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# Geriatric Education Programs for Emergency Department Professionals: A Systematic Review

Gijs Hesselink, PhD,<sup>\*†</sup> Mehmet Demirbas, MD,<sup>‡</sup> Marcel Olde Rikkert, MD, PhD,<sup>‡</sup> and Yvonne Schoon, MD, PhD<sup>\*\*‡</sup>

**OBJECTIVES:** To evaluate geriatric education programs for emergency department (ED) professionals based on: content and teaching methods and learning outcome effects and factors promoting or hindering program implementation.

**DESIGN:** Systematic review.

**SETTING:** ED.

**PARTICIPANTS:** Physicians, nurses, and medical residents working in the ED.

**METHODS AND MEASUREMENT:** Five major biomedical databases were searched for (quasi) experimental studies, published between 1990 and April 2018, evaluating geriatric education programs for ED professionals. Data were synthesized around study quality, learning participants, teaching content and methods, and Kirkpatrick learning outcomes.

**RESULTS:** Nine before-after studies were included. Learners were mostly ED residents and, to a smaller extent, ED nurses and physicians. Study quality was moderate, with the lowest scores on sampling and instrument validity. Programs varied from a 1-day workshop to a 2-year curriculum, mostly combining didactic lectures with active and experiential learning formats. Topics commonly addressed included managing: geriatric syndromes, trauma and falls, medication, atypical presentations, and care transitions. Statistically significant improvements were mostly found in learners' knowledge acquisition (six studies). Significant improvements were also found in single studies on: self-reported geriatric screening, documentation of geriatric care, and appropriate urinary catheter placement. Factors promoting program implementation included: solving competing educational demands and busy work schedules, embedding the

program in preexisting curricula, and close collaboration between emergency and geriatric medicine faculties.

**CONCLUSIONS:** Various geriatric education programs improve the geriatric knowledge of ED professionals and seem to positively impact their clinical practice. However, more program evaluations with larger study samples, and use of valid and reliable outcome measures, are needed to provide robust evidence on the effectiveness of such programs. *J Am Geriatr Soc* 67:2402-2409, 2019.

**Key words:** education and training; emergency department; geriatric emergency medicinesystematic review

Older adults will comprise an increasing share of emergency department (ED) patients in the coming years as the ED is the most common entry point to healthcare for the aging population worldwide.<sup>1-4</sup> Older adults often attend the ED with atypical signs, comorbidity, and polypharmacy,<sup>5-7</sup> which complicate the diagnosis and treatment of underlying diseases.<sup>8,9</sup> Under these circumstances, they are at higher risk of being misdiagnosed,<sup>8,10,11</sup> experiencing a prolonged ED stay,<sup>12,13</sup> revisiting the ED,<sup>14</sup> and experiencing negative health outcomes after ED discharge compared to younger counterparts who visit the ED.<sup>8,9</sup>

With the growing number of ED visits by older adults and their increased risk of adverse outcomes, it is imperative for ED professionals to have geriatric expertise. However, ED professionals have historically not had specific training or been provided with guidelines for the care of frail older people.<sup>15</sup> Several studies have reported that ED professionals feel unconfident in dealing with complex older patients,<sup>16-18</sup> which may be related to the underrepresentation of older patient care issues in the medical and nursing curricula.<sup>19</sup> Surveys by the American College of Emergency Physicians (ACEP) found that practicing EPs considered it more difficult to manage older adults compared to younger counterparts and that the time spent during residency training on geriatric emergency medicine (GEM) was inadequate.<sup>20</sup> Furthermore,

From the \*Emergency Department, Radboud University Medical Center, Radboud Institute for Health Sciences, Nijmegen, The Netherlands; <sup>†</sup>IQ Health Care, Radboud University Medical Center, Radboud Institute for Health Sciences, Nijmegen, The Netherlands; and the <sup>‡</sup>Department of Geriatric Medicine, Radboud University Medical Center, Radboud Institute for Health Sciences, Nijmegen, The Netherlands.

Address correspondence to Gijs Hesselink, PhD, IQ Health Care, Radboud University Medical Center, Radboud Institute for Health Sciences, PO Box 9101, 114 IQ Healthcare, 6500 HB Nijmegen, the Netherlands.  
E-mail: gijs.hesselink@radboudumc.nl

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various reports have indicated that the majority of nurses caring for older populations have not received adequate geriatric education through formal or continuing programs.<sup>21,22</sup>

Fortunately, the need for more education and training in GEM is being increasingly recognized. The Institute of Medicine<sup>21</sup> and ACEP<sup>23</sup> have called for improved geriatric curricula in EM residency training programs. Suggested curriculum domains in Europe and the United States have been published, highlighting the competencies that might be expected of professionals who provide care to older adults in the ED.<sup>15,24</sup> Moreover, the ACEP, the American Geriatrics Society, the Emergency Nurses Association, and the Society for Academic Emergency Medicine formed a task force in 2011 to provide guidelines intended to improve the quality of ED geriatric care. An important guideline consisted of the provision of residency and continuing GEM education for ED staff.<sup>25</sup> Despite the increased awareness of the need to educate ED staff in GEM, a comprehensive evaluation of interventions targeting this problem is lacking. Several reviews have studied the effects of various strategies to improve the quality of care of older people at EDs,<sup>26-29</sup> but none of these reviews evaluated strategies with educational purposes.

Better insight into the features and learners' effects of geriatric education programs is needed to assist managers and professionals in emergency care worldwide by deliberately selecting and implementing programs based on available evidence. Therefore, our aim is to systematically review (quasi) experimental studies evaluating a geriatric education program for ED professionals on educational content, teaching methods, and effects.

## METHODS

We planned and reported this systematic review in accordance with the guidelines for performing and reporting systematic reviews and meta-analyses.<sup>30</sup> The protocol of this review is accessible on the International Prospective Register of Systematic Reviews (PROSPERO) website (registration number CRD42018094829).

### Data Sources and Searches

We searched for studies published between January 1990 and April 2018 in the following databases: PubMed, Cumulative Index to Nursing and Allied Health Literature, Cochrane Library, EMBASE, and PsychInfo. Our search strategies comprised a combination of key search terms related to the concepts of “emergency department,” “elderly patients,” “geriatric emergency medicine,” “education” and “(quasi) experimental studies.” The Supplementary Text S2 provides a detailed listing of the search terms. References of the selected publications were manually checked to identify additional relevant studies that were missed in the database search. We also searched for additional relevant studies in the online archives/bibliographies of four high-impact journals in the field of emergency care and geriatric care (ie, *Annals of Emergency Medicine*, *Academic Emergency Medicine*, *Aging Research Reviews*, and *Age and Ageing*).

### Study Selection

Two researchers (G.H. and M.D.) independently assessed the inclusion eligibility of the retrieved studies using the search

strategy. The initial selection for inclusion was based on the title and abstract of the study. When the title and abstract provided insufficient information to determine the relevance, a full-text copy of the article was retrieved and reviewed. For the final selection, a full-text copy of the study was examined to determine whether it fulfilled the inclusion criteria. Disagreements about inclusion were resolved by discussion. When no consensus could be reached, an experienced geriatrician (Y.S.) made the final decision. Studies were included if they: (1) were described in a peer-reviewed and published article with an abstract in English language; (2) used an experimental or quasi-experimental design (ie, randomized controlled trial [RCT], non-RCT, controlled before after, time series); (3) tested an education program in geriatric medicine (GM); (4) were for professionals working in an ED (ie, physicians, nurses, and residents); and (5) reported one or more learning outcome effects, as classified by the Kirkpatrick hierarchical model: learner satisfaction, attitudes, knowledge or skills acquisition, behavioral change, changes in clinical practice, and benefits to patients.<sup>31</sup>

### Data Extraction

One researcher (G.H.) and one research assistant (J.v.H.) independently extracted data from the included studies using a standard data entry form. In accordance with the Best Evidence Medical Education review protocol,<sup>32</sup> we extracted data on study design and setting, intervention descriptors, methodological quality, and outcomes of interest. Any disagreement was resolved by discussion and, if needed, a final decision was made by the third researcher (Y.S.). We also extracted information on factors that authors described (ie, in the “Results” and “Discussion” sections) as promoting or limiting the program's implementation.

### Assessment of Study Quality

One researcher (G.H.) and one research assistant (J.v.H.) independently rated methodological quality. Study quality was evaluated with the Medical Education Research Quality Instrument (MERSQI).<sup>33</sup> The MERSQI focuses on study design in medical education. A cumulative score (range = 5-18) is calculated from six domains, including study design, sampling, type of data, validity of the evaluation instrument, data analysis, and outcomes. In the case of multiple outcome measures with varying validity scores, both scores were registered and the highest score was selected. The decision on whether the criteria were fulfilled was resolved by discussion or by consulting a third reviewer (Y.S.). Interrater agreement for the individual domains of the risk of bias was calculated by between-group  $\kappa$  agreement, using the assessments from each reviewer before resolution of disagreements. Any disagreement was resolved by discussion among the researchers and, if needed, a final decision was made by the third researcher (Y.S.). Although there are no defined cutoff values differentiating high-quality from low-quality study methods, one study used an MERSQI score of 14.0 or greater as an a priori cutoff of high quality.

### Data Synthesis and Analysis

Data were organized in tabular form, and a qualitative assessment was made based on the study design, methodological quality, type of participants, educational content, teaching

methods, outcome measures, reported effects, statistical significance, and direction of effects observed. We also used simple descriptive statistics to summarize the findings. Educational content from the included studies was categorized on the basis of a framework covering GEM topics. The framework was established after initial detailed reading of all included studies and literature on described competencies for the care of older people in emergency care, as developed by the European Task Force on Geriatric Emergency Medicine (ETFGEM)<sup>15</sup> and an iterative analysis of the educational topics that were addressed in the included studies. After an iterative review and modification by other reviewers, one reviewer applied the final framework to categorize the teaching content from the included studies. We classified learning outcomes using a modified version of the Kirkpatrick classical model<sup>31</sup> by Barr et al,<sup>34</sup> which included impacts on learners' satisfaction (level 1), changes in learners' attitudes or perceptions (level 2A), learners' acquisition of knowledge or skills (level 2B), changes in learners' behavior (level 3), changes to clinical practice (level 4A), and benefits to patients (level 4B). Furthermore, the identified citations describing important factors that limited or promoted the implementation of the evaluated programs were summarized for overarching concepts by one researcher (G.H.).

## RESULTS

### Search Results

Our initial search identified 7122 records. After exclusion of duplicates, 5626 records were screened by title and abstract. Sixteen full-text studies were retrieved and reviewed, of

which eight were excluded. One study was identified through snowballing, so the final set consisted of nine published studies that underwent full-text extraction (Figure 1).

### Study Characteristics

The vast majority (8 [89%]) of studies that evaluated education programs were conducted in the United States<sup>35-42</sup>; one came from Canada (Supplementary Table S1).<sup>43</sup> Participating learners consisted of EM residents in four studies, emergency nurses (ENs) in three studies, EPs in one study, and both EM residents and medical students in one other study.

Most studies (n = 7) used a pre-post multiple or "true/false" choice test to assess participants' knowledge gain on GEM or related issues. Five studies (56%) used questionnaires to assess participants' perceived changes in attitudes toward (caring for) older adults,<sup>38,39,42</sup> GEM competencies,<sup>36</sup> and practice patterns,<sup>43</sup> respectively. Medical charts were reviewed in two studies to assess changes in clinical practice<sup>39,40</sup> and benefits to patients after completion of the education program.<sup>40</sup>

The timing of the measurement of outcomes varied. In two studies, assessments were made immediately or shortly after the intervention. Follow-up measurement periods varied within and between studies from immediate to 15 months after the completion of the education program.

### Study Quality

The overall methodological quality of the studies was moderate (Table 1; Supplementary Table S3). The average MERSQI

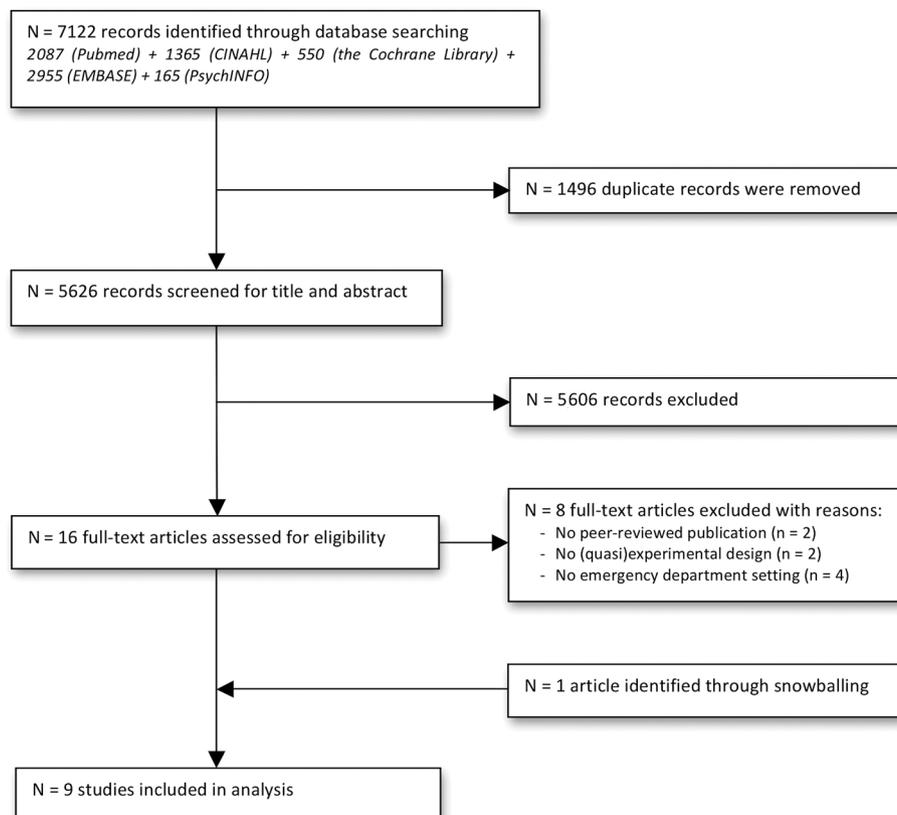


Figure 1. Flow chart of the study selection and review process.

score was  $12.6 \pm 1.6$ , with scores ranging from 11 to 15.0 (median = 12.5). Interrater agreement for the individual scoring domains varied between a  $\kappa$  score of 0.4 and 1.0. Eight teaching interventions were evaluated with single-group before-after test(s); one was evaluated in a controlled before-after design. More than half of the teaching interventions ( $n = 5$ ) were conducted at one medical center or at a 1-day conference site. The overall median participant sample size in the premeasurement and postmeasurement groups was 49 and 51, respectively. All nine studies consisted of a heterogeneous participant sample (eg, based on the type of institution, geographic location, clinical background, working experience, and postgraduate year). Five studies had a response rate lower than 75% or did not report the response rate. Most studies provided poor evidence, supporting the validity of the evidence found; eight studies described the content validity of the evaluation instruments used, but they lacked information on the construct validity of the instruments. Of the six studies using a multiple-choice knowledge test, one reported high-quality (internal) reliability of the instrument.<sup>41</sup> Study findings based on medical chart reviews were possibly subjected to bias because of poor interrater reliability<sup>39</sup> and the absence of a second reviewer.<sup>40</sup> In addition to the use of objective multiple and “true/false” choice tests ( $n = 7$ ), more than half of the studies<sup>36,38,39,42,43</sup> used a self-reported questionnaire to assess pre-post effects, potentially introducing response bias.

### Intervention Characteristics

The content and format of teaching interventions varied across studies (Table 1; Supplementary Table S1). Most interventions (seven studies) combined didactic lectures with active and experiential learning formats (ie, small group case-based discussions, simulations, and individual feedback on geriatric practice). Five teaching interventions consisted of a 1-day lecture, workshop, or course; these interventions were mainly given to EPs and ENs.<sup>35,36,41-43</sup> The other four interventions were educational programs or curricula for EM residents and medical students, with teaching sessions spread over a period of time varying from 2 weeks to 2 years. Educators included physicians, nurses, a pharmacist, and a social worker—all specialized in geriatric (emergency) medicine—and geriatric and EM faculty members.

The teaching programs addressed a range of GEM topics (Table 1). The most common topics were: geriatric syndromes, trauma, pharmacy, atypical presentations of common diseases, and care transitions/ dispositions.

### Changes in Attitudes and Perceptions

EM residents’ views on aging and caring for older people generally improved after following a geriatric curriculum (1-2 years), but no statistically significant pre-post changes were observed.<sup>38,39</sup> Except, there was a shift ( $P = .03$ ) of residents toward strong disagreement with the statement: “Taking a medical history from an elderly patient is an ordeal.”<sup>38</sup> However, this result was based on a small sample. Rhew et al reported improved attitudes of ENs toward older adults after a 1-day geriatric workshop, but the improvements were not statistically significant.<sup>42</sup>

### Changes in Knowledge and Skills

Six of the seven studies that quantified knowledge acquisition reported statistically significant overall knowledge improvements. These studies evaluated programs with a didactic and experiential or active learning component. A 2-week pharmacist-led training program improved residents’ knowledge of evidence-based pharmacologic care standards for older adults.<sup>37</sup> A 2-year geriatric curriculum improved EM residents’ knowledge of geriatric clinical decision making in their first and third postgraduate year.<sup>38</sup> One-day programs improved GEM knowledge of EPs,<sup>35</sup> ENs,<sup>36,43</sup> and EM residents.<sup>41</sup> GEM knowledge improved specifically on: functional decline, trauma, abuse/alcoholism, delirium, acute abdominal pain,<sup>35</sup> atypical presentations, modification of EM intervention, falls, care transition, cognitive and behavioral problems, palliative care,<sup>41</sup> and medication.<sup>37,41</sup>

Désy et al reported no statistically significant pre-post differences between the ENs’ self-reported overall ability to provide geriatric care.<sup>36</sup> Nevertheless, more than 25% of the ENs participating in this study reported an increased ability to assess: the patient’s environment, daily functioning and nutritional status, and diagnosing depression, delirium, and dementia. Additionally, improved ability to provide end-of-life care and appropriate referrals to services were reported.

### Behavioral Change

One study demonstrated statistically significant improvements in ENs’ self-reported behavior after the completion of a 1-day geriatric workshop<sup>43</sup>; 1 month after the workshop, ENs screened more frequently for depression and altered mental status and for assistance at home.

### Changes in Clinical Practice

Two studies reported on changes in clinical practice. Biese et al measured pre-post frequencies of both chemical sedation and urinary catheter placement to evaluate a 1-year geriatric curriculum for EM residents.<sup>39</sup> The authors regarded these practices as potentially harmful and possibly overutilized in the ED setting. The frequencies did not significantly change after the completion of the curriculum. Wadman et al evaluated pre-post changes in EM residents’ documentation of geriatric care at the ED following a series of didactic lectures on three common complaints for older adults (ie, abdominal pain, weakness, and falls).<sup>40</sup> Documentation on cognitive assessment—for older adults with one of these three complaints—improved significantly after the program. For older adults attending the ED with one specific chief complaint (ie, abdominal pain or weakness), significant improvements were also found in the documentation on atypical presentations, communication with the chronic care facility or caregiver, and assessment for polypharmacy.

### Benefits to Patients

One study measured benefits to patients in terms of an intermediate clinical outcome.<sup>39</sup> Based on a 1-month pre-post assessment of almost 50 medical charts, the authors reported a statistically significant reduction of inappropriate urinary catheter placement among older patients, from

**Table 1. Features and Effects of Teaching Interventions Related to the Kirkpatrick Classification of Learning Outcomes and the Study Quality**

First author (year)	GEM topics covered in teaching intervention										Effects per learning outcome <sup>a</sup>				Study quality <sup>b</sup>				
	Aging	Atypical signs	Geriatric syndromes	Trauma	PA/FA	Abuse/neglect	Pharmacy	PC/AD	Care transition	Care instruments	Screening	Other	Teaching form	2A		2B	3	4A	4B
Witzke <sup>35</sup> (1997)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>od</sup>	DL; CBL	↑; ↔	↔	↔	↔	↔	↔	11
Brymer <sup>43</sup> (2001)			✓		✓			✓				DL; CBL	↑; ↔	↔	↔	↔	↔	↔	11
Désy <sup>36</sup> (2008)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>e</sup>	DL; CBL	↑; ↔	↔	↔	↔	↔	↔	12.5
Jellinek <sup>37</sup> (2008)												CBL; RP	↑						11.5
Prendergast <sup>38</sup> (2010)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>f</sup>	DL; CBL; IL; Sim	↑; ↔	↑; ↔	↔	↔	↔	↔	12.5
Biese <sup>39</sup> (2011)			✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>dg</sup>	DL; Sim	↔	↔	↔	↔	↔	↔	15
Wadman <sup>40</sup> (2012)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>d</sup>	DL	↔	↔	↔	↔	↔	↔	11
Hogan <sup>41</sup> (2014)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		DL; CBL	↑						14
Rhew <sup>42</sup> (2017)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>h</sup>	DL; IL	↔	↔	↔	↔	↔	↔	14.5

*Note.* ↑ indicates statistically significant effect in favor of the post group based on  $P < .05$  threshold for statistical significance; ↔, no statistically significant pre-post effects based on  $P < .05$  threshold for statistical significance.

Abbreviations: AD, advanced directive; CBL, case-based learning; DL, didactic lecture; FA, functional assessment; GEM, geriatric emergency medicine; IL, interactive lecture; PA, physical assessment; PC, palliative care; RP, reflective practice; Sim, simulation.

<sup>a</sup>Learner outcomes are classified using the modified version of the Kirkpatrick model<sup>24</sup> by Barr et al,<sup>25</sup> which includes impacts on learners: satisfaction (level 1), changes in attitudes or perceptions (level 2A), acquisition of knowledge or skills (level 2B), changes in behavior (level 3), changes to clinical practice (level 4A), and benefits to patients (level 4B).

<sup>b</sup>Based on the Medical Education Research Quality Instrument score.

<sup>c</sup>Acute abdominal pain.

<sup>d</sup>Acute myocardial infarction, infectious disease, or cerebrovascular accident.

<sup>e</sup>Pain.

<sup>f</sup>Acute coronary syndromes, heart failure, or infectious disease.

<sup>g</sup>Fatrogenic injuries.

<sup>h</sup>Nutritional assessment, nonpharmacological alternatives, or sensory changes in older adults.

16.3% before the implementation of a geriatric curriculum to 2.1% afterwards.

### Factors That Influenced Implementation

Of the nine included studies, six described factors that influenced the implementation of the educational programs. Commonly cited implementation barriers related to learners included: competing educational demands, the level of enthusiasm for geriatric care, and scheduling program activities within existing duty hours and rotations. Important factors related to the educational program included the use of teaching methods that fit with learners' needs and preferences and achieving maximal educational impact in minimal time. A deliberate selection of high-yield GEM topics was perceived as critical to educating learners effectively on often complex geriatric issues. According to some studies, implementation was facilitated when the program could be incorporated into already existing educational structures. One-off teaching sessions were not considered optimal for enhancing knowledge and skill retention. Close collaboration in the development and implementation of educational programs between EM and geriatric medicine faculty members was considered vital for successfully enriching EM didactics with geriatric principals of care.

### DISCUSSION

To our knowledge, this is the first systematic review of the literature evaluating geriatric educational programs for ED professionals on learner outcomes. Most programs were helpful for medical residents, physicians, and nurses in acquiring knowledge on GEM. Interestingly, few studies with moderate methodological quality assessed the program's potential to change behavior, change clinical practice, or improve health outcomes (Kirkpatrick level 3 or 4).<sup>39-43</sup> An even smaller number of studies demonstrated changes in clinical practice and improved patient benefits (Kirkpatrick level 4).<sup>39,40</sup> The significant improvements that were found in these studies did not demonstrate an overall improvement of geriatric emergency care nor benefits for older patients as they only relate to specific older patient groups (eg, those with abdominal pain) and specific medical care (eg, documentation of cognitive assessment). Furthermore, both programs targeted only medical residents. Therefore, the degree to which geriatric care or health outcomes for older adults visiting an ED might improve as a result of specific teaching methods and content remains unclear. Most programs with improved learner outcome effects (Kirkpatrick levels 2-4) consisted of interactive case-based group sessions and simulations. Literature suggests that such active and experiential learning methods are effective ways for learners to bridge the gap between theory and practice, allowing them to take better advantage of their grounding in basic sciences to solve complex patient-oriented problems.<sup>44,45</sup> These learning methods yield higher retention of knowledge and skills and learner satisfaction when compared to the use of traditional didactic lectures.<sup>44,46-48</sup>

The number of studied geriatric education programs for ED physicians and nurses is surprisingly low, knowing that these professionals are often not well trained in geriatrics<sup>19-22</sup> and knowing that GEM expertise is needed to provide high-

quality emergency care for the ever-increasing older patient population.<sup>19,25</sup> The programs that targeted ED physicians and nurses in this review were not assessed on their potential to improve clinical practice and health outcomes (Kirkpatrick level 4). Furthermore, they consisted of only one-time workshops or courses; spaced and repeated delivery of educational activities are needed to achieve long-term improvement of knowledge, skills, and change of practice.<sup>46,49</sup> One-day programs are insufficient to educate ED staff on the wide range of GEM competencies.<sup>15</sup> Furthermore, the included programs were generally developed for single learner types and did not involve patients as educators or participants. This is noteworthy considering that interprofessional education could improve health providers' teamwork skills.<sup>50,51</sup> Bringing providers and patients together in educational settings could also enhance providers' understanding of and dealing with the patients' perspective apart from applying evidence-based standards of care.<sup>50</sup>

The review of studies identified a number of potentially important factors that promote or hinder implementation efforts. Competing educational demands, busy work schedules, learner enthusiasm for the care of older people, program content and teaching methods, and the level of collaboration between emergency and geriatric medicine faculty represent major factors that may influence what would work best to enhance learner outcomes. These findings add to previous reports on the challenges of medical education.<sup>52,53</sup> However, the studies we reviewed did not have the identification of facilitators and barriers to implementation as their primary aim. Consequently, authors may not have recognized or reported aspects of the program implementation systematically.

Our review had several limitations. First, the studies exhibited substantial heterogeneity in terms of the educational content and methods delivered, learners targeted, and learning outcomes reported. Consequently, we did not regard meta-analysis of the data as appropriate. Second, the found effects may relate to a specific setting as many evaluations were based on relatively small samples from single institutions. Third, the effects found may be subjected to bias due to the weak reliability and validity of evaluation methods used across most of the included studies. Fourth, most study outcomes were measured immediately following the participant's completion of the program or a relatively short period later. Hence, whether the program effects are sustained in the long-term is unknown.

In conclusion, the existing literature indicates that educational programs focused on GEM effectively improve the knowledge of ED professionals in this domain. However, the low number of evaluated programs and methodological limitations of the included studies hinder the demonstration of robust evidence supporting these programs, especially those targeting ED physicians and nurses. In the context of the increasing number of older adults attending EDs with geriatric symptoms, our findings call for the development, implementation, and evaluation of geriatric educational programs for ED professionals. We believe that clinicians, educators, and researchers may benefit from the following considerations. First, the development of program content tailored to the local learning needs and interests of ED professionals may maximize learner impact in the limited time available. Second, the use of active and experiential learning methods within repetitive teaching sessions may increase the chance of sustainable learner improvements and improve translation of

knowledge into practice. Third, the involvement of EM and geriatric medicine faculty in program development and implementation is important to align the paradigms of EM and GM and increase learners' understanding of GEM. Fourth, the involvement of patients in educational programs can help ED staff to better recognize older patient needs.<sup>15</sup> Fifth, in addition to knowledge acquisition, future program evaluations must assess changes in clinical practice and health outcomes by using valid and reliable instruments. Only such evaluations will allow us to determine the real success of geriatric education programs. The developed and validated GEM curriculum by the ETFGEM<sup>15</sup> and the GEM competencies for EM residents by Hogan and colleagues<sup>24</sup> can be useful references for developing, implementing, and evaluating local teaching initiatives to better prepare clinicians for the increasing number of older adults in ED settings around the globe.

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**Conflict of Interest:** The authors have no conflicts.

**Author Contributions:** G.H. and Y.S. conceived and designed the study. G.H. and M.B. were responsible for data acquisition. G.H., Y.S., and M.O.R. analyzed and interpreted the data. G.H. drafted the manuscript, which was critically revised for important intellectual content by Y.S., M.D., and M.O.R. All authors read and approved the final article and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

**Supplementary Table S1:** Characteristics of included studies.

**Supplementary Text S2:** Database search strategies.

**Supplementary Table S3:** MERSQI study quality assessment.