers, and emphasizing collective goal setting. The programme, a course on quality improvement, consisted of six 3-hour sessions, of which four were attended by both, physical therapists and quality managers, and two by the quality managers only. The intervention program combined a variety of practical applications (e.g. group work, meet-the-expert session, discussion and feedback), which were deducted from various theory-informed methods (e.g. conscious raising, modelling, active learning) and specifically aimed at changing the salient determinants. The plan for adoption, implementation and sustainability (Step 5) was mainly aimed at the wider environment, such as the professional association. The evaluation plan (Step 6) included an effect and a process evaluation addressing the program, performance and change objectives as well as the program components specified in the previous steps. We concluded that, although not being without difficulties, applying the framework of Intervention Mapping may provide the required sound rationale for intervention programs in the field of guideline implementation.

Finally, Chapter 8 presents a pilot test of the programme. This pilot test found that, despite addressing all the determinants that were found to be important for the improvement of adherence, the programme hardly improved actual overall guideline adherence. However, it also showed that the programme in its current format has the potential to substantially change adherence to a limited number of guideline recommendations (range 23.6% to 43.0%). These included mainly the three aspects of physical therapists' performance for which the therapists and quality managers from a practice formulated collective goals (e.g. the use of health-outcome questionnaires to evaluate treatment effectiveness). However, an adverse effect was also observed. The results showed a substantial decrease (-15.7%) in the correct assessment of patient profiles, which is an important feature of the guideline. Substantial changes were also observed for many individual professional and some organizational determinants. The determinants showed no adverse effects.

The process evaluation revealed that the managers had engaged in the creation of a facilitating environment to achieve the goals formulated within the practice (e.g. creating a space for the patient to complete questionnaires and training a practice assistant to support the patient in
completing the questionnaire). The process analysis also showed that the time frame of the programme was too limited to allow sufficient attention to be paid to the skills determinants and the monitoring of the self-regulation process at the level of the individual professional. Moreover, the short time frame only allowed collective goals to be set for a limited number of guideline recommendations. This may indicate that guideline implementation is a stepwise process that requires a longer period for the physical therapists and quality managers to repeatedly set attainable goals. This process requires ongoing attention and efforts at all levels of the system in which the guideline has to be implemented.

**Improvement of guideline adherence**

Improvement of overall guideline adherence (average improvement of all twelve indicators) was limited to 3.1% and thus negligible. Hence, the hypothetical 25% improvement in guideline adherence was not achieved. The following sections reflect on some major issues in this respect.

**Intervention Mapping process**

The development of our programme was preceded by an extensive theory-based and empirical problem analysis. In accordance with the recommendations of the Intervention Mapping procedure, we used various methods, including a literature study, qualitative and quantitative cross-sectional and longitudinal determinant analyses and subgroup analyses to assess guideline adherence and determinants of adherence. The analysis was based on a theoretical framework including constructs of behavioural and organizational change theories. Factor analysis after the baseline questionnaire survey resulted in 50 potential determinants of guideline adherence, covering five levels for possible intervention: the individual physical therapist, the practice, the professional association, the guideline and the patient. This approach had the benefit of offering a broad view on the implementation problem. However, it also necessitated a pre-selection of determinants and of the levels of intervention in the process of intervention development. The next two sections elaborate on these two moments of pre-selection.

**Pre-selecting determinants**

We first needed to reduce the number of determinants to limit the number of predictors in the quantitative analysis of the relationship between determinants and guideline adherence. This was especially true for the stratified multivariate regression analyses within the awareness subgroups, which had relatively small sample sizes. It is recommended to base the selection of determinants on the available evidence and, especially in the absence of such evidence, on the results of a preparatory bivariate correlation analysis. The process of selecting determinants for the quantitative analyses in our study was performed in accordance with these recommendations. However, since too many determinants had significant bivariate correlations with guideline adherence, some of them had to be excluded from the multivariate analysis. Consequently, potentially influential determinants may have been missing from the further
analysis and, hence, from the needs assessment. Although a distribution over more levels was maintained, our reduction of determinants may be a reason why the cross-sectional analysis did not result in a substantially higher percentage of explained variance, compared to our previous analysis of mainly motivational determinants which exclusively related to the level of the individual professional. The main advantage of the extensive problem analysis might therefore not be the number of determinants left at the end, but rather the fact that these determinants covered more than one level for intervention, and that it indicated which determinants were important at each level.

In addition to these statistical considerations, there were also procedural reasons for further reducing the number of determinants. The determinants had to be selected for the development of a coherent and manageable programme to improve guideline adherence. Selecting determinants is generally based on their importance and changeability. To our knowledge, however, there is no best way to select the most important determinants for intervention development from a mix of quantitatively and qualitatively gathered data. Although other studies in the field of quality of health care have not always presented a clear description of their process of determinant selection for this purpose, various strategies have been described. Some limited the number of determinants by restricting themselves to constructs of one or two theories and supplementing these with evidence from the literature. Other options include selecting determinants exclusively on the basis of a literature review or having them selected by an expert panel. The selection can also be made by linking the determinants that were identified to theoretical models of behaviour change used in previous studies, and on the basis of their potential for modification within a setting comparable to the one under study. We also found an example in which, despite the substantial number of determinants, the researchers decided to include them all because no evidence was found that certain determinants were more important than others. Finally, we found an example where the qualitative information was used as the core of the intervention, and quantitatively assessed determinants were used to complement these determinants (H.D. Castellanos, personal communication).

In our study, we applied a strategy in which we first included the determinants with a higher level of evidence (statistical analysis), and subsequently those with a lower level of evidence (qualitative analysis). In our opinion, this approach had the potential to considerably reduce the number of determinants, with a minimal risk of jeopardizing the selection of relevant determinants for the improvement of guideline adherence. Determinants that were significantly associated with guideline adherence in our cross-sectional and longitudinal multivariate analysis of the complete sample, and of at least one awareness subgroup were selected first for the development of the programme. Secondly, we included determinants that only showed significant relationships with adherence in the individual awareness subgroups. Finally, determinants that were not selected as a result of our quantitative analyses but were greatly
emphasized (i.e. mentioned or agreed with by many physical therapists or evoking emotional reactions) during the focus group interviews were added to the list of determinants that formed the basis for the intervention. This procedure resulted in 12 determinants for the individual physical therapists and 11 for the practice quality managers. Given the lack of literature on behavioural and organizational determinants of guideline adherence in physical therapy, we decided to address all of these 23 determinants in the development of our intervention.

In our opinion, given the large number of determinants of guideline adherence that have been identified,\(^8\)-\(^{10}\) and the recommendation to apply a multi-method approach and include multiple ecological levels,\(^{11}-^{14}\) it seems beneficial to develop a decision aid for the selection of determinants identified in a problem analysis. Our approach could used as a point of departure for the development of such a decision aid. Further development is required to facilitate the selection of important, problem-specific determinants, reduce the risk of omitting important determinants, and make this complex step in the process of programme development more manageable and less time-consuming. In addition, the field of physical therapy is in need of a larger body of evidence on determinants of guideline adherence for future implementation studies. This would provide better support for the selection of relevant determinants for the development of programmes to improve guideline adherence.

**Pre-selecting levels of intervention**

Our problem analysis identified five potential levels of intervention: the individual professional, the practice, the professional association, the patient and the guideline. Attempts to improve guideline implementation have generally targeted the individual health care professional,\(^{15}\) as the "user" of the guideline, but also increasingly the organizational level.\(^{16}\) Although our study combined these two levels, our organizational level was mainly restricted to the practice. The first reason for this was that we expected to be able to exert the strongest influence at these two levels, and the second was that the available timespan and financial resources did not allow the development and implementation of an intervention including all five levels. Nevertheless, some effort was made to include the other three levels, that is, the guideline, the patient and the professional organization.

**The guideline**

Since the guideline for low back pain was under revision, we could contribute our findings during the revision process and use a draft version of the revised guideline in our programme. The outcomes of our determinant study indicated that, in line with recommendations in previous publications,\(^{17}-^{19}\) the guideline should be less comprehensive, easier to read and offer better support for clinical reasoning. The revised version we used was a summary of the recommendations, written in the form of If–then statements (e.g. If you have indications that psychosocial factors are influencing the course of recovery, you can choose the following options:
(1) perform a more thorough history-taking; (2) use a validated questionnaire for.; (3) consult a physician or expert) Although this version contained mostly the same recommendations as the original guideline, it was unanimously evaluated as an improvement by the participants of the pilot test. It was reported to be easy to understand and work with, and was more supportive of decision making. Furthermore, unlike the original guideline it was not too extensive As a consequence, it seems recommendable to reduce the text in the Dutch physical therapy guidelines to the minimum that is necessary to optimize care delivery, and to formulate it in such a way that it is easy to read and supports clinical reasoning.

The patient

Our focus group interviews revealed the concern among physical therapists that patients would leave their practice if they were confronted with guideline-adherent care, instead of the care they had usually received or expected to receive Consequently, physical therapists were inclined to adjust their care to the perceived patient preferences instead of engaging in a shared decision-making process. This might result in patients receiving suboptimal care In an attempt to support physical therapists in their communication about guideline-adherent care, we developed a patient leaflet containing information about the process of physical therapy care for low back pain based on the guideline recommendations. The leaflet was distributed to the participating physical therapists, who could use it to inform their new patients with low back pain. In addition, it was intended to provide patients with an opportunity to ask for guideline-adherent care. However, no further attention was paid to the leaflet during the implementation of the programme Our process analysis revealed that, probably due to the passive dissemination strategy and despite their positive evaluation of the leaflet, it had not been used by the physical therapists to inform their patients Consequently, our programme did not succeed in involving patients in the effort to improve the implementation of the guideline.

Previous studies have reported that patients would like to be involved in decisions concerning their health, especially when they feel empowered by complete information. The Protection Motivation Theory, for instance, indicates that people’s choice of an adaptive coping strategy depends on considerations of response effectiveness, self-efficacy expectations and perceived response costs If patients with low back pain are ill-informed, they might not be inclined to engage in a more active therapeutic approach (higher response cost) when they are not convinced of its effectiveness. As regards the role of clinical guidelines in this respect, the involvement of patients and the public has been recognized as an essential component in development and implementation. This includes the development of patient versions of guidelines. However, further adjustments to guidelines still seem to be required to make them useful in supporting decision making by patients. Moreover, it is highly questionable whether making patient versions available will by itself make patients use them This will also require an active approach towards patients. Hence, future theory-based guideline implementation studies
should include patient-related factors in their problem analysis and in the development of guideline implementation programmes.

**The professional association**

We also invested some effort into meetings with representatives of the Royal Dutch Association for Physical Therapy (KNGF) to inform them of our findings. Various studies have indicated that quality improvement in health care, including guideline implementation, requires a system approach, including stakeholders at all relevant ecological levels. It has also been suggested that new governance structures might be required to adjust the development of guidelines to improve their implementability. In addition, a review of determinants of innovation in health care organizations identified a number of determinants in the socio-political context. In agreement with these findings, our study found several factors at the level of the professional association influencing guideline implementation, e.g., organizing multidisciplinary care, providing resources and giving the guidelines a distinct position in quality policy.

In view of these indications and our own results, we made an attempt to actively approach the KNGF to inform them of the findings of our problem analysis. We aimed to improve the professional association's awareness of the need among physical therapists for a more transparent and supportive policy regarding the use of guidelines. Another aim was to persuade them that such a policy to improve guideline implementation would have to remain in place over a long period. However, our activities were mainly limited to the agenda-setting phase of policy making, and actually getting this on the professional association's decision agenda would require the efforts of an entrepreneur using policy windows. Although the professional organization showed interest in our results, the staff members who were important for our endeavour soon moved to different positions in the organization or left the organization. Since restaffing these positions required time, our indirect influence on the agenda diminished. Due to limited time and resources, we were unable to evaluate the effects of our efforts. Nevertheless, we expect the involvement of the policy level to be an important factor in guideline implementation, especially for the required long-term facilitation of implementation efforts.

**Awareness of personal adherence**

The results of our studies indicate that awareness of personal adherence (i.e., underestimation, realistic estimation or overestimation of personal guideline adherence) may affect the relationship between guideline adherence and its determinants. We therefore recommend taking this factor into account in the development and implementation of a guideline adherence intervention. However, we experienced some difficulties with the decision on ways of handling awareness in our intervention. We found that this decision depended on the specific role of awareness and the preferred intervention strategy. As regards the specific role of awareness, four conceptual issues should be discussed.
First, over- or underestimation could serve as an independent variable that directly influences guideline adherence, without influencing the relation between the other determinants and adherence. In that case, interventions could aim to reach the most beneficial state of awareness with respect to improving guideline adherence.

A second option is that these states of awareness moderate the relationship between the determinants (or some of them) and guideline adherence. In the case of moderation by awareness, it would affect the direction and/or strength of this relationship. Consequently, a positive relationship between a determinant and guideline adherence that is strong for realists might be much weaker, absent or even negative for over- or underestimators. An undifferentiated group of physical therapists, including individuals of all three states of awareness, would therefore make it very difficult to decide which determinants should be addressed in an intervention in order to successfully improve guideline adherence. We can think of two possible approaches to deal with moderation by awareness. One approach is to intervene on awareness before intervening on guideline adherence, which is, for instance, one of the objectives of the increasing use of quality indicators in health care. Intervening on awareness could turn all physical therapists into realists, and the subsequent programme to improve adherence would then only have to address determinants that are related to guideline adherence for realists. Another approach in the case of moderation by awareness would be group segmentation for each state of awareness. This would enable the intervention to target the most influential determinants for every individual subgroup.

Third, awareness could serve as a mediator between determinants and guideline adherence. In that case, the influence of a determinant would at least partly be transmitted to guideline adherence through an awareness state. For instance, a particular determinant could require underestimation to influence guideline adherence, and could not influence guideline adherence in the case of overestimation. The consequences of mediation by awareness for the development of an intervention would be less complicated than for moderation. In an undifferentiated group of physical therapists, developers should ensure that all the determinants mediated by the individual states of awareness are addressed in their programme.

Fourth, the difference in determinants may indicate that the distinction between awareness subgroups is based on differences in personal characteristics of individuals in these groups, rather than on their appraisal of personal adherence. Underestimators in our study appeared to be particularly sensitive to environmental influences, at the level of the practice as well as that of the professional association. Overestimators seemed to be more inclined to follow their own track based on regular evaluations of their work and the results of their treatment, as well as on arrangements made during deliberation meetings at the practice. Adherence by the realists was related to the amount of attention they had paid to the guideline and feelings of discomfort due
to the guideline. This could indicate a rather deliberative type of person. They saw the professional association as having a responsibility, but compared to over- and underestimators, their previous adherence most strongly predicted guideline adherence. If awareness subgroups can be distinguished on the basis of personal characteristics, it would be difficult to estimate whether and how making every individual aware of their personal adherence would change adherence determinants.

However, even if the concept and the specific role of awareness were known, the way to take it into account in a programme would also depend on the preferred intervention strategy. Since the strategy in our studies included individual and organizational self-regulation, joint participation by the physical therapists and their quality managers was preferred. Offering a programme targeting the distinct awareness subgroups would probably have meant separating the physical therapists working in the same practice into subgroups.

As regards the development of an intervention to improve guideline adherence, these issues above raise some dilemma’s. First, it is questionable if making physical therapists aware of their personal level of adherence would also cause their determinants of adherence to shift towards those of the realists. Therefore, even if all physical therapists could have been changed into realists, a new determinant analysis would have been required to enable the development of a sound programme. The second dilemma is that the decision to use a stratified approach and split up the awareness subgroups, would have required three different programmes and, consequently, much more time and resources. In addition, this approach would probably cause a separation of physical therapists and quality managers from a practice. This would eliminate the opportunities for collective goal setting, one of the key factors of task performance and a main element in our intervention, as well as opportunities for staff involvement and joint decision making, which have all been shown in previous studies to be beneficial approaches. The final dilemma is that if awareness groups distinguish themselves on the basis of personal characteristics instead of awareness, determinants of adherence might be moderated or mediated by certain personal characteristics rather than by awareness. As a consequence, in the absence of a moderation-mediation analysis, considering our preferred strategy and the complexity of the other alternatives, and given our limited insight in personal characteristics of individuals of the awareness groups, we decided to develop an intervention for the group as a whole, taking the different states of awareness into account and targeting the determinants of every subgroup.

In view of the above, we doubt whether there is a generally applicable best approach for dealing with personal performance awareness in programmes to improve guideline adherence. The way awareness is handled in an intervention depends not only on the concept of awareness and its specific role in the relationship between determinants and adherence, but also on the preferred
strategy. However, a better understanding of the characteristics of the individuals in the awareness groups and of the specific role of awareness is required to support the decision whether or not to develop a stratified intervention for realists and over-and underestimators of personal guideline adherence. To improve this understanding, future implementation studies might assess personal adherence awareness and do a moderation-mediation analysis or aim at the assessment of personal characteristics of individuals in the awareness groups to confirm its specific role.

Previous adherence
Our study identified previous adherence as the most important predictor of guideline adherence. It is reasonable to assume that previous adherence is partly based on habitual performance. Habit is a form of automaticity characterized by efficiency and executed with limited awareness and control.\textsuperscript{44} The development of a habit requires repeated performance and reinforcement, and occurs especially when the action is performed in a certain stable situation or context.\textsuperscript{45} Habit strength has been found to moderate the relationship between implementation intentions and behaviours.\textsuperscript{46} Well-established habitual behaviour is no longer determined by conscious, decision-making processes,\textsuperscript{45} and its occurrence is related to cues.\textsuperscript{48} Although the process of diagnostics and treatment in physical therapy includes goal-directed behaviours and conscious decision making,\textsuperscript{49} it (or parts of it) may become automatic over time.\textsuperscript{50} A certain degree of automaticity in treating patients is appropriate, since it prevents the physical therapist from having to make conscious decisions about every detail of the diagnostic and treatment process. However, a pitfall may occur when the proportion of the process that relies on habitual performance becomes too large. This could result in a routine approach, which would not do justice to the individuality of the patient.

In our programme, we chose self-regulation as the main strategy of change. The aim was to enhance physical therapists’ awareness of their current performance by means of self-monitoring, thereby making them aware of possible habits. Subsequently, this awareness would provide them with the opportunity to formulate performance goals\textsuperscript{51} and implementation intentions,\textsuperscript{52} bringing the changes in their adherence under volitional control, which could help them break the habit.\textsuperscript{47} However, effectuating this break and forming a new habit of the desired behaviour requires repeated performance of this new behaviour,\textsuperscript{45} and thus time.

In addition, the strategy of self-regulation may not have been the best approach for physical therapists with strong habitual performance. Many physical therapists work in a constant environment for a long time and see several patients with low back pain every day. As a consequence, it is not unlikely for them to develop a strong habitual performance for this patient group. Such strong habits may make it difficult to enhance their awareness, and their implementation intentions will be biased in the presence of strong cue contingent automaticity.\textsuperscript{48}
A better strategy to improve their adherence to guidelines may be the formation of a new habit based on a behaviourist approach, which goes beyond mere awareness.\textsuperscript{53} As a consequence, a programme to improve guideline adherence should include the formation of new cues (e.g. reorganizing an Electronic Health Record System so that it supports guideline adherence) and cue-response links (e.g. addressing psychosocial factors instead of avoiding them in the case of chronic low back pain), as well as the formation of implementation intentions related to these cues and repeated performance of the new methods.\textsuperscript{47,48} Moreover, to increase the chances of behaviour change, the improved guideline adherence should have positive consequences for the physical therapist\textsuperscript{53} (e.g. the use of health outcome questionnaires is supportive for decisions about treatment). Given the fact that the cues for a habit are also context-related, in-company approaches, which have been found to be more effective for changing practitioner behaviour than educational approaches,\textsuperscript{54} might not be the best start for a guideline implementation process. Instead, it might be a reasonable choice to start this process outside the everyday environment of the physical therapists' practice, to avoid the cues that evoke the old habit. However, after a therapist has initiated a change in his performance, the desired behaviour has to be integrated in daily practice. The most suitable approach for this might be on-site training.

\textbf{The use of theory}

We built a theoretical framework around Rogers' Diffusion of Innovations Theory\textsuperscript{55} This theory has been used in many implementation studies, but was not specifically developed for health care implementation problems. We chose this theory because it describes the phases an innovation goes through in the process of being adopted and implemented by individuals in a social system. In doing so, we put the physical therapist, who is the ultimate user, at the centre of the guideline implementation process, but the use of organizational theories reflects our awareness of the existence of other levels that could influence the implementation of guidelines. The multi-theory framework we developed helped us in the problem analysis for our project. It provided us with a broad scope on the problem, and enabled the findings of the interviews we held with physical therapists to be categorized in terms of determinants of guideline adherence. Subsequently, it supported the development of our questionnaire for the survey. However, given the large number of possibly influential factors\textsuperscript{9,56} and applicable theories\textsuperscript{13} or theoretical constructs\textsuperscript{57} that have been identified in the literature, we do not expect our model to provide a complete coverage of these factors.

A more recent theoretical framework for implementation determinant studies has been developed by Paulussen and Fleuren.\textsuperscript{8} The basis of this framework is also the individual process of change. The framework recognizes the influence of characteristics at various ecological levels on the implementation process. These include characteristics of the user, the innovation, the organization, the socio-political context and the implementation strategy. These ecological levels evolved from the labelling of 50 potential determinants of innovation in healthcare organizations.
identified in a literature review followed by a Delphi procedure. A comparison with the most recent work by Rogers shows that many of these factors are mentioned, but they have not been clearly positioned in Rogers' theory. Rogers recognizes the influence of characteristics of the innovation and of communication channels (as a part of implementation strategies) and shows the need for different channels for every step of the change process. He also describes some characteristics of users, but links these to his adopter categories. The organization and socio-political context are included in the social system, which Rogers sees as one of the four main elements (innovation, communication through channels, time and social system) of the diffusion of innovations. Positioning these levels more clearly in a theory of behavioural change, as Paulussen and Fleuren did, enhances our understanding of the complexity of implementation problems, and provides an opportunity to better organize influential factors determining adherence. However, unlike Rogers' theory, Paulussen and Fleuren's theory does not include connecting factors at any of these levels to the phases of individual behaviour change. This is why we still prefer to use Rogers' Diffusion of Innovations theory.

A major challenge for any guideline implementation process is the above-mentioned identification of 50 potential determinants of innovation in healthcare organizations, as well as the large number of factors identified in previous studies, and the advice to include multiple ecological levels. Moreover, despite the already available knowledge, every new implementation process will require an assessment of determinants that are specific for the innovation, the professional group and the situational context. Consequently, this might yield an even larger number of determinants. The question arises as to the added value of theoretical frameworks containing even more determinants and levels of intervention for the development of implementation interventions. Addressing all determinants and all levels in one intervention seems a utopian objective. In our opinion, a theoretical framework would gain in value if it linked various levels (and the factors organized in them) to the phases of diffusion of an innovation at the individual level. If the factors related to the individual phases of diffusion were different, this would support the actual existence of these phases (validation of the phases). Consequently, it would offer the opportunity to identify a population profile with respect to its distribution over phases of diffusion, and for the subsequent tailoring of interventions to this profile. Another way in which theoretical frameworks would gain in value is by specifying the interaction between the various levels. This insight, for which some earlier work provides a basis, would provide a better view of the process of change through the various levels. A better understanding of the way levels connect and interact would provide a decision aid for choosing the best approach for different implementation problems.

Limitations
In addition to the limitations mentioned in the various chapters of this thesis, The design of the pilot study and the measurement of guideline adherence need further elaboration.
Design of the pilot study
The pretest-posttest design of our pilot study has limitations with regard to conclusions about the effectiveness of our programme. Assessment of the effectiveness of interventions would require a randomized controlled trial. However, pilot-testing a programme or programme parts is an integral part of the development of an intervention in Intervention Mapping. Our pilot study did not assess the long-term effectiveness of the programme. As stated above, we were aware that changing a behaviour, and especially maintaining a newly learned behaviour, in this case guideline implementation, requires time, but our programme covered a limited time span of 3 months.

We performed the pilot study with this “short-term” intervention purely to find out whether our approach, which combined a simultaneous intervention at two levels, would have the potential to change guideline adherence to a larger extent than previous implementation interventions. Moreover, the pilot study was meant to provide information on necessary adjustments to the programme to enhance its effectiveness, before engaging in a time-consuming and expensive controlled trial.

Although the design lacked a control group, we were able to compare the results of the pilot test with those of our problem analysis, which had been performed about 18 months earlier. In the problem analysis, we assessed guideline adherence twice with a time interval of 6 months for a sample of almost 400 physical therapists. During these months, no intervention was applied, and guideline adherence was assessed using clinical vignettes, whose content was almost identical to that of the vignettes used in the pilot study. Moreover, the vignettes provided scores on the same quality indicators as those in the pilot study. The results of the problem analysis showed “changes” ranging from 0.25% to 1.7% on the individual quality indicators. It therefore seems acceptable to assume that the changes ranging from 23.6% to 43.0% observed during our pilot study can be attributed to our programme.

Measuring guideline adherence
It is still a challenge to measure clinicians’ performance, in this case physical therapists’ guideline adherence, in a valid, yet manageable way in larger groups of professionals. Our study used paper-and-pencil clinical vignettes, because their development process is not too time-consuming, they are associated with relatively low costs and they are manageable. Moreover, since vignettes offer the opportunity to manipulate several variables, they can be composed in a way that reflects a suitable case-mix. Clinical vignettes have been shown to be valid instruments to measure clinicians’ performance. However, previous studies have found that vignettes are more appropriate to measure knowledge and beliefs than behaviour itself. Others have contended that vignettes measure behavioural intention (Dr. D. O’Connor, personal communication) rather than behaviour.
The vignettes we initially used had acceptable validity for the measurement of Dutch physical therapists' adherence to their guidelines for low back pain. The "longitudinal" vignettes we subsequently developed provided the opportunity to assess the consistency of choices made by the physical therapists throughout the process of care. Consistency of choices reflects the extent to which physical therapists include the findings of earlier stages of the process of care in their subsequent decisions. For instance, it showed whether the physical therapists who identified the influence of psychosocial factors in the diagnostic phase included the relevant factors in their treatment objectives. In our opinion, this goes beyond the mere measurement of behavioural intention.

The longitudinal vignettes had expert validity. To our knowledge, no inexpensive and manageable measurement instrument for physical therapists' performance has been developed with a higher level than expert validity. Our study did not allow a validation study of the vignettes, since that would have required the involvement of standardized patients (SPs). This would have meant an expensive and time-consuming process of training several SPs who had to visit many physical therapists. Moreover, it would require an SP, i.e. a healthy person, to go through a complete diagnostic and treatment process in physical therapy, which might raise ethical objections.

We recognize the self-report nature of clinical vignettes. It is known that self-report measures generally overestimate actual performance. Moreover, a recent study has indicated that clinical vignettes tend to overestimate clinicians' performance. This suggests that the 50% guideline adherence measured with our initial vignettes and the 45% found with our longitudinal vignettes might even be an overestimation. Moreover, if actual guideline adherence were lower than our results showed, the proportion of the physical therapists who overestimated their guideline adherence would be even larger than the 43% we observed in our study. Since they would clearly be the largest subgroup, the determinants of guideline adherence among the over-estimators might have required more emphasis in our programme to improve our results.

Nowadays, much attention is given to the development of quality indicators for the measurement of clinicians' performance. The sets of quality indicators applied in most studies have expert validity. However, if a set of indicators has been developed in accordance with the state of the art, it covers the entire process it intends to measure. However, quality indicators only provide the criteria for this measurement, and there is still a source required to score the indicators. These sources are the same as the ones used before to assess clinicians' performance, with the same validity problems. Our study showed some advantage of Electronic Health Records (EHR), which include quality indicators. However, EHRs suffer from large variability, and, in view of the complexity of data elements required for the quality indicators, only a limited number of quality indicators can mostly be directly derived from the EHR. Moreover, their
implementation can be hampered by insufficient user friendliness, causing a loss of productivity.\textsuperscript{75,76} Another "problem" for performance assessment is that EHRs might function as an intervention. Our study, which used an EHR, found a relatively high mean adherence score (67%) compared to previous studies using other measurement instruments.\textsuperscript{77,78} Since EHRs are preformatted, they might guide professionals in their choices, which means that adherence would be improved just by using them. Consequently, there remains a need for valid and manageable measurement instruments for clinicians' performance.

**Practical implications**

*Implications for the individual physical therapist and the practice*

Since clinical practice guidelines summarize the best available evidence, it is useful for individual Dutch physical therapists to continue their efforts to accept and apply their guidelines. However, keeping physical therapists on this track requires ongoing monitoring and facilitation by their immediate working environment, i.e. the practice they work in. At a time when Dutch private physical therapy practices are generally growing, practice owners should be aware of their responsibility to reserve time for practice management and quality management in particular. The skills required for this task are different from those obtained during their professional education, so practice owners should acquire these skills or delegate this task to a skilled employee. This will probably be a prerequisite for physical therapy practices to maintain the ongoing effort which is required for the implementation of clinical practice guidelines.

*Implications for the professional association*

The Royal Dutch Association for Physical Therapy (KNGF) has a great responsibility in this respect. They should continuously and clearly state and convey their position concerning the quality of care, and the implementation of guidelines in particular, to their professionals in the field. Furthermore, although they appear to provide guideline developers with sufficient financial resources for guideline development and updating, practice shows substantial delays in updates and stagnation in the guideline development processes. Therefore, permanent monitoring, and, if applicable, control of these processes by KNGF seems essential. Moreover, their current efforts to improve guideline implementation (e.g. disseminating guidelines by putting them on the guideline website; the annual programme for peer consultation groups) are still rather non-committal forms of diffusion, since individual professionals can still choose whether to engage in these implementation activities. Although the use of guidelines is required to be included in the national quality register, the "measurement" of guideline adherence is purely subjective. As a consequence, KNGF should facilitate the development of better instruments to asses guideline adherence among its members, in order to better distinguish between physical therapists who use the guidelines and those who do not. After it has improved its ability to distinguish between users and non-users of the guidelines, KNGF might consider rewarding high quality performance with accreditation points for the Dutch physical therapy quality register.
In addition, it might engage in an improvement of its understanding of what physical therapists and practice managers need to improve or keep up their quality of care, and subsequently facilitate them with the knowledge and tools to deliver good quality of care (such as user-friendly Electronic Health Records that support clinical reasoning). As regards the guidelines themselves, KNGF could reconsider their format. Making them less extensive, easier to read and more supportive of clinical reasoning might facilitate their uptake. In addition, it could develop versions of the mono-disciplinary guidelines that are easily accessible and readable for patients, to inform the Dutch public about physical therapy guidelines and about the requirements of good quality physical therapy care.

However, the "Cost survey for guidelines report" by the Dutch Council for the Quality of Healthcare shows that KNGF's annual budget for guideline dissemination and implementation activities is limited. KNGF might therefore engage in negotiations with health insurance companies for compensation for quality management time in practices. If practices can prove they are investing in the improvement of their quality of care, health insurance companies might consider compensating these practices for their efforts. Nevertheless, we agree with the recommendation in the report that maintaining a solid guideline programme, including implementation, requires continuous funding by the government.

**Implications for policy**

Good implementation requires changes at more levels of the system in which a guideline has to be implemented than only that of the individual professional. This includes facilitation by policy over a long time span. Since evidence-based clinical guidelines provide the basis for decisions about the delivery of the best possible care, they are a part of the complex field of quality of health care. The establishment of the Dutch Council for the Quality of Healthcare in 2009 shows that it is accepted that higher ecological levels need to be involved to induce policies to improve the quality of health care. However, although it appears to be an important topic for the Council, the importance they attach to the implementation of clinical guidelines is not clearly communicated to practising physical therapists. A more prominent position of guideline implementation in quality of health care improvement policy will show practising physical therapists that it is an important topic, even at high policy levels. This might be beneficial for the implementation of guidelines.

Recommendations and characteristics of guidelines will probably vary, determinants of guideline use will be different, and implementation of guideline-adherent care will require different organizational changes for different health problems. Hence, every guideline implementation project may require a different emphasis to be successful. As a consequence, there is no "magic bullet" for the implementation of guidelines. Nevertheless, there might be some common barriers or success factors. Hence, besides merely identifying successful implementation
strategies, as has recently been done by the Dutch Council for the Quality of Healthcare, a better understanding of the implementation problem and process could contribute to more successful implementation strategies. In order to enhance this understanding, it might be helpful to, first, attempt to identify common barriers and facilitators in the various efforts to improve guideline implementation and, second, enhance insight in the implementation process, including the interaction between levels of intervention, that makes intervention strategies successful. In order to enhance these insights, intervention studies for guideline implementation should always include a process analysis.

**Scientific implications**

**Determinants and levels of intervention**

A large number of determinants relating to guideline implementation have been identified. It is questionable if much more effort should be invested in the identification of further determinants at the level of individual professionals. Some levels, however, such as the higher policy levels or the patient level, have hardly been the subject of research into guideline implementation. Hence, further determinant studies should examine influential factors at these levels and the interactions between the various levels.

A best approach for the selection of the most important determinants for the development of an intervention to improve guideline adherence is not available. In order to optimize the chances for inclusion or to prevent for the exclusion of influential determinants the process of determinant selection will benefit from the description of a sound selection procedure.

**Measurement of guideline adherence**

Valid instruments for the measurement of guideline adherence are scarce, expensive and difficult to manage when large groups of professionals are involved. We recommend the development and validation of manageable measurement instruments that can be developed and applied at relatively low cost. Special attention should be paid to the development and validation of computerized clinical vignettes and to EHRs.

**Theories and theoretical frameworks**

The greatest gain with respect to implementation theories is probably to be found in linking determinants to the individual phases of diffusion. A better understanding of the determinants and ecological levels that are more important in every phase will create a better understanding of the way the target population is distributed over these phases. Second, awareness of this distribution enables a better selection of appropriate strategies. This creates the opportunity to target the intervention to this population profile.
The use of a theoretical framework is beneficial in guideline implementation research. It can broaden one’s view of the implementation problem and it can work as a tool to create order in the chaos of large numbers of determinants. Subsequently, after study findings have been categorized in terms of determinants and phases of diffusion, the framework provides a basis for the development of the intervention. The current interest in theory-based implementation studies, however, creates the pitfall of large numbers of frameworks being developed in which the wheel is reinvented over and over again. Guideline implementation researchers should therefore consider using existing frameworks and, if applicable, expanding them for the purpose of their studies with categories or individual determinants that meet the specific requirements of the study at hand.

Awareness and habitual performance
Although we know that personal performance awareness influences the relation between guideline adherence and determinants, it remains unclear how it does this. This imperfect understanding hampers the ability to make the best choice with respect to the position of awareness in interventions to improve guideline adherence. Moreover, there are some indications that the three subgroups of awareness (overestimators, underestimators and realistic estimators) may be based on personal characteristics rather than awareness. A moderation-mediation analysis of awareness is required to examine the specific role it plays in guideline implementation. Such an analysis should preferably have a longitudinal design with more than two measurements to enable assessment of the relationship between a change in determinants and a change in adherence. Another topic of interest would be to study the determinants of realistic estimation and over- and underestimation. This may reveal the personal characterization of the individuals in these subgroups.

Given its influential character, habit strength should be part of the assessment. If strong habits are present among physical therapists in their treatment of patients with low back pain, this would have serious consequences for the development of an intervention to change their performance. In that case, a stronger emphasis on the non-cognitive creation of new habits may be required.

General conclusion
Our theory-based and systematic approach demonstrated that there is still substantial room for improvement in the extent to which Dutch physical therapists adhere to their guideline for the treatment of low back pain. The results of our study indicate that improvement of guideline adherence would probably best be served by changes at more levels than merely the performance of the individual professional, namely those of the practice, the professional association, higher policy levels, the guideline and the patient. Our intervention, which targeted the individual professional and the practice level simultaneously, seemed to have a substantial
effect in terms of improving the adherence to a limited number of recommendations. It seems that, given the substantial number of recommendations, guideline implementation is a stepwise process in which physical therapists have to repeatedly set attainable goals. Consequently, it requires an intervention over a longer time span before adherence to all recommendations, and hence overall guideline adherence, is improved.

Three issues need further investigation. First, the specific role of personal adherence awareness and the possible differences in personal characteristics of individuals in awareness subgroups should be further explored. This would inform the decision whether or not group segmentation is required in adherence improvement programmes. The second issue concerns previous adherence. If previous adherence is based on habitual performance, this has serious consequences for the development of programmes to improve guideline adherence. In that case, such programmes might benefit from the inclusion of strategies based on behaviourist principles. Third, the influence of higher policy levels and the patient deserve attention.

Future attempts to improve guideline adherence should therefore focus on system approaches, including patients and policy levels. Given the importance attached to high quality care and the high costs associated with such an approach, financial investment should be a joint effort of the professional association, health insurance companies and the government.
References


Summary
Subject of this thesis is the systematic and theory-based development and pilot testing of an intervention to enhance Dutch physical therapists' adherence to the national evidence-based clinical guidelines for patients with low back pain. The thesis first touches on the measurement of physical therapists' clinical performance and the importance of guideline adherence. Second, it concentrates on a theory-based, systematic approach to intervention development. Finally, it reports on the pilot test of the resulting programme to improve quality in physical therapy.

Chapter 1 presents the essential background information for the study. It addresses the problem of low back pain, clinical guidelines in physical therapy and difficulties in guideline implementation. The chapter concludes with a short introduction to the theory-based, systematic approach to intervention development.

Low back pain is a highly prevalent health problem with serious individual and societal consequences, especially when it becomes chronic. Physical therapy is expected to have the potential to contribute to the prevention of chronic low back pain. Hence, to reassure high quality of physical therapy care, the Royal Dutch Association for Physical Therapy (KNGF) has developed a series of clinical guidelines. The Dutch guidelines for low back pain include recommendations for physical therapy care based on the best available evidence, but there is as yet no proof that better guideline adherence results in better treatment outcomes.

In addition, despite the presence of an implementation plan and efforts of the professional association to support their diffusion, the use of these guidelines in practice is limited, and the effectiveness of interventions to improve overall adherence to these guidelines is only moderate. A reason for this limited effectiveness may be the lack of a sound rationale for the choice of such interventions. This may be due to the limited use of theoretical frameworks in efforts to promote guideline adherence, the strong focus on the individual professional and the failure to include the organizational and wider environmental context. Finally, the analysis of implementation determinants has mostly been restricted to either qualitative or quantitative research methods, whereas a combination of both is recommended.

We used the stepwise Innovation Decision Process of Rogers' Diffusion of Innovations Theory as the basis for the present thesis. This theory covers the entire diffusion process and offers the opportunity to integrate various motivational and affective theoretical constructs in the different steps of the diffusion process. Rogers' recognition of the importance of the social system allows for the additional inclusion of constructs from organizational theories. Rogers' theory provided the framework for a needs assessment that was organized in conformity with the Precede-Proceed Model. A needs assessment is the first step of the method of Intervention Mapping (IM). This method serves as a blueprint for the development of intervention programmes on a foundation of theoretical, empirical and practical information. We used this systematic approach...
to develop a programme to optimize Dutch physical therapists’ adherence to their guidelines for low back pain

The central question addressed in this thesis is whether a theory-based, systematically developed programme to enhance guideline adherence would result in better use of the guidelines in physical therapy practice. To make a real difference, the programme should increase the average percentage of adherence to the low back pain guidelines among Dutch physical therapists by at least 25 percentage points.

The study reported on in Chapter 2 assessed the validity of clinical vignettes for the measurement of physical therapists’ adherence to the Dutch guidelines for low back pain. Four vignettes were constructed, and three of those were found to represent an adequate case-mix for the measurement of guideline adherence. Of 113 primary care physical therapists that were invited, 72 agreed to participate. They completed the vignettes in the time period between June and September 2003. Adherence scores on the vignettes were compared with adherence scores measured with semi-structured treatment recording forms that were completed by the participating physical therapists when they participated in a randomised clinical trial 8 months earlier. The criterion validity was determined with Spearman’s $r_s$, using Cohen’s classification for the behavioural sciences to categorize its effect size. Both adherence measures were available for 34 participants, providing 102 vignettes and 268 recording forms. Mean guideline adherence scores were 57% (SD=17) when measured by vignettes and 74% (SD=15) when measured by recording forms. Spearman’s $r_s$ was 0.31 ($P=0.036$), which, according to Cohen’s classification, is a medium effect size. We concluded that, given an adequate case-mix, clinical vignettes can be used with acceptable validity. They represent an inexpensive and manageable instrument that can be used among large groups of physical therapists to measure their adherence to the guidelines.

The study presented in Chapter 3 investigated the relationship between guideline adherence and the effectiveness and efficiency of physical therapy treatment. Between September 2005 and February 2006, sixty-one private practice physical therapists recorded the process of care and the number of treatment sessions of 145 patients with low back pain in web-based patient files. Guideline adherence was assessed using quality indicators. Physical functioning was measured by the Dutch version of the Quebec Back Pain and Disability Scale and average pain with a Visual Analogue Scale. Relationships between the percentages guideline adherence and outcomes of care were evaluated with regression analyses. The study found that higher percentages adherence were associated with fewer functional limitations ($\beta=-0.21, p=.023$) and fewer treatment sessions ($\beta=-0.27, p=.005$). In addition, the results of the study indicated that patients with chronic low back pain might benefit more from guideline adherent care than patients with acute low back pain.
Chapter 4 reports on a qualitative assessment of motivational determinants of physical therapists' guideline adherence. Another objective of the study was to evaluate the opportunities of a theoretical framework in this respect. For these purposes, 3 focus group interviews (n=12, 10, and 8) were held between November 2002 and January 2003. Physical therapists were asked to discuss their opinions about and experiences with the Dutch guidelines for low back pain. Data were analyzed qualitatively using a directed approach to content analysis. Rogers' Diffusion of Innovations Theory formed the basis for both, the interview route and the analysis of the interviews. The study revealed that the physical therapists had rather unfavourable opinions about the guideline. Categorization of the findings in terms of the stages of Rogers' Diffusion of Innovations Theory, showed that most physical therapists participating in the interviews were in the early phases of the diffusion process. The determinants of adherence were mainly related to the dissemination phase of the implementation process, but the interviews yielded relatively little information related to the subsequent adoption phase. The findings indicated that the diffusion process of guidelines among physical therapists was not yet completed. The theoretical framework appeared to be a useful tool to properly structure the focus group interviews, to systematically analyze the data collected, and to determine that supplementary interviews would be necessary to cover the entire diffusion process.

Chapter 5 describes a cross-sectional assessment of the relationship between motivational determinants and guideline adherence that was performed between September and December 2003. In this study, we also compared self-reported and actual guideline adherence to assess awareness of personal adherence. A random sample of 1,500 private practice physical therapists in the Netherlands received a questionnaire. Actual guideline adherence was measured by means of validated clinical vignettes and self-reported adherence by asking the physical therapists to report their own level of adherence. For the assessment of motivational determinants we used a theoretical framework that was based on Rogers' Diffusion of Innovations Theory. The response rate was 31.5% (n=472), and the average guideline adherence rate was 50.4% (SD=16.8). Three subgroups were indentified, distinguished by their degree of awareness of their own adherence to the guidelines: physical therapists that had accurate perceptions about their adherence to the guidelines (realists), those who overestimated (overestimators) and those who underestimated (underestimators) their adherence. Since the explained variance for the total group was only 6.7%, whereas that for the realists was 31.2%, the study indicated that this personal adherence awareness affects the relationship between determinants and guideline adherence. Since more than 50% of the physical therapists had misperceptions about their adherence, this seemed an important factor to take into account when assessing determinants of adherence and in the development of interventions to improve adherence. The study also showed that relative advantage (e.g., the perception that guideline-adherent care results in better treatment effects) is the most important motivational determinant of guideline adherence.
Chapter 6 reports on a longitudinal survey to assess motivational, affective and organizational determinants that explain and predict guideline adherence. Therefore, we once more distinguished between the subgroups of personal adherence awareness. A random sample of 1600 physical therapists in the Netherlands received a questionnaire by mail in November 2007 and again in June 2008. Determinants of adherence were measured with this questionnaire that also used four clinical vignettes to measure guideline adherence. Multiple regression analysis was used to assess the relationship between determinants and adherence. The response at follow up was 24.6% (n=394). Average guideline adherence was 45.6% (SD=7.8) at baseline and 46.3% (SD=8.8) at follow-up. Guideline adherence was not explained to a substantially larger extent than in previous studies. However, determinants included the individual professional, the practice and the professional organizations’ level. The study also showed that determinants explaining adherence differed from those predicting adherence, and that the influential determinants differed for the three awareness subgroups. In the cross-sectional analysis, most of the adherence was explained by individual professional determinants, such as the amount of attention paid to the guideline, regular evaluation of performance and results and uncertainty about the role of physical therapy in the recommended treatment of patients with low back pain. However, the inclusion of previous adherence, which was the strongest predictor of guideline adherence for physical therapists with realistic perceptions (41.5%) and for those who overestimated their personal adherence (42.6%), in the longitudinal analysis resulted in a substantial increase of the proportion of variance explained. Organizational determinants were important for physical therapists who underestimated their adherence (23.1%). Personal adherence awareness appeared to affect the relationship between determinants and guideline adherence. We concluded that guideline adherence is a multilevel phenomenon. Implementation of clinical guidelines requires a multilevel programme, and should take personal adherence awareness into account.

Chapter 7 presents the use of the systematic and theory-based method of Intervention Mapping (IM) for the development of a programme to improve the implementation of the Dutch physical therapy guidelines for low back pain. In IM step 1, we conducted an extensive needs assessment (described in the previous chapters). In IM step 2, we formulated programme objectives (e.g. increase guideline adherence), performance objectives (e.g. adhere to guideline recommendations) and change objectives, specifying who and what will change as a result of the interventions. In Step 3, the performance objectives guided us in choosing theory-informed methods of change and practical applications of these methods. In Step 4, the results of the previous steps were combined into an intervention programme to improve guideline adherence. In Step 5 and 6, we developed a plan for adoption, implementation and continuation and a plan to evaluate the programme.
The needs assessment (Step 1) revealed that our intervention should preferably be aimed at the physical therapists and the quality managers of the practice. Step 2 and 3 made clear that self-regulation could serve as the core theory of the intervention, but that the additional constructs of other behavioural and organizational theories were required. Step 4 resulted in a multilevel intervention programme, allowing for interaction between physical therapists and quality managers, and emphasizing collective goal setting. The programme, a course on quality improvement, consisted of six 3-hour sessions, of which four were attended by both, physical therapists and quality managers, and two by the quality managers only. The intervention programme combined a variety of practical applications (e.g. knowledge transfer, meet-the-expert session, discussion and feedback), which were deducted from various theory-informed methods (e.g. conscious raising, modelling, active learning) and specifically aimed at changing the salient determinants. The plan for adoption, implementation and sustainability (Step 5) was mainly aimed at the wider environment, such as the professional association. The evaluation plan (Step 6) included an effect and a process evaluation addressing the programme, performance and change objectives as well as the programme components specified in the previous steps.

We concluded that, although not being without difficulties, applying the framework of Intervention Mapping may provide the required sound rationale for intervention programmes in the field of guideline implementation.

In Chapter 8, we report on the pilot test of the programme. The aim of the study was to evaluate the multilevel Quality Improvement in Physical Therapy (QUIP) programme’s potential effectiveness and the fidelity, acceptability and feasibility of its implementation. For the evaluation of the potential effectiveness, we performed a one-group, pre-test, post-test study (n=8 practices, n=32 physical therapists, 8 of whom were also quality manager in their practice) between September and December 2009. Guideline adherence was measured using clinical vignettes that addressed 12 quality indicators reflecting the guidelines' main recommendations. Determinants of adherence were measured using quantitative methods (questionnaires that were completed at baseline and within two weeks after finishing the programme). Changes in adherence and determinants were expressed in effect sizes (ES· Cohen's d) and tested in the paired samples T-tests. Changes in practice quality management were additionally measured with observations, group interviews, and document analyses.

This effect evaluation found that, despite addressing all the determinants that were found to be important for the improvement of adherence, overall guideline adherence negligibly improved from 51.5% to 54.6% (3.1%, ES=0.35). However, it also showed that the programme in its current format may have the potential to substantially change adherence (range 23.6% to 43.0%) to a limited number of guideline recommendations. This improvement included mainly the aspects of physical therapists' performance for which the therapists and quality managers from a practice...
formulated collective goals (e.g., the use of health-outcome questionnaires to evaluate treatment effectiveness). However, an adverse effect was also observed. The results showed a substantial decrease (-15.7%) in the correct assessment of patient profiles, which is an important feature of the guideline. Substantial positive changes were also observed for many individual professional and some organizational determinants. The determinants showed no adverse effects. The qualitative assessment revealed that the managers had engaged in the creation of a facilitating environment to achieve the goals formulated within the practice (e.g., creating a space for the patient to complete questionnaires and training a practice assistant to support the patient in completing the questionnaire).

The process evaluation was an observational study. Concerning the fidelity of the implementation, we formulated research questions with regard to the themes addressed, the methods and applications actually applied, and the determinants dealt with. Related fidelity issues were the quality of the delivery of the programme components and the extent to which the physical therapists and the quality managers actually took part in the various modules of the intervention programme. Research questions concerning the acceptability of the programme addressed the materials that were used and the participants' evaluation of the intervention. With regard to the feasibility of the intervention programme, evaluation questions addressed potential barriers, such as time and financial limitations. Measurement instruments for the process evaluation included observations, group interviews, document analysis, field notes and a general evaluation questionnaire.

The process analysis showed that the integrated approach of individual physical therapists and their quality managers seems to benefit positive performance change. The self-regulation approach was suitable if it begins and ends with thorough self-reflection on personal performance and if continuity of the process is guaranteed. Interactive, small group sessions with the practice, modelling and plenary deliberation with peer and expert feedback appear to be the best strategies. However, the programme should allow sufficient time for attention to individual subjects and strategies. Moreover, the programme needs a follow-up session to assess and support sustainability. Furthermore, we concluded that guideline implementation may be a stepwise process that requires a longer period for the physical therapists and quality managers to repeatedly set attainable goals to implement the individual recommendations of the guideline. This process requires ongoing attention and efforts at all levels of the system in which the guideline has to be implemented. The QUIP programme may have the potential to substantially change physical therapy practice but should be considerably revised to induce the ongoing quality improvement process needed to optimize overall guideline adherence.
Chapter 9 is the general discussion of this thesis in which we summarize the main findings of the study as a whole, and answer the research question posed in Chapter 1. In the subsequent sections some major issues and limitations encountered during the study are discussed. In this final chapter, we also present the main societal and scientific implications of the findings. The chapter ends with a general conclusion of the thesis.

The central question addressed in this thesis was whether a theory-based, systematically developed programme to enhance guideline adherence would result in better use of the guidelines in physical therapy practice. To make a real difference, the programme should increase the average percentage of adherence to the low back pain guidelines among Dutch physical therapists by at least 25 percentage points. The results of the pilot study show, however, that overall guideline adherence hardly improved, but that the programme in its current format may have the potential to substantially change adherence (range 23.6% to 43.0%) to a limited number of guideline recommendations for which physical therapists and the quality manager of a practice had set collective goals.

In our discussion, we first reflect on the use of the method of Intervention Mapping and, in particular, on the consequences of conducting an extensive problem analysis. These include the necessity of pre-selecting determinants in order to perform a quantitative analysis, and, in case of the presence of multiple possible intervention levels, of pre-selecting levels of intervention. We conclude that it is beneficial to develop a decision aid for the selection of determinants identified in a problem analysis. As regards the levels of intervention, we explain our choice to intervene on the individual physical therapist and the quality manager of the practice. In addition, we elaborate on our efforts to also include the levels of the guideline, the patient and the professional association.

In the next section of the discussion we present our considerations about the complicated role of personal adherence awareness in programmes to improve guideline adherence. First, awareness, i.e. realistic estimation, over-estimation or under-estimation of personal adherence, has appeared to affect the relationship between guideline adherence and determinants. It can function as an independent variable of adherence, as a moderating factor or as a mediating factor of this relationship. Second, awareness groups might distinguish themselves on the basis of characteristics of individuals in these groups rather than on their level of awareness. Finally, the way to take awareness into account in a programme to improve guideline adherence also depends on the preferred strategy of the programme. As a conclusion, we express our doubt whether there is a generally applicable best approach for dealing with personal performance awareness in programmes to improve guideline adherence. Moreover, given the impact on the adherence-determinant relationship and, thus, the possible influence on the effectiveness on
intervention to improve guideline adherence, the understanding of the concept of awareness needs further improvement.

Subsequently, we debate the role of previous adherence. Previous adherence may, at least partly, consist of habitual performance. In the case of strong habits, self-regulation to improve awareness may not be the best approach to improve guideline adherence. A better strategy to improve adherence may be the formation of a new habit based on a behaviourist approach, which goes beyond mere awareness of physical therapists. As a consequence, a programme to improve guideline adherence should include the formation of new cues (e.g., reorganizing an Electronic Health Record System so that it supports guideline adherence) and cue-response links (e.g., addressing psychosocial factors instead of avoiding them in the case of chronic low back pain), and the formation of implementation intentions related to these cues and repeated performance of the new methods. Moreover, to increase the chances of behaviour change, the improved guideline adherence should have positive consequences for the physical therapist.

Next, we reflect on the use of Rogers' Diffusion of Innovations theory in our effort to improve guideline adherence. We compare Rogers' theory with the more recent theory of Paulussen and Fleuren, that more clearly positions characteristics of the user, the innovation, the organization, the socio-political context and the implementation strategy in the process of behaviour change. This provides an opportunity to better organize influential factors determining adherence, and enhanced our understanding of the complexity of implementation problems. However, unlike Rogers' theory, Paulussen and Fleuren's theory does not include connecting factors at any of these levels to the phases of individual behaviour change. In addition, Rogers' theory also recognizes the various ecological levels, but positions them rather implicitly in his theory. This is why we still prefer to use Rogers' Diffusion of Innovations theory.

We subsequently discuss two further limitations of the studies. First, we elaborate on the rudimentary design of the pilot-test of the programme and explain why we chose this design. Although this design is susceptible to various forms of bias, we explain why we think it is acceptable to attribute the observed changes in adherence to the programme. The second limitation we discuss concerns the difficulties with the measurement of guideline adherence. In our study, we used "cross-sectional" and "longitudinal" clinical paper and pencil vignettes. Vignettes may measure attitudes and behavioural intentions rather than behaviour, and they may overestimate clinicians' performance. We express the urge for better, user-friendly, and valid, yet manageable and inexpensive instruments to measure clinicians' performance, which can also be used for larger groups of professionals. Electronic Health Records may be promising in this respect.
The final section of the discussion presents practical and scientific implications of the findings. On practice level, physical therapists and practice managers should be aware of their responsibility towards the delivery of high quality of care. Managers should reserve time for quality management. The professional association has several responsibilities with respect to guideline implementation. These concerns, for instance, transparency of their quality policy, better monitoring and control of the process of guideline development and update, and facilitating the development of better instruments to assess guideline adherence among its members. They could also reconsider the format of the guidelines to facilitate their uptake, and they could develop versions of the mono-disciplinary guidelines that are easily accessible and readable for patients. However, given the professional association's limited annual budget for guideline dissemination and implementation activities, and the shared responsibility for high quality of care, we conclude that maintaining a solid guideline programme, including implementation, requires continuous funding by the government.

The implications for higher policy levels also include communicating the importance they attach to the implementation of clinical guidelines to practising physical therapists. They might further engage in a facilitation of a better understanding of the implementation problem. Therefore, it might be helpful to, first, attempt to identify common barriers and facilitators in the various efforts to improve guideline implementation and, second, enhance insight in the implementation process, focusing on the interactions between levels of intervention that make intervention strategies successful.

As regards the scientific implications we indicate that further determinant studies should examine influential factors on the higher policy and patient level, and should focus on the interactions between the various levels that are involved in guideline implementation. We also recommend the development of a sound selection procedure for determinants of guideline adherence. As regards the measurement of guideline adherence we recommend the development and validation of manageable measurement instruments that can be developed and applied at relatively low cost. Special attention should be paid to the development and validation of computerized clinical vignettes and to Electronic Health Records. With respect to the use of theories and theoretical frameworks we express our concern for large numbers of frameworks being developed in which the wheel is reinvented over and over again. Guideline implementation researchers should therefore consider using existing frameworks and, if applicable, expanding them for the purpose of their studies. Finally, we recommend an improvement of the insight in the concept of awareness of personal guideline adherence and in the role of habits with respect to the improvement of guideline adherence.
Samenvatting
In deze thesis wordt de systematische en theoriegebaseerde ontwikkeling en de pilot-test beschreven, van een interventie ter bevordering van de adherence van Nederlandse fysiotherapeuten aan de KNGF richtlijnen voor lage rugpijn. Als eerste behandelt de thesis het meten van het klinische handelen van de fysiotherapeuten en het belang van adherence aan de richtlijn. Vervolgens wordt een theoriegebaseerde en systematische wijze van interventie ontwikkeling beschreven. Tot slot wordt de pilot-test van het ontwikkelde programma ter bevordering van de kwaliteit van het fysiotherapeutische handelen besproken.

Hoofdstuk 1 voorziet in de achtergrondinformatie van het onderzoek. Het vóórkomen en de gevolgen van lage rugpijn worden beschreven en evidence based richtlijnen in de fysiotherapie en de daarmee gepaard gaande implementatieproblemen worden belicht. Het hoofdstuk eindigt met een korte introductie van de gebruikte theoriegebaseerde en systematische wijze van interventie ontwikkeling.

Lage rugpijn heeft een hoge prevalentie en heeft, met name als het chronisch wordt, substantiële gevolgen voor individu en samenleving. Van fysiotherapie wordt verwacht dat het kan bijdragen aan het voorkómen van het ontstaan van chronische lage rugpijn. Om een hoge kwaliteit van de fysiotherapeutische zorg te bevorderen heeft het Koninklijk Nederlands Genootschap voor Fysiotherapie (KNGF) richtlijnen ontwikkeld, die zijn gebaseerd op de best beschikbare evidentie. Voor de KNGF Richtlijn Lage rugpijn is er echter nog geen bewijs dat een hogere mate van opvolgen van de aanbevelingen in de richtlijn resulteert in betere behandelresultaten.

Ondanks de aanwezigheid van een implementatieplan en ondanks activiteiten van het KNGF om de diffusie van de richtlijnen te bevorderen is de toepassing van deze richtlijnen in de praktijk beperkt. Bovendien is de effectiviteit van interventies ter bevordering van het toepassen van richtlijnen matig. Het ontbreken van een steekhoudende rationale voor de keuze van dergelijke interventies lijkt een belangrijke reden te zijn voor deze matige effectiviteit. Het ontbreken van deze rationale is op zijn beurt het gevolg van het in beperkte mate toepassen van theoretische raamwerken, een te sterke focus op de individuele professional en het ontbreken van aandacht voor de organisationele context. Daarnaast zijn determinantenanalyses van implementatieproblemen vaak beperkt tot kwalitatieve óf kwantitatieve methoden, terwijl een combinatie van beiden wordt aangeraden.

leidraad voor een behoeften inventarisatie. Deze behoeften inventarisatie werd uitgevoerd volgens het Precede-Proceed Model en vormt de eerste stap van de methode van Intervention Mapping (IM). IM is een blauwdruk voor de ontwikkeling van interventieprogramma's, gebaseerd op informatie uit de theorie, empirie en praktijk. Met behulp van deze systematische aanpak is een programma ontwikkeld ter bevordering van het toepassen van de aanbevelingen in hun richtlijn voor lage rugpijn door fysiotherapeuten in Nederland.

De centrale vraagstelling van deze thesis is of een systematisch ontwikkeld en theorie-gebaseerd programma ter bevordering van het opvolgen van de aanbevelingen in richtlijnen daadwerkelijk leidt tot hogere mate van toepassing van de richtlijn. Om een duidelijk verschil te maken zou het programma moeten resulteren in een toename van gemiddeld 25% in het opvolgen van de aanbevelingen van de richtlijn voor lage rugpijn door Nederlandse fysiotherapeuten.

Hoofdstuk 2 beschrijft een onderzoek naar de validiteit van klinische vignetten voor het meten van het gebruik van hun richtlijn voor lage rugpijn door Nederlandse fysiotherapeuten. Er werden vier vignetten ontwikkeld, waarvan drie een adequate case-mix vormden voor het meten van de mate van toepassen van deze richtlijn. Van de 113 fysiotherapeuten die werden benaderd, namen er 72 deel aan het onderzoek. Zij vulden de vignetten één maal in, in de periode van tussen juni en september 2003. De scores voor richtlijngebruik van de vignetten werden vergeleken met die van semigestructureerde behandlingsregistratieformulieren, die de deelnemende fysiotherapeuten hadden ingevuld tijdens deelname aan een RCT 8 maanden eerder. De criterium validiteit werd bepaald met Spearman’s r, waarbij Cohen’s classificatie voor de gedragswetenschappen werd gebruikt om de effect-size te categoriseren. Van 34 deelnemers waren beide metingen voorhanden, wat in totaal 102 vignette-scores en 268 scores met het registratieformulier opleverde. Spearman’s r was 0,31 (P=0.036), wat volgens Cohen kan worden geclassificeerd als een medium effect-size. De conclusie was dat, in het geval van een adequate case-mix, klinische vignetten een acceptabele validiteit hebben. Vignetten zijn een goedkoop en goed hanteerbaar instrument, dat bij grote groepen fysiotherapeuten kan worden gebruikt om het opvolgen van aanbevelingen in richtlijnen te meten.

In Hoofdstuk 3 wordt een onderzoek naar de relatie tussen het opvolgen van richtlijnaanbevelingen en de effectiviteit en efficiëntie van de fysiotherapeutische behandeling gepresenteerd. Tussen september 2005 en februari 2006 registreerden 61 eerstelijnsfysiotherapeuten het zorgproces en het gegeven aantal behandelingen van 145 patiënten met lage rugpijn in een web-based patiëntendossier. Het opvolgen van aanbevelingen in de richtlijn werd vastgesteld met kwaliteitsindicatoren. Het niveau van beperkingen in lichamelijke activiteiten werd gemeten met de Quebec Back Pain and Disability Scale – DLV en pijn werd gemeten met de Visual Analogue Scale. Met behulp van regressie-analyse werd de relatie tussen het percentage richtlijntoepassing enerzijds en de gezondheidsuitkomsten en het aantal
behandelingen anderzijds gegreevalueerd. Er werd vastgesteld dat een hoger percentage toepassing van de richtlijn was gerelateerd aan een lager niveau van beperkingen in lichamelijke activiteiten ($\beta=-0.21, p=.023$) en een lager aantal behandelingen ($\beta=-0.27, p=.005$). De resultaten indiceerden bovendien dat patiënten met chronische lage rugpijn meer baat zouden hebben bij richtlijn adherente zorg, dan patiënten met acute lage rugpijn.

Het onderzoek dat wordt beschreven in Hoofdstuk 4 betreft een kwalitatieve studie naar motivationele determinanten van het toepassen van de richtlijnen door fysiotherapeuten. Dit onderzoek beoogde ook het nut van het gebruik van een theoretisch raamwerk te evalueren. Tussen november 2002 en januari 2003 werden drie focusgroep interviews (n=12, 10, and 8) gehouden. De deelnemende fysiotherapeuten werd gevraagd hun mening over de KNGF-Richtlijn Lage-rugpijn met elkaar te bespreken. Voor de data analyse werd gebruik gemaakt van de ‘directed approach to content analysis’. Rogers' Diffusion of Innovations Theorie vormde de leidraad zowel voor de interview route als voor de analyse. Uit het onderzoek bleek dat deelnemende fysiotherapeuten een tamelijk negatieve mening hadden over de richtlijn. Gerelateerd aan de stappen volgens Rogers zat het merendeel van de therapeuten nog in de vroege fasen van het diffusie proces. De determinanten van richtlijntoepassing waren hoofdzakelijk gerelateerd aan de disseminatie fase van het implementatieproces en de interviews leverden weinig informatie op over de daarop volgende adoptiefase. De resultaten lieten zien dat het diffusieproces van richtlijnen in de fysiotherapie nog niet volledig was doorlopen. Het theoretisch raamwerk was een nuttig hulpmiddel bij het goed structureren van de focusgroep interviews en het systematisch analyseren van de verzamelde data. Extra interviews bleken nodig te zijn om informatie over het gehele diffusieproces te verzamelen.

Hoofdstuk 5 beschrijft een cross-sectioneel onderzoek naar de relatie tussen motivationele determinanten en het opvolgen van aanbevelingen in de richtlijn, dat werd uitgevoerd tussen september en november 2003. In dit onderzoek werd ook het bewustzijn van het eigen richtlijngebruik vastgesteld, door de zelf gerapporteerde mate van toepassing te vergelijken met de werkelijke mate van richtlijngebruik. Een willekeurige steekproef van 1500 Nederlandse eerstelijns fysiotherapeuten ontving een vragenlijst. Werkelijk richtlijngebruik werd gemeten met gevalideerde klinische vignetten en de zelf gerapporteerde mate van toepassing door de fysiotherapeuten te vragen hun eigen mate van richtlijntoepassing aan te geven. Voor de evaluatie van determinanten werd gebruik gemaakt van Rogers’ Diffusion of Innovations Theorie. De respons was 31,5% (n=472) en de gemiddelde mate van opvolgen van richtlijn aanbevelingen was 50,4% (SD= 16.8). Er werden drie subgroepen onderscheiden met de mate van bewustzijn van het eigen richtlijngebruik. Fysiotherapeuten met een juiste inschatting van hun mate van toepassing van de richtlijn aanbevelingen in de richtlijn (realisten) en fysiotherapeuten die dit overschatten (overschatters) dan wel onderschatten (onderschatters). Omdat de determinanten de variantie in het toepassen van de richtlijn voor de totale groep voor slechts 6,7% maar voor de
realisten voor 31,2% verklaarden, duidden de resultaten er op dat bewustzijn van het eigen richtlijngebruik de relatie tussen determinanten en het toepassen van de richtlijn beïnvloedt. Aangezien meer dan 50% van de therapeuten hun eigen richtlijngebruik verkeerd inschatte, leek dit een belangrijke factor om rekening mee te houden bij een determinanten analyse en bij de ontwikkeling van interventies er bevordering van het opvolgen van aanbevelingen in de richtlijn. Uit de resultaten bleek verder dat het gepercipieerde voordeel van de richtlijn (o.a. de perceptie dat richtlijn adherence zorg resulteert in betere behandelresultaten) de belangrijkste motivationele determinant is van het toepassen van de richtlijn.

In Hoofdstuk 6 wordt een longitudinale survey gepresenteerd, die tot doel had vast te stellen welke motivationele, affectieve determinanten en determinanten van de organisatie het opvolgen van aanbevelingen in de richtlijn konden verklaren dan wel voorspellen. Ook hierbij werd onderscheid gemaakt tussen de drie subgroepen van bewustzijn van het eigen richtlijngebruik. Een willekeurige steekproef van 1600 fysiotherapeuten in Nederland ontving een vragenlijst per post in November 2007 en juni 2008. Determinanten van het opvolgen van de aanbevelingen in de richtlijn werden gemeten met deze vragenlijst waarin tevens vier klinische vignetten waren opgenomen om de mate van toepassen van de richtlijn te meten. De relatie tussen de determinanten en richtlijntoepassing werd vastgesteld met meervoudige regressie-analyse. De respons na de twee vragenlijsten was 24,6% (n=394). Het gemiddelde percentage van opvolgen van aanbevelingen in de richtlijn was 45,6% bij de eerste meting en 46,3% bij de tweede meting. De verklaarde variantie van de cross-sectionele analyse was niet veel hoger dan in eerder onderzoek, maar determinanten op het niveau van de individuele fysiotherapeut, de praktijk en de beroepsvereniging bleken van belang te zijn. Bovendien bleken verklarende en voorspellende determinanten van richtlijntoepassing, evenals de determinanten van de drie subgroepen van bewustzijn, van elkaar te verschillen. In de cross-sectionele analyse, werd de mate van toepassing van de richtlijn hoofdzakelijk verklaard door determinanten op het niveau van de individuele fysiotherapeut, zoals de mate van aandacht die aan de richtlijn was besteed, het regelmatig evalueren van de werkwijze en de resultaten en onzekerheid over de plaats van de fysiotherapie in de door de richtlijn aanbevolen zorg voor patiënten met lage rugpijn. De toevoeging van de voorafgaande mate van opvolgen van aanbevelingen in de richtlijn, de meest voorspellende factor voor de ‘realisten’, in de longitudinale analyse resulteerde in een duidelijke toename van de verklaarde variantie. Determinanten van de organisatie bleken belangrijk voor onderschatters. Bewustzijn van het eigen richtlijngebruik bleek de relatie tussen determinanten en het opvolgen van aanbevelingen in de richtlijn te beïnvloeden. De conclusie was dat het toepassen van de richtlijn een fenomeen is dat meerdere niveaus in zich heeft. Het bevorderen van de implementatie van richtlijnen vraagt dan ook om een programma dat insteekt op deze niveaus. Bovendien moet een dergelijk programma rekening houden met het bewustzijn van het eigen richtlijngebruik.
De systematische en theorie gebaseerde ontwikkeling, met behulp van Intervention Mapping (IM), van een programma ter bevordering van de implementatie van de KNGF Richtlijnen Lage rugpijn, wordt beschreven in Hoofdstuk 7. In de eerste stap van IM werd een uitgebreide probleemanalyse uitgevoerd (beschreven in de voorgaande hoofdstukken). In de tweede stap zijn programma doelen (bijv. verbeteren van richtlijntoezetting), gedragsdoelen (bijv. opvolgen van de specifieke aanbevelingen in de richtlijn) en veranderingsdoelen geformuleerd. Veranderingsdoelen specificeren wie en wat moet veranderen ten gevolge van de interventie om aan het gedragsdoel te voldoen. In de derde stap werden op basis van de gedragsdoelen en de determinanten theoretische methoden van verandering en een daarbij horende praktische toepassing gekozen. In de vierde stap werd, op basis van de voorgaande stappen, een coherent programma ter bevordering van het toepassen van de richtlijn ontwikkeld. In stap vijf en zes werden een implementatieplan en een evaluatieplan voor het programma geformuleerd.

Uit de probleemanalyse (Stap 1) bleek dat het programma zich bij voorkeur moest richten op de individuele fysiotherapeuten en de kwaliteitsmanager van de praktijk. Stap 2 en 3 leidden tot de keuze van zelfregulatie als de belangrijkste theorie van het programma, aangevuld met constructen van andere gedrags- en organisatietheorieën. Stap 4 resulteerde in een interventie programma op meerdere niveaus, met een ruime mogelijkheid tot interactie tussen therapeuten en kwaliteitsmanagers en een nadruk op het vaststellen van gezamenlijke doelen. Het programma, een scholing in kwaliteitsverbetering, was opgebouwd uit zes bijeenkomsten van drie uur, waarvan er vier werden bezocht door zowel de fysiotherapeuten als de kwaliteitsmanagers en twee door alleen de kwaliteitsmanagers. Het programma bestond uit een combinatie van verschillende praktische toepassingen (bijv. interactieve colleges, een ‘meet the expert’-bijeenkomst, discussie en feedback) van theoretische methoden (bijv. consciousness raising, modelling, actief leren). De praktische toepassingen waren vooral gericht op het beïnvloeden van saillante determinanten. Het implementatieplan (Stap 5) richtte zich vooral de omgeving van de fysiotherapeut en de praktijk, zoals de beroepsvereniging. In het evaluatieplan (Stap 6) was een proces analyse opgenomen waarin zowel de programmandoelen, de gedragsdoelen en de veranderingsdoelen als de programmaonderdelen uit de eerdere stappen werden geëvalueerd. De conclusie van het ontwikkelproces was dat, ondanks complicerende factoren, Intervention Mapping een methode is die kan voorzien in de rationale voor de ontwikkeling van interventie programma's ter bevordering van implementatie van richtlijnen.

Hoofdstuk 8 betreft de pilot-test van het programma. Het doel van het onderzoek was de potentiële effectiviteit en ‘fidelity’, de ‘acceptability’ en de ‘feasibility’ van de implementatie van het Quality Improvement in Physical Therapy (QUIP) programma te evalueren. De potentiële effectiviteit werd vastgesteld in een one-group pre-test post-test design (n=8 praktijken, n=32 fysiotherapeuten, waarvan er 8 tevens kwaliteitsmanager waren in hun praktijk) tussen september en december 2009. Het opvolgen van de aanbevelingen in de richtlijn werd gemeten.
met klinische vignetten, waaruit scores op twaalf kwaliteitsindicatoren konden worden gegenereerd. De indicatoren waren een weergave van de belangrijkste aanbevelingen van de richtlijn. Determinanten van toepassing van de richtlijn werden gemeten met kwantitatieve methoden (een vragenlijst die werd ingevuld voor aanvang en twee weken na beëindiging van het programma). Veranderingen in determinanten en richtlijntoepassing werden getoetst met de Student t-toets voor gepaarde waarnemingen en werden uitgedrukt in effect-sizes (ES. Cohen's d). Naast deze kwantitatieve methoden werden veranderingen in het kwaliteitsmanagement van de praktijk gemeten door observaties, groepsinterviews en documenten analyses.

Uit de effectevaluatie bleek dat, ondanks het feit dat alle belangrijke determinanten aan bod waren gekomen, toepassing van de totale richtlijn in verwaarloosbare mate was toegenomen van 51,5% naar 54,6% (3,1%, ES=0,35). Toch bleek eveneens dat het programma in zijn huidige vorm de potentie kan hebben tot een duidelijke verbetering van het opvolgen (range 23,6% tot 43,0%) van een beperkt aantal aanbevelingen van de richtlijn. Deze verbetering betrof vooral die onderdelen van het fysiotherapeutisch handelen waarvoor fysiotherapeuten en hun kwaliteitsmanagers collectieve doelen hadden geformuleerd (bijv. het gebruik van vragenlijsten om het effect van de behandeling te evalueren). Er waren echter ook enkele negatieve effecten, zoals een duidelijke afname (-15,7%) van de keuze van het juiste patientenprofiel, wat een belangrijk onderdeel is van de richtlijn. Ook werden duidelijke positieve veranderingen waargenomen in een groot aantal determinanten van de individuele fysiotherapeut en van een aantal determinanten van de organisatie. De determinanten vertoonden geen negatieve effecten. Bij de kwalitatieve evaluatie werd nog vastgesteld dat de managers in de praktijk een omgeving hadden gecreëerd die faciliterend was voor het bereiken van de collectieve doelen (bijv. het creëren van een ruimte in de praktijk waar patiënten vragenlijsten konden invullen en het trainen van de praktijkassistenten zodat zij patiënten kon helpen bij het invullen van de vragenlijsten).

De procesevaluatie bestond uit een observationeel onderzoek. De ‘fidelity’ van de implementatie van het programma werd geëvalueerd aan de hand van onderzoeksvragen betreffende de mate waarin en de wijze waarop geplande onderwerpen, theoretische methoden en bijbehorende praktische toepassingen en determinanten aan bod kwamen in het programma. Er werd geëvalueerd hoe de kwaliteit van de invulling van de programma componenten was en in hoeverre fysiotherapeuten en managers daadwerkelijk deelnamen aan de diverse onderdelen van het programma. Voor de ‘acceptability’ betroffen de onderzoeksvragen de gebruikte materialen en de wijze waarop het programma door de deelnemers werd geëvalueerd. De onderzoeksvragen aangaande de ‘feasibility’ betroffen de potentiële barrières, zoals tijd en financiële beperkingen. Data werden verzameld door middel van observaties, groepsinterviews, documenten analyse en een algemene evaluatievragenlijst die standaard door het instituut dat de scholing verzorgde werd gebruikt.
Bij de procesanalyse werd vastgesteld dat de integrale aanpak van fysiotherapeuten en hun kwaliteitsmanager gezamenlijk van toegevoegde waarde lijkt te zijn voor de verandering van het fysiotherapeutisch handelen. Zelfregulatie was een geschikte methode, mits het proces werd gestart en beëindigd met een grondige evaluatie van het eigen handelen en als de continuïteit van het proces was gewaarborgd. Interactieve groepssessies met de eigen praktijk, modelling en plenaire discussie of presentatie met feedback van peers en experts leken de meest effectieve strategieën. Het programma moet echter de tijd bieden om voldoende aandacht te kunnen schenken aan de individuele onderwerpen en componenten. Ook zou het programma gebaat zijn bij een follow-up sessie om het behoud van de veranderingen te kunnen evalueren en ondersteunen. De resultaten van de procesevaluatie impliceerden bovendien dat het implementeren van richtlijnen een stapsgewijs proces is over een langere tijdsperiode, waarin fysiotherapeuten en kwaliteitsmanagers steeds nieuwe, haalbare doelen stellen om zodoende de verschillende aanbevelingen in de richtlijn te kunnen invoeren. Dit proces vraagt om aanhoudende aandacht en inspanning op alle niveaus van het professionele systeem waarin de richtlijn moet worden ingevoerd. Het QUIP-programma lijkt de potentie te hebben om het fysiotherapeutische handelen duidelijk te veranderen. Verbetering van het programma is echter vereist om te resulteren in het in gang zetten van een doorlopend kwaliteitsbevorderingsproces dat nodig is om toepassing van de richtlijn te optimaliseren.

Hoofdstuk 9 is de algemene discussie van het proefschrift, waarin allereerst de belangrijkste bevindingen worden samengevat en de onderzoeksvraag, die is gepresenteerd in Hoofdstuk 1, wordt beantwoord. In de daarop volgende paragrafen worden een aantal belangrijke aspecten en beperkingen van het gehele onderzoek bediscussieerd. Ook worden de belangrijkste praktische en wetenschappelijke implicaties gepresenteerd. Het hoofdstuk eindigt met een algehele conclusie.

De centrale vraagstelling van dit proefschrift was of een systematisch ontwikkeld, theorie gebaseerd programma ter bevordering van het opvolgen van aanbevelingen in de richtlijnen zou leiden tot een hogere mate van toepassing van de richtlijnen in het fysiotherapeutisch handelen. Om van betekenis te zijn zou het programma het gemiddelde percentage toepassing van de KNGF Richtlijn voor Lage rugpijn door fysiotherapeuten in Nederland met minstens 25 procent moeten verbeteren. Uit de resultaten van de pilot-test blijkt echter dat de algehele mate van toepassing van de richtlijn niet verbetert, maar dat het programma in zijn huidige vorm kan leiden tot een substantiële verbetering van toepassing van de aanbevelingen waarvoor fysiotherapeuten en managers uit een praktijk collectieve doelen hebben geformuleerd.

Het eerste punt van aandacht in de discussie is het gebruik van de Intervention Mapping methode en daarin de consequenties van het uitvoeren van een uitgebreide probleemanalyse in het bijzonder. Dit betreft onder anderen de noodzaak van het voorselecteren van determinanten
voor de kwantitatieve analyse en, indien er sprake is van meerdere mogelijke interventie niveaus, een selectie van de niveaus waarop daadwerkelijk zal worden aangegrepen. De conclusie is dat het zinvol zou zijn een hulpmiddel voor de besluitvorming over de determinantenkeuze te ontwikkelen. Verder wordt de keuze om te interveniëren op het niveau van de individuele fysiotherapeut en de kwaliteitsmanager toegelicht en wordt ingegaan op de activiteiten om ook het niveau van de richtlijn zelf, de patient en de beroepsvereniging bij de interventie te betrekken.

Het volgende onderwerp van discussie is de gecompliceerde rol die het bewustzijn van het eigen richtlijngebruik speelt in programma's ter bevordering van het toepassen van de richtlijn. Allereerst laat het onderzoek zien dat dit bewustzijn, d.w.z. het correct inschatten, overschatten of onderschatten van het eigen richtlijngebruik, invloed heeft op de relatie tussen het toepassen van de richtlijn en de determinanten ervan. Het kan daarbij een rol vervullen als onafhankelijke variabele, of als medierende of modererende factor van deze relatie. Ten tweede is het mogelijk dat de drie groepen zich onderscheiden op basis van eigenschappen van de individuen die er deel van uitmaken, in plaats van op basis van de inschatting van het eigen richtlijngebruik. Tot slot hangt de wijze waarop met het bewustzijn van het eigen richtlijngebruik wordt omgegaan in een programma ter bevordering van het toepassen van de aanbevelingen in de richtlijn, mede af van de voorkeursstrategie van het programma. De conclusie is dat er geen eenduidige of beste manier bestaat om met bewustzijn van het eigen richtlijngebruik om te gaan in dergelijke programma's. Gezien de invloed die het heeft op de relatie tussen het toepassen van de aanbevelingen in de richtlijnen en de determinanten en dientengevolge op de effectiviteit van programma's ter bevordering van het toepassen van richtlijnen, is beter inzicht in het concept bewustzijn van het eigen richtlijngebruik wenselijk.

Hierop volgend wordt de rol van de voorafgaande mate van toepassen van de richtlijn besproken. De voorafgaande, of eerdere, mate van toepassing zal, tenminste voor een deel, bestaan uit gewoontegedrag. In het geval van sterk verankerde gewoonten is zelfregulatie mogelijk niet de meest kansrijke benadering om het toepassen van de richtlijn te bevorderen. Een betere aanpak is dan mogelijk het ontwikkelen van een nieuwe gewoonte op basis van een meer behaviouristische benadering, die verder gaat dan louter het bewustzijn van fysiotherapeuten. Bij een dergelijke benadering zou een programma ter bevordering van richtlijngebruik onder anderen moeten inzetten op de vorming van nieuwe cues (bijv. het herinrichten van een elektronisch patienten dossier) en cue-response links (bijv. het ingaan op i.p.v. het vermijden van het bespreken van psychosociale factoren bij chronische lage rugpijn). Ook het vormen van implementatie intenties gerelateerd aan deze cues en het oefenen van de nieuwe vaardigheden zouden aan bod moeten komen. Van belang is bij deze aanpak, dat de gedragsverandering, in casu het in hogere mate toepassen van de aanbevelingen in de richtlijn, positieve consequenties heeft voor de fysiotherapeut.
Het gebruik van Rogers' Diffusion of Innovations theorie is het volgende onderwerp dat wordt besproken in de discussie. Hierbij wordt deze theorie vergeleken met de meer recente theorie van Paulussen en Fleuren, die de eigenschappen van de gebruiker, de innovatie, de organisatie, de sociaal-politieke context en de implementatiestrategie een meer zichtbare plaats geeft in het proces van gedragsverandering. Dit biedt de mogelijkheid om de factoren die van belang zijn voor richtlijngebruik te categoriseren en zodoende structuur aanbrengen in de complexiteit van implementatieproblemen. In tegenstelling tot de theorie van Rogers legt de theorie van Paulussen en Fleuren echter geen verband tussen factoren uit de genoemde categorieen en de opeenvolgende stappen van het proces van gedragsverandering van het individu. Bovendien erkent ook de theorie van Rogers de verschillende ecologische niveaus, maar plaatst ze tamelijk impliciet in zijn theorie. Op basis van het voorgaande gaat onze voorkeur uit naar het gebruik van Rogers' Diffusion of Innovations theorie.

Twee beperkingen van het onderzoek worden nog verder toegelicht. Allereerst wordt het rudimentaire design van de pilot-test van het programma besproken en wordt uitgelegd waarom hiervoor is gekozen. Er wordt beargumenteerd waarom het verantwoord lijkt de geobserveerde veranderingen in het toepassen van bepaalde aanbevelingen in de richtlijn, ondanks de gevoeligheid van het design voor verschillende vormen van bias, toe te dichten aan het programma. De tweede beperking die wordt toegelicht is het probleem van het meten van de mate van richtlijngebruik. In de onderzoeken is gebruik gemaakt van ‘cross-sectionele’ en ‘longitudinale’ papieren klinische vignetten. Het is mogelijk dat vignetten vooral de attitude en/of gedragsintentie meten in plaats van het werkelijke gedrag. Bovendien zouden zij het gedrag, in casu richtlijn toe passing, overschatten. De dringende behoefte aan gebruiksvriendelijke, meer valide doch hanteerbare en betaalbare meetinstrumenten voor het meten van het klinische handelen, die ook kunnen worden gebruikt voor grote groepen professionals, wordt geuit. Digitale patiëntendossiers lijken mogelijkheden te bieden in dit opzicht.

In het laatste deel van de discussie worden de praktische en wetenschappelijke implicaties van de bevindingen gepresenteerd. Op praktijkniveau dienen fysiotherapeuten en praktijkmanagers zich bewust te zijn van hun eigen verantwoordelijkheid tot het leveren van kwalitatief optimale zorg. Managers zouden tijd moeten reserveren voor kwaliteitsmanagement. De beroepenvereniging heeft in meerdere opzichten verantwoordelijkheden met betrekking tot richtlijnimplementatie. Dit betreft onder anderen de transparantie van het kwaliteitsbeleid, het goed monitoren en controleren van de ontwikkeling en update van de verschillende richtlijnen en het faciliteren van de ontwikkeling van valide meetinstrumenten voor het vaststellen van de mate van toepassing van de richtlijn onder haar leden. Zij zouden ook het format van de richtlijnen kunnen heroverwegen om zodoende de adoptie te faciliteren en zij zouden kunnen denken aan de ontwikkeling van versies van de monodisciplinaire richtlijnen waarover patienten gemakkelijk kunnen beschikken en die voor hen goed leesbaar zijn. Echter, gezien het beperkte
jaarbudget dat de beroepsvereniging ter beschikking heeft voor disseminatie en implementatie activiteiten en gezien de gezamenlijke verantwoordelijkheid voor kwalitatief goede zorg wordt geconcludeerd dat het onderhouden van een solide richtlijnenprogramma, inclusief de implementatie, vraagt om een doorlopende financiële ondersteuning van de overheid.

Voor de hogere beleidsniveaus geldt eveneens dat zij het belang dat zij hechten aan de implementatie van richtlijnen duidelijk communiceren naar de praktiserende fysiotherapeuten. Zij zouden bovendien een faciliterende rol kunnen spelen bij het doorgronden van het implementatieprobleem. Het identifieren van overeenkomstige barrières en facilitatoren in verschillende implementatieprocessen en het inzichtelijk maken van het implementatieproces waarbij ook wordt gekeken naar de interacties tussen de verschillende interventieniveaus die het implementatieproces succesvol doen verlopen.

Met betrekking tot de wetenschappelijke implicaties wordt aangegeven dat toekomstige determinanten onderzoeken zich zouden moeten richten op het hogere beleidsniveau en de patient en op de interactie tussen de verschillende niveaus die van belang zijn voor de implementatie van richtlijnen. Ook wordt aangeraden een gedegen selectieprocedure voor determinanten van richtlijntoepassing te ontwikkelen. Voor het meten van de mate van toepassing van de richtlijn wordt de ontwikkeling van valide en hanteerbare meetinstrumenten aanbevolen die tegen relatief lage kosten kunnen worden ingezet. Hierbij kan vooral worden gedacht aan de ontwikkeling en validering van digitale klinische vignetten en aan digitale patiëntendossiers. Enige zorg wordt uitgesproken over de ontwikkeling van steeds meer nieuwe theoretische raamwerken in implementatieonderzoek. Geadviseerd wordt zoveel mogelijk voort te bouwen op bestaande theorieën en theoretische raamwerken. Tot slot wordt aanbevolen verder onderzoek te doen naar het concept van bewustzijn van het eigen richtlijngebruik en naar de rol van gewoonten in relatie tot het bevorderen van het toepassen van aanbevelingen in de richtlijn.
Dankwoord
Allereerst de mensen die direct betrokken zijn geweest bij het tot stand komen van dit proefschrift. Hartelijke dank aan mijn directe begeleiders. Rob, met je opmerking ‘Scholing in wetenschap, is dat niks voor jou’ ergens in de negentiger jaren van de vorige eeuw, is het begonnen. Van het een kwam het ander en uiteindelijk dit proefschrift. Ik bedank je voor de kans die je me hebt gegeven. Verder veel dank voor je altijd wijze aanwezigheid en de manier waarop je steeds de grote lijn in de gaten hield als de neiging ontstond om nog eens een zijstraat in te slaan dan wel een laagje dieper te gaan. Janneke, ik denk dat we wel mogen spreken over vriendschap i.p.v. goede collega’s. Je scherpe oog voor het detail is bijzonder en dat gecombineerd met het feit dat je niet snel tevreden bent met het resultaat heeft me soms in de spreekwoordelijke gordijnen gejaagd, maar heeft in hoge mate bijgedragen aan het proefschrift zoals het er nu ligt. Veel dank voor je niet aflatende betrokkenheid, zeker ook in de tijd dat het allemaal in eigen tijd moest. En, oh ja, planningen zijn inderdaad wél nuttig. Nanne, zeker in aanvang wat meer op afstand, maar in de laatste anderhalf jaar vanaf ‘een paar deuren verderop’. Je deskundige en kritische kijk tijdens het projectgroepoverleg had altijd een opbouwend karakter. Dat is niet iedereen gegeven. Het hield me enorm bij de les, gaf richting in de aanpak van de ‘databrei’ en inspireerde weer tot het maken van volgende stappen. Veel dank daarvoor.

Leden van de begeleidingscommissie. Jozé, Stef, Piet, Erik, Philip, Steef en Marcel, ik heb onze bijeenkomsten altijd met plezier tegemoet gezien. Door jullie verschillende achtergrond en deskundigheid leverde het altijd weer een andere invalshoek op, een bevestiging van de aanpak, of een reden om nog eens opnieuw te kijken naar vooraf gedane arbeid.

Special thanks to Prof Dr L.K. Bartholomew. Dear Kay, starting at our fabulous IM-week in Houston you showed great interest and involvement in our project. The meetings we had in Nijmegen and Oosterhout were very helpful because you always showed us another way to approach the problem. Besides, I enjoyed the pleasant atmosphere. Thank you for your substantial contribution to the creation of the implementation programme and this thesis.

Rob van Dolder en Roland van Peppen, samen van P&D. Het was een gouden greep om jullie bij het ontwikkelen van de interventie te betrekken en hem door jullie te laten uitvoeren. Het moest allemaal snel en met beperkte middelen, maar desondanks stond er een compleet programma, dat onmiskenbaar was geent op de door ons aan jullie verstrekte informatie. Ik ben steeds met plezier als observator naar de bijeenkomsten van het programma gekomen en het is jammer dat het (nog ) geen vervolg heeft gehad.

Natuurlijk is het met twee banen bij tijd en wijle schipperen met de tijd. Sinds de start van mijn onderzoekactiviteiten heb ik in drie praktijken gewerkt en van de betreffende praktijkeigenaren wel wat extra privileges gevraagd. Nico en Mieke, Theo en op dit moment Marcel, Marit en Paul,
jullie hebben me onvoorwaardelijk steeds de mogelijkheid geboden, of doen dat nog steeds, om dit werk en de daarbij vaker voorkomende extra’s, te doen. Veel dank daarvoor. Het mooie in jullie praktijken is dat het hart ligt bij goede zorg op maat voor de patiënt. Dat blijft de kern. Patientenzorg is een prachtige bezigheid en de fysiotherapie biedt nog altijd de mogelijkheid om daarvoor ruim de tijd te nemen. Een enorme meerwaarde. Marcel, toen het een periode tegenzat en ik eraan twijfelde of dit boekje er nog wel ging komen, heb je het belang van de praktijk toch min of meer opzij geschoven en me de ruimte te geven om het af te ronden. Dat is bijzonder en voor mij een cruciale factor geweest om dit ‘appeltje te schillen’. Om dezelfde reden een extra woord van dank aan Stef Kremers die het toeliet dat er toch nog wat Maastricht-uren werden geïnvesteerd in het tot stand komen van de thesis.

Karin en Caroline, kamergenoten in Nijmegen en natuurlijk (bier)maten Selma en Marije. Hard werken, maar op z’n tijd effe beppe. Volgens mij is dat wel een succesformule, zeker als dat dan nog eens wordt overgoten met een sausje van gerstenat of iets dergelijks. Een echte toevoeging aan de bedrijfscultuur.

Vrienden van de harde kern van FysioMaatwerk. Toen het afronden van dit proefschrift in eigen tijd moest, heb ik mijn activiteiten voor FysioMaatwerk op een laag pitje moeten zetten. Ik dank jullie voor het begrip daarvoor en de ruimte die jullie me hebben gegeven.

Zonder deelnemers geen onderzoek. Ik bedank de fysiotherapeuten die ertoe bereid waren patenten te registreren in een web-based EPD, iets wat toen nog in de kinderschoenen stond, de fysiotherapeuten die hebben deelgenomen aan de focusgroep interviews, degenen die twee keer onze uitgebreide vragenlijsten en vignetten hebben ingevuld en de praktijken die deelnamen aan de pilot van het programma en de daarop volgende interviews.

Steef, me brokker, de eerste stappen hebben we samen gemaakt en het was me veel waard om je er bij het vervolg ‘bij te hebben’. Maar, dat geldt niet alleen voor dit project. Laat het nog maar lang zo zijn.

Ma, he he, het is klaar. Dikke punt erachter, dus dat kan van het zorgenlijstje af. Bedankt voor je niet aflopende betrokkenheid bij het wel en wee van ‘je mannen’.

Han, Bas en Luuk. Toen het gewoon werk was ging het goed, maar toen er nog gedurende een te lange periode veel tijd in moest worden geïnvesteerd naast het gewone werk, werd het een verzoek. Het heeft ook van jullie veel gevraagd en jullie hebben daar nooit over geklaagd. Het zal nu echter veel vaker voorkomen dat ik ‘Nee’ kan antwoorden op de vraag ‘Pa, zit je boven?’.
Curriculum Vitae


Geert Rutten, born on June 6th, 1962 in Veghel studied Physical Therapy in Heerlen for which he graduated in 1984. He worked in several private practices. After he finished his education as a manipulative physical therapist (MPT) he was involved in the development of a training course for MPTs in Germany, for which he has worked as instructor untill 2000. At that time, he started his study Health education and Health promotion at Maastricht University. In 2004 he graduated with an analysis of the implementation of the Dutch physical therapy guidelines. He was one of the initiators of the foundation of FysioMaatwerk, a cooperation of 7 physical therapy private practices in Brabant, of which he is still a board member. Since 2005 he was a researcher at the present Scientific Institute for Quality of Healthcare (IQ healthcare). He executed several studies concerning the quality of physical therapy care, before he started his PhD project in 2007. Since 2010 he is employed as a researcher for 3 days a week at the department of Health Promotion at Maastricht University where he studies the implementation of the BeweegKuur, a lifestyle intervention for overweight and obese adults. The other 2 days he works as a manipulative physical therapist at FysioMaatwerk Heeswijk Dinther. Geert lives in Uden with Hannie. He has two sons.
Stellingen

behorende bij het proefschrift van Geert Rutten

Setting and keeping the professional system in motion
Using Intervention Mapping to develop a programme
to improve guideline adherence in physical therapy

1 Het bevorderen van het gebruik van praktijkrichtlijnen vraagt om een continue cyclus van op elkaar afgestemde, kwaliteitsbevorderende activiteiten van de individuele professional, de praktijk, de beroepsvereniging, richtlijnontwikkelaars, de patiënt en de hogere beleidsinstanties (Dit proefschrift)

2 Het is niet haalbaar om, met de beschikbare middelen, een interventie ter bevordering van richtlijnimplementatie te ontwikkelen die gelijktijdig aangrijpt op het niveau van de patiënt, professional, praktijk, de richtlijn zelf en de beroepsorganisatie (Dit proefschrift)

3 Een uitgebreide probleemanalyse levert een breed inzicht op in bevorderende en belemmerende factoren voor de implementatie van richtlijnen, maar maakt van de ontwikkeling van een implementatie-interventie een gecompliceerd traject (Dit proefschrift)

4 Zelfregulatie lijkt een effectieve benadering m het verbeteren van de kwaliteit van het fysiotherapeutisch handelen, maar is een proces dat zowel de individuele fysiotherapeut als de kwaliteitsmanager moet worden aangeleerd (Dit proefschrift)

5 Een groot deel van de fysiotherapeuten schat de eigen mate van richtlijngebruik verkeerd in, maar het is nog niet duidelijk hoe hiermee het beste kan worden omgegaan in interventies ter bevordering van implementatie van richtlijnen (Dit proefschrift)

6 Interventies die erop gericht zijn het gebruik van richtlijnen te bevorderen moeten zich ook richten op het doorbreken van gewoonten (Dit proefschrift)

7 Een kwaliteitsmanager is van toegevoegde waarde voor de kwaliteit van de zorg in de praktijk, maar dient daarvoor zelf ook over voldoende kwaliteiten te beschikken

8 Het op een valide, maar hanteerbare wijze meten van het fysiotherapeutische handelen blijft een uitdaging, maar is een voorwaarde voor het beoordelen van de kwaliteit van de fysiotherapeutische zorg

9 Een goede dossiervoering vormt de basis van kwalitatief goede zorg, maar mag niet belangrijker worden dan de zorg zelf

10 Om te voorkomen dat fysiotherapiepraktijken zich meerdere keren per jaar moeten opmaken voor een kwaliteitscontrole, is er grote behoefte aan een eenduidig kwaliteitscontrole systeem

11 Aan het eind van mijn budget heb ik nog een stuk promotietraject over (vrij naar Loesje)

12 Het zou de verkeersdoorstroming ten goede komen als er behalve, of zelfs in plaats van, een grote hoeveelheid asfalt, een gezonde dosis fatsoenlijk rijgedrag over dit land zou worden uitgestort

13 De slager hoort na het afrekenen niet alleen de kinderen maar ook de papa en/of mama een stukje worst aan te bieden (Kees van Kooten)