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REVIEW ARTICLE

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Geriatric education for pharmacy students: A scoping review

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Abstract

Background: Comprehensive medication management for older adults requires specific knowledge and skills. Therefore, pharmacy curricula should include appropriate strategies to prepare students for care of this population. This scoping review aimed to identify how geriatric concepts, such as geriatric topics and competencies, are included in pharmacy curricula, and to map current literature on preferred teaching and assessment methods related to geriatric pharmacy education.

Methods: Four databases were searched to identify papers involving pharmacy learners, education, and geriatrics. Selection process was a two-step approach, involving independent title/abstract screening by two reviewers, then full-text retrieval for eligibility assessment. All types of articles were considered except opinion papers. Data extraction included details on methodology, participants, setting, educational activity, teaching method, and outcomes assessed.

Results: A total of 2537 articles were identified from which 189 met the inclusion criteria: 221 documents after citation and gray literature searching. Articles were grouped for analysis as education-related intervention articles

Preliminary results were presented to the 2021 Virtual Annual Scientific Meeting of the American Geriatrics Society and the corresponding abstract was published online (Maurice N., Sadowski C.A., Choiniere A., Papillon-Ferland L. Geriatric pharmacy education for undergraduate students: A scoping review. J Am Geriatr Soc 2021;69:S275. doi:10.1111/jgs.17115).

(studies, $n = 100$ or descriptive articles/case reports, $n = 49$), studies not including an education-related intervention ($n = 49$), and others (e.g., reviews, position papers/statements, $n = 23$). Various teaching methods were reported including experiential, didactic, interprofessional, or simulation. Most articles reported positive outcomes on skills, knowledge, or attitudes, but few articles used a validated assessment tool. Curricula and student's surveys were consistent with suboptimal geriatric education, with few programs offering mandatory dedicated geriatric courses or rotations.

Conclusions: Gaps remain regarding geriatric inclusion in pharmacy curricula despite decades of evidence, advocacy, and frameworks to guide its development. A wide diversity of teaching methods has been described and their combination may be considered for skills and competency development. There is a need for the scholarship of teaching and learning to be applied to pharmacy programs in order to prepare future pharmacists for an aging society.

KEYWORDS

competency, curriculum, education, geriatric, pharmacy

INTRODUCTION

Older adults are more likely to experience multimorbidity and polypharmacy,[1,2] which may lead to medication-related harm and require additional care.[3] Pharmacists play a central role in optimizing medications use,[4] including prevention and management of drug-related problems.[4]

Comprehensive medication management for older adults is complex and requires specific knowledge and skill development,[5] which should be included in education programs in health sciences.

However, the place of geriatrics in the pharmacy curriculum is not well established: geriatric coverage varies by country and program, recommendations vary based on the professional association, and inclusion of geriatrics varies between schools.[5–9] Indeed, both the American and Canadian accreditation standards do not explicitly require geriatrics content or courses.[10,11] Student surveys also indicate insufficient confidence in managing geriatric issues.[12,13] It has already been established that, despite a rich literature of recommendations regarding the importance of preparing pharmacists for the care of older adults, the paucity of specialized geriatric education in pharmacy schools is a major problem.[6]

This scoping review aims to identify how geriatric concepts (such as geriatric topics and competencies necessary to develop a patient-centered care approach adapted to older adults) are included and taught in pharmacy curricula internationally, including preferred teaching methods, as well as knowledge and skills assessment related to geriatric pharmacy education.

Key points

- Competency in geriatrics pharmacy education has been identified as a gap for decades and lack of mandatory inclusion in curriculum may contribute to this gap.
- Various teaching methods were identified and a combination may be considered to achieve competency development.

Why does this paper matter?

Pharmacy students need to have adequate geriatric education to care for this population, and this review shows a remaining gap in pharmacy curricula, although evidence is available for multiple educational activities in literature that may inspire and improve curricula.

METHODS

Protocol and registration: Standardized methods by Johanna Briggs Institute and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methods were followed for this scoping review.[14,15]

The protocol was registered with the Open Science Framework.[16]

Search strategy

With the guidance of a health sciences librarian, four databases were searched: MEDLINE, EMBASE, CINAHL, and ERIC (search strategy in Supplementary Table S1, Search Strategy). Databases were searched from inception to April 14, 2024. In addition, gray literature was searched by targeting key pharmacy and geriatric association websites, and institutional repositories were screened.

Inclusion criteria

Articles published in English or French meeting the following criteria were included: education related to pharmacy students (including curriculum, teaching methods, skills training, pharmacy practice experience) and geriatrics, including geriatrics pharmacy-related subtopics (e.g., polypharmacy, deprescribing, inappropriate prescribing). All types of articles were eligible except opinion papers. Conference abstracts were considered if sufficient information was available. Articles from the gray literature were included if they were from the United States, Canada, Western Europe, Australia, and New Zealand due to similarities in pharmacy education.

Selection

Covidence software, version 2024, was used for screening. The article selection was initially tested by multiple reviewers to clarify and refine eligibility criteria. Article titles and abstracts were then reviewed by two independent reviewers, with discrepancies addressed by consensus or a third reviewer when needed. Finally, full-text articles were screened for eligibility following the same method. References from selected articles were searched for additional publications.

Data extraction

Data extraction was done with a standardized data collection form by one reviewer. A second reviewer verified 10% of extracted articles, with a third researcher involved for any disagreements. The variables extracted are available in Supplementary Table S1 (list of variables for data extraction).

Synthesis and analysis

Reports were categorized into three categories for analysis: (1) Studies meeting inclusion criteria (e.g., geriatric pharmacy education related) but not reporting an educational intervention; (2) articles reporting an education-related intervention (studies, descriptive articles); and (3) other types of reports (e.g., reviews, curriculum guides, position statements). Studies in the first category were subcategorized considering similarities in population and design: Curriculum organization studies describing existing geriatric coverage in pharmacy programs, pharmacy students' surveys/interviews, and other types of studies. Descriptive statistics and narrative summary were then used to synthesize the data.

Ethics approval

Approval from the institutional health research ethics board was not required for this study.

RESULTS

Selection of sources

The initial search identified 2537 documents, of which 189 were included (Figure 1). Cohen's kappa coefficient for inter-rater reliability was 0.73 and 0.79 for title/abstract screening and full-text review, respectively. An additional 27 articles were identified by cross-reference screening and 5 documents were added from gray literature search (Supplementary Table S3 Gray Literature Search) for a total of 221 reports. A complete list of included documents is available in Supplementary Table S4 (list of included references).

Synthesis of results

The oldest included document was published in 1977, although most were published after 2010 (70.6%). Papers were mostly from America (United States 77%, Canada 3.6%), followed by Europe (9%) and the Western Pacific (5.9%) (Figure 2). The summary of included documents is available in Supplementary Tables S5 (Curricular organization studies); S6 (Pharmacy students' interview/survey studies), S7 (Education-related intervention studies), S8 (Case reports/descriptive articles), S9 (Studies [other types]) to S10 (Miscellaneous types of articles). Main characteristics are described in Table 1 and below.

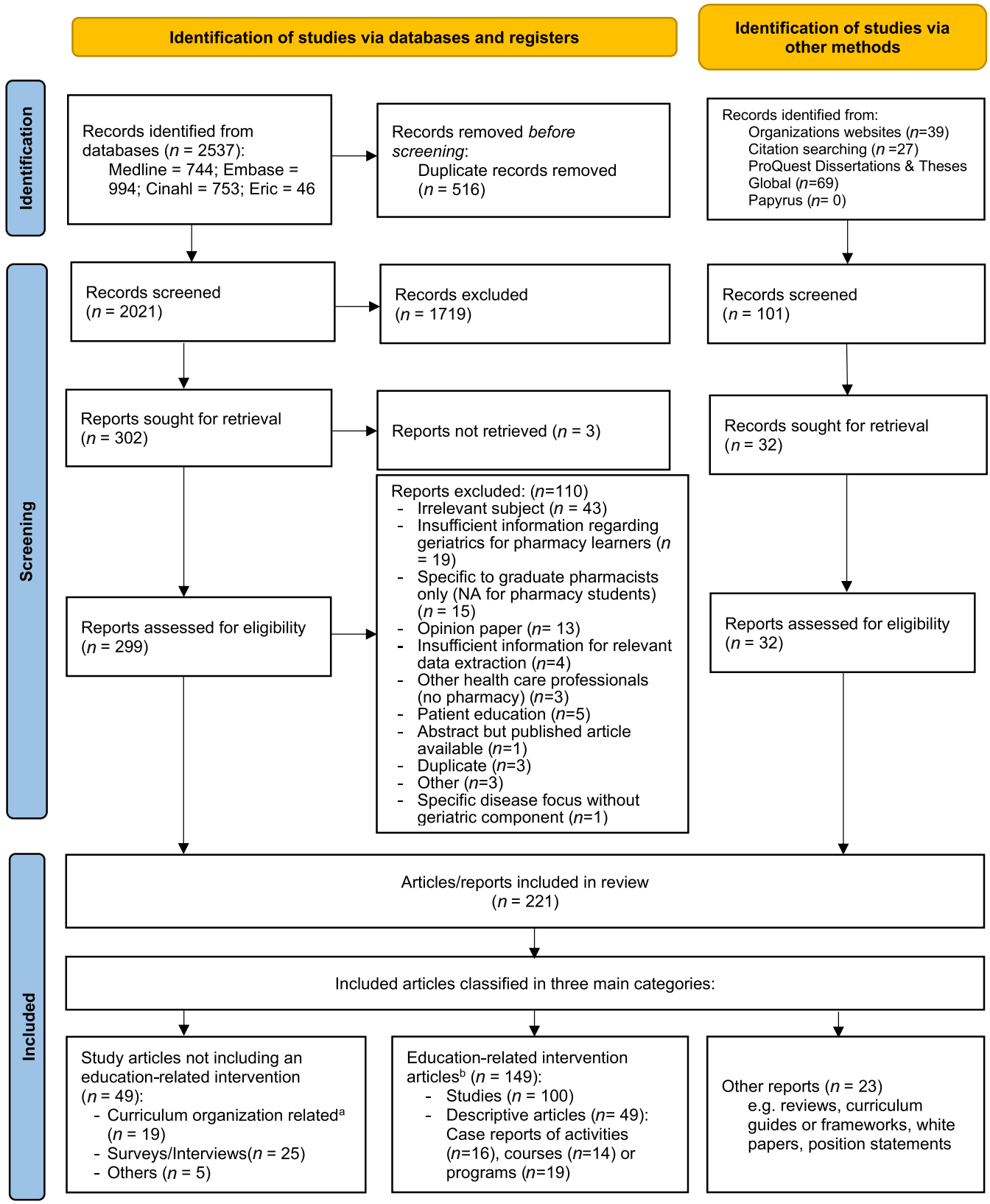

FIGURE 1 PRISMA diagram. [a]Curriculum organization articles were studies describing geriatric coverage in pharmacy programs whose population was defined as schools or faculty members; [b]Education-related interventional articles presented a population being pharmacy students sometimes including professionals (pharmacist, physicians or others), pharmacy residents, and students from other professions such as medicine, nursing, social work, and dentistry.

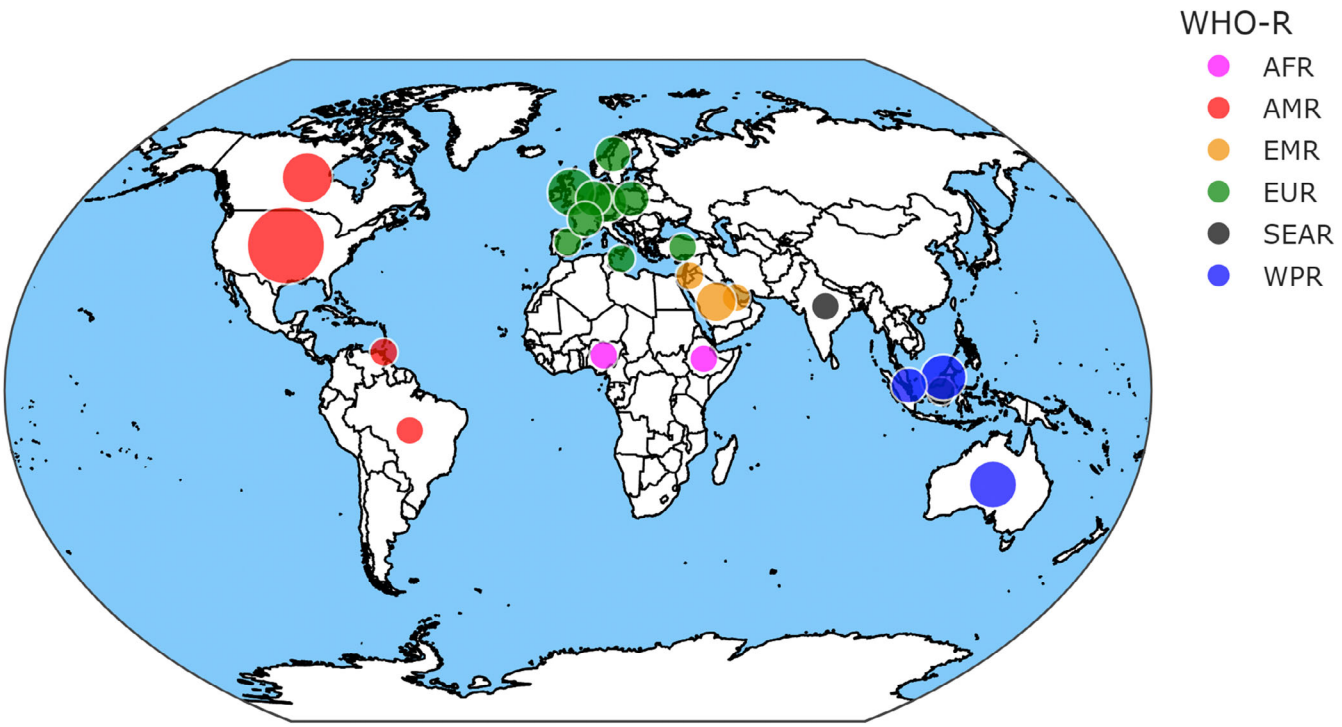

FIGURE 2 Distribution of articles per country of origin ($n = 221$). Coloring classification as per World Health Organization Regions (WHO-R). Bubble sizes follow a logarithmic scale ($s = \log2(n + 1)$). AFR: African Region; AMR: Region of the Americas; EMR: Eastern Mediterranean Region EUR: European Region; SEAR: South-East Asian Region; WPR: Western Pacific Region.

Curriculum organization studies

A total of 19 papers addressed existing curriculum (Supplementary Table S5, Curricular organization studies), most being cross-sectional surveys. Most surveyed or interviewed administrators regarding issues such as geriatrics content or elective status. North American programs consistently did not include mandatory courses, with most programs providing integrated content within other courses, or elective geriatrics courses, although a 2022 American survey reported 35% of schools required a geriatric course.[8] A few studies found that the majority of geriatric rotations were not mandatory.[5,6,17–23] Two studies focused exclusively on residency programs found that geriatrics rotations were available, but less than a third had a mandatory geriatrics rotation.[24,25]

Pharmacy students' interview/survey studies

Thirteen studies assessed pharmacy students' general geriatric knowledge, attitudes toward older adults, or interest in geriatrics (Supplementary Table S6 Pharmacy Students' interview/survey studies). Previously attending a course in aging or past positive experiences with older adults were positively associated with interest in geriatrics.[26–28] Discouraging factors included inadequate geriatric exposure and difficulty communicating with older adults.[27,28] Many studies that assessed geriatric knowledge reported insufficient knowledge.[29–32] However, the majority of students reported an interest in increasing their knowledge of geriatrics and agreed with the importance of geriatric content.[13,31,32]

Eight studies reported pharmacy students' attitudes toward older adults: Positive factors included student's participation in a geriatric course.[33] Previous experience in offering services to an older adult or volunteer work did not significantly affect attitudes.[34,35] Living with an older adult or having regular contact were not consistently associated with positive attitude, with mixed results from available studies.[34–36]

Five studies reported pharmacy students' perspective related to deprescribing, which found insufficient exposure or awareness.[37–39] Confidence or comfort level to manage deprescribing was also modest, and students recommended appropriate training in curriculum.[12,37,40–42]

Finally, three studies assessed knowledge of Alzheimer disease (AD), and. students with prior practice experience or education in AD had significantly higher scores.[43,44]

TABLE 1 Main characteristics of included articles (studies and descriptive articles).

Variables	Article type	
	Curriculum organization studies ($n = 19$)	**Pharmacy student's Survey/ Interview studies ($n = 25$)[a]**
Study design		
Observational	2	0
Qualitative	1	3
Cross-sectional survey	16	22
Single center	2	15
Multiple center	17	9
Results		
Qualitative	1	3
Quantitative	8	19
Mixed	10	3
	Education-related intervention studies ($n = 100$)[b]	**Case reports/ Descriptive articles ($n = 51$)[c,d]**
Study design		
Single center	80	30
Multiple center	20	20
Single group	56	24
Multiple groups; randomized	3	0
Multiple groups; non-randomized	8	2
Multiple serial groups	33	15
Prospective	75	14
Retrospective	25	35
Results		
Qualitative	16	23
Quantitative	36	6
Mixed	48	17
Assessment		
Pre-post	61	8
Post	38	27
Mixed/other	1	4
Study setting		
Skills lab	17	1
Clinical placement	27	23
Classroom	23	5
Mixed	13	10
Other	20	10
Included in geriatric class/ rotation/program	46	38
Not included in geriatric class/rotation/program	49	12
Intervention description		
Single activity	31	5
Longitudinal activity	69	45
Optional activity	36	22
Required activity	41	10
Other/Mixed	9	3
Teaching methods[e]		
Interprofessional	49	25
Experiential	52	39
Didactic	55	28
Simulation or case simulation	28	8
Case study	27	11
Other	32	29
Education provider		
Pharmacy faculty	38	19
Clinical pharmacist	5	7
Mixed (Faculty/Clinical pharmacist)	10	8
Mixed with other professions	38	14
Other	9	1
Population		
Learner type: Pharmacy learners only	44	24
Learner type: Mixed with other professions	56	26
Pharmacy education level: Senior	49	19
Pharmacy education level: Junior	20	4
Pharmacy education level: Mixed	16	10
Sample size: 10 or less	22	9
Sample size: 11–50	31	11
Sample size: 51–100	13	6
Sample size: >100	29	7

(Continues)

TABLE 1 (Continued)

	Education-related intervention studies ($n = 100$)[b]	Case reports/ Descriptive articles ($n = 51$)[c,d]
Outcomes[e]		
Not geriatric education related	9	22
Geriatric knowledge	30	19
Attitudes	55	19
Skills and competencies	38	22

[a]Total *n* in sections below is less than 25 when information was not specified or not applicable in articles.
[b]Total *n* in sections below is less than 100 when information was not specified or not applicable in articles.
[c]Total *n* in sections below is less than 51 when information was not specified or not applicable in articles.
[d]*N* is more than the initial total ($n = 49$) as article Lam, 2013, presented three projects under one.
[e]*N* is more than the initial total as it is possible to offer more than one teaching method or outcomes.

Education-related intervention studies and descriptive articles (case reports)

Among studies ($n = 100$, Supplementary Table S7 Education-related intervention studies) or descriptions ($n = 49$, Supplementary Table S8 Case reports/ descriptive articles) of educational activities ($n = 149$), few ($n = 13$) included a comparator group and only three were randomized. Approximately half of the articles reported only a post-assessment ($n = 65$).

Participants included pharmacy learners exclusively in 68 articles. In articles that included other health professions ($n = 82$), the most frequent were medical or nursing students. Senior pharmacy learners (third-year PharmD students and above) were most commonly included ($n = 68$). A clinical site was the most frequent setting ($n = 50$), followed by classroom ($n = 28$) and then skills laboratory ($n = 18$).

Different teaching methods, such as interprofessional, experiential, didactic, or case simulations, were often combined. Educational interventions with similar characteristics were grouped (Figure 3).

For **experiential activities**, many articles reported a clinical rotation in a long-term care setting, including medication assessments and deprescribing.[45–51] In some cases, the clinical activity aimed to simply promote interacting such as talking with a senior resident to sensitize students to residents' needs.[52] Some case reports described complete immersion in a senior living community, with a student staying with residents for a week[53] or attending a gym program with veterans.[54] Exposure to multiple geriatric settings (long-term, acute, ambulatory care) was also reported.[55,56] Some ambulatory rotations included home or senior center visits to increase student awareness about medication's impact on patients daily life or promoting skills such as communication.[57–60] One experiential setting included a campus-based pharmacy.[61]

Among the 60 articles that reported an experiential activity, many reported interprofessional clerkships ($n = 36$; mainly long-term care, geriatric clinic, home visits, telehealth services). Some interdisciplinary programs targeted specific geriatric issues such as falls,[62,63] bone health,[64] pain,[65] or polypharmacy.[66–69]

Nineteen articles described **other health-related activities**. Some were part of a service learning experience such as companionship or older adult shadowing project,[70–73] others included disease screening and education events.[74–80]

Several articles evaluated **simulations** like "Geriatric Medication Game" or "Geriatric Sensitivity Training exercise", where students experienced scenarios simulating challenges faced by older adults such as sensory impairment or mobility issues to promote empathy toward this population. Polypharmacy simulations involved students taking candies representing medications to improve empathy and awareness of adherence challenges.[81–84] Less common simulation activities included a simulated home environment,[85] a theatrical performance on challenges of aging,[86] an interprofessional simulation on comprehensive geriatric assessments,[87] and having an older person participating in skills lab activities to share their experience and difficulties related to medication adherence.[88]

Various types of **geriatric courses or programs** were reported in 34 articles. An elective geriatric course was described in nine, including didactic mixed with simulation, case study, or games.[78,89–96] Five articles included participation of older adults (e.g., sharing experiences or receiving visits of students in their facilities).[89–92,97] Six articles reported a geriatric program that consisted of didactic courses followed by an experiential rotation.[98–103] Donohoe et al. reported an integrated geriatric curriculum including special population courses (introduction and capstone course), geriatric content integrated throughout therapeutic courses followed by a mandatory APPE geriatric rotation in fourth year.[104]

Fourteen articles described **innovative teaching methods** for their time, either incorporating technology such as virtual patient, web-based case, Facebook discussion,[105–107] games (e.g., escape game, Age Game board game, or Prescribing Cascade Game,[108–110]), or

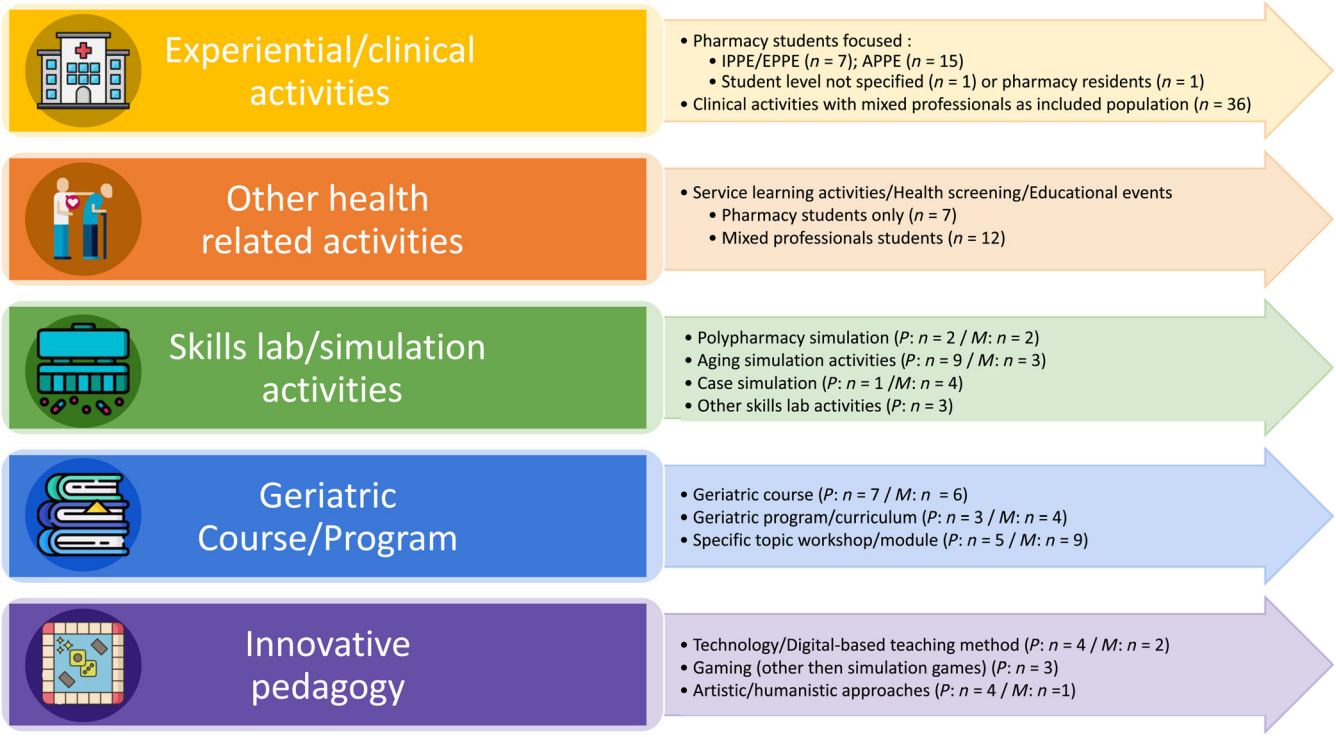

FIGURE 3 Visual summary of education-related interventions (studies and descriptive articles) ($n = 149$). IPPE: Introductory pharmacy practice experience; EPPE: Early pharmacy practice experience; APPE: Advanced pharmacy practice experience; P: Pharmacy learners only; M: Mixed professional students. The list of references for each category is available in Supplementary Table S11. The n is more than the initial total ($n = 100$) since article Lam (2013) presented three projects under one. Source Icon credit: Flaticon.com.

artistic/humanistic approaches (e.g., movie, life review, visual arts).[111–113]

Topics description

A few courses or workshops targeted specific topics, such as falls prevention,[73,78,102] delirium,[114] diabetes management,[115] dementia,[116] hearing impairment,[117] the 5 M's geriatric assessment,[118] or medication management.[119] However, for most activities, multiple topics were addressed (Figure 4).

Assessment of education-related intervention

When reported, the most common outcome was change in student's attitudes, with the vast majority showing improvement (Table 1).

However, a standardized or validated assessment tool was not used for many studies. Assessment was often based on surveys of outcomes such as student experience, self-efficacy assessment, results of knowledge quiz/exams, or qualitative comments. When available, empathy or attitude scales were the most common tools used, such as Geriatric Attitudes Scales, Kiersma-Chen Empathy Scale, or Jefferson Scale of Empathy ($n = 17$). The Geriatric Knowledge Assessment Survey was used to assess knowledge in four studies. A Polypharmacy Knowledge Assessment Instrument was validated but included only a few pharmacy learners (Supplementary Table S9 Studies, other types).[120]

Miscellaneous types of reports

Our search included institutional documents outside the scientific literature (Supplementary Table S10 Miscellaneous types of articles). Colleges of pharmacy education,[8,121–125] pharmaceutical societies,[7,126] and governments[127] issued recommendations. Reports frequently specify the contours of specialized geriatric teaching in pharmacy studies, proposing content, organization, or adapted teaching methods. Notably, there have been calls to increase the integration of deprescribing education in pharmacy curricula.[128,129] Evaluation is less frequently described in these documents. This is consistent with review papers we extracted for our study, some concerning pharmacy specifically,[130–133] others concerning the

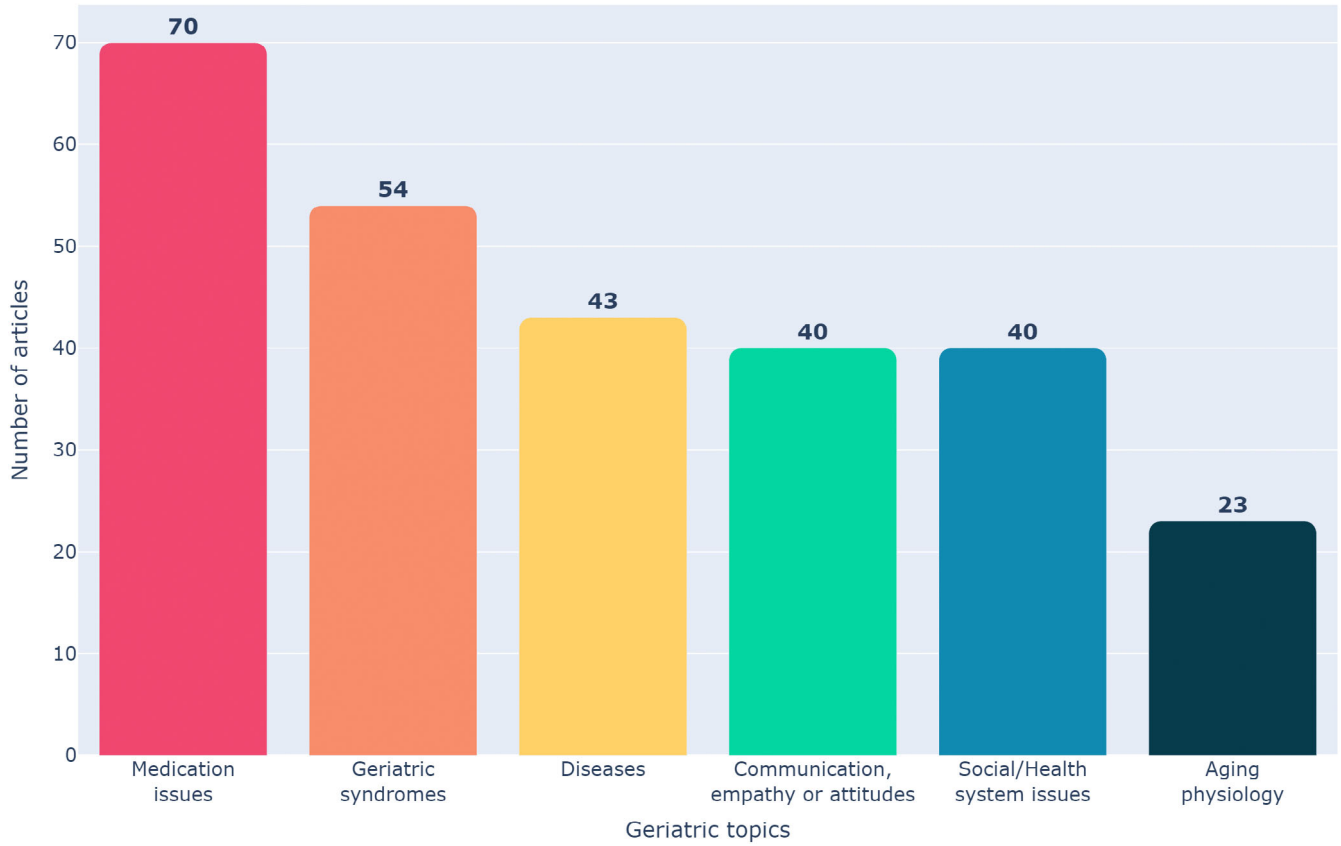

FIGURE 4 Most reported geriatric topics within educational intervention studies and descriptive articles ($n = 112$). The total number (n = 112) is less than included articles in educational intervention studies and descriptive articles ($n = 149$) since geriatrics topics were not available (or not applicable) in some articles.

integration of geriatrics into health studies in general.[134,135] All conclude that geriatrics should be given more attention in healthcare education, particularly pharmacists, given the increasing complexity of drug therapy.

DISCUSSION

The purpose of this scoping review was to review how geriatric concepts are included, taught, and assessed in pharmacy curricula. We found 221 articles representing work from the past five decades, the majority including studies or narrative descriptions of educational activities. The tremendous diversity of activities generally showed that knowledge and attitudes can be increased in pharmacy students, but differences in included reports did not allow for comparison. Indeed, many articles were descriptive with small sample sizes and few had a control group. In several cases, a geriatric-related educational activity was described, but outcomes were either not reported or not relevant to this review.

A historical perspective of geriatrics inclusion in pharmacy curricula

In older reports, 22% of schools reported having no geriatric course content at all,[23] but this has improved, with more recent surveys finding 100% of participating schools reporting at least some geriatric content.[18,20] However, this may not be generalizable outside of the United States, as reported in a survey done in Canada and Qatar, which reported a lower percentage (79%) of geriatric teaching in schools.[5] While only a few US schools (<15%) offered mandatory geriatric courses in the past,[18,20] a recent survey may indicate an increase (35%) in mandatory geriatric courses among US schools, although this may be biased by partial response rate (29%).[6] Indeed, insufficient curricular emphasis on geriatrics was reported by 44% of respondents.[6] Barriers reported to include geriatric content were curriculum overload and lack of clinical sites for geriatric rotations. Other papers have identified bias against learning about geriatrics, a form of ageism, as a common barrier.[5,132]

Curriculum overload has been noted by authors internationally to be associated with significant stress for

students and faculty.[136–138] For geriatrics content, the situation may be more specific to curriculum imbalance, which requires a review of content missing in the context of relatively extensive coverage of other topics or populations.[136] This may help guide faculties in addressing how geriatrics can be effectively integrated into current courses or activities without adding more hours to the program or displacing other valuable content.[137] Guidance on curricular efficiency has been provided by educational experts highlighting the need for all faculty to be engaged, and program leadership to support decisions locally through awareness of national conversations and initiatives.[139]

As reported by Felton et al., there should be a more consistent integration of content, by a variety of means (such as geriatrics in an existing course, elective course, Introductory Pharmacy Practice Experience [IPPE], Advanced Pharmacy Practice Experience [APPE], and areas of concentration).[131] Some organizations have even proposed geriatric curriculum guidance (e.g., American Society of Consultant Pharmacist [ASCP]).[7] However, it remains difficult to assess whether teaching related to older adults, especially when integrated in other courses, is sufficient to ensure geriatric competency development. Unfortunately no mandatory content is required from accreditation standards.[10,11]

Interestingly, the report by the Center for Human Services from the US Department of Health, Education and Welfare provided specific curricula recommendations that pharmacy schools should follow: (1) educate and train all of their graduates to meet the pharmaceutical needs of older adults; (2) conduct assessment of their curricula to determine the extent to which course offerings are addressing the needs of this population; (3) plan a systematic approach in order to integrate aspects of aging and care of the aged into existing courses; and (4) pursue innovative methods of teaching to implement an integrated curriculum which includes geriatrics.[127] These recommendations, although published more than 40 years ago, are still relevant. The fact that no specific accreditation criteria exist that capture the recommendations listed above is surely contributing to the ongoing issue of insufficient training and heterogeneity in programs. Although accreditation requirements could be perceived to contribute to curriculum overload, history has shown that it will be difficult to address geriatrics content without mandatory requirements. The American College of Clinical Pharmacy (ACCP) suggests in their "Pharmacotherapy Didactic Curriculum Toolkit" some specific topics such as potentially inappropriate medications and deprescribing as a Tier 1 level (i.e., sufficient education to be practice-ready pharmacists). This may help schools to include some geriatric topics in the prioritization of their didactic content. However, these topics do not provide comprehensive geriatrics education and may not be sufficient to achieve minimal skills and competencies without integration through curricula and clinical application in dedicated activities (skills lab, clinical rotation, or service learning).[8] Extrinsic motivation through meeting accreditation standards could be the most effective mechanism to include mandatory program assessment and adaptation to develop sufficient geriatric competencies.

To support integrating geriatric content in the context of curriculum overload, a comprehensive geriatric list of topics and competencies with level of education desired at entry-to-practice (such as provided in ACCP Toolkit or specifying minimal level of related Entrustable Professional Activity) would be optimal. The ASCP Curriculum guide also provides useful insights, with topics suggested for different trainee levels.[7] The extensive educational activities documented in this review that integrate geriatrics into other competency development, such as interprofessional education and healthcare delivery, provide possible solutions. The integration of geriatrics through a whole curriculum including didactic contents with mandatory geriatric practice experience reported by Donohoe et al. is also a successful example of geriatric inclusion.[104] However, sufficient expertise of faculty is essential to optimize geriatrics inclusion. Faculty training programs may be necessary.[140] Our review could not identify, specifically, who should be responsible for teaching as the expertise of the education provider was often not specified. Future recommendations should include this aspect, as done recently in a pediatric statement on pharmacy education.[141]

Is there a preferred teaching method?

This review highlighted the diversity of teaching methods, providing multiple opportunities to promote competency development. A combination of different methods will likely be complementary and appropriate based on the competencies to be achieved. For example, basic knowledge may be taught with didactic teaching, and other activities such as simulations, service learning, and IPPE or APPE will be essential to translate this knowledge into practice and develop adequate clinical skills and healthy attitudes toward older adults. The place for interprofessional activities is also challenging across programs, but team-based care is essential in geriatrics, and this population may be the ideal focus for mandatory interprofessional education.[142] In this review, interprofessional activities in geriatric settings were documented, but the assessment of specific geriatric knowledge or

skills outcomes was often overlooked, missing an opportunity to evaluate their effects.

Knowledge and skills/competency assessment in geriatric pharmacy education

Our review also showed that few standardized tools were used for knowledge and skills/competency assessment. Although student evaluations need to be adapted to learning objectives for pedagogic alignment, this lack of standard tools makes it difficult to compare the efficacy of activities. Student confidence self-assessment of ASCP's geriatric competencies was reported in one article and may be interesting to replicate.[104] Standardized assessment tools would enable a systematic evaluation of students and would possibly allow comparison of different curricula to promote best education practices in geriatric pharmacy.

Other literature reviews about pharmacy curriculum and medical specialties

This scoping review is the most comprehensive to date concerning the integration of geriatrics into pharmacy education. However, studies have been published on the integration of other content into pharmacy curricula, including palliative care, pediatrics, and antibiotic stewardship.[143–145] The results are similar to ours where the implementation of these specific topics in curriculum is inconsistent. These studies also included many different teaching methods, including interprofessional and focused experiential experiences.[141]

The same conclusions were drawn regarding the need to make the topics mandatory in the curriculum. While the majority of courses were elective, the authors agree that this questions the importance given to serious health issues and diseases whose prevalence is steadily increasing, whether it be geriatrics, pediatrics, or anti-infectives misuse. Finally, these three reviews also support that pharmacy education should be reformed to strengthen students' understanding of current challenges. This would benefit from further guidance by local, national, or international organizations, or from pharmacy or geriatrics accrediting or advocacy bodies. Academic bodies could also be involved in the production of standardized competency assessment tools to monitor ongoing efforts. The need for international recommendations and homogenization of medical educational practices is also similarly raised by physicians.[146–148]

Strengths and limitations

Our paper has some limitations. First, our search may not have been exhaustive, although the search strategy was performed from database inception and guided by a librarian. Many papers were long and unstructured, possibly affecting data extraction.

In addition, the fact that only articles in French or English were included, and that the majority of the data came from North America, makes generalization more difficult. We excluded papers focused on education of other health professions, but in the future this could be studied.

The integration of geriatrics into pharmacy education is a critical aspect of improving patient care for older adults. In this context, the strengths of our article are noteworthy. The review synthesized a wealth of literature spanning several decades, encompassing multiple languages and databases, while considering a broad range of article formats. Furthermore, the review included a thorough extraction of intervention details, context, and expert opinion, providing a comprehensive overview. Significantly, the participation of pharmacy students in the review offered a constructive user perspective on the data. The scoping review's breadth and depth in its search distinguish it as an important contribution to the field, given the lack of similar studies conducted previously.

CONCLUSIONS

This scoping review found a large body of literature regarding geriatric pharmacy education, spanning decades, countries, and programs. While studies show geriatrics education does improve knowledge and attitudes, this review indicates that there are calls for reform in pharmacy education, to intentionally optimize integration of the geriatrics content and prepare future generations of pharmacists for the needs of an aging society. There is a need for the scholarship of teaching and learning to be applied to pharmacy programs and their geriatrics and interprofessional education.

AUTHOR CONTRIBUTIONS

The conception and design of the study were carried out by Noémie Maurice, Louise Papillon-Ferland, and Cheryl A. Sadowski. Data collection was performed by Noémie Maurice, Andréa Choinière, Louise Papillon-Ferland, and Razmig Aredjian. The analysis and interpretation of the data involved Lilia Ben Abdelkader, Yara Awad, Andréa Choinière, Jean-François Huon, Noémie Maurice, Louise Papillon-Ferland, Cheryl A. Sadowski, and

Razmig Aredjian. The manuscript was prepared by Lilia Ben Abdelkader, Jean-François Huon, Louise Papillon-Ferland, Cheryl A. Sadowski, and Razmig Aredjian. Jean-François Huon, Louise Papillon-Ferland, and Cheryl A. Sadowski critically revised it for important intellectual content. All authors gave final approval of the published version.

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CONFLICT OF INTEREST STATEMENT

All authors have no relevant conflict of interest with this report.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supplementary Table S1. Search strategy.
Supplementary Table S2. List of variables for data extraction.
Supplementary Table S3. Gray literature search.
Supplementary Table S4. List of included references.
Supplementary Table S5. Curricular Organization studies.
Supplementary Table S6. Pharmacy students' interview/survey studies (Without specific educational intervention/activity).
Supplementary Table S7. Education-related intervention studies.
Supplementary Table S8. Case reports/descriptive articles.
Supplementary Table S9. Studies (Other types).
Supplementary Table S10. Miscellaneous types of articles.
Supplementary Table S11. Detailed list of references for Figure 2.

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