Original Research Paper

Development, implementation, and assessment of a web-based interprofessional curriculum on age-friendly care for health professions students

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Abstract

Background: Older adults experience disproportionately higher rates of harm, delay, and discoordination while seeking and receiving healthcare. To optimize training for entry-level healthcare providers, we developed a curriculum to enhance the readiness of health professions students to provide age-friendly care (AFC) to older adults using the 4Ms framework. **Methods:** Kern's 6-step approach guided the development of the curriculum. Participants included 434 students in Pharmacy, Physical Therapy, and Physician Assistant programs, 34 alumni, and 28 faculty affiliated with a university in the southeastern United States. Formative evaluation occurred throughout and included interviews and surveys with key stakeholders. Summative evaluation included collection of quantitative and qualitative data. Quantitative data addressed students' knowledge via module-specific quizzes and students' attitudes per the Geriatric Attitudes Scale (GAS) and the Expectations Regarding Aging-12 Scale (ERA12). Qualitative data included narrative responses on two reflections: the student's role as a member of the older adults' healthcare team, and incorporating principles of AFC for older adults during their upcoming clinical rotations. **Results:** Kern's approach was an effective framework to guide the curricular development. Students' knowledge increased per successful completion of module quizzes (scores 80 and above). There were no changes in pre-post GAS or ERA-12 scores. Qualitative assessment of reflections identified four themes related to the delivery of age-friendly care: interconnection between the 4Ms, importance of the interprofessional team, person-centered care, and provider competency and accountability. **Discussion:** The web-based curriculum enhanced the perceived readiness of health professions students to provide care to older adults. The open-access curriculum appears to be one component that helps optimize the training of entry-level healthcare providers to better prepare them for interprofessional practice in the care of older adults.

Keywords:
Geriatrics, interprofessional education, Older adults, Primary care

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BACKGROUND:

The population of the United States (U.S.) is aging and projections estimate that by the year 2040, one in five Americans will be 65 years of age or older, with the most significant growth in those 85 years of age or older.[1] Almost three-quarters of older adults in the U.S. have one chronic, non-communicable disease that requires ongoing care and management and 40% have four or more.[1] Healthcare challenges include the growth in volume and multi-complexity of older adult patients, even when components of the life course include healthy aging. The healthcare needs of older adults are complex. Both health systems and providers are often unprepared or

underprepared to deliver that care. Older adults use healthcare services more than other age groups and have disproportionately higher rates of health-care-related harm, delay, and discoordination.[2] To address this need and optimize training for entry-level healthcare providers (HCPs), the United States Department of Health and Human Services, Health Resources & Service Administration (HRSA) provides funding opportunities directed at enhancing the geriatric workforce.[3] The goals of these five-year cooperative agreements are to improve health outcomes and develop a well-prepared healthcare workforce for older adults.

The work presented in this exploratory study is part of that funding, as one specific aim of this grant is to improve the geriatric education of healthcare professionals. We developed a curriculum to enhance readiness of health professions students to provide age-friendly care (AFC) in Georgia.[3] The 14-module curriculum applies the AFC 4Ms framework (What Matters, Medication, Mind (Mentation), and Mobility) to overarching geriatric topics and syndromes, and includes content integral to learners' needs across settings and disciplines. This report details the development, implementation, and evaluation of that curriculum to support the delivery of AFC and readiness for interprofessional practice.

METHODS:

Kern's 6-step approach guided the development of the curriculum.[4] Developed in 1998 for medical education, the model integrates a variety of curriculum development approaches. Since that time, it has been used across a variety of healthcare programs to develop, implement, evaluate, and continually improve didactic education and clinical training.[4] The following narrative describes the steps and its application to our process and ultimate work product, a web-based, open-access curriculum called *"engage."* Institutional Review Board approval was received for this project (H191315_01).

Step 1: Problem identification and general needs assessment: Step 1 includes three components: an assessment of the problem, the current approach to addressing the problem, and the ideal approach that describes a better way to address the need. [4]

The problem: Efforts focused on increasing the number of health care professionals (HCPs) specializing in the care of older adults have yet to yield positive results. Fewer providers across all healthcare disciplines choose to specialize in geriatrics while the need for a competent, well-trained workforce for an aging population grows.[5,6] Health professions education programs have an obligation to address this need and prepare members of the older adults' healthcare team regardless of specialty practice area or discipline.

The current approach: The number of providers with geriatric specializations is unable to meet the needs of 58 million Americans over 65 years of age.[1,6] The healthcare needs of this population are further complicated by the varied distribution of the population and caregiver support across the country. Most members of the older adult's healthcare team deliver care based on entry-level training where content specific to geriatrics varies and may not be sufficiently mandated by accreditation standards.[7] Content specific to older adults is typically delivered either as a dedicated course, a curricular thread, interprofessional education (IPE) activities, or experientially and may or may not be delivered by faculty with a specialization in geriatrics. Lack of emphasis and instruction specific to the complex needs of aging adults may compromise optimal healthcare delivery. Government and private sector initiatives to develop, prepare, and sustain a workforce capable of meeting the needs of an aging population continue to be implemented without significant improvements.[5]

The ideal approach: In 2017 the John A. Hartford Foundation, Institute for Healthcare Improvement (IHI), and other partners developed and implemented a new approach to support organized, efficient, reliable, and effective care for older adults across delivery systems, and introduced the concept of the Age-Friendly Health System (AFHS).[2] The AFHS promotes value for older adults; their friends, families, and caregivers; communities; providers; and the health system itself. Within that system is the concept of AFC, healthcare that addresses the older adult's unique needs and wants. AFC is based on evidence, informing the most important aspects of care to address at each patient encounter. The AFC concept is built on the 4Ms framework of What Matters, Medication, Mentation (Mind), and Mobility and is inclusive of multi-complexity, the 5th M of geriatric medicine. [2,8]

The 4Ms provide a framework to optimize older adult health outcomes and the care experience. To optimize training for entry-level HCPs to better prepare them for interprofessional practice in the care of older adults, the grant tasked our team with

developing, implementing, and evaluating a curriculum to support the delivery of AFC and test it with Master of Medical Science Physician Assistant (PA), Doctor of Pharmacy (Pharm), and Doctor of Physical Therapy (PT) students at one university. Once completed, the intent was to expand access to these education modules to other health professions programs including physician and nursing training within and external to the University.

Step 2: Targeted needs assessment: Step 2 assesses the current state and needs of specific targeted stakeholders and groups through different and multiple methods such as informal discussions, formal interviews, focus groups, and questionnaires.[4]

Current State and Needs: Once we identified our goal of developing an interprofessional curriculum based on the AFC and 4Ms framework, we needed to gather information from key stakeholders at our university as to their assessments of the current state of geriatric education within healthcare programs and ascertain identified needs. We identified our stakeholders as the deans of the Colleges that included healthcare programs; faculty within the PA, Pharm, and PT programs; and recent graduates from those programs.

The first step was to interview the deans to determine their views on the state of geriatric training in their respective Colleges. We developed an interview guide and hired an outside marketing firm to conduct the interviews to mitigate bias. The deans provided suggestions on training models and offered comments on the value of a more intentional and interprofessional geriatric curriculum. We then developed surveys for faculty and recent graduates from the PA, Pharm, and PT programs to gather their views on current practice challenges and academic and clinical preparedness related to the delivery of older adult care. These two surveys were similarly structured to compare faculty and alumni responses. Surveys were distributed via Qualtrics using an anonymous link (Qualtrics XM, Seattle, WA, USA). 28 faculty (80%) and 41 graduates (18%) responded.

Faculty and alumni identified the same top four challenges in caring for older adults: the highest identified challenge was comorbidities and complexity of the patient, followed by time constraints of the practice environment, inability to address all of the patient's needs, and end-of-life-issues. Faculty and graduates agreed that the depth and breadth of geriatric content was insufficient for readiness for contemporary practice in Georgia and across the United States. When asked about familiarity with the AFC framework, only 15% of faculty and 5% of alumni were aware of the model. 75% felt that the proposed modules would be extremely or very useful during didactic education, and 70% felt similarly for clinical education. Interestingly, both faculty and graduates voiced concerns about other HCPs´ perceptions of their profession's role on the interprofessional team. None from either group identified that others' perceptions were extremely accurate. More than half of faculty and alumni felt that others' views were moderately, slightly, or not at all accurate.

Step 3: Goals and specific measurable objectives: Step 3 establishes goals and objectives based on the needs assessment that directly impact curricular content. Goals are broad and apply to the entire curriculum, while the specific objectives may refer to specific elements of the curriculum such as individual learning modules or lectures.[4]

Application: Faculty and alumni survey results identified a significant and consistent concern about other HCPs' perceptions of their profession's role on the interprofessional team. This led the research team to step back and dive deeper into that concern. Interprofessional teams rely on having a shared language and mutual understanding of others' roles, along with respect for contributions which directly impact patient satisfaction and patient outcomes. Our research team included a physician assistant, a pharmacist, and two physical therapists. We discussed the narrative data provided in the surveys and found that we shared similar concerns. We found that we used different terminology and applied different definitions to terms. For example, the PT program uses the International Classification of Functioning, Disability, and Health model to assess health and disability, while the Pharm program uses the Pharmacists' Patient Care Process, and the PA program operates from a more traditional biomedical model. All are standardized processes but differ significantly in application and intent.

These differences in approaches and terminology can lead to fragmented care where important aspects of the patient's condition may be overlooked or misinterpreted because they are not communicated effectively across the team. This discovery led us to identify a previously unidentified need for a shared glossary of terminology related to healthcare for

older adults that could be used across professions. Before we could create shared teaching modules, we needed to ensure that we had a mechanism for understanding each other. This became our first goal—to create and disseminate a glossary of terms and resources. Goals 2 and 3 related to the curriculum. Goal 2 related to the learning methodology—to create sustainable, comprehensive intra- and interprofessional age-friendly learning modules. Goal 3 related to the educational goal to develop providers prepared to provide AFC to improve health outcomes for every older adult.

Learning module topics were selected and vetted by a multidisciplinary team of healthcare and community service providers. Specific objectives were developed for each learning module addressed and were formatted around the verbs of "knowing" and "doing." The objectives addressed what we deemed as essential for all age-friendly health professionals to "know" and "do" in their practice, despite their professional designation. As an example, a "knowing" learning objective in the Frailty module is that students should "know how to screen, assess, and treat frailty;" a "doing" objective is that students "should be able to apply evidence-based screenings, assessments, and interventions for the prevention and treatment of frailty."

Step 4: Educational Strategies: Step 4 addresses strategies that align with the goals and objectives to best deliver the curriculum content to the learner.[4]

Application: Creating the glossary was the first step. We prepared a glossary of 151 terms associated with the healthcare of older adults, with corresponding definitions and links to resources. The terms came from a review of resources including course syllabi, entry-level competencies for the care of older adults, websites of geriatric-focused healthcare and professional organizations, and professions' accreditation standards. The glossary was edited and vetted by a team of local healthcare and community service providers (e.g., a State aging services coordinator, a Georgia Department of Public Health representative, a community geriatric pharmacist, a gerontologist, and an internal medicine physician). The glossary was placed on the University Library website with open access.[9]

The glossary was operational while we continued building the curriculum modules. The learning methodology identified for the curriculum was a series of evidence-based narrated modules, with optional assessment quizzes and Microsoft PowerPoint (Microsoft Corp. Version 21, Redmond, WA, USA) slide decks delivered via a web-based platform. The modules were developed using a uniform process to support learning across the curriculum. Structural uniformity for all modules included objectives, a patient case, relevant definitions aligned with the glossary, background information, screening and assessment tools, interventions, referral options, reassessment of the patient case in the context of un-age-friendly and age-friendly care (AFC), and clinical pearls.

An example of an educational strategy aligned with an instructional learning objective from the Falls module was use of the CDC STEADI initiative's three key questions for fall risk screening that can and should be used by all HCPs.[10] We again partnered with a marketing company to create templates for the modules. The marketing company had been instrumental in conceptualizing our mission as they had worked with us to envision our name (the *engage* curriculum) and logo the year prior (see Figure 1).[11] Their contributions are acknowledged on each module.

Figure 1: The curriculum name, logo, and tagline

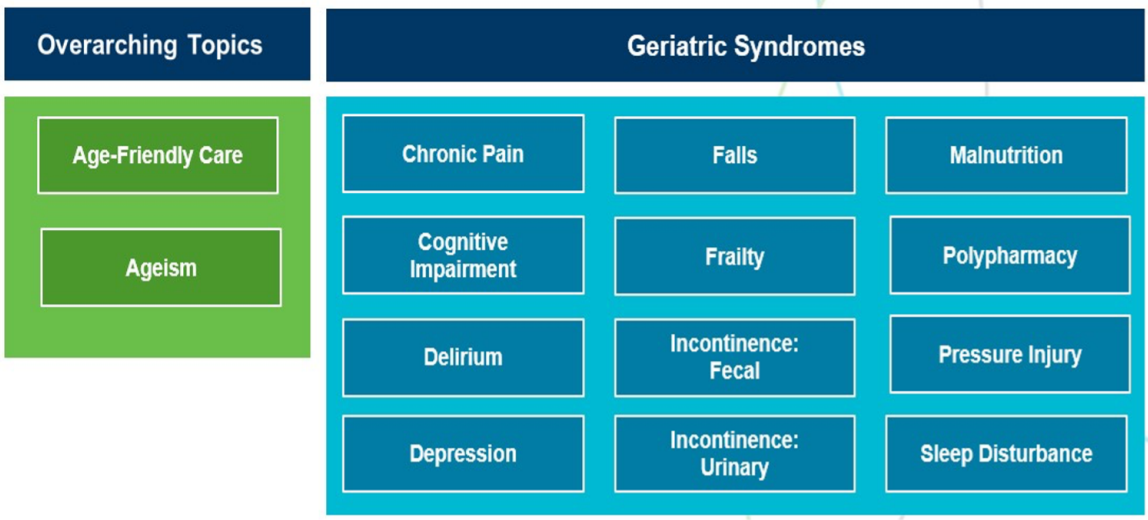
Visual consistency reinforced topics and transitions. This pedagogical approach reinforced the importance of these concepts to future health professionals. Consistency was also reinforced when developing the scripts for each learning module. Research team members with subject matter expertise created scripts using evidence-based resources that adhered to the agreed-upon format. The work products were peer-reviewed by all research team members and edited to ensure the information was relevant across health professions programs. Our marketing partner identified an accessible platform for the *engage* curriculum, taking into consideration our intent for the curriculum to be freely accessible and have opportunities for expansion and editing.

Step 5: Implementation: Step 5 includes pilot implementation, including obtaining faculty buy-in, addressing barriers, and formative assessment.

Application: The research team presented the *engage* curriculum to the faculty in PA, Pharm, and PT during departmental faculty meetings prior to implementation so that all faculty would be familiar with the curriculum if a student referenced it in their class, and for their future use. Pilot testing occurred during a three-month period (August–November 2022) in the Pharm and PT programs. Modules were placed within courses on the University learning management system (LMS). Narrated presentations, quizzes, and a pdf copy of presentation slides were provided in the LMS. In PT, the timing of the pilot test coincided with the start of a dedicated 3-credit hour geriatric physical therapy course. The complete *engage* curriculum was implemented throughout that course (horizontal implementation) and all modules and associated quizzes were part of the course's required activities. PT students viewed the modules prior to in-class discussions for each topic. Examination questions were based on module content, classroom instruction, and assigned readings. The Pharm implementation used a spiral approach, placing the modules in required core classes across the curriculum where content aligned.

Following pilot testing, formative feedback was solicited from students and instructors. We independently viewed all the recorded modules again, noting areas for improvement and incorporating student and instructor suggestions. Revisions included removing content deemed too dense, ensuring consistency of language across modules, and trimming each module to be approximately 30 minutes. The revised 14 modules were re-recorded in the university-based AV room and a media technician edited each module for timing and transitions (see Figure 2). The revised modules were implemented in the Fall and Spring Semesters of 2023 for PA, Pharm, and PT. PT continued with a horizontal implementation via a dedicated course in the fall and an elective course in the spring. Pharmacy implemented the revised modules in an elective course. PA implemented the curriculum as a complement to the older adult course. Implementation was program-specific to best meet the needs and outcomes of each program. In all, 434 students in PA, Pharm, and PT programs used the curriculum.

Figure 2: The 14 modules of the *engage* curriculum



The full curriculum was published on an open-access learning system, teachable. (www.teachable.com. New York County, New York, USA) in October 2023 for use across health professions programs in the U.S. We provided AFC implementation books,[2] flyers, and QR codes to 11 rural health clinics across the state, held an information session about the program in central Georgia, and emailed the directors of PA, Pharm, PT, and PTA programs in the state, providing links to the *engage* platform. Additionally, we developed a module to support clinicians' use of the materials. The curriculum was further presented at gerontology, interprofessional, and HCP national meetings.[12-16]

Step 6: Evaluation and Feedback: Step 6 addresses the varying types of evaluation that occurred for each program goal.

Application: Evaluation of Goal 1 (to create and disseminate a shared glossary to support the delivery of AFC) is ongoing. The glossary was initially published in April 2021, with the last annual review and updates occurring June 2024. The glossary is open access and managed on the University's library webpage.[9] Feedback and recommendations are solicited via the *engage* email address published on the site. Library faculty perform yearly audits of link functionality and usage metrics. The research team annually assesses content to ensure accuracy, and updates accordingly, including new terms and resources reflective of contemporary practice.

Evaluation of Goal 2 (to create sustainable comprehensive intra- and interprofessional age-friendly learning modules) utilized Tyler's revised 6-stage model for curriculum development and incorporated formative and summative strategies.[17] We have begun our second annual audit of each module for necessary revisions and updates. As with all curricula, we are planning for an expansion of modules to other topics or professions. Regarding sustainability, the College of Health Professions has pledged ongoing budgetary support to continue free open access to the *engage* curriculum and resources.

Evaluation of Goal 3 (to develop providers prepared to provide AFC to improve health outcomes for every older adult) was guided by Tyler's model and used a mixed methods approach. Quantitative assessments included module-specific quizzes, the UCLA Geriatric Attitudes Scale (GAS), and the Expectations Regarding Aging-12 (ERA-12).[18,19] Qualitative assessments included students' narrative responses to investigator-developed reflection questions implemented during course final examinations after completion of the curriculum in PA, Pharm, and PT. Students provided written reflections on their role as a member of the older adults' healthcare team in the context of the AFC framework, and how they foresaw incorporating principles of AFC for older adults during their upcoming clinical rotations.

RESULTS

Summative assessments demonstrate that students' knowledge increased per successful completion of module-specific quizzes, as evidenced by attainment of a minimum of 80% on each module quiz. There were no changes in scores on the GAS (pre=51.6, post=53,3; p=.181) or ERA-12 (65.9. post 69.1, p=.194) surveys per t-tests (IBM SPSS Statistics for Windows, Version 27. Chicago, Ill, USA). Qualitative analysis using Colazzi's phenomenological approach identified four themes across PA, Pharm, and PT students.[20,21] Examples of students' narrative responses are provided in Table 1.

Two themes aligned with broader knowledge and awareness, or knowing (*Interconnection between the 4Ms* and *Importance of the interprofessional team)* and two aligned with individual action, or doing (*Person-centered care* and *Provider competency and accountability).*

The interconnection between the 4Ms was defined as the understanding that successful implementation of Age-Friendly Care requires two critical elements: 1) to understand the 4Ms framework; and 2) its relationship to the patient's care plan across care delivery systems. Consistently and across programs, students identified an integrated approach to the application of the 4Ms framework in providing health care for older adults. Student responses aligned with key tenets of the 4Ms framework of AFC including incorporation of the framework into existing care delivery systems across settings and application at every patient encounter by assessing patient needs and implementing the 4Ms together as part of a care plan.[2]

Importance of the interprofessional team was defined as understanding the roles and responsibilities of members of the interprofessional team and the necessary interconnections between providers and care plans, including knowing how, when, and to whom to refer. Students embraced the

Table 1: Students' responses aligned with themes

Interconnection of 4Ms (Knowing)	
PA	"I plan to keep the 4Ms at the forefront of my mind when caring for my older patients on rotations to ensure I am providing age-friendly, patient-centered care."
Pharm	"During my upcoming APPE rotation, I will keep 4M's in mind and will do my best to serve the patients in our community."
PT	"I will be able to treat more effectively since I understand how what matters, mentation, mobility, and medications all tie together in the consideration of an optimal care plan."
Importance of the Interprofessional Team (Knowing)	
PA	"As a member of an older adult's health & wellness team, a physician assistant can play a role in all aspects of the 4Ms framework, while working alongside other members of the team…the PA can assess the patient's mobility and then refer to a PT to help the patient reach their goals."
Pharm	"The role of the pharmacist is to provide screening tools that will focus on preventing, identifying, treating, and managing dementia, depression, and delirium."
PT	"It is important that as physical therapists we make sure to work as a team with the other healthcare professionals involved. This can include helping with patient education for other wellness and health needs as well as the importance of managing other co-morbidities the patient may have. I would also think about possible referrals to other providers to get into the habit of thinking of multiple disciplines."
Person-Centered Care (Doing)	
PA	"Everything we do is so the patient can live the life the way they want to. Patients' wishes should not be overlooked; I will be sure to have quality conversations with my patients to learn what is important to them."
Pharm	"Valuing the goals of patients, even if it differs from what I or other HCP members of the team would recommend. It would be important to value and respect what the patient wants."
PT	"I will continue to incorporate the principles of age-friendly care, the 4Ms, for the older adult patients because it gives me the ability to look at the entire person and who they are and what matters to them. Understanding the older adult patients better will increase my ability to give them a personalized, effective, and safe patient-care experience."
Provider Competency and Accountability (Doing)	
PA	"The role of the PA as a member of the older adults' healthcare and wellness team is to be the patient's advocate. I will never assume that ´someone else has probably already screened them´ or other assumptions that can lead to missed diagnoses."
Pharm	"I will try to be aware of ageism stigmas that are associated with older adults. I want to be able to learn from first-hand experiences rather than be swayed by other people's beliefs."
PT	"I will reflect on my internalized biases and help older adults combat their beliefs on old age. I can also educate my CI, other students, other PTs, and other healthcare professions about the 4Ms and how important and helpful they can be in the age-friendly care for their older adult patients."

concept that the interprofessional team includes all members of the care team and that proper utilization of all members helps to address the time limitations present in many medical practices. Students also identified the importance of referring patients to other providers. They noted the value of knowing how to screen, assess, and refer. PT students frequently identified the need to refer patients to physicians or pharmacists for issues related to medication management. Similarly, PA and Pharm students recognized the importance of referring patients to PT for mobility assessments and interventions. This reciprocal recognition of each profession's strengths is a key component of interprofessional education as it prepares students to work collaboratively in real-world healthcare environments.

Person-centered care was defined as delivering health care that is guided and informed by the patient's goals, preferences, and values ("what matters") and empowers patients and providers to collaborate in decision making. Students noted their willingness to work with other providers in a team-based approach to develop an individualized care plan for each patient, guided and informed by the patient's goals, preferences, and values ("what matters"). The relationship is built on trust and a commitment to long-term well-being.[22]

Provider competency and accountability is defined as continually reflecting on internalized biases,

ageism, and barriers to implementation of AFC, and engaging in ongoing professional development. Actions related to each student's individual accountability and integrity are foundational to practice and are part of each professions' code of ethics. Students expressed awareness of their professional obligations and active commitments to participate as AFC providers. They were cognizant of their responsibility to stay abreast of information. Students identified their responsibility to look back at the modules as a refresher and serve as advocates for their patients' well-being.

DISCUSSION

Kern's framework was invaluable in the process of developing the *engage* curriculum intended to enhance the preparedness of healthcare professions students and providers to provide AFC with every older adult at every patient encounter. The six-step approach to curriculum development provided a structured, systematic, and reflexive methodology. The surveys completed during step 2 (targeted needs assessment) led us to the critical and unrecognized need for a shared glossary. Without that feedback from faculty and alumni, we would not have been aware of the need for this foundational step. This insight emphasized the need for clarity and consistency in communication, both of which are essential for effective team-based care of older adults.

Strengths: Participation in the *engage* curriculum appears to support the preparation and readiness of PA, Pharm, and PT students to function as providers for older adults in AFHS and provide AFC. Further assessment is needed to determine how AFC is delivered in precepted and independent clinical practice. The number of practices and health care systems identified as AFHS continues to grow, but the approach has yet to be adopted by all practices and providers. The initiative began with five pioneer sites and as of December 2024 has 4,834 hospitals and healthcare practices recognized as AFHSs.[23]

Student responses align with evidence supporting the 4Ms framework and with suggested implementation strategies including assessment, interventions, care coordination, and care planning. The *engage* curriculum adds to educational resources designed to integrate the 4Ms into health professions education and enhance readiness for practice using an interprofessional approach to management of geriatric syndromes. The *engage* curriculum also supports multiple pedagogical approaches including lecture, case-based learning, interprofessional education, simulation, and clinical education experiences within and across curricula. Additionally, the *engage* curriculum maintains AFHS and AFC fidelity in addressing all 4Ms relative to each geriatric syndrome presented.[24,25] Inclusion of 4Ms content in health professions education through a web-based curriculum such as *engage* may address provider knowledge deficits and barriers to providing AFC and support provider readiness to care for the complex healthcare needs of older adults. It also supports faculty training and resource development.

Limitations: The initial curriculum focused on three professions, which were highlighted explicitly in these modules. This explicit inclusion could be perceived as exclusionary by other central members of the older adult's healthcare team. As we make refinements to these modules, we plan to expand the curriculum to include additional professions and ensure that more members of the interprofessional team are represented. This will also help students understand the broad scope of interprofessional collaboration in providing care to older adults. Further iterations should include more rigorous quantitative assessments of knowledge attainment.

Concluding Thoughts

A healthcare workforce prepared to meet the complex needs of older adults across the continuum of care is needed in Georgia and across the United States. The *engage* curriculum provides tools and resources for education and training that are interprofessional, address geriatric syndromes, and apply the 4Ms frameworks of AFC. Use of the *engage* curriculum appears to enhance the readiness of health professions students to provide AFC as evidenced by increases in module-specific scores and knowledge of the 4Ms framework. Of note, learners embraced the value of applying the AFC model within their specific profession's approach to care and acknowledged their responsibility in being prepared to fully participate as a member of an interprofessional team. The curriculum is one component of geriatric education that may help optimize the training of entry-level HCPs to better prepare them for interprofessional practice in the care of older adults. Future opportunities including badging or recognition for completion of the *engage* curriculum are being explored. Continued efforts to address these challenges will be crucial in preparing healthcare professionals to effectively meet the needs of an aging population.

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