

complicated by a medical emergency. Physicians called upon to treat passengers in-flight find themselves in the unfamiliar surroundings of an airliner cabin with limited resources, space, and equipment. Simulation of in-flight emergencies has been shown to improve medical student fund of knowledge and comfort level when responding to these unique situations.

Educational Objectives: Our goal was to simulate an in-flight emergency for residents in a space similar to that of an airliner cabin using only equipment typically available on a plane or in a standard airline medical kit. After participating in this simulation, residents would be familiar with 1) the contents of an in-flight emergency kit, 2) crowd-sourcing to obtain additional supplies, 3) the challenges in providing care on a plane, and 4) possible flight diversion.

Curricular Design: We designed an in-flight pediatric anaphylaxis simulation. Any necessary equipment needed to either come from the in-flight emergency medical kit, which the team had to request, or be crowd-sourced from other passengers. Passengers on the plane provided useful adjuncts, including a glucometer and an Epi-pen. Upon recognizing anaphylaxis, the team administered epinephrine, diphenhydramine, and IV fluids. Flight diversion was discussed with the pilot. During the scenario the team faced many challenges, including working in a limited space with immovable chairs and a narrow central aisle. They had to interface with fellow passengers, some of which were helpful, while others were irritated or inebriated. Residents also needed to recall pediatric medication dosing as their smartphones were nonfunctional. The overall assessment of resident performance was made by direct observation during the simulation.

Impact/Effectiveness: Participants were surveyed to assess the efficacy of the simulation. Feedback was uniformly positive, with 6 of 7 respondents rating the simulation as “excellent” and 1 of 7 rating it as “good.” No learners considered the simulation “poor,” “fair,” or “average.” One learner described the case as a “good review of a common, real-life situation.” We believe simulation of in-flight emergencies will provide residents with a framework for approaching this common resource-limited scenario.

6 Foundations EKG: An Open Access Flipped Classroom Critical EKG Curriculum

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Background: Electrocardiogram (EKG) interpretation is critical to Emergency Medicine (EM) practice. Hartman et al found 28%, 39%, & 54% of PGY1s, PGY2s, and PGY3/4s respectively passed a validated test of critical EKG interpretation. Despite this educational gap, Ginde et al found that 36% of residencies lack formal EKG curricula. Free Open Access Medical Education (FOAMed) resources for EKG interpretation exist but are not focused on the specific needs of the junior learner.

Educational Objectives: We sought to demonstrate the value of a flipped classroom, critical EKG curriculum for junior learners that incorporates curated FOAMed content into didactic instruction. Additionally, we (1) provide an interpretation framework to help residents develop mastery and rely on when confronted with complex EKGs and (2) ensure open-access to the curriculum for all residency programs or interested individual learners.

Curricular Design: The 2016-2017 Foundations EKG curriculum was organized around 5 concise reviews of core EKG principles and 20 challenge EKG cases. Topics included the 15 critical EKG diagnoses reported by Hartman et al and 5 additional topics. Cases included a brief history, EKG(s), standard interpretation stem(s), and FOAMed links. Using a flipped classroom approach, learners were assigned EKGs weekly for independent review. During a subsequent 10-minute didactic session faculty or senior resident facilitators guided a review of core concepts and interpretation of EKG(s).

Impact/Effectiveness: Our curriculum was offered to any interested residency program. In February 2017, program leaders and learners from 6 sites were surveyed by collecting anonymous responses to 5-point Likert scale questions and a free response section. All leaders, 5/5 (100%) with 1 leader excluded as a course creator, and 54 of 76 learners (71%) completed the survey. We found high satisfaction among both leaders and learners (Table 2). Additionally, learners believed the curriculum to be level-appropriate, were satisfied with the standardized format, and noticed a beneficial clinical impact.

Survey responses from all Foundations leaders/learners showed significant interest in an EKG curriculum for advanced PGY2/3 learners. In response, we added 28 new cases for a total of 48 and divided the curriculum into Fundamental and Advanced courses for the 2017-2018 academic year.



Table 1. Curriculum overview.

Foundations EKG Curriculum Schedule		
Session	Challenge EKG #	EKG Core Content Review
1	Core 1	How to Read an EKG (NSR)
2	Core 2	Approach to Ischemia
3	EKG 1	Anterior STEMI
4	EKG 2	Posterior STEMI
5	EKG 3	Inferior STEMI, RV STEMI
6	EKG 4	LBBB/Pacer (Sgarbossa)
7	EKG 5	STEMI Mimics (Hyperkalemia, Pericarditis)
8	EKG 6	STEMI Mimics (Isolated aVR, Benign Early Repolarization)
9	Core 3	Approach to Syncope
10	EKG 7	WPW
11	EKG 8	Brugada
12	EKG 9	Long QT
13	EKG 10	PE/RV Strain/RVH
14	EKG 11	LVH/HOCM
15	Core 4	Approach to Bradyarrhythmias
16	EKG 12	2nd Degree Type II, 3rd Degree AV Block
17	Core 5	Approach to Tachyarrhythmia (Sinus Tach)
18	EKG 13	Atrial Fibrillation/Flutter with RVR
19	EKG 14	SVT
20	EKG 15	VT/VF
21	EKG 16	RBBB/LBBB
22	EKG 17	TCA Overdose
23	EKG 18	Digoxin Toxicity
24	EKG 19	Pacemaker Malfunction
25	EKG 20	Cerebral T Waves

Foundations EKG I course (previously “EKG Fundamentals”) is available as part of the Emergency Medicine Foundations curriculum. Open access to curriculum challenge and answer documents is available on the course website:
www.emergencymedicinefoundations.com

Table 2. Survey data.

Learners		
Survey Item (1- Strongly Disagree, 3- Neutral, 5- Strongly Agree)	Agree or Strongly Agree	Mean
The EKG challenges are appropriate for my level of learning.	85% (46/54)	4.20
The EKG challenges are helpful for learning fundamental knowledge.	80% (43/54)	4.09
I like using the standard interpretation format for EKG challenges.	78% (42/54)	4.00
The Foundations EKG curriculum helped me interpret EKGs on shift.	70% (38/54)	3.96
Steve Smith’s Blog is beneficial for understanding key concepts for EKG challenges.	72% (39/54)	4.09
I am highly satisfied with EKG Fundamentals.	80% (43/54)	4.09
I would recommend the EKG Fundamentals curriculum to other learners.	78% (42/54)	4.07
[I am interested in] participating in an Advanced EKG curriculum targeted towards PGY2-3 learners.	80% (152/190)	4.05
Leaders		
I am highly satisfied with EKG Fundamentals.	100% (5/5)	4.80
I would recommend the EKG Fundamentals curriculum to other learners.	100% (5/5)	4.80
[Our program is interested in] participating in an Advanced EKG curriculum targeted towards PGY2-3 learners.	89% (16/18)	4.33

7 Innovation per DiEM (Design in Emergency Medicine): A Longitudinal Medical School Design Co-Curriculum Led by Emergency Medicine Mentors for Real Emergency Department Issues

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Background: Innovations that revolutionize healthcare are typically derived from non-traditional research and collaboration from seemingly disparate disciplines. The use of design principles in tackling complex health issues is gaining significant traction. If the inclusion of design in healthcare is to become a new standard, medical education, too, must evolve to prepare future clinicians on design thinking methods.

Educational Objectives: 1) To introduce both medical students and EM faculty to design thinking methods; 2) To apply design thinking to address common clinical and workflow challenges that are intrinsic to the ED; 3) To create a ‘design in medicine’ curriculum that exposes clinicians to real-world design experience that can be adopted at other institutions.

Curricular Design: Twenty first-year medical students from the Sidney Kimmel Medical College were enrolled in eight 3-hour experiential design sessions in 2017. Student teams were matched with EM physician-mentors, acting as stakeholders and content experts in their respective academic interest (i.e. education, clinical operations, ultrasound). Didactic content includes: 1) empathy building; 2) idea generation; 3) prototyping; 4) testing; 5) the user experience; 6) service design; 7) idea presentation; and 8) business canvas planning. Teams were tasked with applying design thinking methods to specific ED problems (i.e. patient-physician identification, managing patient expectation, point-of-care ultrasound). Each team project was evaluated using the Kirkpatrick Model through self-evaluation, group presentations, essays, and project deliverables (Table 1).

Impact/Effectiveness: Innovation per DiEM is a unique design curriculum that focuses on EM challenges with active EM clinician mentorship. Both students and faculty mentors report new senses of accomplishment and better understanding of design through the application of novel frameworks (i.e., user/patient experience design, clinical workflow optimization). The authors plan to evaluate each project longitudinally with the long-term goal of achieving level four on the Kirkpatrick Model (i.e., organizational outcomes): 1) improved patient satisfaction; 2) decreased resource utilization; and 3) integration of a design curriculum in medical education.