Kaleidoscopic integration: Advancing the integration of incommensurable knowledge in healthcare guidelines

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ABSTRACT
The integration of different types of knowledge in epistemically hierarchical settings remains one of the greatest challenges when developing standards for healthcare practices. In this article, we open up the notion of knowledge integration and empirically examine the various ways in which different types of knowledge interact and can be integrated. To allow us to focus on the diverse forms of knowledge as well as their interaction and integration, we combine Moreira’s work on repertoires of evaluation with that of Dewulf and Bouwen on frame interactions.

We examine the quest for knowledge integration by studying interactions in the case of the development of the COVID-19 vaccination guideline in the Netherlands, a prime example of the encounter of a wide range and diversity of knowledge that needs to be appraised and integrated into guideline recommendations. Drawing on ethnographic observations of more than 70 guideline development meetings between 2021 and 2022, we first map the different types of knowledge and reasonings used by the guideline developers and subsequently analyze their interactions.

We identified eight knowledge interaction patterns, being disconnection, polarization, accommodation, incorporation, reconnection, reconciliation, passive juxtaposition, and kaleidoscopic integration. We hereby draw attention to the various possible knowledge interactions encompassed in the concept of “knowledge integration”, especially to those in which integration is achieved while differences and incompatibilities are maintained. Finally, we discuss potential ways to facilitate fruitful knowledge interactions during collaborative work which include the ability to accept and sustain tensions between different types of knowledge and making more explicit use of frame or rather repertoire reflection.

1. Introduction

Encountering and combining different types of knowledge is an integral part of inter- and transdisciplinary collaboration. At the same time, it remains one of its most demanding tasks (Godemann, 2008; Pineo et al., 2020). Many scholars have explored this challenge under the headings of “knowledge integration” or “knowledge co-production” with the aim to provide practical methodological guidance through frameworks and road maps on how to make this complex endeavor succeed (Daniels et al., 2020; Djenontin and Meadow, 2018). Nevertheless, there is still not much known about the knowledge dynamics in this process and about what actually happens during “knowledge integration” and non-integration. In this article, we open up the notion of knowledge integration and empirically examine in the case of clinical guideline development the various ways in which diverse types of knowledge interact.

Clinical guideline development has been shown to be an arena for different types of knowledge coming together (Wieringa et al., 2018). Public health and clinical practice guidelines are a cornerstone of evidence-based medicine as they are developed to combine the best available evidence on a given issue to support health professionals in (clinical) decision-making. Guideline developers thereby primarily rely on evidence resulting from clinical research such as randomized controlled trials and systematic reviews thereof, and to a lesser extent on...
cohort and case studies and expert opinions (Guyatt et al., 1995; Knaapen, 2013). The inclusion of different stakeholders’ experience-based knowledge and value considerations has been increasingly recognized as valuable but incorporating this kind of knowledge on a regular basis is not yet common practice (Kim et al., 2020; Zuiderent-Jerak et al., 2012). Furthermore, social scientists and STS scholars (Knaapen et al., 2010; Moreira, 2005; Wieringa et al., 2021), have deepened our understanding of the range of knowledge and resources besides scientific research that are consulted in guideline development. Guideline developers mobilize ethical principles and existing (practice) standards (Knaapen, 2013) and bring in contextual development, and our analysis thereof. Next, we present our findings, i.e., the different repertoire interaction patterns we have identified, through empirical examples. Lastly, we discuss potential ways to facilitate the more fruitful interactions among them, as well as the implications of our findings for the concept of “knowledge integration” and for multi-stakeholder collaborations.

2. Theoretical framework

Moreira (2005) uses the concept of “repertoires of evaluation” to capture how clinical guidance is constructed through the combination of various types of knowledge. Building on Bolanski and Thevenot (1991), he defines repertoires of evaluation as recurrent forms of situated judgment by which actors determine what is deemed legitimate or worthy. Repertoires of evaluation thereby also form a means for harmonizing action between actors: they render certain judgements on knowledge questions legitimate. In his ethnographic study of several guideline development processes, Moreira (2005) identified four main repertoires of evaluation: “science”, “practice”, “politics” and “process”. The “science” repertoire refers to guideline developers evaluating the technical robustness of the evidence presented, as well as the recommendations they generate. In this paper, we also use this repertoire when guideline developers refer more generally to the scientific evidence base. The ‘practice’ repertoire applies when guideline developers assess the practical applicability of the knowledge under discussion by anticipating its potential consequences in everyday healthcare settings. The “politics” repertoire signifies that guideline developers think about how their decisions might be received in the socio-political context in which the guideline is situated. Lastly, Moreira describes the “process” repertoire to capture how guideline developers continuously reflect on the methodological adequacy and process of the ongoing guideline development. In our analysis, Moreira’s repertoires will serve to identify the different types of reasoning employed by guideline developers.

Furthermore, however, we are particularly interested in the interaction dynamics between these repertoires: how do they interact and how are recommendations formed that draw on a variety of repertoires? The problem-solving nature of much of the literature on knowledge integration in transdisciplinary contexts often leads to less attention being placed on exploring differences – rendering this literature of limited help in this matter. There is much literature available on the practical organization of successful knowledge co-production in multi-stakeholder contexts (e.g., Bergmann et al., 2021; Hall et al., 2012), which, however, remains rather vague about what happens when different kinds of knowledge meet. Moreover, there is a tendency to seek to conceal friction (Klenk and Meehan, 2015), overcome differences, and reach consensus (Pineo et al., 2020) that permeates many approaches to knowledge integration.

There are some noteworthy exceptions, such as Sjogren’s (2008) analysis of handling the ambiguity of multiple knowledge claims when allocating pharmaceutical subsidies and Willems’ (2021) in-depth study of actors’ “knowledge work” when dealing with differing knowledge practices in collaborations. Another example is Arie Rip’s (1999) notion of “kaleidoscopic integration” a form of integration that retains “analogisms and outliers [sic]”. We explore this concept further and how it helps us understand how integration may be combined with making different knowledge counts on their own terms.

To empirically investigate the interactions of diverse knowledge types we turn to Art Dewulf and René Bouwen’s (2012) framework for frame interaction strategies. They developed a typology of actors’ interaction strategies for dealing with differences in issue framing, drawing on literature in conflict management, organization studies, and their conversational analyses of multi-actor project meetings for natural resources management. Framing is defined, following an interactional approach, as “the dynamic enactment and alignment of meaning in ongoing interactions” (Dewulf and Bouwen, 2012, p. 169). They (2012, p. 179) distinguished five interaction strategies:

- **Frame disconnection.** Disconnecting the challenging element from the ongoing conversation as irrelevant, unimportant or the like
- **Frame polarization.** Polarizing the difference by reaffirming your own issue framing or an upgraded version of your own issue framing
- **Frame accommodation.** Accommodating your own issue framing to the challenging issue element
• Frame incorporation. Incorporating a downgraded reformulation of a challenging element into your own issue framing
• Frame reconnection. Reconnecting frames by taking both elements seriously and taking away the incompatibility between them.

These types will be discussed in more detail and illustrated through examples during the analysis. We are aware that Moreira’s repertoires are closer to the notion of multiplicity and Dewulf and Bouwen’s frames are more perspectival, but we nevertheless join them for our exploration because this enables us to not only investigate repertoires but also the interaction between them. For this paper, we will thus refer to repertoire interactions. Moreover, we adopt the term interaction ‘types’ instead of ‘strategies’, as the latter suggests conscious action, which in our experience need not always be the case.

3. Data and methods

3.1. Data

From February 2021 to August 2022, we conducted observations of more than 70 meetings on the development of the Dutch COVID-19 vaccination guideline, led by the Dutch Institute for Public Health and the Environment (RIVM). This work was part of a larger research project between the Athena Institute and the Social AI group of the Vrije Universiteit Amsterdam and the RIVM, which explores the potential of AI-based methods to include experience-based knowledge from professionals, patients, and citizens in clinical guideline development. Of these 70 meetings, 52 were held with the core group of 5–10 guideline developers, which included policy and medical advisors, researchers, GPs, specialists, and methodologists and 20 of them were “user feedback meetings” involving a range of additional stakeholders e.g., from various professional associations. The core group’s primary task during these meetings is to review and discuss the evidence presented following standardized procedures and finally to formulate recommendations in the guideline. In the case of the COVID-19 vaccination guideline, the core group discussed, for example, medical and practical information on the implementation of vaccination, e.g., maintaining vaccine cold chains, preparing vaccines for administration, and the vaccination process for immunocompromised patients. The tasks of the user feedback group are to read along with the meeting minutes, comment on draft versions of the guideline, and provide advice on specific topics. It should be noted that the development of the COVID-19 vaccination guideline is likely to differ from the usual guideline development process in several respects. Particularly notable is the high frequency of actively online – meetings, which often took place weekly, the limited availability of evidence, especially scientific studies, constantly evolving information, and the high pressure and constant sense of urgency (Moleman et al., 2022b). The last author attended the majority of the guideline meetings and the first author was present at 10 sessions. The sessions lasted between 30 and 75 min and were audio-recorded, transcribed verbatim, and anonymized. We will refer to each guideline developer using the abbreviations P1-6, which consistently refer to the same person within a meeting, but not across meetings, to further support anonymization.

3.2. Analysis

The 1st and 2nd author performed a detailed analysis of 14 of the transcribed meetings – 11 core group and 3 user-feedback meetings – from nine different months across the entire period. Meetings were purposefully sampled based on fieldnotes that showed the discussions involved complex decision-making processes invoking multiple repertoires. In total, these 14 meetings amounted to about 104 agenda points that were discussed and required decisions. While the topics of the meetings continued to change, the patterns of interaction during discussions and decision-making became repetitive, leading to the decision to discontinue analyzing further meetings based on what we call ‘interactional saturation’. The 14 transcripts were analyzed qualitatively with the help of Atlas.ti software which consisted of several rounds of coding following an iterative and abductive (Timmermans and Tavory, 2012) process. We started by coding Moreira’s repertoires of evaluation, first establishing whether they could be applied to the development of the COVID-19 vaccination guideline and capture the different types of reasoning. When this proved to be largely the case, we systematically coded the various repertoires used during the guideline development. This was followed by cross-checking and alignment between the two coders and slight adjustments of some repertoires from how Moreira uses them, as described above. Next, focusing on repertoire interactions, we coded based on the interaction types proposed by Dewulf and Bouwen (2012), but also marked those that did not clearly fit their typology. To ensure the adequate and coherent application of Dewulf and Bouwen’s framework, the two coders extensively discussed their coding decisions multiple times and exchanged and reviewed examples. Lastly, those repertoire interactions that did not fit Dewulf and Bouwen’s typology were re-analyzed. We discussed these cases among the authors and refined the coding until we arrived at three new repertoire interactions which satisfactorily captured the interactions beyond Dewulf and Bouwen’s typology. Our final analysis was returned to two representatives of the guideline developers to check for accuracy and resonance with their experiences (Birt et al., 2016).

4. Results

This section presents an in-depth analysis of the different types of repertoire interactions encountered during the selected development meetings of the Dutch COVID-19 vaccination guideline. In the following, we first present empirical examples of the five interaction types described by Dewulf and Bouwen (2012). Beyond these, three additional types emerged from the analysis that offer fruitful ways of dealing with contrasting repertoires, namely “reconciliation”, “passive juxtaposition” and “kaleidoscopic integration”.

We start by providing background information for each situation that occasioned putting a particular issue on the agenda, and then describe who introduced which repertoire and for what reason. Close attention is also given to how the different repertoire interactions shaped the outcomes of the discussion, particularly regarding the initial differences, potential tensions, and incompatibilities between repertoires.

During repertoire disconnection, an actor responds to a challenging repertoire by disconnecting it from the ongoing conversation as irrelevant, unimportant or the like. Examples of this are replies such as “Yeah, that’s a different story” (P4), or calling something “just an opinion” (P1). We observed an example of this interaction during a discussion on the practical challenges related to the required storage temperature of vaccines. Originally, the manufacturer had recommended, based on available studies, that the vaccines should not exceed 8 °C. However, this raised questions at the vaccination sites about how to work with this limit. Several vaccine doses could be administered from one vial, and the more a vial had already been used, the higher the risk that it warmed up. The people administering the vaccines thus asked the guideline developers how to comply with the temperature limit while avoiding having to throw away half-empty vials due to uncertainty about the temperature, which was deemed unethical in times of vaccination shortages.

So, the two opposing repertoires that the guideline developers had to take into account in this meeting were the scientific repertoire – scientific studies prescribing a limit of 8 °C – and the practical repertoire – the challenge of implementing this limit at the vaccination site.

After some debate, guideline developer P4 proposed a description for the guideline on handling vaccines and temperature compliance that was more tangible and workable at the vaccination site:
P4: […] can you imagine just putting a time limit on it, like: “within half an hour you can put it [the vial] back in the fridge, if it is outside for longer than an hour, not anymore”, something like that?

P2: Yes, the limit is now that it must remain below 8°C.

The above example illustrates how two repertoires remain disconnected. There is no apparent recognition of each other’s reasoningnor mutual engagement therewith. As a result, the scientific and practical repertoire remain detached, offering little opportunity for further exploration and exchange. In this repertoire interaction type, differences are disregarded and persist, as does the incompatibility between them.

What happened next in this discussion can be classified under repertoire polarization. P1 and P4 did not settle for this answer and expanded on their previous argument about the difficulties at the vaccination site regarding the temperature limit. They once again confronted the scientific repertoire with the practical one:

P1: Yes, but there is no way to know that. It should be possible to quickly take it [the vial] out and put it back. But if you leave it somewhere on a table and it’s just standing there for a while, […] in a big building, and the logistics … I can imagine that at some point, when the vial is half empty, you may think, the vaccine might have exceeded the 8°C.

P4: Yes, I think so too.

P1 restating and deepening the original argument is an example of repertoire polarization. This usually causes differences and incompatibilities between repertoires to persist or even exacerbate. While this interaction type is common when issues are debated, it is also often a reaction to an attempted repertoire disconnection or superficial attempts at problem-solving that do not offer substantive solutions.

Repertoire accommodation refers to actors giving up their original point of view and adopting that of someone else. Such an interaction unfolded when guideline developers had to determine the interval between a COVID-19 infection and the first and second vaccination.

Originally, they had set a 4-week interval between a COVID-19 infection and the first vaccination and 8–12 weeks between infection and the second vaccination. The longer second interval reflected the medical consideration that the first vaccine and COVID-19 infection would have already triggered an immune response twice within a short time. Therefore, the second vaccination should be delayed until 8–12 weeks after the onset of symptoms. Thus, the intervals were established primarily based on the scientific repertoire. However, during the last user feedback meeting, the Municipal Health Service, which scheduled and administered a large proportion of the vaccines, explained, “One time, 4 weeks, and the next time 8–12, … that doesn’t work for us”, and asked if 8 weeks for everything would also be acceptable.

Therefore, the guideline developers now revisited the intervals in this meeting. They understood the Municipal Health Services’ wish for uniformity, and found nothing wrong with their suggestion, whereupon they agreed to adjust the intervals from 4 weeks and 8–12 weeks to a uniform 8 weeks between COVID-19 infection and vaccination:

P4: Yes, that’s fine. On that health declaration, they want to ask just one question. Right now, it says 4 there, and it should be 8.

P1: Yes, that is correct. And for the second shot, it won’t be 8–12 but yes, it can stay that way. 8 to 12, or should I-

P4: No, that should just be 8 then. Yes.

P1: Eight? Okay.

P4: Then it will be 8 for everything. That was the idea. That makes it easy.

The guideline developers thus accommodated the practice repertoire, that was brought forward in a prior meeting. While Dewulf and Bouwen (2012) note that accommodating strategies generally form part of a larger tactic involving concessions on some issues while polarizing or disconnecting others (in return), we cannot confirm this coupling. In the example above, the guideline developers comply with the frontline’s need for clarity without seeking anything in return. The initial differences between the science and practice repertoire and their potential incompatibility have been resolved.

Repertoire incorporation happens when actors give partial credit to a challenging repertoire and reformulate and integrate it into their reasoning. Actors thus incorporate a part of the challenging repertoire while disregarding the remainder. One such situation arose right after the Dutch Association of Hospital Pharmacists had developed its own guideline for preparing one of the COVID-19 vaccines. The guideline developers considered this second guideline alongside the national one to be potentially problematic, fearing that it could lead to confusion, especially if it contained contradictory information.

The repertoire interaction started when P1 described the situation and expressed concerns about the process, i.e. the official procedures of guideline development. In this case, with a second guideline being issued by another association, guideline developer P1 is concerned about who should have overall jurisdiction over guideline development and about how to handle two parallel guidelines, especially if they are incoherent. As a response, P2 indicated that from a practical standpoint, there were important differences between the two guidelines: while the national guideline contained general information on the preparation of vaccinations, the pharmacist’s guideline provided more concrete work instructions and step-by-step advice. P1 then responded:

Okay … of course we are a bit half-hearted here because we did originally create an instruction called ‘Prepare vaccine’, which is already fairly concrete, and now you see that this [the pharmacist’s guideline] is even more concrete, umh, but there are also some differences, well, that then again is a bit of a mess, yes.

By stating that the national guideline already tried to provide practical guidance, P1 indirectly acknowledged that there was a need for practical guidance, as described by P2. However, P1 also said that the national guideline is already fairly concrete and concluded by stressing the differences between the two guidelines, which echoed her previous argument that two contrasting guidelines might cause confusion. Although the exact solution is still pending, this repertoire incorporation resulted in agreement on addressing the practical needs, which sets the scene for seeking a solution. It then partially resolved the initial incompatibility between the two challenging repertoires – as they agree on the need for practical guidance – while some differences remain – the ambiguity about needing a second guideline persists.

P4 ultimately suggested a solution to this issue, which was eventually adopted and which we coded with repertoire reconnection; Dewulf and Bouwen’s last interaction type. With repertoire reconnection, both opposing repertoires are taken seriously, and each is left relatively intact, but actors find a “workable relation between them” which resolves their incompatibility.

P4: How bad is it if you have one guideline for pharmacists for example, and possibly the Municipal Health Service, who have undergone special training, and that there is a slightly more general one that can be used as basic knowledge for those who haven’t followed the training? You know, we can add that [recommendation] ourselves: “In case you have followed a special training for pharmacists refer to the one guideline. If you follow the general guideline, as we wrote it, you are fine as well.”

This solution catered to both the practice repertoire by satisfying the need for specific work instructions for pharmacists and the process repertoire by providing procedural clarity as to which guideline should be used for what. Even though the two guidelines remained contradictory and the potential for confusion persisted, the tension was largely relieved, by determining a distinct purpose for each of them. Both guidelines were considered legitimate and retained as separate entities.
that became compatible by reframing the relation between them.

The five interaction types described by Dewulf and Bouwen (2012) already represent several important patterns of repertoire interactions that frequently occurred and alternated constantly throughout the discussions. However, we noticed that the framework does not cover many interaction types where a satisfactory outcome is found without resolving differences and incompatibilities. Knowledge integration forms that make different repertoires count on their own terms, allow for outliers and antagonisms neither play a major role in the framework nor are they facilitated in practice. When analyzing how guideline developers continuously dealt with new information, we also encountered other practices of engaging with heterogeneous knowledge, that extend Dewulf and Bouwen’s (2012) framework. We identified three further repertoire interaction types: reconciliation, passive juxtaposition, and kaleidoscopic integration.

While Dewulf and Bouwen focus largely on one actor’s response to the challenging argument, during reconciliation the opposing parties jointly seek a solution that works for all. In this way, they resolve the original differences and incompatibility.

An example of this interaction occurred during a discussion at a user feedback meeting, i.e., a guideline development meeting attended by a larger group of professional representatives and relevant stakeholders. Shortly before, the Dutch health council had advised a second booster for “people aged 70 and above and people in nursing homes”.

The repertoire interaction was initiated when P7, a representative of the professional association for intellectually disabled people, pointed out that it was unclear what this formulation meant in practice for different forms of elderly care, such as young dementia patient care or disability care: “This is really elderly care, these are really vulnerable people, but they do not recognize themselves in the term nursing home.” While the guideline developers understood the issue, they also cautioned that the wording in the guideline could not deviate too much from the official recommendation of the health council (process repertoire). Several participants suggested different descriptions to cover all eligible individuals without deviating too much from the health council’s recommendation. After a lengthy discussion, they arrived at the following formulation which satisfied everyone:

P1: In the guideline, shall we just say … – unless you come up with something better now –, “those groups 70 years and older and in residential facilities for elderly anyone with a similar vulnerability to people over 70?”

This formulation, jointly negotiated in the discussion, met the needs of the practice and was legitimate according to procedural requirements, thus resolving the original differences and tensions.

Another interaction type that became apparent in our analysis is passive juxtaposition. Actors take both opposing elements seriously and acknowledge the contradiction between them. No further action is taken other than leaving the differences to coexist.

This unfolded clearly, for example, when the guideline developers reflected on their experiences with the COVID-19 vaccination guideline development. Although they originally intended not to change the recommendation, during a feedback meeting, i.e., a guideline development meeting attended by a larger group of professional representatives and relevant stakeholders, they explicated the contradiction and then left it at that and took no further action. Another time that passive juxtaposition became evident was when the guideline developers’ decision proved contrary to what other countries were doing:

P1: Then I think yeah, we can very much say it doesn’t make sense from a medical point of view to boost 16- and 17-year-olds but if they do it in Germany … Well, you only have to live a few hundred kilometers east. It’s the same people, and they are not completely clueless in Germany either …

They recognized the tension between their recommendation that it was medically not scientifically solid to boost this age group (scientific repertoire) and the fact that it was nevertheless done in their neighboring country (politics and practice repertoire). However, no further action followed; the guideline developers stuck to their recommendation, resulting in differences between repertoires and incompatibilities remaining. Differences could remain because in this repertoire interaction type, guideline developers resisted the all-too-common “sense of urgency to act and a fear of inaction” (Jerak-Zuiderent, 2015, p. 908).

Contrary to juxtaposition, however, we also observed situations with the same starting points – both repertoires are taken seriously, and their incompatibility is acknowledged – whereupon action is taken to navigate this tension. We use the concept of kaleidoscopic integration (Rip, 1999) to refer to instances where guideline developers acknowledge the contradicting repertoires, then take action but leave the contrasting repertoires intact and incompatible. Thus, the tension between repertoires is not resolved, however, the guideline developers find ways to accommodate it, as we will illustrate in the following three examples.

The first example is the end of the previously introduced discussion on the difficulty of translating the requirement to keep vaccines below 8°C (science repertoire) into workable instructions that can be implemented at the vaccination site (practice repertoire). After several attempts to resolve this tension e.g., through repertoire disconnection, polarization, and attempted reconciliation, the guideline developers find a way forward by turning to professional judgment:

P5: … it just shouldn’t warm up, so you do it how you do it, but it just shouldn’t warm up. And then …

P1: Yes … [unintelligible] fine.

P5: Haha, yes, such a walk-in fridge would be great, but I mean this should also be part of the professionalism of the Municipal Health Services right?

P1: Exactly, yes but also ours, right? […]

P5: […] so that’s an additional argument for [department within the RIVM] that we don’t nail it down too much, I think.

P1: Yeah, no, we shouldn’t seal this too tightly.

Eventually, they relied on the professionalism of the people handling the vaccination to ensure the temperature remained cool enough. In this way, the tension between the scientific norm and practicality remained and was left to the practitioner to navigate responsibly between them.

In another example, guideline developers explicitly referred to their own professionalism to maneuver between contradictory repertoires. One person asked whether they were allowed to diverge from the recommendations in the vaccines’ package leaflet. Someone clarified:

P1: Yes, in the guideline, we can always overrule a leaflet, because in there, what we just talked about, they are sometimes very cautious. Uh, what we just talked about … opening and closing the fridge; sometimes for pragmatic reasons you just have to pass over that.
P6: Okay, yes thank you.

Pharmaceutical companies might be “sometimes very cautious” to prevent adverse vaccination reactions (practice repertoire), to be legally secured (politics repertoire), or because certain scientific studies are required to include something in the leaflet (science repertoire). This is contrasted by a need for practical guidance despite all uncertainty (practice repertoire) that the guideline tries to provide. Since the guideline ultimately differed from the package leaflet, the incompatibility thus remained. However, the guideline developers could tolerate the tension on the grounds that it was the result of continuous professional judgment, which may legitimately deviate from the leaflet.

The third example happened during a user feedback session on how to deal with people needing additional vaccinations to meet other countries’ immunization requirements for travel. The conversation started with some guideline developers opposing to address this issue in the guideline. They argued that there was no medical reason for vaccination (science repertoire) and that it concerned foreign countries rather than the national vaccination program (process repertoire). At this point, the discussion could have ended with disconnection (disregarding the need for vaccination for travel and guidance in this case as irrelevant) or with passive juxtaposition (acknowledging all different repertoires as legitimate, without taking further action). However, P4 and P5 spoke up and stressed that guidance was needed, recalling that some cohorts were exclusively offered Johnson & Johnson vaccines, with one injection being sufficient, which was now causing problems.

P5: Yes, I can agree with part of [P4]. It results in very big discussions when people need it for something. I recognize that from our care. No, I hope that there will be a [guideline] version that, if you need it for something, there can be a way. From a medical perspective, I think, we have to clarify that it is not reasonable. Like the Health Council also says. Let’s see if we can create room for both of them (own highlight).

Eventually, the meeting chair summarized:

P1: If I try to summarize: There is clearly a problem, as all four of you have said, and we have to deal with it. You can’t simply say: this is the guideline and sort it out yourself. […] Because here too, not everything will be possible and some things will not be perfect from a medical standpoint, but not a disaster either, so to speak. […]

Through the push and invitation to think about possible options, P4 and P5 prevented the tension from being settled too quickly and paved the way for kaleidoscopic integration. One suggestion on how to proceed was to explicitly describe the considerations in the guideline:

P6: Well, okay those considerations you mention, [P1], we say within a month we’re going to boost? I don’t think so, but you can say a booster makes no sense medically if you do it within three months. So, if someone can wait, you advise them to come back later. If they can’t wait because they have to go on a compulsory trip, you can explain to them what it would entail to get an earlier vaccination. But it’s precisely having that on paper that every professional can pass on these considerations.

Instead of resolving the tension between repertoires, the strategy here was to make it explicit and conveyable. So, the tension persisted but tools were provided to help navigate it. In a later meeting, they found a way to incorporate the tension into the guideline through a special headline structure:

P3: Yes, I think we should do that (…) because you do have to offer the Municipal Health Services something of an approach because otherwise, you get all sorts of discussions on site. But surely, we can split that up between “these are the medically substantive reasons and considerations to vaccinate, these people get this because they get better from it”, so to speak. And then a separate heading:

Vaccinating for other purposes. And then we can just give some factual information.

This proposal was ultimately adopted in the guideline. Separate headlines and explaining the considerations at hand are both techniques for bringing opposing repertoires together without reducing either and without resolving the tension between them. The particular achievement that guideline developers accomplished here is that they made consequential decisions without the premise of reconciling differences and finding consensus first. They created spaces of exceptions, such as relying on professional judgment and structural arrangements in the guideline text, which enabled knowledge integration while incompatibilities persist. Table 1 provides an overview of all eight repertoire interaction types, the actions taken in each case, and the implications for the initial differences and incompatibilities between repertoires.

5. Discussion

5.1. Rethinking knowledge integration

In this study, we merged Moreira’s (2005) repertoires of evaluation with Dewulf and Bouwen’s (2012) frame interaction framework to, first, sort and systematize the different types of reasoning and, second, analyze their interactions in the discussions during the Dutch COVID-19 vaccination guideline development meetings.

Although we largely relied on Moreira’s repertoires “science”, “practice”, “politics” and “process” in this analysis, we also encountered a few arguments that did not easily fit into any of the four repertoires. One example of this was the argument about distributional fairness of vaccines, i.e., whether it is justifiable that some people in the Netherlands had already gotten their second vaccination while others had not yet received their first vaccination, pointing to a repertoire of “equity” that may appear in guideline development depending on the topic.

Similarly, Dewulf and Bouwen’s (2012) framework highlighted important repertoire interaction patterns and how these might shape the outcome of the discussion. During our analysis, we identified three other repertoire interaction types that can be valuable extensions of the framework, especially through integration types such as “passive juxtaposition”, where a contrast is pondered upon but action is not taken, and “kaleidoscopic integration”, where integration is achieved while antagonisms are maintained. These additional types are not contrary to Dewulf and Bouwen’s (2012). In fact, the different types often alternate and build on each other during the process of knowledge integration; an interplay that may be crucial for reaching a satisfactory
outcome.

In this study, we have tried to open up the notion of “knowledge integration” and have demonstrated various ways in which knowledges can interact and be integrated. This is a crucial lesson, especially with regard to the introduction of formal consensus methods in clinical guideline development and other fields (Arakawa and Bader, 2022; Carter et al., 2021). It might be more valuable and yield results that are more favorable for all participants if consensus is not perceived in a narrow sense but can encompass a range of interaction types. Furthermore, consensus may not always be the most preferable solution; different situations might require different types of repertoire interaction and integration.

We would like to draw particular attention to forms of knowledge integration that enable the integration of different kinds of knowledge while allowing incompatibilities to remain. There is a need in guideline development in particular, and in multi-actor collaborations in general, for ways to draw on diverse knowledge without first having to resolve differences and contradictions. Such forms of integration are rarely part of current knowledge integration frameworks and also not fostered in practice.

We used the term “kaleidoscopic integration” to denote this type of knowledge integration. It was coined by Rip (2000, p. 13), who briefly mentioned it a few times and described it as “integration without doing away with antagonisms and outliers [sic]”. Exploring this notion further, we found that kaleidoscopic integration is a process that enables the combination of different types of knowledge, where each element is taken seriously and preserved, and tensions that may arise are not resolved but accommodated. It may enable and encourage actors to draw on different, conflicting types of knowledge, and to sustain and manage contradictions. In our case, guideline developers navigated the tension e.g. by invoking professional judgment — an approach that stands out in contrast to prevailing trends in healthcare, where changing practices in response to increasing accountability, standardization and datafication often restrict the scope for professional judgment (Hoeyer and Wadmann, 2020; Allen et al., 2023). Tensions were also navigated by making the contradictions explicit, e.g., by describing the respective considerations in the guideline or by using a specific heading structure. An example of the latter can be found in the Dutch guideline for chronic fatigue syndrome (ME/CFS) (Dutch Association of Medical Specialists, 2013). The list of treatment recommendations is followed by the heading “Position of patient representative regarding the first 4 recommendations” explaining why the patient representative disagrees with those recommendations. Such a kaleidoscopic recommendation may be surprising in a guideline; however, it may be preferable for physicians and for patients to know of the deliberations and differences rather than only receiving a coherent list of unequivocal recommendations. While this example concerned guideline development, awareness of the variety of knowledge interactions and the possibility of kaleidoscopic integration holds equal value in other knowledge-intensive decision-making processes, for example in health technology assessment (Gunn et al., 2023).

5.2. How can meaningful knowledge interaction be facilitated?

Our analysis draws attention to the various possible knowledge interactions encompassed in the concept of “knowledge integration”, especially to those in which integration is achieved while differences are preserved. Furthermore, for our findings to best support collaborative work, the question emerges as to how meaningful repertoire interaction can be facilitated. In principle, all 8 repertoire interaction types can play an important role in the knowledge integration process. However, when referring to meaningful repertoire interaction, we generally consider repertoire interactions where both repertoires are taken seriously as a starting point for finding a solution as more desirable than repertoire disconnection or polarization where differences are disregarded or exacerbated without arriving at a workable outcome. The latter generally do not occur out of principle, but because of the hierarchical order of medical knowledge that often results in the marginalization of knowledge that does not fit the dominant image. While some scholars believe that there is “no universal formula for integration” (Klein, 2012), we did observe some patterns and characteristics that seem to influence the dynamics of the discussion.

First, a crucial skill we have already mentioned is the ability to accept and sustain tension, that is, “the tension of holding incompatible things together because both or all are necessary and true” (Haraway 1985). Kaleidoscopic integration and passive juxtaposition in particular invite actors to think about how to cope with tension in other ways than by resolving it. For this, guideline developers had to resist the temptation to put tensions aside too quickly. Especially for kaleidoscopic integration this was achieved several times by individual participants speaking up and encouraging or demanding to further think through an issue.

Second, another key competency that guideline developers practiced – consciously or unconsciously – that facilitated more meaningful repertoire interaction was frame reflection (Schön and Rein, 1994), or rather repertoire reflection. Frame reflection refers to the process of becoming aware of one’s own perspective in relation to the perspective of others (Schön and Rein, 1994). The guideline developers engaged in repertoire reflection when they made an effort to reflect on their own and the other’s position in a particular situation, i.e., putting themselves in the other’s shoes. Most importantly, they voiced this reflection. For example, in the discussion about providing vaccines to people for travel, one of the guideline developers stated clearly that she understands the others’ reservations, but nevertheless encourages them to think further:

> Look I also don’t think it makes sense that if we gave these people their booster in December that we are already going to give them their next vaccination, but when would that be possible? And under what conditions?

Our data indicate that there was significantly more repertoire reflection practiced during repertoire reconnection, reconciliation, passive juxtaposition, and kaleidoscopic integration than during disconnection and polarization. In discussions characterized by strong polarization or disconnection, no or little repertoire reflection was carried out by the guideline developers. During the sequences that we coded as kaleidoscopic integration, repertoire reflection was even performed reciprocally by both opposing spokespersons. Building on this observation, stimulating and engaging in repertoire reflection might be a critical step in fostering productive knowledge interactions, like kaleidoscopic integration, within multi-actor collaborations.

Lastly, we would like to pursue an impression that the way a repertoire is represented in the guideline meeting might also affect what types of repertoire interactions are initiated. Repertoires are incorporated into guideline meeting discussions in a number of ways. For example, they may be brought forward by medical advisors who are no longer practicing physicians but draw on their practical experience and professional knowledge to advise the guideline development group. Another route was that repertoires were directly conveyed to a guideline developer at a previous meeting, such as a user feedback meeting, and were then indirectly re-narrated by that guideline developer. At times, repertoires and other stakeholders’ interests, questions, or needs were simply assumed and anticipated. Finally, repertoires were being represented directly in the discussion, as was the case on several occasions in user feedback meetings.

More careful analysis is needed to determine how the presence of a repertoire might affect repertoire interactions and integration, but we were able to discern some initial trends. When repertoires were directly represented in guideline development meetings, it led to reconciliation and kaleidoscopic integration. Other levels of presence, e.g., through medical advisors, or previously conveyed to guideline developers or pure imagination, led to different interactions. Although these are only initial analyses of selected meetings, this could be a hint to firstly highlight the importance of user feedback meetings and secondly to
improve other methods to make different types of knowledge present during the guideline development process. Exploring inventive ways of making such different types of knowledge present may be crucial for facilitating generative knowledge interactions in other instances of knowledge-intensive decision-making as well.

6. Conclusions

Our analysis demonstrates the variety of possible interactions between different knowledges, encompassed in the term “knowledge integration”. Next to Dewulf and Bouwen’s (2012) interaction types of disconnection, polarization, accommodation, incorporation, and reconnection, we have identified three additional types: reconciliation, passive juxtaposition, and kaleidoscopic integration. Based on empirical examples from the Dutch COVID-19 vaccination guideline development, we examined for each of them which actions the actors performed, how the interaction affected the original differences and incompatibilities between repertoires, and how this may shape the potential for knowledge integration in a discussion. Arguably, the complex and continuously changing context of the COVID-19 vaccination guideline development affected the possibilities for knowledge integration compared to traditional guideline development processes. The uncertainty and lack of scientific studies in the case of COVID-19 necessitated the consideration of a wide range of knowledge but also limited efforts toward knowledge integration due to time constraints.

We have particularly highlighted and advanced forms of integration such as kaleidoscopic integration, where different types of knowledge are integrated, while each element is taken seriously and preserved, and the resulting tension is navigated rather than resolved. In our case, the guideline developers accomplished this by relying on professional judgment and rendering contradictions explicit, e.g., by describing the respective considerations in the guideline or by using a specific heading structure. We have found that more fruitful interactions can be facilitated by allowing for tension, engaging in repertoire reflection, and potentially making various types of knowledge more directly available at guideline development meetings.

Becoming aware of the variety of knowledge interactions as well as the possibility for knowledge integration without having to resolve all differences may broaden our horizon in terms of knowledge integration beyond the pursuit of consensus. It might enable and encourage actors in facilitating generative knowledge interactions in other instances of knowledge integration due to time constraints.

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Appendix A. Supplementary material

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References


