Development, Implementation, and Evaluation of an Open Access, Level-Specific, Core Content Curriculum for Emergency Medicine Residents

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ABSTRACT

Background Leaders in graduate medical education must provide robust clinical and didactic experiences to prepare residents for independent practice. Programs traditionally create didactic experiences individually, requiring tremendous resources with variable content exposure and quality.

Objective We sought to create and implement a free, open access, learner-centric, level-specific, emergency medicine (EM) residency curriculum.

Methods We developed Foundations of Emergency Medicine (FoEM) Foundations I and II courses using Kern's model of curriculum development. Fundamental topics were identified through content guidelines from the American Board of Emergency Medicine. We incorporated learner-centric strategies into 2 flipped classroom, case-based courses targeting postgraduate year (PGY) 1 and PGY-2 residents. The curriculum was made freely available online in 2016. Faculty and resident users were surveyed annually for feedback, which informed iterative refinement of the curriculum.

Results Between 2016 and 2020, registration for FoEM expanded from 2 sites with 36 learners to 154 sites and 4453 learners. In 2019, 98 of 102 (96%) site leaders and 1618 of 2996 (54%) learners completed the evaluative survey. One hundred percent of responding leaders and 93% of learners were "satisfied" or "very satisfied" with FoEM content. Faculty and residents valued FoEM's usability, large volume of content, quality, adaptability, organization, resident-faculty interaction, and resident-as-teacher opportunities. Challenges to implementation included resident attendance, conference structure, technology limitations, and faculty engagement.

Conclusions We developed and implemented a learner-centric, level-specific, national EM curriculum that has been widely adopted in the United States.

Introduction

Educational leaders in graduate medical education (GME) must provide robust clinical and didactic experiences to prepare residents for independent practice.[1] Regulatory bodies provide a framework for skills and medical knowledge to be acquired during residency, but leave the finer details of specific content, formalized objectives, and educational strategies to programs.[2,3] Programs traditionally tackle didactic experiences individually, requiring tremendous resources with variable content exposure and quality.[4,5]

Medical educators face a number of challenges in delivering high-quality instruction. They often have competing clinical and administrative responsibilities and may have variable resources available to develop and implement innovative educational content.[6,7] Crowdsourcing has been suggested to mitigate the burden of work required to create novel didactic experiences for medical learners,[8,9] but there is no centralized or comprehensive process for core content instruction in any specialty, only limited examples of resources at single locations or for specialized topics.[10–13] The nature of emergency medicine (EM) practice and resident clinical schedules places constraints on didactic time and the majority of programs that use a block weekly format (ie, a weekly half day reserved for didactics).[14–16] Addressing the needs of multiple learner levels within the available didactic time and structure presents an additional challenge. Despite growing support for level-specific didactics, this is far from the norm.[16–20]

Contemporary learners value a focus on teamwork, alternatives to traditional lectures, and the use of technology.[21–25] As an example, residents commonly use online educational resources, including free open access medical education (FOAM).[26–29] This is particularly true in EM, with nearly 98% of residents

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surveyed using some form of online resource or social media for learning for at least 1 hour per week.[30] Multiple studies have demonstrated clear benefit from learner-centric approaches (prioritizing the needs of the learner) such as small group discussion, peer learning, and individualized guidance.[26,31–34] Educators can enhance learning by promoting interactivity during didactics, which has been shown to improve engagement and knowledge retention.[4,25,35–40] The flipped classroom is an example of an interactive learner-centric approach particularly well-suited to the needs of contemporary resident learners. The flipped classroom model incorporates learner-directed study of core concepts in preparation for more interactive didactics, allowing a classroom focus on higher-order thinking.[41] Numerous studies both within and outside of GME demonstrate the benefits of flipped classroom over traditional lectures, including increased learner satisfaction and improved knowledge acquisition.[11,41–56]

We created Foundations of Emergency Medicine (FoEM)[57] as a national, free, open access, online EM curriculum to address the needs of contemporary residents and medical educators around the country. Our objective was to build standardized, level-specific, core content courses for EM residents utilizing learner-centric educational strategies.

Objectives
We sought to create and implement a free, open access, learner-centric, level-specific, emergency medicine residency curriculum.

Findings
Foundations I and II courses were developed for postgraduate year (PGY) 1 and PGY-2 residents using learner-centric strategies resulting in broad national implementation and high leader and learner satisfaction.

Limitations
Further study is needed to understand the impact of F1 and F2 courses on objective learning outcomes.

Bottom Line
The Foundations of Emergency Medicine curricular model could be replicated to create free, open access, core content for new learner types and other medical specialties.

Methods

We designed and implemented a national curriculum for postgraduate year (PGY) 1 and PGY-2 EM residents in the United States. The design and implementation process took place from 2014 to 2018 (TABLE 1), and we collected outcome data in 2019. The development team (K.G.M., N.W., J.B.) employed Kern's model of curriculum development[58] as a conceptual framework for the development, implementation, and evaluation of FoEM's core content Foundations I (F1) and II (F2) courses, as summarized in the BOX.

Targeted Needs Assessment

We reviewed the literature to identify key variables to consider in building educational content for EM trainees, including structural constraints on didactic time (eg, critical care rotations, routine night shift work), variability between 3-year and 4-year EM training programs, and high preference for FOAM and multimedia resources.[20,24,59,60] EM-specific best practice guidelines recommend level-specific instruction, shorter lectures that incorporate active learning, use of the flipped classroom model, clinically relevant small group discussions, and timely feedback with individualized guidance.[16,20,31,52] Other recommended techniques to improve retention and long-term recall include interleaving, guided notes, practice testing, and spaced repetition.[16] Barriers to implementing best practice techniques include a high burden of work for content development and limited faculty buy-in.[24,61]

Educational Strategies

Educational theories that informed the development of FoEM courses include social constructivism, transformative learning theory, cognitive load theory, and deliberate practice.[18,62–64] A summary of FoEM goals and educational strategies is included in the BOX; course objectives are included in the online supplementary data. F1, an EM core content course targeted toward PGY-1 learners, is outlined in TABLE 2; F2, an EM critical care course targeted toward PGY-2 learners, is outlined in TABLE 3. Fundamental emergent and critical care topics were identified using the American Board of Emergency Medicine's Model of the Clinical Practice of EM (EM Model), which specifies core content for the specialty, and the Accreditation Council for Graduate Medical Education (ACGME) program requirements for EM.[2,59,65,66] Focused content that challenges learners based on training year and experience aligns with cognitive load theory.[18,63] We prioritized the use of learner-centric strategies recommended for the target population, including incorporation of technology, collaboration, and targeted feedback. F1 and F2 make use of a flipped classroom model, allowing directed self-learning using vetted multimodal asynchronous resources (termed "Learning Pathways") and interactive, clinically oriented small group discussion in the classroom using Foundations cases (TABLES 2 and 3). Small group cases, led by faculty or senior resident instructors, allow learners to develop clinical reasoning skills and demonstrate simulated patient care (stabilization, diagnosis, management, and disposition) in the

TABLE 1
Process for Development of Foundations I and II Courses

Academic Year	Development Processes
2014–2016 Registered sites: 2 Learners: 36	Piloted Foundations I (F1) course developed by primary author (K.G.M.), implemented at Northwestern University and Emory University Components: ▪ Asynchronous single high-yield text assignments ▪ In class small group "Foundations Case" review
2016–2017 Registered sites: 19 Learners: 276	Recruited leadership team[a] to expand concept and launch national pilot of F1 New components: ▪ Added targeted teaching points and point-of-care ultrasound (POCUS) to cases ▪ Created Learning Pathways (LPs) with multimodal asynchronous options ▪ Developed logo and website[b] ▪ Developed implementation guidelines and resources ▪ Developed coordinated assessments
2017–2018 Registered sites: 102 Learners: 2632	Expanded leadership team and recruited national contributors from existing sites to crowdsource revision of F1 course and create new Foundations II (F2) course New components: ▪ Created new F2 LPs ▪ Expanded implementation resources ▪ Created new logo and website[b]
2018–2019 Registered sites: 136 Learners: 3965	Refined and improved F1 and F2 content based on user feedback New components: ▪ Incorporated POCUS videos into cases ▪ Expanded implementation resources ▪ Developed additional Foundations of Emergency Medicine (FoEM) courses
2019–2020 Registered sites: 154 Learners: 4453	Expanded organizational infrastructure and developed a sustainability plan while adapting to situational needs created by the COVID-19 pandemic New components: ▪ Expanded asynchronous and assessment options ▪ Created 501(c)(3) nonprofit[c] ▪ Developed fundraising plan ▪ Created virtual FoEM implementation guidelines

[a] Members of our current and past leadership and development teams can be found at: https://foundationsem.com/who-we-are-2021/.
[b] Originally "Emergency Medicine Foundations," changed to "Foundations of Emergency Medicine."
[c] Foundations of Medical Education Inc.

classroom setting. Norms of collaborative problem-solving, critical reflection, and peer learning using Foundations cases exemplify social constructivism and transformative learning theory.[62] Weekly structured simulated cases within each course support deliberate practice and include timely targeted feedback.[64] Essential learning points are summarized and shared with learners to fill knowledge gaps and allow for spaced repetition. Coordinated multiple-choice knowledge assessments paired with each unit, provided by third parties, reinforce concepts and help remediate knowledge deficits.

All content is available online. Residency programs can register with FoEM for free and have access to all available content on the FoEM website.[57] This site includes content to support learner navigation of each course and resources for site leader implementation and management, summarized in the online supplementary data.

Implementation

The development of the F1 and F2 courses involved a multistep, multiyear process (TABLE 1) and was led by our authors with advanced training and experience in EM education. The original F1 curriculum was created and piloted at a single 4-year EM residency program beginning in 2014 and a second 3-year EM residency program in 2015. In 2016, a leadership team was recruited to expand the concept, create implementation resources (online supplementary data), develop the FoEM website[57] using Wordpress, and launch a national pilot. Implementation resources included the following recommendations: required asynchronous preparation in the flipped classroom model, incorporating 30 units of F1 into in-person didactics for PGY-1 learners, and use of faculty or senior resident instructors to facilitate small group learning. We recruited pilot sites through a national

BOX Curriculum Development for Foundations I and II Courses (Kern's 6 Steps)

Problem Identification and General Needs Assessment[a]

- In general, didactic experiences are developed locally, resulting in a heavy workload for faculty and variable content exposure and quality for residents
- Residents benefit from level-specific education, but mixed-level didactics are the norm
- Contemporary residents prefer and benefit from interaction, use of technology, collaboration, and feedback

Needs Assessment for Targeted Learners (EM Residents)

- EM-specific best practice guidelines recommend use of flipped classroom, small group learning, peer learning, active learning, III, multimedia resources, real-time feedback, and level-specific education
- Clinical schedules limit attendance at didactic conferences and lead to unreliable content exposure and gaps in knowledge
- Textbooks are heavily being replaced by FOAM resources despite limited quality control

Goals and Objectives[b]

- Develop free, national, level-specific, core content courses:
  - Foundations I (F1) for PGY-1s—fundamental knowledge from EM model
  - Foundations II (F2) for PGY-2s—critical care focus from EM model
  - Structured resident-as-teacher experience for PGY-3s/PGY-4s
- Use of innovative learner-centric instructional strategies
- Implementation resources and educator support

Educational Strategies

- Flipped classroom to allow independent core content review followed by interactive didactic sessions to promote higher order learning
- Vetted asynchronous resources with multimedia options allowing learner choice
- Focused teaching point references to fill gaps and allow for spaced repetition
- Coordinated paired low-stakes assessments

Implementation

- Local development of Foundations I course and local pilot testing
- Launch of website[c] and implementation resources for national pilot testing
- Crowdsourced renovation of Foundations I and development of Foundations II
- Gradual national expansion
- Iterative annual improvement

Evaluation and Feedback

- Annual survey of active leaders and learners
- "Submit Feedback" link on website for real-time feedback

Abbreviations: EM, emergency medicine; III, Individualized Interactive Instruction; FOAM, free open access medical education; PGY, postgraduate year; EM Model, The Model of the Clinical Practice of Emergency Medicine.
[a] Discussed further in our Introduction section.
[b] Specific F1 and F2 course objectives can be found in online supplementary data.
[c] Foundations I and II course resources and implementation guidelines can be found at www.foundationsem.com.

EM residency program listserv. We held orientation meetings to discuss implementation recommendations with member sites. The majority of sites followed provided guidelines; however, programs were permitted to modify implementation to address program-specific needs. In 2017, we expanded our leadership team and utilized crowdsourcing to refine the F1 curriculum and expand content for F2. Volunteer EM physicians, primarily recruited from pilot sites, developed content, which was vetted by EM education experts. We used this coproduction and peer-review approach to create 90 F1 cases, 60 F2 cases, 60 coordinated handouts of teaching points for the F1 and F2 organ system-based units, and more than 60 hours of vetted multimodal asynchronous assignments. Given the logistical limitations of our volunteer-based effort, we relied on a mix of FOAM and paid third-party asynchronous resources and coordinated assessments (TABLES 2 and 3). Since 2017, national use of F1 and F2 has continued to

TABLE 2
Overview of Foundations I (F1) Course

F1 Course Description: Longitudinal flipped classroom course targeting PGY-1 learners that provides a 30-unit, systems-based review of fundamental knowledge and "can't miss" diagnoses within the EM Model.			
Time Requirements	**Asynchronous**	**Didactic Meeting**	**Reinforcement**
▪ Asynchronous (1–2 hr) ▪ Didactic (50 min) ▪ Reinforcement (50 min)	Learning Pathways provide multimodal options for asynchronous review of core content	3 small group oral boards style cases with focused teaching points, led by senior resident or faculty instructors	Residents review a focused teaching points handout and complete a coordinated assessment[a]
F1 Learning Pathway Example: Asynchronous assignments[b]			
Unit: Pulmonary I Noninfectious **Objectives:** Identify clinical features, diagnosis, and acute management of the following conditions: ▪ Hemoptysis ▪ Asthma ▪ COPD ▪ Pulmonary embolism ▪ Tracheostomy complications ▪ Respiratory failure requiring noninvasive positive pressure ventilation	**Traditional Textbook** **Rosen's (9th)[c]:** Chapters 2, 21, 22, 58, 63, 64, 78 *OR* **Tintinalli's (9th)[d]:** Chapters 28, 56, 63, 69, 70, 247	**High-Yield Textbook** **Tintinalli Manual (8th)[e]:** Chapters 1, 25, 33, 34 *OR* **River's (9th)[f]:** Pages 264–265, 269–280, 282–290, 889	**Multimedia** **Hippo Videos[g]:** ▪ Chief complaints ▪ Upper airway ▪ Obstructive disease ▪ Vascular *AND* **FOAM[h]:** ▪ REBEL EM: Critical PE ▪ CORE EM: Common Tracheostomy Issues ▪ First 10 EM: Asthma ▪ REBEL EM: Hypoxemia
F1 Case Examples: selected topics for in-class meeting, small group oral boards style cases			
Unit: Pulmonary I Noninfectious pulmonary disease	**Case A:** Asthma	**Case B:** Pulmonary embolism	**Case C:** Tracheostomy complication

Abbreviations: PGY, postgraduate year; EM Model, The Model of the Clinical Practice of Emergency Medicine; COPD, chronic obstructive pulmonary disease; PE, pulmonary embolism; FOAM, free open access medical education.
[a] Coordinated assessments are provided by 3rd parties (Rosh Review, EMCoach) or may be independently created.
[b] Website includes full references for asynchronous assignments and active links to multimedia resources.
[c] *Rosen's Emergency Medicine: Concepts and Clinical Practice*, 9th ed.
[d] *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*, 9th ed.
[e] *Tintinalli's Emergency Medicine Manual*, 8th ed.
[f] *Preparing for the Written Board Exam in Emergency Medicine*, 9th ed.
[g] Hippo Education-Emergency Medicine Board Review: https://www.hippoed.com/em/.
[h] FOAM websites: https://rebelem.com/; https://coreem.net/; https://first10em.com/.

expand as a result of direct recruitment via the EM residency program listserv, word of mouth, and program exposure at professional society conferences through scholarly presentations and abstracts. We utilized an evaluative annual survey to gather user feedback from participating sites. This feedback informed iterative refinement of both courses. Total expenses have ranged from $2,000 to $5,000 annually and were supplied by individual donors, institutional donors, and grant funding. Itemized annual expenses include website development and maintenance ($700–$2,000), administrative costs ($500–$2,000) and contributor appreciation ($200–$1,700).

Evaluation

We administered annual online evaluative surveys to FoEM site leaders and resident learners at the end of the academic year to inform further development and ensure continuous quality improvement. We sent an electronic link to the survey by email to individual leaders and learners utilizing the Qualtrics platform (Qualtrics, Provo, UT). We report key survey results from our 2019 survey (online supplementary data) to reflect the program in its mature form. Our study team of expert EM physician educators developed the survey based on literature review and course objectives to maximize content validity. We incorporated established guidelines for survey research.[67,68] The survey consisted of multiple-choice, numerical, and free-response items. Prior to implementation, we piloted the survey with a small group of reference subjects, including faculty, fellows, and residents. We made revisions for clarity based on results of piloting. We calculated and reported descriptive statistics for items with discrete answer choices. Two analysts (H.C.W., J.J.), experienced in

TABLE 3
Overview of Foundations II (F2) Course

F2 Course Description: Longitudinal flipped classroom course targeting PGY-2 learners that provides a 30-unit, systems-based review of complex diagnoses and critical care management within the EM Model.		
Asynchronous	**Didactic Meeting**	**Reinforcement**
Learning Pathways provide multimodal options for asynchronous review of core content (1–2 hours)	2 small group oral boards style cases with focused teaching points, led by senior resident or faculty instructors (50 minutes)	Residents review a focused teaching points handout and complete a coordinated assessment[a] (50 minutes)
F2 Learning Pathway Example: Asynchronous assignments[b]		
Unit: Pulmonary I Respiratory Failure **Objectives:** Identify best practices in diagnosis and management of the following conditions in critically ill patients: ▪ Acute respiratory failure ▪ Intubation ▪ Ventilator management ▪ Acute severe asthma ▪ Severe COPD exacerbation ▪ Pulmonary hypertension	**Text-Based** **Harwood-Nuss (6th)[c]:** Chapters 1, 2, 73, 76, 77 *OR* **Critical Care Medicine (5th)[d]:** Chapters 9, 10, 36, 37, 38, 43 *AND* **Primary Literature:** ▪ Article 1 (Holley 2009) ▪ Article 2 (Wilcox 2015) ▪ Article 3 (Stanley 2008)	**Multimedia** **FOAM[e]:** ▪ Asthma (CORE EM) ▪ Ventilator Part II (EMCrit) ▪ Pulmonary HTN (EM Docs) ▪ Crashing Vent (REBEL) ▪ Difficult Airway (EMCRIT)
F2 Case Examples: selected topics for in-class meeting, small group oral boards style cases		
Unit: Pulmonary I Respiratory failure	**Case A:** Crashing COPD	**Case B:** Crashing pulmonary hypertension

Abbreviations: PGY, postgraduate year; EM Model, The Model of the Clinical Practice of Emergency Medicine; COPD, chronic obstructive pulmonary disease; FOAM, free open access medical education; HTN, hypertension.
[a] Coordinated assessments are provided by 3rd parties (Rosh Review, EMCoach) or may be independently created.
[b] Website includes full references for asynchronous assignments and active links to multimedia resources.
[c] *Harwood-Nuss' Clinical Practice of Emergency Medicine*, 6th ed.
[d] *Critical Care Medicine: Principles of Diagnosis and Management in the Adult*, 5th ed.
[e] FOAM websites: https://coreem.net/; https://emcrit.org/; http://www.emdocs.net/; https://rebelem.com/.

qualitative methods, analyzed free response data using a thematic approach. The study was determined to be exempt by the Institutional Review Board at Stanford University.

Results

Between 2016 and 2020, registration for FoEM course use expanded from 2 sites with 36 learners to 154 sites and 4453 learners (FIGURE). As of December 2020, registration for the 2020–2021 academic year (AY) included 198 sites and 5453 learners, with growing use at international sites (13) and for new learner types (46 clerkship sites, 9 advanced practice provider programs).

For the 2018–2019 AY, more than half (130 of 247, 53%) of ACGME-accredited EM residency programs in the United States[69] registered for FoEM. We distributed our online evaluative survey in June 2019 to eligible site leaders and learners. We excluded sites that reported limited content use (eg, piloted only a few cases or units, newly accredited programs without trainees) or registered past the midpoint of the academic year. Ninety-eight of 102 eligible site leaders (96%) and 1618 of 2996 learners (54%) completed the survey. Survey data demonstrated that 97% of sites (95 of 102) utilized the F1 course and 76% of sites (74 of 102) utilized the F2 course. One hundred percent of site leaders were "satisfied" or "very satisfied" with FoEM content and reported average preparation time of 1.16 hours a week (SD 0.79). Seventy-three percent (72 of 98) reported use of coordinated assessments, and 61% (49 of 81) reported that FoEM helped identify learners with gaps in medical knowledge or clinical application. Ninety-three percent of learners (1499 of 1612) were "satisfied" or "very satisfied" with FoEM content. Learners also indicated adherence to asynchronous assignments (mean 1.6 hours a week, SD 0.96). Results of qualitative analysis show that leaders value FoEM's usability, large volume of material, content quality, adaptability, organization, resident-faculty interaction, and resident-as-teacher opportunities. Barriers included resident attendance, conference structure, technology limitations (eg, website download issues, access to asynchronous links), and faculty engagement. Additionally, faculty

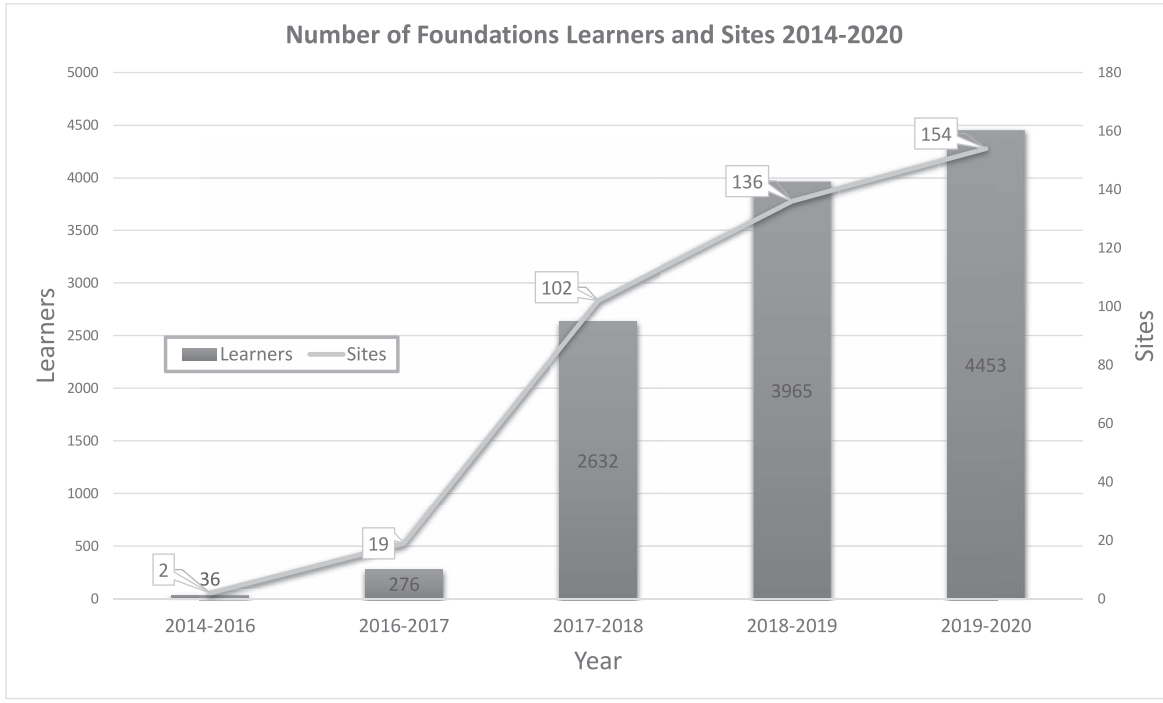

FIGURE
Foundations of Emergency Medicine Registration, 2014–2020

expertise in small group teaching, oral board style case presentation, and succinct review of targeted learning points was variable. Recommendations for improvement included diversifying and expanding content, frequently updating content, focusing more on evidence-based medicine, and ensuring accessibility of asynchronous resources. Learners identified similar benefits and improvements as leaders. Additionally, learners appreciated facilitation of asynchronous learning and recommended improved technology (eg, improved usability of website, updating inactive links), a refined tracking method, and expanded self-assessments.

Discussion

Within 3 years (2015–2018), we developed, implemented, and refined 2 level-specific, learner-centric core content courses in EM on a national level. To our knowledge, this endeavor is the first of its kind in any medical specialty.[10–13] F1 and F2 have been widely utilized across US EM residency programs and are viewed positively by faculty leaders and resident learners.

The F1 and F2 courses fill an identified need in GME and provide an easy way for EM program leaders to adopt best practices in education.[4,25,26,31–35,37–40,70] The centralized, free, accessible nature of FoEM reduces the burden of work for educators and allows incorporation of level-specific core content education using proven effective learning methods such as active learning, small group collaboration, interleaving, and spaced repetition.[71,72] Further, the flipped classroom model employed by the courses allows for formal implementation of individualized interactive instruction, adhering to recommended guidelines by providing vetted asynchronous resources for independent study.[1,73] These structured Learning Pathways address concerns in the medical education community regarding the scope and quality of online resources as learners move away from use of traditional textbooks.[26–29]

The FoEM curricular model could be replicated to create free, open access, core content for new learner types and other medical specialties. Crowdsourcing has helped ensure feasibility and quality assurance. F1 and F2 content was created and vetted by faculty around the country, incorporating diverse perspectives and accounting for local practice norms. Content is also consumed by a national audience, generating robust feedback and peer review. Of note, our program relies on substantial volunteer effort.[74] Faculty participation in other settings may be variable and subject to institutional norms regarding the value of digital scholarship for promotion. Finally, maintenance of content and sustainability should be considered, as widespread adoption creates substantial administrative work and, once developed, content

must readily adapt to changing needs, course feedback, emerging literature, and updated practice guidelines. FoEM content is updated annually based on user feedback, and a comprehensive content revision is performed at least every 3 years to align with emerging literature and updated practice guidelines.

Although the FoEM courses are standardized, participating programs must address their own unique needs and barriers; this may result in high variability in course implementation or adherence to recommended implementation guidelines. In particular, access to third-party asynchronous assignments and assessments (eg, textbooks, paid online learning platforms) is variable by institution. While we present FoEM as an innovation, we include supporting data based on annual stakeholder surveys. As with all surveys, ours is subject to potential selection bias and both individual and item non-response bias.[75] Although these biases may exist, given the large number of leader and learner responses, we believe that our fundamental findings are unlikely to be markedly affected. We chose to limit this innovation to a single medical specialty as a pilot. While it is possible the results may not be generalizable to other settings, we believe that there are enough similarities in the needs and delivery of all GME that, with content modification to meet specialty-specific needs, this model may help others create similar programs.

Stakeholders identified several benefits, barriers, and strategies for improvement. FoEM will continue to incorporate user feedback to optimize strengths, troubleshoot weaknesses, and curate curricula. Short-term interventions include updating all F1 and F2 cases to ensure adherence to current evidence-based guidelines and expanding options for self-study resources in our Learning Pathways. Further study is needed to understand the impact of F1 and F2 courses on objective learning outcomes, including medical knowledge and clinical care delivery. Additional topics for future investigation include learner preferences and adherence to asynchronous assignments and characteristics of use of resident instructors within the FoEM model. We are currently working to develop additional FoEM content to support other learner groups, including a Foundations III course for PGY-3 learners and targeted content for medical students, advanced practice providers, and emergency care providers in international settings. Though there are limitations to the curriculum and outcomes as described above, the FoEM curricular model appears to be beneficial, generalizable, and feasible to implement on a large scale. FoEM may be used as a prototype to expand content to new learner types and different specialties across a wide variety of practice environments.

Conclusions

We developed and implemented a learner-centric, level-specific, national EM residency curriculum that has been widely adopted in the United States.

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