


CLINICAL CONCEPTS

Education

Educational concepts: A longitudinal interleaved curriculum for emergency medicine residency training

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Abstract

Traditionally, emergency medicine (EM) residency programs teach non-adult emergency department activities (such as pediatric EM, point-of-care ultrasound [PoCUS], emergency medical services, and others) in a block format. In this way, a resident may have a 1-month pediatric EM rotation and then not have any further pediatric EM exposure until their next pediatric rotation 6–9 months later. Furthermore, some rotations are only allotted for 1-month during the entire residency. A first-year EM resident may have their only formal PoCUS rotation early in the first year of training when their overall skills are developing, and their level of understanding and retention of information may not be optimal at that juncture of their residency training. This is far from ideal from an educational perspective. Learning scientists have now suggested that a longitudinal interleaved curriculum has substantial advantages over the traditional block format. This curriculum allows for a “spaced retrieval” practice that enhances retention of material and develops thinking processes that are important in clinical practice. The increased continuity of clinical experience has been shown to improve educational outcome and learner satisfaction. We developed a novel longitudinal interleaved curriculum for our EM resident trainees. This curriculum encompasses the entire 3 years of residency training and has the goals of increasing EM knowledge and clinical skills and being excellent preparation for board certification examinations. This concept has clear educational benefits. While adapting an existing medical training program would be challenging, a longitudinal curriculum could be phased in to replace a traditional EM curriculum.

1 | BACKGROUND

As medical educators, we have an important responsibility to use the best possible education strategies with those who learn from us: Nelson Mandela said, “Education is the most powerful weapon you can use to change the world.” In any educational program, both the content and method of delivery of the educational material are important

to facilitate optimal learning. Recent evidence in the field of learning science has suggested that longitudinal interleaved curricula may have advantages over traditional block format curricula in terms of the method of educational delivery.¹ This approach, called spaced or distributed learning, has proven effective in many fields, such as point-of-care ultrasound (PoCUS),² undergraduate clinical medical training,³ family medicine residency training,⁴ and medical procedure training.⁵

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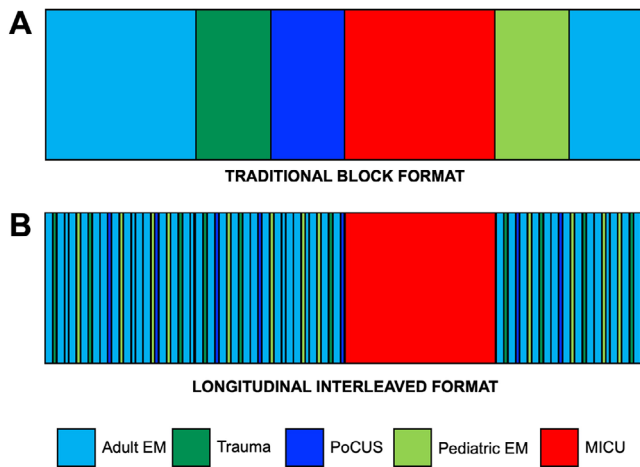


FIGURE 1 An illustration of the differences between the traditional block format curriculum and the longitudinal interleaved curriculum. The traditional block format curriculum (A) has 2- or 4-week blocks in various disciplines. The longitudinal interleaved curriculum (B) shows the elimination of most blocks, with shifts in various disciplines “interleaved.” For example: instead of a 1-month block of pediatric emergency medicine (EM) in a year (in the block format), the pediatric EM shifts may be scheduled once a week, to interleave with other shifts. The total exposure time to each discipline remains the same, but the resident will switch between disciplines with a much higher frequency. There is still retention of some blocks in this format, in which continuity of exposure has many educational and practical advantages (eg, critical care rotations). The exact disciplines and time periods shown in this figure are for illustrative purposes only. MICU, medical intensive care unit.

Longitudinal interleaved residency training is now receiving increased interest in medical education because of these potential benefits.¹ The curriculum (where learners switch between multiple related subjects in a short period of time) allows learners to develop cognitive connections and improve memory associations, which ultimately improve inductive reasoning.^{6–8} Yuan intriguingly described in their review that spaced learning offers significant benefits for enhancing learning but that these benefits might not be fully reflected in test scores in the short term.⁹ However, the enhanced long-term memory and memory processing benefits are without doubt. This has important implications in improving medical thinking and clinical decision making. Although this approach has been adopted in many undergraduate medical programs, graduate medical education (GME) has lagged behind, including in emergency medicine (EM) residency training.^{3,10–12} At least part of this lag is because educators have struggled with how to implement and evaluate these learning methods in postgraduate medical education programs, despite the evidence of their benefits.¹³ Figure 1 shows a graphical representation of the differences between the block format and longitudinal interleaved curricula.

At the residency level, GME schedules share many of the same characteristics as the traditional medical student scheduling model. Rotations are typically 1 month long and will often move from one major specialty or subspecialty area to another, with no overlap

or integration of patient care. This type of experiential learning is fragmented and lacks continuity in some subject areas required for learners to obtain overall specialty competency. Previous GME studies have also shown that longitudinal curricula improve the acquisition of practical skills.^{2,14,15} A specific example of the effectiveness of longitudinal training was described by Kelm et al. They found that a longitudinal PoCUS training program for internal medicine residents produced significantly better retention of skills than a block-type training program.¹⁴ Similarly, in a review on graduate and undergraduate PoCUS training, Martin et al concluded that a multi-year longitudinal curriculum was the most effective educational strategy.¹⁶

Some family practice residencies have already adopted longitudinal interleaved curricula.^{17–19} However, few, if any, other specialties have utilized this educational format for residency training. In EM, we were unable to identify examples of longitudinal interleaved curricula for residency training.^{20,21} However, Shappell and Ahn reported a strong interest in the concept, at least for didactic teaching, among first-year EM residents in the Chicago area.²² There are, however, many EM programs that utilize aspects of longitudinal clinical teaching. Some EM residencies offer topic areas of focus, commonly referred to as scholarly tracks. Jordan et al. described these as “longitudinal curricular experiences with clear goals and objectives to allow residents to explore and develop skills in a particular clinical or academic area of focus within EM.”²⁰ In their survey of EM residencies, approximately 45% offer some sort of scholarly track.²⁰ Track participation was voluntary in 60% of the programs and was typically available only to senior-level residents. EM tracks have been usually viewed as opportunities for advanced training in particular topic areas, including administration, disaster medicine, education, emergency medical services (EMS), global health, observation medicine, ophthalmology, public health, radiology, research, simulation, toxicology, PoCUS, or wellness.^{21,23–26}

When applying the longitudinal interleaved concept to GME residency training, the required non-adult emergency department (ED) activities can be interspersed into EM blocks over the entire residency education, rather than scheduled as their own dedicated blocks. This longitudinally implemented curriculum maintains the overall total hours of all activities but allows the residents’ non-adult ED activity exposure to grow with their overall clinical knowledge and integrate aspects of graduated responsibility with their progression in residency. Furthermore, it allows learners to be more engaged in their own learning and establishes a foundation for life-long learning. One additional benefit is that it also ensures that residents will be exposed to conditions that have a seasonal variation in presentation. Examples of this would include trauma presentations (higher in warmer months) and pediatric respiratory virus infections (higher in winter months). This significantly increases the strength of the curriculum.

Currently, there is a paucity of literature on integrating non-adult ED activities longitudinally into EM residency education. Although the transition from traditional block-based subspecialty rotations to an integrated longitudinal curriculum remains a novelty and a challenge, EM training programs in Europe and the United States have conducted

TABLE 1 The advantages and disadvantages of the longitudinal interleaved curriculum compared with the traditional block curriculum.

Benefits of longitudinal interleaved curriculum	Disadvantages of longitudinal interleaved curriculum
Spaced retrieval practice enhances long-term retention of material. ^{b,7,28}	May not be suitable if pediatric ED or other off-service departments are not close to the base hospital. ^a
Overall increase in resident knowledge, both self-reported and when compared to residents in conventional curriculum. ^{4,29,30}	More complex scheduling. ^a
Improved educational outcome (improved in-training exam scores) when interleaved teaching strategies used. ^{1,31}	
Improved inductive reasoning, through direct comparisons between interleaved and non-interleaved teaching processes. ^{b,32,33}	
Enhanced decision making (problem solving). ^{28,32-34}	
Increased recovery time from regular ED shifts. ^a	
Better management of circadian rhythm disruptions. ^a	
Increased number of procedures. ³⁵	
Maximized exposure to seasonally variable presentations. ³⁶	
Increased resident satisfaction. ^{6,8}	
Improved administrative experience (prolonged hospital committee participation). ^a	

^aItems based on our experience and speculation.

^bItems based primarily on educational science and undergraduate educational studies.

needs assessments and identified a strong interest in a longitudinal curriculum.^{22,27}

2 | IMPORTANCE

It is self-evident that educating future physicians optimally is of great importance. It is incumbent on educators to provide the best possible learning environment to prepare residents for future clinical practice. It is possible that the longitudinal interleaved curriculum might provide this environment. It is important for EM (and other) program directors to be aware of this conceptual change in understanding the significance of curriculum structure. It would be valuable for program directors and other decision makers to consider the benefits and disadvantages of the longitudinal interleaved curriculum. Finally, it is essential to conduct research to verify that new educational principles based on basic learning science translate into measurable improved educational outcomes.

The benefits and disadvantages of the longitudinal interleaved curriculum are summarized in Table 1.

3 | REQUIREMENTS FOR EMERGENCY MEDICINE RESIDENCY CURRICULUM

The Accreditation Council for Graduate Medical Education (ACGME) has strict requirements for clinical experiences in EM residencies. According to the program requirements, residents must spend 60% of their clinical education in the ED under the supervision of EM faculty. Five months, or 20% of all EM encounters, need to be dedicated to the

pediatric patient (under 18 years of age). PoCUS, EMS, and trauma are all important aspects of the EM residency curriculum, but minimum time in each area is not specified in the ACGME program requirements. Additionally, there are requirements for scholarly activity (research) and patient safety/quality improvement training. Although the ACGME requires EM residency programs to include these specific non-adult ED activities in the residency curriculum, they do not specify how they should be incorporated.³⁷

4 | DEVELOPMENT AND DESCRIPTION OF THE LONGITUDINAL INTERLEAVED CURRICULUM

Kern's process to curriculum development, as applied to our curriculum, is described in Table 2.³⁸

When we designed our longitudinal curriculum, all clinical experiences were combined into a longitudinal format throughout the 3 years of EM residency training. The only exceptions were 4-month-long intensive care unit (ICU) rotations, 1-month-long trauma service rotation, and 1-month-long elective block. The few retained blocks differ between training years. PGY-1 residents have medical ICU, surgical ICU, and trauma blocks. PGY-2 residents have medical ICU and pediatric ICU blocks. PGY-3 residents have an elective block. The longitudinal interleaved curriculum is mandatory for residents and occurs throughout the duration of training. In this new format, the non-adult ED activity curricular areas do not have separate rotations or blocks. Individual training shifts or parts of shifts are assigned to each resident in each of these areas throughout their residency. Compared to a traditional dedicated EM rotation, a typical month in our curriculum has two to three fewer clinical ED shifts and fewer circadian rhythm-disruptive

TABLE 2 Kern's six steps to curriculum development, as applied to our experience.**Step 1: Problem identification and general needs assessment**

- Optimum training is essential to equip residents with the skills and knowledge to be safe and effective emergency physicians.
- Training must comply with the requirements set down by ACGME and ABEM.
- Training should maximize learning and minimize negative impacts on residents (e.g., fatigue, circadian rhythm disruptions).
- Current approach: the standard curriculum contains the necessary training elements, but the structure is not ideal for learning, nor for resident wellbeing. Long periods between certain training blocks (e.g., pediatric EM), leaves residents unable to master knowledge and skills in these disciplines.
- Ideal approach: the curriculum is structured according to educational ideals, to maximize learning, to maximize preparation of the resident for clinical practice, and to maximize resident wellbeing.
- While there is substantial evidence to support the benefits of an interleaved curriculum, the methods of establishing it in graduate education have not been well studied.

Step 2: Targeted needs assessment

- EM residents were the targeted learners, consensus gained from residents, key faculty, and course directors:
 - Residents need to develop ACGME- and ABEM-required competencies.
 - Need to improve continuity of learning, for example, concerns related to wide separation of blocks, or only single exposure during residency training.
 - Limited ability to participate in ED management or quality control processes.
 - Risk of burnout from long working hours and circadian rhythm disruption.

Step 3: Goals and objectives

- Establish longitudinal interleaved curriculum in 3-year residency program.
- Enable frequent and repeated exposure to topics that would be in block format in old curriculum.
- Reduce disruption of circadian rhythm.
- Increase longitudinal exposure to administrative aspects of ED management.

Step 4: Educational strategies

- Introduce interleaved longitudinal curriculum, specifically to:
 - Reduce the number of block training clinical experiences (pediatric EM, point-of-care ultrasound, emergency medical services, trauma, research).
 - Replace suitable block training experiences to interleaved spaced learning experiences, throughout 3-year training period.
 - Retain clinical experiences best learned through continuity of care (intensive care unit rotations, elective rotation).

Step 5: Implementation

- For ab initio implementation in new residency program:
 - Introduction of curriculum with first class.
- For evolution from standard curriculum in existing residency program:
 - Speculation: possible phased introduction of new curriculum with each new class—3-year process to complete. Pediatric EM as first change.

Step 6: Evaluation and assessment

- Resident feedback.
- Resident performance on ITE and board examinations.
- Evaluation of resident performance by experienced faculty.
- Evaluation of new curriculum by experienced faculty.

Abbreviations: ABEM, American Board of Emergency Medicine; ACGME, Accreditation Council for Graduate Medical Education; ED, Emergency Department; EM, Emergency Medicine; ITE, In-Training Examination.

shift changes. These shifts are replaced with shifts in PoCUS, EMS, administration, or other EM areas of focus. Although each resident will have fewer EM shifts each month than in a conventional curriculum, each resident will also have fewer off-service blocks away from the ED. Over the duration of the residency program, the number of ED shifts was very similar to that in traditional block format programs.

Parsons et al recently published data from a survey of the shifts and hours worked in US EM residency programs.³⁹ Like most of residencies in this survey, our program increased the amount of time spent in the ED in successive years. However, unlike most of the programs, our PGY-1 residents spent more than 70% of their clinical experiences in the ED, increasing to 92% in the PGY-3 year. The longitudinal for-

mat allows the resident's home base to remain in the ED for more than 70% of their entire residency education. This is reflected in the one to two more blocks in each PGY, when compared with the median reported in the survey. We have one to two fewer shifts per 28-day block and slightly fewer total hours per ED block when compared with the survey medians. Our average ED shift length is 10 h. Thus, in residencies with traditional curricula, 3-year programs have a median of 23 ED blocks, each consisting of a median of 18 shifts, with a total of approximately 3980 h of adult ED time. Our curriculum contains 29 months of the longitudinal curriculum, with each month including a median of 14 adult EM shifts, with a total of approximately 4060 h of adult ED time. In addition, two to three pediatric EM shifts and variable

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Conf 7A-12P	Adult ED 4P-2A	Adult ED 4P-2A	STEMI Cmte 2P-4P	OFF	Adult ED 7A-3P	Adult ED 8A-5P
Research 1P-3P						
Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Conf 7A-12P	Ped ED 7A-7P	OFF	Admin 9A-12P	Adult ED 9A-5P	Ped ED 7A-7P	Adult ED 11A-7P
US 1P-5P						
Day 15	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
Conf 7A-12P	OFF	Adult ED 8A-5P	Adult ED 4P-2A	Adult ED 8P-7A	OFF	OFF
EMS 1P-8P						
Day 22	Day 23	Day 24	Day 25	Day 26	Day 27	Day 28
Conf 7A-12P	Trauma 7A-3P	Ped ED 7A-7P	Adult ED 1P-11P	Adult ED 4P-2A	OFF	OFF
Wellness 1P-6P						
Day 29	Day 30	Day 31				
Conf 7A-12P	Adult ED 8P-7A	Adult ED 10P-7A				
PS/QI 2P-4P						

FIGURE 2 A sample of the longitudinal interleaved curriculum monthly schedule. The interleaved components of the PGY-1, PGY-2, and PGY-3 schedules are identical. Many of the half-day shifts were scheduled for Tuesday afternoons, with Tuesday mornings allocated to conference (didactic teaching). The QI experience was one of these shifts. The administration experience was a hospital wide event, which needed to be scheduled differently. The exact detail of the scheduling could be modified for programs with different needs. For emergency medical service (EMS) shifts, residents were offsite with one of the local county EMS crews. During shifts allocated to ultrasound, residents exclusively performed ultrasound scans and procedures in the emergency department (ED). During the trauma shifts the resident will attend major trauma presentations, respond to trauma activations, and see other trauma-related presentations in the ED. Admin, administrative time; Adult ED, adult emergency department shift; Conf, didactic conference; EMS, emergency medical services ride along shift; Ped ED, pediatric emergency department shift; PS/QI, patient safety/quality improvement project; Research, research project; STEMI Cmte, ST segment elevation myocardial infarction hospital committee meeting; Trauma, trauma shift; US, ultrasound scanning shift; Wellness, wellness residency group activity.

numbers of shifts in trauma, EMS, and PoCUS are interspersed with the ED shifts. Figure 2 shows the different modalities utilized to provide longitudinal educational activities for the non-adult ED activity portions of the curriculum. The typical shift lengths are 8–11 h for adult EM, 12 h for pediatric EM, 8–12 h for trauma, 8 h for EMS, and 4 h for PoCUS. Furthermore, residents are allocated dedicated and protected time to work on research and patient safety/quality improvement projects in each block. No nightshifts are allocated on Monday nights prior to the weekly resident didactic half day (conference) on Tuesday mornings. Residents are also given dedicated time to participate in hospital quality assurance committees. Committee responsibilities were added to the official resident schedule to prevent conflicting responsibilities. This allows the residents to commit to

their roles on the committee (typically monthly or quarterly meetings) during a prolonged period of their residency.

Overall, the time requirement for each traditional area of rotation is satisfied, but the experience is dispersed over all 3 years of the program instead of within individual blocks. This allows the residents' clinical applications of material to grow with their overall medical knowledge. Furthermore, the ACGME requirements are met in a way that complies with the current thinking and evidence in educational science.

5 | WORK-LIFE BALANCE: POTENTIAL BENEFITS

Although the residents complete similar hours in required activities when compared to traditional block scheduling, the spacing and layout of these activities utilizing a longitudinal format can help to improve the residents' work-life balance. The longitudinal interleaved curriculum provides variety in each resident's weekly schedule. Since shifts in the ED are very physically and mentally taxing, a schedule that balances a week of three or four 10-h adult ED shifts with a 4-h PoCUS shift or a 3-h research block helps assist with the residents' ability to recover. Spacing these shorter and less intense components out over the course of all adult EM blocks (over the entire duration of the residency) was intended to enhance recovery time for the residents. The timing of these non-adult ED activities can be very flexible and can be scheduled to assist the resident's circadian rhythm adjustments from nights to days and vice versa.

6 | OUR EXPERIENCE

Our residency program has three hospital training sites in Bethesda Hospital East, Palm Beach County, Florida (Boynton Beach, 58,000 annual patient visits), Delray Medical Center (Delray Beach, 53,000 annual patient visits, Level 1 Trauma Center), and St. Mary's Medical Center/Palm Beach Children's Hospital (West Palm Beach, 50,000 annual patient visits, Level 1 Trauma Center, dedicated pediatric hospital).

The faculty is composed of six senior clinicians in core faculty leadership roles and 34 clinical affiliate faculty at the training hospitals. The Department of Emergency Medicine is the leading clinical research department at Florida Atlantic University's Charles E. Schmidt College of Medicine.

The program's core faculty all had exposure to several traditional block curricula at their prior programs (as residents, fellows, and faculty). Based on these experiences, they identified the need for a better system. From established research in undergraduate education programs, and early work in family medicine programs, they elected to devise and implement a longitudinal curriculum for the inaugural class of EM residents at the Florida Atlantic University program. The longitudinal curriculum has been used from the inception of the program, and includes integrated pediatric EM, PoCUS, trauma, EMS, EM administration, research, and patient safety/quality improvement throughout the residents' 3-year training period. The inaugural class of six EM

residents was admitted in 2017. Since then, the program has graduated 24 residents.

We conducted a brief survey of our current emergency residents in July 2022 (see [Supporting Information](#)). All 18 residents completed the survey anonymously. Their opinions of and satisfaction with the longitudinal curriculum were evaluated. A five-point Likert scale (strongly disagree: 1 to strongly agree: 5) was used to quantify the impact of the curriculum on their learning, confidence, overall wellness, and selection of the program when applying to residency (influence on their rank order lists). Three major themes were identified from the survey. First, there were very positive responses about the benefit of the curriculum structure on wellness, work–life balance, and on time for academic activities. Second, the majority believed that the most beneficial aspect of the longitudinal curriculum was pediatric EM (89%). This was notable because other studies have identified pediatric EM training as problematic in the current block format. This is mainly due to the need for exposure to seasonal variation in pediatric presentations but also because of limited time to learn core content and master procedural skills in the traditional format.^{15,36,40} The longitudinal interleaved curriculum has been shown to provide a better learning experience for residents in this component of training.^{5,41} EMS and PoCUS followed with 6% of the residents choosing each of these rotations as most beneficial. Third, it was notable that there were very few negative or strongly negative ratings of any of the longitudinal curriculum components. However, residents were more neutral about the longitudinal curriculum for rotations other than pediatric EM. There was no majority choice for the least beneficial component: research (39%) was followed by patient safety/quality improvement (17%), trauma (17%), EMS (11%), and PoCUS (11%).

The overall satisfaction with the format of the curriculum was very high, and many residents reported that the curriculum had an important impact on their decision to rank the program highly when applying for residency.

7 | IMPLEMENTATION

We had the benefit, as a new program, of being able to create a novel curriculum from the outset. Without a traditional framework in place, it was easy to institute the longitudinal interleaved model. However, it would be more challenging to redesign a fully established traditional residency curriculum, and there is limited published evidence or published experience to guide this process. In addition, this process might be more complex for EM than for other disciplines, as some rotations (such as pediatric EM and trauma) are dependent upon other departments' cooperation, and changes might affect their service delivery and the training of their own residents. In our hospitals, we do not have a pediatric residency or pediatric EM fellowship, which made scheduling pediatric ED shifts easier. Furthermore, the surgery residency was established at the same time as the EM residency, allowing us to work with the surgery program in developing the trauma rotations. Other rotations (such as PoCUS and research) are not dependent on other departments and would be easier to implement.

A full discussion of the process for executing a curriculum change is beyond the scope of this concept paper, but there are a few core principles to consider. Most importantly, changes in postgraduate medical education are essential as new educational philosophies or technological advances become available.⁴² However, when considering any curriculum change, it is essential to adhere to sound change management principles, and to collaborate with specialists in educational science.⁴³ The key factors for success in postgraduate medical education curriculum changes, as reported by Wijk et al., are working as a team; having a clear vision of the change and the process and believing in its value; having an explicit mandate for the change; having the support of colleagues and superiors; and having a long-term perspective.⁴²

In terms of introducing a longitudinal curriculum in an established EM residency program, we speculate that slowly implementing changes over time could be the most effective model. Two possible approaches to transitioning to a new curriculum over a 3-year timespan could be considered.

In the first pathway, the changes to the new curriculum would be phased in over a 3-year period. In year 1, pediatric EM would be introduced in a longitudinal format for all residents (PGY-1, PGY-2, and PGY-3). In year 2, additional blocks could be converted to interleaved rotations (e.g., PoCUS and trauma). In year 3, the final remaining blocks could be changed to the new format. This would need to be designed to ensure that all residents still complete the required time in each rotation.

The second pathway would require the introduction of the longitudinal curriculum at the beginning of the academic calendar for a new PGY-1 class while retaining the old curriculum for the existing PGY-2 and PGY-3 residents. In year 2, both PGY-1 and PGY-2 residents would follow the new curriculum, with PGY-3 still in the old curriculum. In year 3, all residents would follow the new curriculum. This pathway could be simpler to implement but would require all elements of the new curriculum to be in place at the outset of the planned change.

8 | LIMITATIONS AND LESSONS LEARNED

A limitation of our study is the small size of our residency program, which may have skewed our experience. Even in our small program of 18 residents, however, the intricate longitudinal scheduling is a large administrative burden. Ensuring that all residents are scheduled for the proper number of longitudinal shifts to offset a traditional block schedule requires more effort than following the traditional block schedule format. This is feasible with a smaller program but may require extra administrative support in larger residency programs. It is also important to track when a resident may miss a longitudinal experience to ensure that it is completed in the future.

We also learned that it is important to be consistent with the resident scheduling on off service longitudinal sessions. For example, it is important for our surgery colleagues to know when an EM resident will be on a longitudinal trauma shift so that the scheduler can plan for a full trauma team accordingly. We modified the original format to

consistently cover trauma on certain days, so that they can rotate off their surgical seniors.

Additional limitations that may have skewed our experience were starting our program at the same time as the surgical residency program, and the absence of pediatric training programs at our hospitals. These factors may have made this curriculum easier for us than it might be for others.

9 | FUTURE DIRECTIONS

Perhaps, most importantly, it needs to be established whether the outcomes of our training program are equal or superior to the existing curriculum. In a future study, we will partner with an institution with a traditional curriculum and compare the residents using objective measures such as ITE scores, number of procedures, perceived procedural competency, and board examination scores. In addition, resident wellbeing and risk of burnout will be evaluated between the different programs.

Should the longitudinal curriculum prove better than the traditional curriculum, future work will also need to evaluate potential methods of achieving curriculum evolution and determine the most appropriate approach.

10 | CONCLUSIONS

There is considerable evidence to support the educational benefits of a longitudinal interleaved curriculum. It is gaining traction in undergraduate training and in some residency disciplines, although not yet in EM. The EM curriculum, however, is well suited to be transitioned from a traditional block format to the longitudinal interleaved format. We achieved this goal by creating a novel, longitudinal interleaved EM residency curriculum by integrating pediatric EM, PoCUS, trauma, EMS, administration, research, and patient safety/quality improvement rotations throughout all 3 years of the residency. The effects of this educational format appear to be beneficial across EM, with pediatric EM being the area where a longitudinal experience has the greatest potential value. The curriculum has been well received by the residents and is a drawcard for future residents. This field of study has enormous potential for future research. This curriculum format may be useful in other medical disciplines, and these specialties should consider the benefits that it could add to their training programs.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest.

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SUPPORTING INFORMATION

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

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