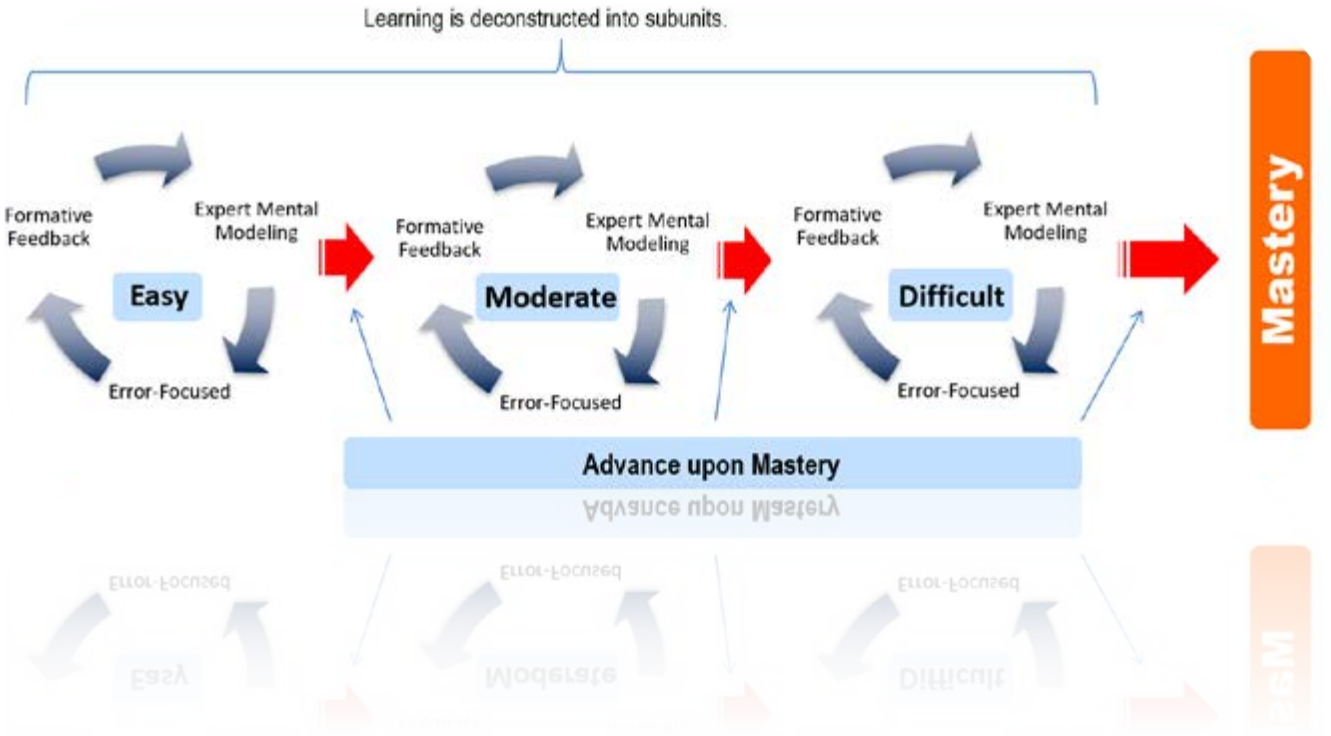
EDUCATION

Innovations in Fellowship Education

2019 Highlights Book



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Dallas, TX
May 17 - May 22, 2019
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PROGRAM DETAILS

The American Thoracic Society greatly values a strong fellowship program as a means of academic and clinical success. In an effort to recognize programs that implement exceptional practices, the ATS Training Committee developed the Innovations in Fellowship Education program. All pulmonary, critical care, sleep, and allergy fellowship programs (adult and pediatric) were invited to submit abstracts showcasing a novel and innovative best practice. Abstracts were reviewed and ranked by the ATS Training Committee based on the following criteria:

1. Innovation: How unique is the educational program? What is new and different?
2. Implementation/Sustainability: How was the program implemented and how effective was such implementation? Is this program sustainable?
3. Transferability: How easily might this educational program be adopted by other fellowship programs?
4. Outcomes: Are there reported outcomes or plans to measure them?

The goal of this program is to recognize fellowship programs that demonstrate educational excellence and to share these best practices with other programs.

The committee is pleased to honor the following top programs:

Baylor College of Medicine, Texas Children's Hospital

Innovating a Mastery Learning Program for Point-of-Care Ultrasound Using the Design-Based Research Model

Beth Israel Deaconess Medical Center and Massachusetts General Hospital, Harvard Medical School:

Clinical Educator Training in Pulmonary and Critical Care Medicine Fellowship: Producing Education Scholars

Wayne State University/John D. Dingell VA Medical Center:

A Novel Simulation and Ultrasound-Based Curriculum for Shock Management in a Pulmonary and Critical Care Medicine Fellowship Training Program

TOP INNOVATION ABSTRACT OF 2019!

Baylor College of Medicine, Texas Children's Hospital

Innovating a Mastery Learning Program for Point-of-Care Ultrasound Using the Design-Based Research Model

Authors: Kyle Brown, MD; Alan Riley, MD; Danny Castro, DO, MEd; Kiyetta Alade, MD; Adam Adler, MD; Mohammad Tcharmtchi, MD; Satid Thammasitboon, MD, MHPE; and the TCH POCUS Collaborative Baylor College of Medicine, Texas Children's Hospital Pediatric Critical Care Fellowship

Program Director: Mohammad Hossein Tcharmtchi

PROGRAM DESCRIPTION

The Pediatric Critical Care Fellowship at Baylor College of Medicine is an ACGME-accredited fellowship that is affiliated with Texas Children's Hospital. The program consists of 20 pediatric critical care fellows, and the department includes approximately 60 attendings and 20 advanced practice providers.

BACKGROUND

Point-of-care ultrasound (POCUS) has become a well-accepted method to facilitate timely clinical decisions in the pediatric intensive care unit. Many PICU providers have attended POCUS workshops, but very few use POCUS in daily practice.

OBJECTIVE

To employ the "Design-Based Research" (DBR) model (Analysis/Exploration, Design/Construction, and Evaluation/Reflection) to guide the development of a competency-based educational program for PICU providers.

METHODS

We analyzed and explored an educational problem through a targeted survey of PICU providers, a thorough review of the literature, and solicitation of expert opinion. We determined that the conventional, two-day workshop format did not prepare learners to achieve competence in POCUS.

Using mastery learning (ML) and Deliberate Practice (DP) as conceptual frameworks to address this problem (Figure 1), we designed a five-unit program for competence in POCUS skills: 1) POCUS Fundamentals: online didactics with embedded assessments; 2) Image Library: a web-based "assessment for learning" module; 3) Skills Practice: a virtual simulator with probe orientation tracking technology for practice and assessment of image acquisition; 4) DP Workshop: a one-day, hands-on session with human volunteers and expert coaches; and 5) On-the-Job Learning: an autonomous application of learned POCUS skills in the clinical setting using a cloud-based system with timely feedback from experts (Figure 2).

Using Focused Cardiac Ultrasound (FoCUS) as an exemplar for Unit 2, experts constructed a cardiac Image Library prototype comprising 90 questions organized into three levels of difficulty. Aligning with ML and DP principles, learners were given a set of 10 questions, learned from feedback, and repeated an additional set in the same difficulty until achieving a pre-defined level of mastery. A rapid prototyping process enhanced and finalized the module. It was then piloted with learners to evaluate the ML design principles. The Fundamentals, Image Library, and Virtual Simulator (Units 1-3) were launched three months prior to the workshop. At the workshop, learners were divided into beginner vs. advanced level and then performed DP according to their skill level. We evaluated educational processes and final skill level of learners as evidence for merit and worth of the program.

RESULTS

For the Image Library (Unit 2), a total of 17 PICU faculty and fellows attempted to complete the module and 14 achieved mastery by passing all three difficulties. Learners who took the module scored 72% on a 10-question assessment while experts and novices who did not take the module scored 82% and 17%, respectively. The Image Library was in-line with ML principles as the first-attempt score and the time spent on each question was consistent with level of difficulty, and the number of questions needed to pass the entire module varied greatly among learners (range 30 to 300). After the Workshop (Unit 4), 9 of 11 learners demonstrated competency in image acquisition by passing a pre-defined "mastery" level on a 5-point entrustment scale (median scores before vs.

after workshop: 2 vs. 4, p=.005). On a 5-point scale, learners' confidence increased from before to after the entire program, both with image interpretation (1 vs. 3, p=.005) and with image acquisition (1 vs. 4, p=.005). Learners rated the quality of the entire program for facilitation of learning (median 5/5), for being worth the time commitment (median 5/5), and for useful knowledge and skills to improve clinical practice (median 5/5).

FUTURE RESEARCH

After reflecting on this program, we plan to use evaluative data to enhance and develop future modules. Specifically, we will revise the teaching and feedback content and user interface within the modules to improve learners' confidence and performance.

CONCLUSION:

The DBR model was useful in innovating a robust POCUS program for PICU providers. Our results demonstrate the importance of Deliberate Practice and individualized learning timelines for POCUS skills.

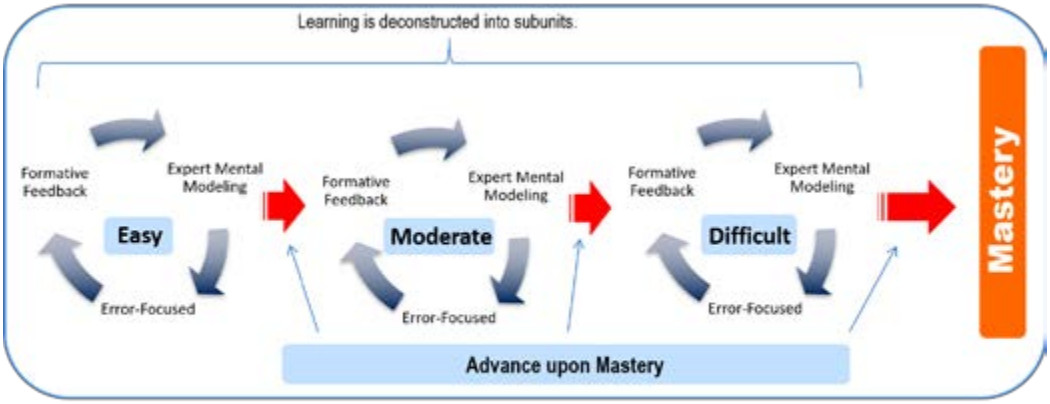


Figure 1 – Mastery Learning with Deliberate Practice for the POCUS Program
The program is divided into subunits of increasing difficulty. Each subunit incorporates key components of the Deliberate Practice model. Learners can move on to more difficult subunits only after demonstrating mastery on easier ones.

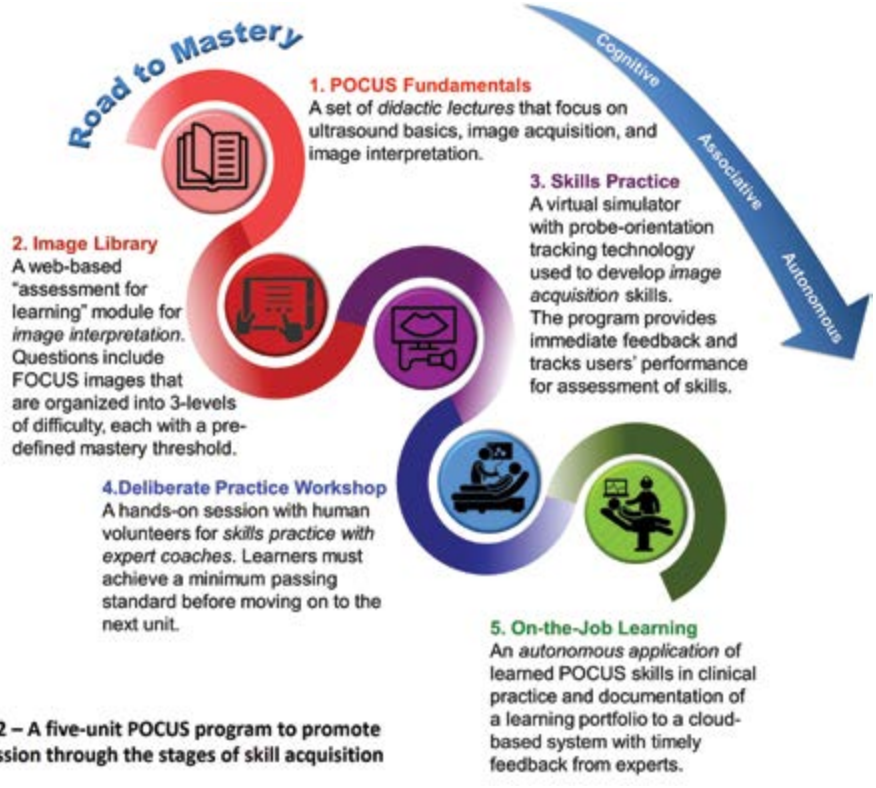


Figure 2 – A five-unit POCUS program to promote progression through the stages of skill acquisition

Beth Israel Deaconess Medical Center and Massachusetts General Hospital, Harvard Medical School

Clinical Educator Training in Pulmonary and Critical Care Medicine Fellowship: Producing Education Scholars

Authors: Richard M. Schwartzstein, MD; Jeremy B. Richards, MD; Asha Anandaiah, MD; Amy Sullivan, EdD; Margaret M. Hayes, MD

Program Director: Asha Anandaiah, MD

Associate Program Director: Kathryn Hibbert, MD

PROGRAM DESCRIPTION

The Harvard Combined Pulmonary and Critical Care Fellowship is a three-year program with 20 months devoted to clinical work across the spectrum of pulmonary and critical care medicine, including ambulatory, consultative, and intensive care experiences. Following their foundational year, clinical responsibilities emphasize increased autonomy and sub-specialty training and experiences, such as transplantation. In years two and three, fellows commit 16 months to pursuing academic research pathways in biomedical science, medical education, or clinical medicine.

BACKGROUND

An increasing proportion of candidates for pulmonary and critical care medicine (PCCM) fellowships are interested in pursuing academic careers focused on medical education. Consequently, many fellowship programs have created clinical educator pathways or tracks that focus on assisting fellows in acquiring teaching skills. However, to be a complete educator in academic medicine, one should acquire skills in medical education investigation and contribute to the creation of new knowledge and scholarship. To address this need within our PCCM fellowship, we have created a 16-month educational scholarship program for fellows interested in academic careers.

OBJECTIVE/METHODS

The Harvard Combined PCCM Fellowship Clinician Education Pathway (CEP) program provides fellows with extensive formal training in teaching and learning, as well as research skills and experience performing education investigations. In addition to extensive training in pedagogy, curricular development, and active teaching strategies, the core program provides a foundation for scholarship.

Components include (also see Figure 1)

- Formal curriculum that includes cognitive theory, principles of adult learning, curriculum development, feedback and evaluation methods, and teaching skills for a range of learners and venues
- Formal curriculum in medical education research methodology, including qualitative and quantitative methods
- Research training and practical experiences with experienced medical education researchers
- Identification of and support in applying for medical education research grant funding
- Career development support and coaching to facilitate fellows transitioning to clinician-educator faculty positions

In conjunction with the Shapiro Institute for Education and Research at Harvard Medical School and Beth Israel Deaconess Medical Center, we have also created a Medical Education Research Laboratory (MERL). Modeled after biomedical laboratory training, the MERL has monthly meetings at which new and existing studies are discussed, the latest journal articles are reviewed, and individuals present work-in-progress for comment and feedback from colleagues. PCCM fellows in the CEP join faculty as co-investigators on existing projects and, over time, develop their own medical education research projects.

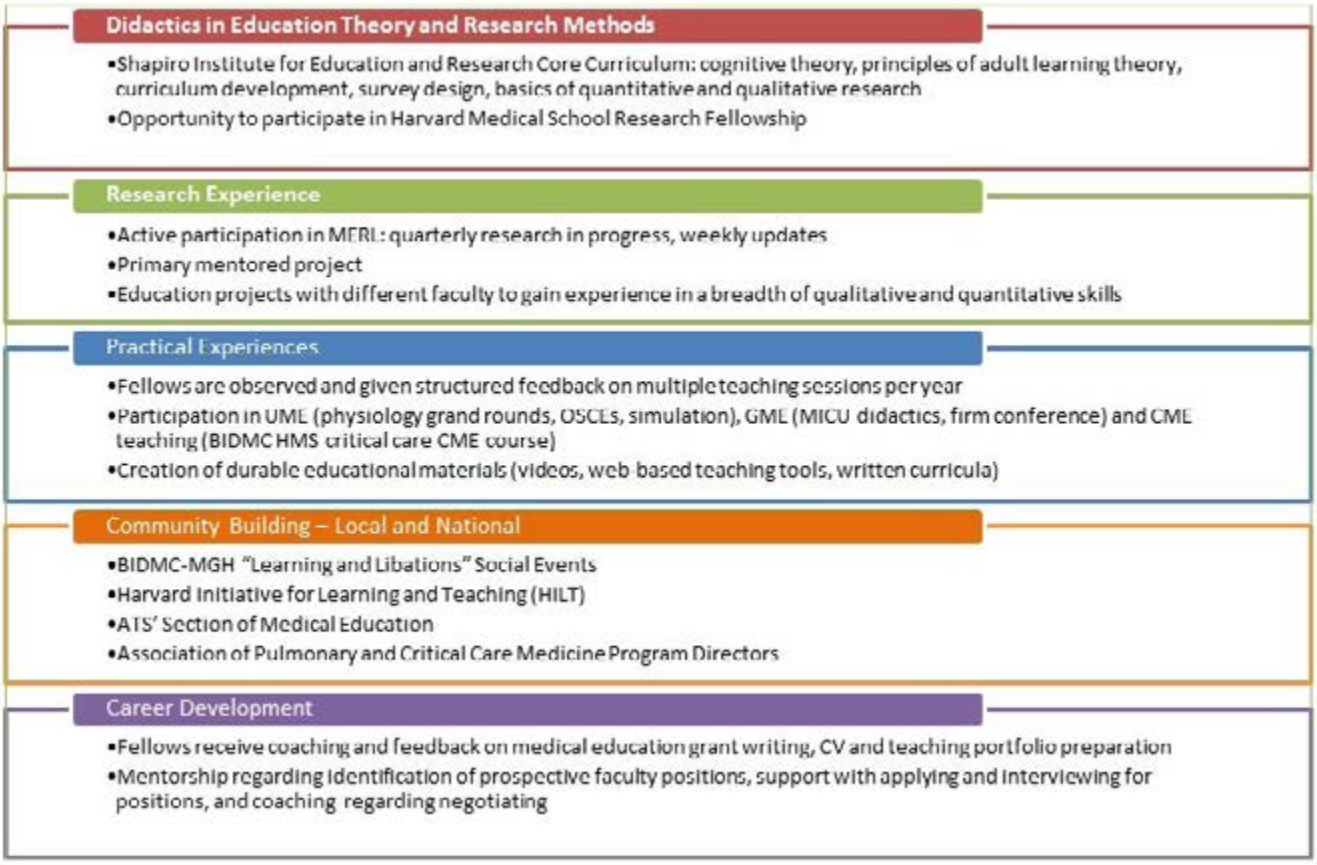
We expect all CEP fellows to publish educational papers during their training. To date, three individuals have completed the CEP program (one female and two males) and two fellows are currently in the program. All three graduates have full-time

faculty positions at academic medical centers, have leadership roles in UME, GME, and/or CME, and all have a strong publication history (total of 84 peer reviewed manuscripts). The most recent graduate (2018) had 4 first author publications at the time she assumed a faculty position. The two current fellows, after less than six months in the program, have a total of 3 abstracts submitted to upcoming conferences, including the ATS International Conference; one fellow has a first author paper currently submitted for publication.

RESULTS

In designing and implementing the CEP, we have created an education scholar program that provides PCCM fellows interested in academic education careers with both advanced teaching and medical education research skills. The focus on training CEP fellows to become successful and productive medical education researchers represents an extension of standard teaching-focused clinician-educator tracks in subspecialty medicine training programs. This innovative approach to training medical education scholars represents an evolution of clinician-educator training in PCCM; the CEP provides fellows with the knowledge and skills to be independent investigators contributing to the evidence base so sorely needed to move the field forward. Furthermore, this approach is critical to ensuring that our graduates have the tools to pursue productive and successful academic careers.

FIGURE 1



Wayne State University/John D. Dingell VA Medical Center

A Novel Simulation and Ultrasound-Based Curriculum for Shock Management in a Pulmonary and Critical Care Medicine Fellowship Training Program

Authors: Shyam Ganti, MD[1,2]; Sammar Alsunaid, MD[1,2]; Sarah Lee, MD[1,2]; MaryJean Schenk, MD[1]; and Abdulghani Sankari, MD, PhD[1,2]

[1]Wayne State University, John D. Dingell VA Medical Center, Detroit, MI; [2]Wayne State University, Detroit Medical Center, Detroit, MI

Program Director: Dr. Abdulghani Sankari, MD, PhD

PROGRAM DESCRIPTION

The Detroit Medical Center combined Pulmonary and Critical Care Fellowship-Clinician Educator (CE) track is a three-year program with first two years devoted to clinical work across the spectrum of pulmonary and critical care medicine. In year three, CE track fellows commit to pursuing academic research pathway in medical education and curriculum development.

Our program utilizes several simulation-based curriculums in training fellows on mechanical ventilation, bronchoscopy, and shock management using ultrasound simulation. Our program always looks for new and innovative teaching methods and tries to implement these into the fellowship program.

BACKGROUND

Shock is a common and significant cause of morbidity and mortality in intensive care units. There is no standardized training to manage septic shock in the ICU. Simulation is known to improve clinical outcomes and enhance both patient and learner safety and satisfaction. Ultrasound (US) plays a major role in early detection and management of shock. We created a standardized curriculum that aims to improve knowledge and acquire competency in shock management using the US while practicing evidence-based medicine.

METHODS

The curriculum includes a baseline knowledge test made of 15 multiple-choice questions, a high-fidelity simulation manikin [Sim Man 3G®], a 29-item checklist to assess clinical competency in shock diagnosis and management, a Simbionix® ultrasound simulator, and a 15-item checklist for the US competency. The training team consisted of two clinical educator PCCM fellows and two teaching attendings.

Each learner underwent the following chronological steps: 1) A baseline knowledge test. 2) A baseline simulation session with a standardized case scenario testing shock and a baseline one-on-one US simulation session assessing US skills using standardized competency checklists. These were conducted over 30- to 40-minute sessions followed by structured 10-minute debriefings. 3) A 60-minute didactic lecture. 4) Bedside US/shock teaching rounds in an ICU. 5) Post-course simulation sessions with debriefing and competency checklists similar to the initial sessions performed approximately two weeks prior. 6) Post-course knowledge test. 7) And a post-course survey using a Likert scale (1-5) to evaluate learners' course satisfaction.

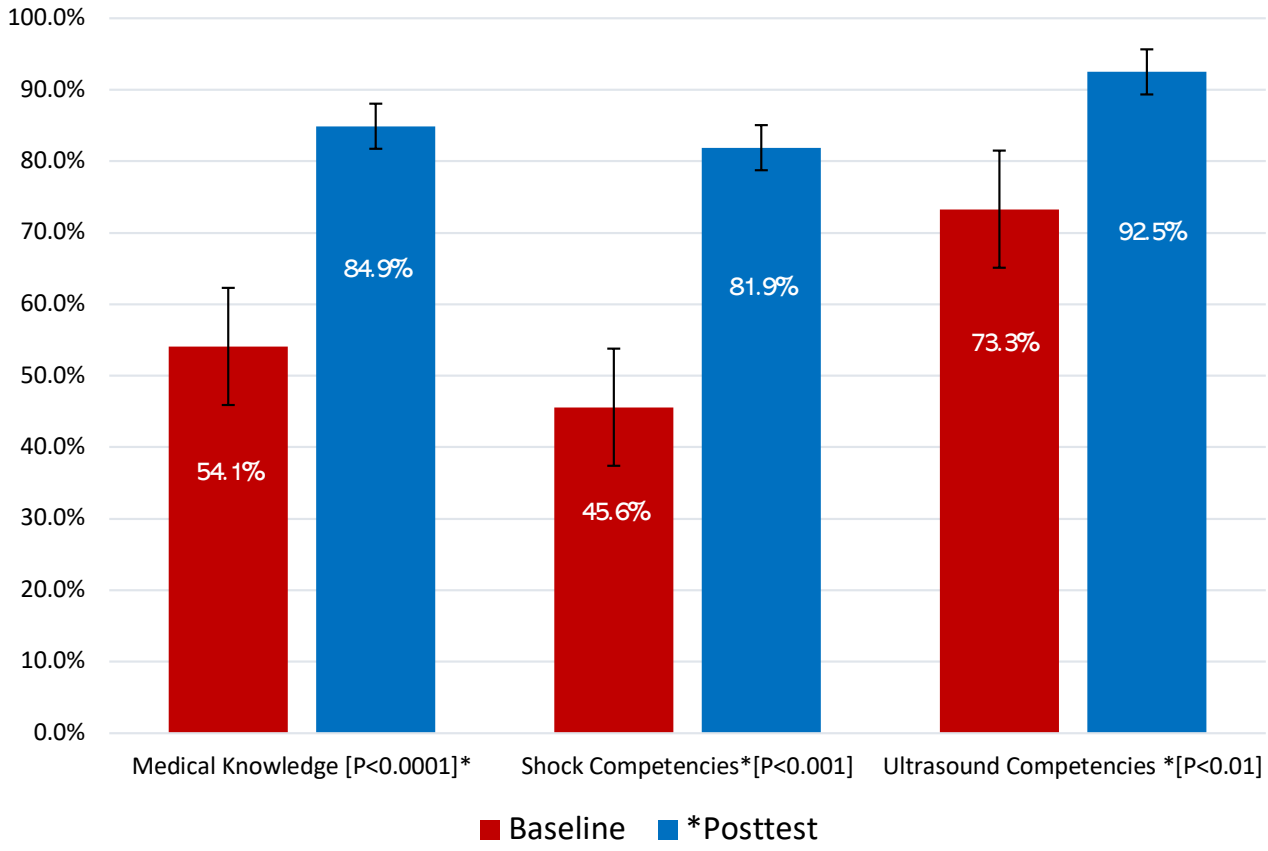
RESULTS

A total of eight first-year PCCM fellows completed the course as part of the fellowship orientation. All fellows showed significant improvement in baseline knowledge when compared to post- course test scores [54.2% and 85.0%, $p<0.0001$] (Figure 1). The post-course shock simulation competencies improved significantly from a baseline of 45.7% (13.3/29) to 81.9% (23.8/29) ($p <0.001$) [Figure 1]. The average US competency also significantly improved from 73.3% (11/15) to 92.5% (13.9/15) ($p<0.01$) [Figure 1]. The course was highly rated by trainees with a mean score of 4.9/5 on the Likert scale.

CONCLUSIONS

This novel standardized curriculum is an effective teaching method to improve new learners' competency in shock management using the U.S. and high-fidelity simulation. The course was perceived as an effective interactive education curriculum by new learners. We are planning a further follow-up to assess long-term retention and feasibility of implementing this curriculum to different levels of trainees. This standardized method of training will likely affect clinical outcomes, but future studies are needed to assess its impact.

Figure-1- "Results of medical knowledge and competency assessment pre and post-training"



Boston Children's Hospital

High-Fidelity Bronchoscopy Trainer with Novel Functionality to Augment Skill Acquisition and Maintenance

Authors: Katie Krone, MD*; Carmen Astudillo, MD*; Gregory Loan, ALM; Peter Weinstock, MD, PhD; Stephen Wilson, BSME; Debra Boyer, MD, MHPE; Kenan Haver, MD

*Co-authors

Program Director: Debra Boyer

Associate Program Director: Alicia Casey

PROGRAM OVERVIEW

The Pediatric Pulmonology Fellowship Program is a three-year program, with the majority of the first year dedicated to clinical service on the inpatient services and the latter two years focusing on research. Inpatient services include the CF/pulmonary inpatient service, transplant/NICU, consult, and bronchoscopy. The bronchoscopy service performs >400 bronchoscopies a year. Outpatient exposure includes longitudinal pulmonary clinics and subspecialty clinics throughout the three years of training. Four new fellows are accepted into the program each year.

BACKGROUND

Considerable practice is necessary to develop the skills essential for successful and safe performance of flexible bronchoscopy (FB). There exists a significant but essential learning curve for FB, which can potentially lead to adverse outcomes, including damage to bronchoscopes, increased airway wall contact, procedural delays, and increased duration of anesthesia. Currently available airway trainers used for acquisition and maintenance of FB skills are limited with regard to realism and task performance, such as the inability to practice bronchoalveolar lavage (BAL), a key component of FB. Additionally, these airway trainers are often cost prohibitive, ranging from $5,000-$65,000, for smaller fellowship training programs.

METHODS

We designed and fabricated a novel high-fidelity bronchoscopy trainer at low cost using a three-dimensional-printing process (Figure 1). Patient-derived computed tomography chest images were used to 3D-print a tracheobronchial tree, which was subsequently embedded in silicone, and then this scaffolding was chemically removed. Surface finishing provided the addition of colored markers to allow identification of all subsegmental anatomy. Lastly, modifications were made such that BAL could be performed in the right middle lobe (RML) bronchus (RB4, RB5) and left lower lobe (LLL) bronchus (LB8, LB9, LB10). In this airway trainer, use of colored markers to delineate all subsegmental anatomy allows learners to learn independently at their own pace by essentially providing a roadmap based on combinations of colored markers.

RESULTS

Prototype testing performed by pediatric pulmonary fellows and attendings demonstrated: (1) realistic representation of tracheobronchial tree anatomy, (2) ability to enter and recognize all tertiary bronchopulmonary segments, (3) ability to wedge and perform BAL in the RML and LLL, (4) >50% volume return of saline with suctioning after wedge and BAL, and (5) normal physiologic change in anterior-posterior diameter with application of negative pressure by suctioning. Given this demonstrated functionality and realism, the next phase is use of this trainer in an educational intervention focused on self-directed teaching of flexible bronchoscopy to novice learners as well as enhancing procedural skill maintenance for experienced bronchoscopists. This will consist of a combination of individualized hands-on simulation sessions as well as self-directed learning sessions. Performance will be assessed after each session as well as six-months post-participation. Assessment will include the Bronchoscopy Skills and Tasks Assessment Tool (BSTAT), a structured, validated and quantifiable evaluation of bronchoscopy skills, as well as the Bronchoscopy Self-Assessment Tool (BSAT).

DISCUSSION

This airway trainer represents, to our knowledge, the only 3D-print-derived high-fidelity airway trainer capable of BAL, in addition to providing a platform

for self-directed off-stage learning of FB. While 3D-printing is certainly poised to transform model systems for learning bronchoscopy, the materials used are inflexible and ultimately unrealistic. For this reason, we have used a 3D-printing process to fabricate a realistic silicone model that is preferable with regard to cost, availability and authenticity.

We propose that use of our trainer, in conjunction with simulation scenarios and self-directed learning, currently underway at our program, will offer an innovative, inexpensive, and safe method of augmenting an essential learning curve and maintaining skills while improving patient safety and care.

Figure 1: Endobronchial anatomy of the airway trainer as visualized through a 3.6mm flexible bronchoscope.

Hospital of the University of Pennsylvania

Development and Implementation of an Active Trainee- Led Precepting Model for Subspecialty Fellows' Clinic

Authors: Janae K. Heath, MD[1,2]; Caitlin B. Clancy, MD[1,3]; C. Jessica Dine, MD, MSHP[1,3]; Maryl Kreider, MD, MSCE[1,2]; D. Rani Nandiwada, MD[1]; David Aizenberg MD[1]; Stacey Kassutto, MD[1]

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Program Director: Maryl Kreide MD, MSCEr

PROGRAM DESCRIPTION

The Pulmonary and Critical Care Medicine Fellowship at the Hospital of the University of Pennsylvania is an academic training program situated in a large tertiary academic medical center. Our program currently has 27 fellows, in first to fourth year of subspecialty training, with typical completion of training at 3.5 years. Upon graduation, our fellows establish careers in basic science and translational research, clinical research, and medical education.

RATIONALE

Optimal learner-centered education in ambulatory clinic has been limited by multiple factors, most notably time constraints and increased documentation burden. Several precepting models have been developed to improve learning in the ambulatory setting for medical student and resident learners. However, the fellowship setting may be even better suited for implementation of a learner-driven precepting model, as advanced trainees may be more likely to benefit from a focus on targeted, higher-level discussions and an emphasis on efficiency. Therefore, we aimed to develop and implement a novel, fellow-led precepting model for ambulatory subspecialty fellows' clinic, incorporating active, learner-driven precepting strategies.

METHODS

To guide development of a new precepting model, we first performed a mixed-methods qualitative study to explore current perceptions of outpatient precepting and identify precepting practices currently employed within fellows' clinics. We performed a targeted needs assessment by surveying second-, third-, and fourth-year fellows at the conclusion of the 2017-2018 academic year. Survey domains included assessment of the impact of precepting on learning and patient care, identification and perception of current precepting practices, and challenges to effective precepting. Summary statistics were used to analyze Likert-scale items, with thematic analysis performed on free-text comments. Two authors (JH and CC) performed direct observation of clinic precepting to further characterize the current state. We convened three separate focus groups (two for current preceptors, one for fellows), facilitated by an ambulatory precepting expert (DA) from outside the division, to identify barriers to ideal precepting and develop models for precepting best practices. Based on feedback from the focus groups, the authors developed and pilot-tested a novel subspecialty precepting model.

RESULTS

Seventeen of 18 fellows (94%) completed the needs assessment survey. While fellows reported satisfaction with the overall clinic experience (88% rating experience as "Very Good" [n=7] or "Good" [n=8]), only half (53%, n=9) agreed that they were satisfied with the precepting experience during fellows' continuity clinic. Furthermore, while the majority (65%, n=11) agreed that precepting improved patient care, only 59% (n=10) felt discussion of a case with the preceptor enhanced their knowledge of ambulatory medicine. The majority of fellows identified a traditional precepting model (e.g., SOAP- Subjective, Objective, Analysis, and Plan) as the predominant precepting style used in clinic (65%, n=11). Eighty-eight percent (n=15) reported that no clear expectations were set for how to present cases in clinic. Fifty-three percent (n=9) of fellows reported that they did not receive feedback

from clinic preceptors, and 88% (n=15) felt there was an absence of clear goal setting.

Table 1 details themes of an ideal precepting session, as identified in fellow and faculty focus groups. Direct observation of clinic precepting practices revealed several notable findings, including significant variation in precepting encounter time (mean 11.2 minutes, range 1-24 minutes), with the majority of time spent relaying historical details and data, as opposed to clinical reasoning and formulation of plans. Based on these responses, a novel precepting model, "STEP-UP" was developed, pilot tested among faculty and fellows, and ultimately implemented in the subspecialty fellows' clinic. The model combines elements of previously used precepting models adapted for the fellow-level learner and the variable complexity of cases seen in ambulatory subspecialty clinic (Figure 1).

CONCLUSION

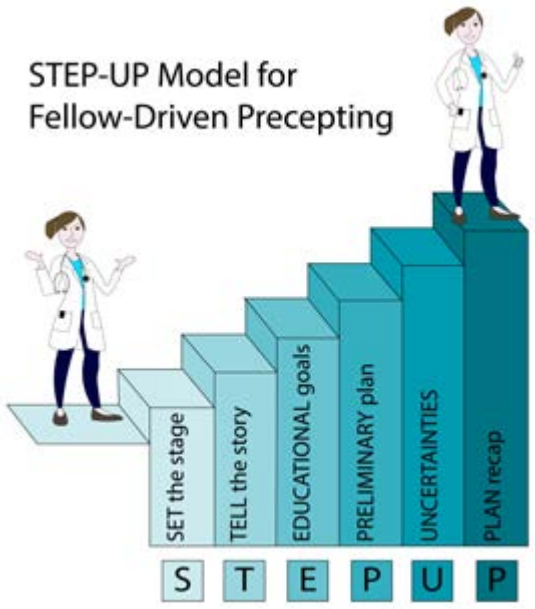
We created a novel, learner-driven precepting model, STEP-UP, for use in the subspecialty fellowship clinic setting, incorporating features from existing active-precepting models and adapted to the fellowship-level learner. Future directions include analysis of patient-flow data following implementation of the STEP-UP model, as well as monitoring of uptake and fellow and faculty perceptions of the new model.

Table 1. Identified Opportunities of Improved Precepting Interaction Identified in Free-Text Survey Responses and Focus Groups.

Fellow Participants	- Graduated responsibility - Uniform precepting style - Opportunities for increased feedback - Implementation of standardized pre-cepting model - Preference for streamlined HPI
Faculty Participants	- List of Best Practices - More opportunities for feedback - Graduated responsibility - Optimizing encounter for education - Interested in standardized precepting model

FIGURE 1

	Description	Explanation	Example
S	**Set the Stage** / Align Expectations with Faculty	The fellow should identify which precepting model can be used in the current encounter (STEP-UP versus a traditional SOAP model).	"This case is very straight-forward, I would like to proceed with the STEP-UP." Versus "This is a complicated new patient and a diagnostic dilemma, and therefore it would be helpful to do a traditional SOAP presentation."
T	**Tell the Story**, Starting with the Diagnosis (in less than 60 seconds)	The fellow should briefly summarize the key history, physical, and data on the patient in less than one minute. This should begin with the final diagnosis.	"This is a patient with stable COPD. Briefly, he is a 60-year-old heavy smoker, who developed dyspnea several years ago. He was diagnosed with COPD based on obstruction on PFTs, and flattened hemidiaphragms on CXR. He can walk several blocks before getting winded, and has one exacerbation per year managed as an outpatient. He is only on SABA therapy currently."
E	**Educational Goals** for Encounter	The fellow should identify two potential learning goals for the encounter, which can include both direct observation components as well as medical knowledge components.	"I would learn more about the evidence base of current smoking cessation resources, but also would love to get feedback on my smoking cessation communication with this patient."
P	**Preliminary Plan**	The fellow will discuss the preliminary plan, prior to input from the faculty member.	"My big focus today is his smoking - I would like to start him on nicotine patches and gum. Otherwise, I would continue his current inhalers as is. He is already up-to-date with lung cancer screening, has been vaccinated, and we already reviewed how to use his inhalers."
U	**Uncertainties** / Return to Learning Objectives	The faculty member will clarify any uncertainties with the presentation, and address the learning objectives of the fellow.	"Let's talk about some options to help patients succeed with smoking cessation. What options are you familiar with?"
P	**Plan Recap**	The fellow and faculty member will confirm the plan prior to conclusion of the encounter.	"Ok, so in addition to his current inhalers, we will recommend Varenicline to assist with smoking cessation."



Hospital of the University of Pennsylvania

Development and Implementation of an Online Application to Assess Self-Directed versus Pre-Established Objectives in the MICU

Authors: Sydney Hyder, MD; Rebecca Wang, MD; Janae Heath, MD; and C. Jessica Dine, MD, MSHP

Program Director: Maryl Kreider, MD, MSCE

PROGRAM OVERVIEW

The program is dedicated to developing physician leaders for academic medicine and industry, advancing the frontiers of medicine through research aimed at developing new strategies for the prevention, detection, and treatment of respiratory and allergic disease. The program cares for patients as a multidisciplinary team of professionals who apply the latest scientific and medical advances with competence, compassion, and humility.

BACKGROUND

ACGME continues to provide tools to assess physician competencies, which led to the development of milestones for medicine residents and fellows deemed necessary to master in becoming an independent physician. While there is ample literature on how to incorporate and measure these competencies in GME, there has been minimal evaluation of trainee perspective and response to these pre-determined objectives. Adult learning theory argues that adult learners are self-directed and want to take responsibility for their education and decisions, which requires understanding and self-motivation for success. To better understand the efficacy of self-directed learning within internal medicine training programs, an online application was created to empower resident and pulmonary/critical care fellows to set objectives for themselves during their rotation in the medical intensive care unit, in addition to allowing faculty feedback on those objectives. The online application also helps collect data to understand how the concept of self-directed objective-setting fits into the ACGME's understanding of learning objectives.

METHODS

Residents and fellows use a confidential, online application to write their own learning objectives for their rotation in the MICU at the Hospital of the University of Pennsylvania. These objectives can be downloaded to an iPhone for continual reflection. Once objectives are set, the learner can share these objectives with attendings to obtain valuable continual feedback using a numerical scale and free-form space for written feedback. At the end of the two-week MICU rotation, a survey is administered to evaluate perception of the efficacy of the tool in improving on their self-directed objectives.

RESULTS

In the pilot study, an electronic application for the iPhone was developed that allows the learner to enter objectives. These objectives are then transformed into an assessment form that allows the self-identified supervising attending to assess whether the trainee has achieved these goals and what specific steps are needed to improve further. The application allows the learner to identify attendings who receive notification to electronically complete the assessment in real time. The data collection of usability and satisfaction is still being collected. So far, four learners successfully utilized the application in the MICU. They have found the application useful and important and its interface easy to use.

CONCLUSION

The pilot study showed that the online application was easy to access and use. Early data suggests that this program creates new open lines of communication between learner and teacher that previously had been closed. The newly developed application allows real-time setting and assessment of learner relevant objectives. Future work will determine whether the feedback is relevant and helpful and could be used for the completing of reporting milestones assessment in the ICU.

Hospital of the University of Pennsylvania

#PCCM #Fellowship #MedEd: Use of a Program Twitter Account as Content Bank and Spaced Learning Tool

Authors: Caitlin B. Clancy, MD[1,2]; Janae K. Heath, MD[1,3];Jessica Lee, MD, MPH[1, 4]; Maryl Kreider, MD, MSCE[1,2]; and C. Jessica Dine, MD, MSHP[1,3]

[1]Department of Medicine, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; [2]Center for Healthcare Improvement and Patient Safety, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; [3]Center for Clinical Epidemiology and Biostatistics, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; [4]Leonard Davis Institute of Health Economics, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania

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The Pulmonary and Critical Care Medicine Fellowship at the Hospital of the University of Pennsylvania is an academic training program situated in a large tertiary academic medical center. Our program currently has 27 fellows, in first to fourth year of subspecialty training, with typical completion of training at 3.5 years. Upon graduation, our fellows establish careers in basic science and translational research, clinical research, and medical education.

RATIONALE

The role of social media (SoME) in medical education has been expanding rapidly. In particular, Twitter has become a popular platform in graduate medical education. Prior studies, primarily in internal medicine residency, have indicated that trainees find program-run SoME accounts helpful, and particularly value posts that provide follow-up information from topics covered in conference, disseminate medical news, and focus on evidence-based medicine. A Twitter-based learning platform may be particularly well-suited for subspecialty fellowship learners, as their goals include establishing a command of current literature, keeping abreast of new publications relevant to their clinical interests and research, and preparing for board certification examinations. SoME based education platforms, especially Twitter, are consistent with many adult learning theory principles, including self-motivation, interactivity, spaced learning, asynchronous learning, communities of learning, and relevance.

Below Goal	At Goal	Above Goal
Asthma	Idiopathic ILD	COPD
CTD-ILD	Granulomatous ILD	Other obstructive (CF, bronchiectasis)
Constrictive bronchiolitis	Diffuse cystic lung disease	QI/Safety improvement methods
Genetic/rare ILD	Radiation-induced pneumonitis and fibrosis	Complications of medical care
Sleep (respiratory, non-respiratory, epidemiology)	Drug-induced ILD	Ethics and professionalism
Hypoventilation	PAP	Pulmonary hypertension
Lung cancer	Other intrathoracic tumors	Respiratory physiology
Physiologic assessment for lung surgery	Malignant pleural disease	Special situations (pregnancy, obesity, altitude, diving, etc.)
Disclosure of medical errors	Neoplasia complications	Approach to pulmonary symptoms
Sickle cell disease	Pulmonary nodules	Occupational and environmental lung disease
	IP and thoracic surgery	
	Lung cancer screening	
	QI/Safety monitoring methods	
	Lung transplant	
	Pulmonary complications of non-lung transplantation	
	Pulmonary thromboembolic disease	
	Pulmonary vasculitis and capillaritis	
	Pulmonary vascular malformations	

Table 1. ABIM Pulmonary Certification Examination Blueprint Topic Representation in @PennPulmonary Posts. At goal was defined as within 1 percentage point of the Blueprint weight.

METHODS

A Twitter account, @PennPulmonary, was created on behalf of the fellowship. A priori goals for the social media account were: to encourage spaced learning by posting content in follow-up to fellowship conferences, promote and disseminate the scholarly work of the pulmonary fellows and department faculty, and curate new literature and learning materials for fellows. All tweets, retweets, likes, and follows were managed by the chief fellow, requiring approximately 15-30 minutes of effort daily.

There was no planned effort to address particular topics—subjects were covered as occurred naturally from department conferences, publications, or appearance

on social media. The data collection period did coincide with the Summer Lecture Series, our annual conference series providing introductions to a breadth of topics in pulmonary and critical care medicine. Twitter account analytics were generated weekly by a free outside service. All original tweets and retweets were catalogued, and content analysis was performed to map posts to categories in the ABIM Pulmonary Disease Certification Exam Blueprint. Posts could be mapped to as many topics as applicable. Summary statistics were performed to determine whether the account content adequately covered the categories in the blueprint. Tweets and RTs were analyzed to capture the use of multimedia, links to papers or blogs, tags, and mentions, as well as promotion of fellows and department members.

RESULTS

A total of 266 original tweets and retweets were generated by the fellowship account from June 2018-October 2018. The account has 160 followers, including 18 of the 27 fellows currently in our program, 10 pulmonary/critical care fellowship accounts, 5 journals and societies, and 11 influencers with >1000 followers. The peak reach, or number of unique Twitter accounts reached by @PennPulmonary tweets was 31,100, with an average two-week reach of 11,096. The tweets mapped to ABIM Blueprint categories 331 times, covering 45 of 55 unique categories. The percentage of tweets and retweets mapped to each category was used to determine whether a topic was below goal, meeting goal, or above goal (Table 1).

CONCLUSIONS

A fellowship Twitter account can serve as a content source for fellowship learners, covering a breadth of pulmonary topics without specific curriculum planning efforts, although conference-based posts will reflect the underlying curriculum design. Tweets and retweets from the @PennPulmonary account covered 82% of the ABIM Pulmonary Certification Exam Blueprint categories in five months. It's unclear at this point whether overrepresentation of certain topics is a meaningful measure, but the program may be able to use this information to encourage fellows to shift focus to underrepresented areas for their case presentations. Future directions include investigation of use patterns, engagement, and content retention by fellows.

Johns Hopkins

Interdisciplinary, Fellow-Developed Radiology Curriculum for Pulmonary, Critical Care Fellows

Authors: Katherine Wonneberger Gardner, MD; Jacqueline O'Toole, DO; Henry Fessler, MD; Cheng T Lin, MD; Michelle Sharp, MD
Program Director: Henry Fessler

PROGRAM DESCRIPTION

The primary goal of the Fellowship in Pulmonary and Critical Medicine at Johns Hopkins is to train the next generation of leaders in biomedical science and clinical care.

BACKGROUND

ACGME requires pulmonary and critical care medicine fellows to achieve competence in the utilization and interpretation of pulmonary disease imaging techniques. However, comprehensive chest imaging curricula for PCCM fellows has often been lacking, with most programs relying on subspecialty conferences and clinical exposure for the majority of radiographic learning. In the annual fellow's survey by the Association of PCCM Program Directors, 46% of fellows cited a lack of formal imaging curriculum as a barrier to their education. We have attempted to address this gap within our training program.

METHODS

Based on consensus of PCCM board review materials, chest imaging texts, and interdisciplinary collaboration with radiology and pulmonology experts, we developed a systematic, year-long chest imaging curriculum for PCCM fellows. Delivery of the curriculum is via weekly, one-hour didactic sessions. The first three months consist of interactive introductory lectures on common chest X-ray and CT patterns and their differential diagnosis.

The curricular design utilizes specific evidenced-based techniques to enhance learning and recall, including interactive quizzes interspersed in each lecture, spaced repetition, and interleaving of multiple topics per lecture. The following nine months incorporate teaching of more complex disease presentations from active institutional cases, led by the chief fellow with radiology and faculty oversight. These are supplemented by pre-selected cases chosen to refresh and reinforce the initial introductory didactics. Assessments consist of chest X-rays and CT scans selected from a bank of images provided by radiology faculty. A panel of subject matter experts comprising mid-level and senior faculty from the pulmonary and radiology departments identified key findings and set interpretation standards for each image via a modified Angoff method, from which anticipated scores were derived.

Fellows completed assessments at baseline and three months, providing free-text interpretations of two independent series of three plain radiography, and three CT images at each time point. These were scored by comparison to the expert interpretation using a rubric of the key findings. Fellows also rated their confidence in their interpretation from 1-10.

RESULTS (n=27)

Pre-test scores were lower than predicted by the expert panel for all levels of fellows. For all questions and all levels of training, there was no correlation between score and reported confidence in answers (Figure 1). After three months, first-year fellows showed the greatest improvement, matching performance of all other fellowship years (Table 1).

CONCLUSION

We created comprehensive chest imaging curriculum utilizing evidence-based teaching methods and objectively assessed fellows' skills. Initial assessment showed that fellows have lower than expected proficiency in radiology interpretation and fellows' confidence and knowledge do not correlate. After three months, first-year fellows had attained the skill level previously demonstrated by more senior fellows, but senior fellows failed to improve beyond their baseline. Further study will examine whether scores continue to improve after an entire year of the curriculum. This curriculum provides a systematic process to advance and assess radiographic knowledge in our PCCM fellowship.

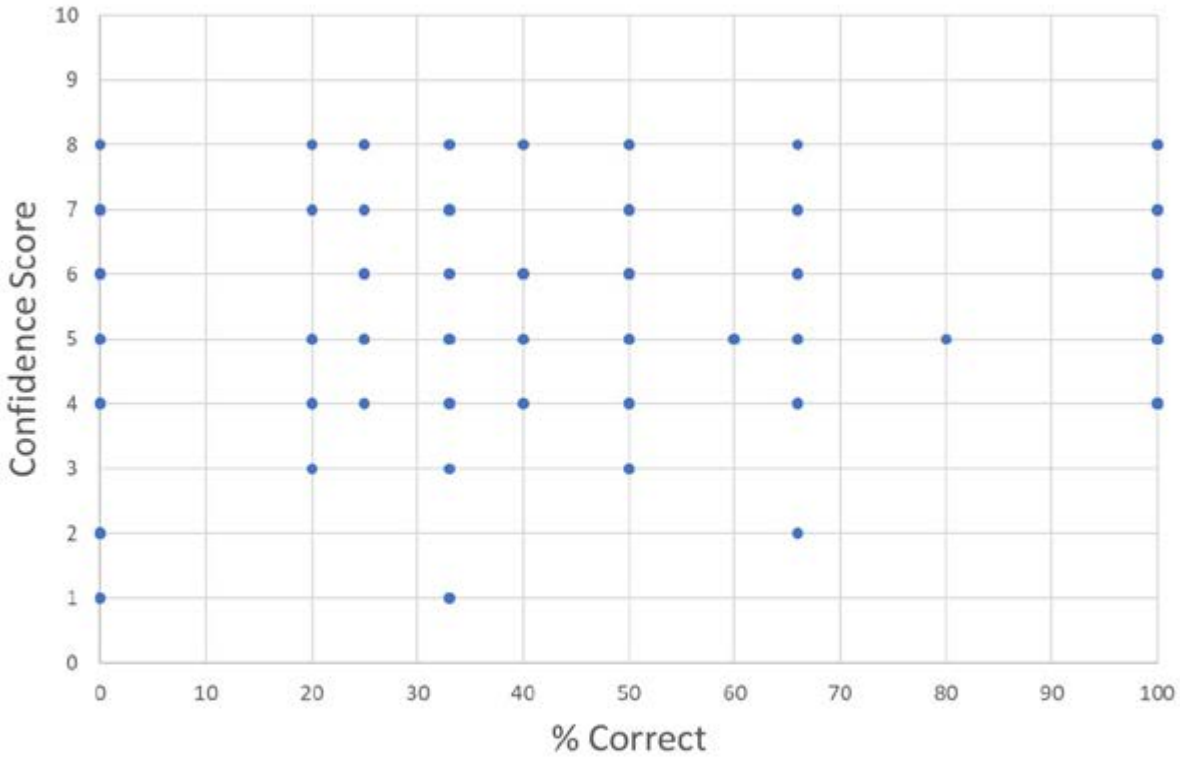


Figure 1: For each image, fellows rated their confidence in their interpretation on an arbitrary 0-10 scale. This is shown plotted against their actual score on each image in the assessment.

Fellowship year (n)	Expected baseline score (% correct)	Actual baseline score (% correct)	3 month score (% Correct)
First Year (8)	39	32+/-17	45 +/-19
Second Year (6)		44+/-15	49 +/-16
Senior Fellows (10 and 3 respectively)	86	47+/-8	49 +/-10

Mayo Clinic

Bronchoscopy Assessment of Fellows in the ICU: Creation and Validation of the Mayo Bronchoscopy Assessment Measure (MBAM-6)

Authors: Gautam Raju Mehta, MBBS; Darlene Nelson, MD; Alexander Niven, MD; John Park, MD; Kianoush Kashani, MD; Cassandra Braun, MD; Eric Edell, MD; Thomas Beckman, MD; Diana Kelm, MD

Training Program Director: Kannan Ramar

PROGRAM DESCRIPTION

The Pulmonary and Critical Care Fellowship at Mayo Clinic is a traditional three-year fellowship. We also have a two-year critical care fellowship and a one-year anesthesia critical care fellowship. All fellows work together and rotate through multiple intensive care units and various other inpatient/outpatient services. We have the opportunity to work closely with residents from multiple specialties and advanced practice providers. There is a strong academic and educational culture here.

RATIONALE

Bronchoscopy is a complex and potentially hazardous procedure that requires psychomotor skills and good hand-eye coordination. Current pulmonary and critical care medicine fellowship requirements state that basic competency is established when at least 100 flexible bronchoscopies are performed in a supervised setting. However, whether trainees are truly proficient after completing the prescribed number remains questionable. The lack of competency-based metrics in bronchoscopy training within PCCM fellowship programs means that not all ICU physicians will be equally prepared and competent in performing the procedure thus patients may bear the burden of insufficient training. Therefore, there is a need for bronchoscopy competency assessment, which requires valid metrics.

METHODS

We will conduct a single-center prospective cohort study to develop and validate a bronchoscopy assessment tool to be used in the ICU for PCCM trainees. A core faculty group of raters will be identified and will assess ten videotaped simulations for interrater reliability assessment, which will be determined using an intraclass correlation coefficient. Factor analysis (FA) will be completed and clustering of multiple ratings within faculty members will be accounted for with the use of an adjusted correlation matrix and generalized estimating equations. FA will also be performed with an unadjusted correlation matrix to compare the analysis for faculty members, fellows, and the overall model.

To look for relations to other variables, independent variables will be derived for faculty, fellows, and patients. Faculty member variables include: experience (in years), prior training (academic versus community), clinical time (percentage of time in the ICU over one year) and involvement in medical education. Fellow variables include: knowledge assessment (based on a bronchoscopy knowledge test), bronchoscopy experience, numerical procedural values, post-graduate year, number of ICU rotations, and future career plans. Patient variables include: sequential organ failure assessment scores, reason for the procedure, ICU length of stay, procedural burden, and mechanical ventilation days. Categorical variables will be summarized as numbers and percentages. Continuous variables will be categorized as means and standard deviations. Associations between scores from the new tool with characteristics of teachers, fellows, and patients will be determined with the Kruskal-Wallis test.

RESULTS

Within our PCCM division, we have a standing committee consisting of 11 faculty members and six fellows who are dedicated to educational research. For the purposes of this study and for the goal of achieving evidence-based assessing the performance of bronchoscopies by fellows, we reviewed the literature – along with the assistance of a librarian who has expertise in literature searches – to identify studies regarding assessment of bronchoscopies in various educational environments, including the ICU (Table 1). This literature review identified several studies, including development of the 12-item Ontario Bronchoscopy Assessment Tool (OBAT). On numerous occasions over a two-month period, our team attempted to utilize the OBAT in the ICU; however, we found that

it was too lengthy and difficult to apply efficiently in the real-world ICU setting. Therefore, we convened to discuss limitations of the current bronchoscopy tools including the OBAT. Using a modified Delphi method, we identified six items that seemed most relevant to the assessment of bronchoscopy in the ICU. Subsequently, several authors re-convened for the purpose of determining the most appropriate scale for our new, six-item instrument, the Mayo Bronchoscopy Assessment Measure (MBAM-6) (Figure 1). Additionally, anchors were developed for the new instrument, including an overall entrustability scale based on a study from the surgical literature.

CONCLUSION

At the conclusion of this study, we anticipate having an efficient and effective bronchoscopy assessment tool to be practically used in the ICU for PCCM trainees for real-time feedback and procedural competency over time.

Table 1: Current Bronchoscopy Assessment Tools

Tools Available	Use of the Tool	Limitations for Use in the ICU
Bronchoscopy Skills and Task Assessment Tool (BSTAT)	Scored checklist that assesses anatomy, scope maneuvering, equipment handling and knowledge of mucosal abnormalities	Assesses only technical skills
Bronchoscopy Step-by-Step Evaluation Tool (BSET)	Developed to aid assessment while using standardized training modules to gradually teach bronchoscopy skills	Learner goes through specific exercises that may not be appropriate in critically ill patients in the ICU setting
Bronchoscopy assessment by Konge *et al*	Checklist administered by two blinded raters review of video recordings of the bronchoscopic camera during the procedure	No assessment of pre- and post-procedural assessment and scope mechanics
Ontario Bronchoscopy Assessment Tool (OBAT)	Includes pre-procedure assessment and sedation, technical skills and diagnosis, and post-procedure related items	Long (12-items), complex scale (entrustability scale)

Figure 1: Mayo Bronchoscopy Assessment Measure (MBAM-6)

MAYO CLINIC

Flexible Bronchoscopy Assessment in the ICU

Trainee _____ Level of Trainee_____ Supervisor_____

	Please Circle One
Performs adequate pre-procedure evaluation of patient	
1: Lack of knowledge relating to patient factors; lack of appropriate consent; unclear of the indications and/or risks; lack of communication with team members	1
2: Appropriate knowledge relating to patient factors and reviews chart for prior bronchoscopies; obtains consent, but unclear of indications for procedure; communicates with team members, but plan unclear	2
3: And aware of indications/risks/benefits; identifies appropriate therapeutic plan (i.e. segment of interest)	3
4: And an effective team leader with clear communication; creates a contingency plan to address the potential issues	4
Selects and directs administration of appropriate sedation and local anesthesia	
1: Lack of appropriate vital sign monitoring; does not select appropriate sedative medications; inadequate topicalication of the airway	1
2: Appropriate vital sign monitoring; appropriate sedative medication selection, but inadequate dosing of sedative medications and topical anesthesia	2
3: And achieves appropriate level of sedation tailored to patient; anesthetizes airway adequately to minimize coughing/discomfort	3
4: And responds appropriately to hemodynamic variables related to sedation, patient remains comfortable	4
Correctly identifies bronchial anatomy	
1: Unable to recognize basic bronchial anatomy; unorganized airway assessment	1
2: Able to correctly identify bronchial anatomy, but requires occasional prompting and redirection; airway assessment is somewhat organized, but requires coaching	2
3: And has an organized stepwise approach to bronchial anatomy assessment	3
4: And demonstrates ability to identify anatomic variations if present	4
Ensures proper scope mechanics	
1: Incorrect hand placement while holding bronchoscope; unable to keep bronchoscope midline; frequent mucosal wall trauma	1
2: Proper hand placement and body mechanics with the bronchoscope but requires coaching throughout the procedure	2
3: And is able to remain midline without mucosal wall trauma with minimal coaching	3
4: And no coaching required; able to easily navigate difficult anatomy	4
Able to independently recognize and describe abnormal findings	
1: Unable to differentiate between normal and abnormal anatomy; unable to describe bronchoscopic findings	1
2: Able to describe bronchoscopic findings; difficulty interpreting findings in the appropriate clinical context	2
3: And correlates findings in the appropriate clinical context	3
4: And initiates appropriate therapeutic/diagnostic plan based on findings	4
Develops plan to ensure appropriate testing and intervention	
1: Unable to perform appropriate intervention; does not request appropriate testing; obtains inadequate samples; does not ensure timely processing of samples	1
2: Performs appropriate intervention with moderate assistance; ensures appropriate testing and processing of samples with coaching	2
3: And performs appropriate interventions with minimal assistance	3
4: And identifies a management plan based on interventions performed; anticipates results of the testing	4

OVERALL RATING:

☐ I had to take over	☐ I had to talk the trainee through	☐ I had to prompt the trainee occasionally	☐ I needed to be in the room in case	☐ I did not need to be there

Comments:_____

_____

_____

Medical University of South Carolina

Respiratory Failure Simulation Curriculum: A Novel Approach to Improving Resident Education and Performance as a Member of a Rapid Response Team

Authors: Nicholas Fox, MD[1]; Travis Ferguson, MD[1]; John Walker, BHS, ASLEOT, CHSO[2]; Charlie Strange, MD[1]

[1]Division of Pulmonary, Critical Care, Allergy and Sleep Medicine, [2]Simulation Center, Medical University of South Carolina, Charleston, SC

Training Program Director: Nicholas Pastis, MD

PROGRAM DESCRIPTION

The Pulmonary and Critical Care Fellowship Program at the Medical University of South Carolina in Charleston is a fully accredited program. The program offers a three-year combined fellowship in pulmonary and critical care medicine and has five positions available per year.

BACKGROUND

Understanding hypoxic respiratory failure and oxygen delivery modalities is critical for swift and effective patient care. Most hospitals throughout the country have started to utilize a "Rapid Response Team" to help quickly manage acute respiratory failure. At many academic institutions, residents are an integral part of this team. Considering the acuity and severity of illness for these clinical scenarios, how best to prepare and train residents for this role continues to be a focus of medical education. To date, there has been concern raised that resident education in resuscitative medicine is sorely lacking (1). This gap in knowledge can leave residents feeling unprepared for such a role and ultimately directly influence patient outcomes. To narrow this gap, we embarked on a quality improvement project that utilized simulation experience focused on educating residents on hypoxic respiratory failure and specific oxygen delivery modalities. Our aim was to improve resident preparedness as a rapid response team member through high-fidelity simulation scenarios centered on respiratory failure events.

METHODS

The simulation experience utilized the Laerdal Learning Application (LLEAP) software, version 6.4. The Laederal SimMan Essential manikin was used for all clinical scenarios. Each simulation event consisted of six first-year residents, one or two instructors, and commonly available respiratory equipment (nasal cannula, simple face mask, venturi mask, non-rebreather mask, high flow, CPAP, and BiPAP). All events took place at the Medical University of South Carolina Simulation Center in a fully equipped replica of a hospital room.

The educational experience lasted two hours and incorporated three simulated scenarios with formal debriefing sessions. Study individuals participated in a pre-simulation survey that consisted of questions regarding their experience and comfort level with hypoxic respiratory failure. These questions were delivered in a Likert scale with responses ranging from 1-6. Following the pre-simulation survey, participants completed three clinical scenarios involving respiratory failure without any prior knowledge of the scenarios. The group was divided into pre-defined roles including: team leaders, respiratory therapists and observers. The simulation lasted approximately twenty minutes based on the group's performance.

Following each simulation, all individuals debriefed and an interactive didactic session covered pre-defined teaching objectives. After each scenario, participants rotated roles and by the third simulation, each participant had assumed the role of leader, respiratory therapist, and observer. Following completion of the session, a post-simulation survey was administered.

RESULTS

The pre- and post-survey data was analyzed to study the effect of the simulation curriculum on residents' perceived level of preparedness as a member of the medical emergency team. To simplify the results of the surveys, the Likert scale was dichotomized. All responses below "moderately prepared," "very confident," or "moderately agree" were defined as a "0." All answers above these marks were defined as a "1." A Pearson's chi-squared test was then used to compare the before and after survey responses for each of our study questions. The results were further divided into variables demonstrating self-perceived confidence as a rapid response participant

and variables representing ability to initiate and titrate oxygen delivery systems. In all categories, comparison of pre- and post-responses following the simulation session demonstrated statistical significance, $p<0.05$.

CONCLUSION

Overall, the results of our pilot study suggest that a directed simulation experience can be profoundly successful in preparing and educating residents on hypoxic respiratory failure. Residents also identified an increased confidence in being an active member and leader of the rapid response team following the simulation event. The future direction of this project would be to measure feasibility and sustainability of this curriculum as well as the effects on resident performance during respiratory failure events

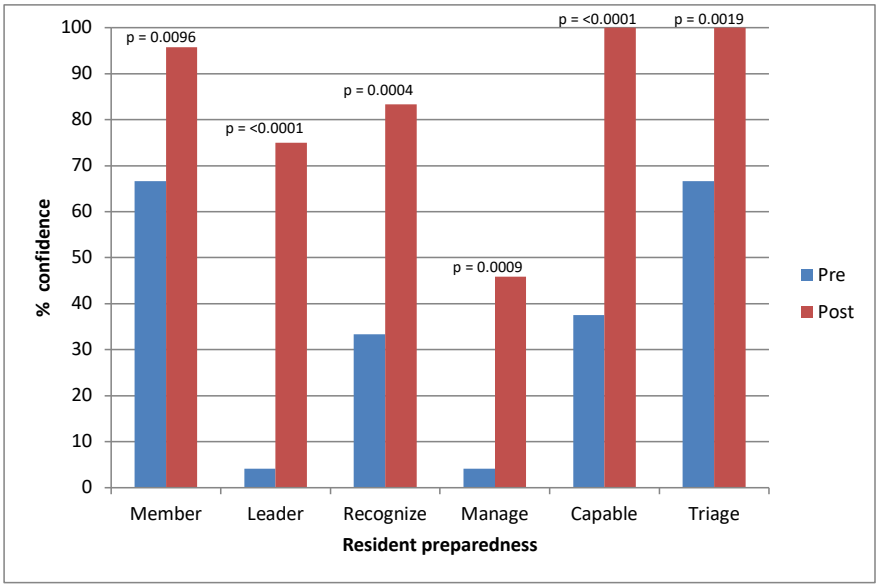


Figure 1: Survey responses pre and post intervention. Responses relate to resident preparedness for being a *member* or *leader* of the rapid response team; resident confidence in *recognizing* and *managing* respiratory failure; resident ability to *capably* initiate the correct oxygen delivery device; and resident ability to appropriately *triage* the patient.

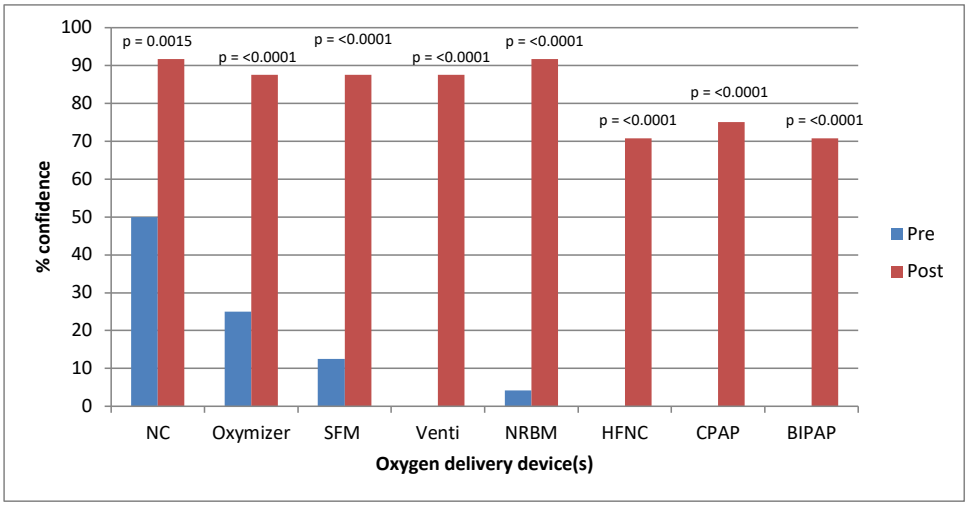


Figure 2: Survey responses pre and post intervention. Responses highlight resident confidence in initiating and titrating the above oxygen delivery devices.

Montefiore Medical Center/ Albert Einstein College of Medicine

Critical Care Fellowship: Now available on Google Play© and App Store©. Download Now!

Authors: Jay Patel, MD; Aluko Hope, MD; Adam Keene, MD

Training Program Director: Adam Keene, MD

PROGRAM DESCRIPTION

One- and two-year fellowships for critical care medicine training. Fellows are trained in med/surg, neuroscience, trauma, and cardiothoracic surgical patient care along with familiarity with mechanical support devices and procedural medicine. Also take part in liver, kidney, heart, lung, and bone marrow transplant programs.

BACKGROUND

The days of equating medical education to spending 50 minutes letting somebody talk at you and rewarding yourself with a ten-minute break have come and gone. There are new models in place that have proven to be superior in teaching medicine. Concepts such as the flipped classroom and problem-based learning have been shown to improve learner experience and result in a better prepared medical provider. We aimed to build on this momentum and incorporate hand-held technology into the learning experience.

METHODS

Using a cell-phone-based mobile application, we supplemented learning material for a Critical Care Fellowship training program for one year. We made available multiple-choice questions with detailed feedback, reviewable lectures, relevant journal articles, and helpful diagrams on a rolling basis throughout the year temporally related to live didactic sessions. This content was released every two to three weeks and push notifications were used to enhance utilization. We compared user experience, utilization, and preparedness for practice from the learner group pre- and post-implementation. Twelve critical care fellows were surveyed in the pre-intervention group; this was compared to 11 critical care fellows in the post-intervention group.

RESULTS

Fellows engaged in problem solving more often, reviewed material after didactic sessions more often, and felt more confident about their fund of knowledge (all comparable data sets reached statistical significance with p values < 0.05). The following table describes our results.

	Pre-Implementation mean	Post-Implementation mean	p-value
How satisfied are you with your didactic experience? 1-10 (10 = most satisfied)	6.92	7.92	.0974
How confident do you feel about your fund of knowledge? 1-10 (10 = most confident)	6.42	7.91	.0199
How often do you engage in problem based learning? 1-10 (10 = most often)	5.67	7.18	.0253
How often do you review material within 1 day of it being presented in lecture? 1-10 (10 = most often)	3.42	5.33	.0496

CONCLUSION

By allowing interaction with the interface, mobile-app-based learning provides real-time feedback for the learner on a 24-7 basis and offers a more customizable learning experience when compared to traditional lecture-based education. The availability of learning material to be placed on a personal mobile phone also allows for learning material to enter into the personal space of the learner. This allows push notifications to be effective in improving utilization. The digestible amount of information that was made available on the app also made digital

learning more appealing compared to the daunting amount of information that exists on the web.

Mobile-app-based learning has a few limitations. Creating the ideal platform for content delivery can cost upwards of $10,000 and take about six months to generate. Content is also dependent on the creator and requires personnel familiar with the technology. It also presents new obstacles, such as lag time and input errors, that previous program directors may not be as used to overcoming. There is much that remains to be explored in the field of medical education.

Future endeavors may be focused on customization of content to the individual learner and allowing benchmarks to help leadership track progress of participants. Outcomes may be different in other specialties or programs of varying sizes. As mobile apps become more commonplace in the learning environment, user experiences should be shared to help guide the best implementation strategies. An app-based curriculum improves learning experience and preparedness of learners in a critical care fellowship. Program directors in critical care fellowships should strongly consider implementing this technology to augment the educational experience. It will be exciting to see how this technology evolves over time.

NYU School of Medicine

A Design Thinking Workshop to Combat Burnout and Expand the Quality Improvement Toolkit

Author: Allison A. Greco, MD

Program Director: Doreen Addrizzo-Harris, MD

PROGRAM DESCRIPTION

The NYU Langone Pulmonary and Critical Care Medicine Fellowship Program utilizes the clinical and research programs at three main hospital centers (NYU-Langone Hospital, Bellevue Hospital, and the Manhattan VA), located in New York City. The fellowship program accepts eight fellows each year and consists of two years of clinical training with a third year dedicated to research. A diverse patient care experience is combined with an extensive curriculum using didactics, case-based learning, and simulation.

BACKGROUND

Every aspect of the daily practice of medicine from an examination table, electronic health record, to surgical instruments has been created through a design process that rarely involves physicians or patients. This results in inefficient, unsafe, and fragmented patient care and a broken health care system. Inability of physicians to address the inadequacies within their work environment can lead to a loss of job satisfaction as well as foster the development of apathy toward patients and colleagues.

Design thinking is an approach used to creatively solve complex problems. The methodology relies on several core concepts: a user-centric approach, the belief that every person is creative, involvement of a multidisciplinary team, rapid prototyping of an idea, and tolerance of failure. Physician groups have used design thinking to tackle initiatives such as encouraging self-care following lung transplant, detecting subtle changes in patients' vital signs in an intensive care unit, and improving medication adherence.

Here, we present a workshop that teaches physicians basic design-thinking skills. The skills learned can be applied not only to the development of quality improvement initiatives, but also to curriculum development, public health, research, and hospital administration.

DESCRIPTION

In our workshop, we provide an overview of the concept of design thinking and its applications in healthcare. We then use the five steps of the design-thinking process empathizing with the user, defining the problem, brainstorming, prototyping, and testing and feedback to help solve a problem or inefficiency chosen by the group. Participants split into dyads or triads to practice techniques such as empathy mapping, storyboarding, and "5 Why's" to brainstorm and create a solution to the problem at hand (Figure 1). The session culminates in each group's creation and showcase of its prototype (Figure 2) and concludes with time for feedback and discussion.

CONCLUSION

Our workshop was well received and can easily be adapted for all levels of medical training. It offers participants an opportunity to unwind and discuss shared common inefficiencies and problems that they encounter, while also teaching innovative quality-improvement skills needed to create solutions.

Figure 1: Participants learn and practice skills such as empathy mapping to help create solutions to a problem chosen by the group.

FIGURE 2: Participants showcase prototypes of their innovations, which they design and create using craft supplies.

Penn State Health, Milton S. Hershey Medical Center

A Self-Directed Deliberate Practice Approach to Point of Care Ultrasound Training for Critical Care Fellows in Limited Resource Settings

Authors: David M. Shore, MD; David C. Chu, MD

Program Director: Margaret Wojnar, MD

Associate Program Director: David C. Chu, MD

PROGRAM DESCRIPTION

The goal of the Pulmonary and Critical Care Medicine Fellowship Program is to prepare pulmonary and critical care specialists for medicine in the 21st century with a three-year training program focusing on clinical knowledge, procedural expertise, and broad exposure to research. We provide a great deal of flexibility to allow fellows to obtain the training needed to help them succeed in the career of their choice.

BACKGROUND

Critical care ultrasonography (CCUS) is an essential skill for critical care fellows in the intensive care unit, and for later board certification. While widely accepted, it is a relatively new diagnostic modality, and many faculty members at fellowship training programs are not well educated in its use. This can be a major obstacle in fellow education, as mastery of image acquisition and interpretation requires real-time feedback. In order to better guide our fellows towards clinical mastery, we created a novel CCUS curriculum based on a deliberate-practice model.

METHODS

Based on a literature search of previously validated CCUS curricula, and in accordance with the 2009 ACPC Consensus Statement on Critical Care Ultrasonography, we created a curriculum to teach CCUS covering the heart, lungs, pleura, abdomen, and evaluation for deep vein thrombosis (DVT). Fellows were introduced to CCUS by two instructors over two four-hour sessions, whereby each system and relevant background on the science of ultrasound was introduced with a 30-minute didactic session followed by a hands-on practice session using fellows as models.

After orientation, we provided fellows access to point of care ultrasound machines on their medical ICU and interventional pulmonology rotations. We instructed fellows to obtain and store images for review as clinically indicated. One faculty member performed bedside ultrasound rounds in the medical ICU with the fellow on service weekly. While on the MICU rotation, each fellow chose an aspect of the CCUS exam each week to practice based on their current level of skill and knowledge. The next week, the fellow would receive feedback during ultrasound rounds, and a new assignment was provided based on their progress. As a general goal, we provided fellows with the portfolio image requirements from the ACCP Critical Care Ultrasonography Certificate of Completion program and instructed them to obtain enough images to satisfy the requirements of the program by the end of their first year.

To improve skill in image interpretation and to provide education to interested faculty, we held monthly ultrasound case conferences as part of our general conference series for the fellowship. The first few months focused on general overviews of a particular aspect of CCUS, to reinforce both background knowledge of ultrasound physics and to provide examples of less common pathology. For the rest of the year, fellows were instructed to bring images acquired during their clinical rotations for group review, both for interpretation and to critique image acquisition. Evaluation In this ongoing study, three first-year fellows were assessed at the start of orientation using cognitive tests available as part of the point of care ultrasound for critical care curriculum developed by the University of Washington to establish their baseline level of knowledge. Cognitive and psychometric-based assessment is planned after 12 months to evaluate their proficiency with CCUS. Their evaluations will be compared to the scores of fellows (n=6) who completed their first-year training prior to implementation of this curriculum. Additionally, as we often have fellows utilizing CCUS when with faculty who are not proficient in its use, we plan to assess faculty regarding their views on CCUS following implementation of the curriculum, and to assess interest in providing training to other faculty as well.

CONCLUSION

We have created a novel deliberate-practice based curriculum to foster CCUS mastery early in fellowship training. Our innovation lies in modifying existing curriculum to promote self-directed learning, while requiring a reduced faculty burden, and thus can easily be adopted to training programs with limited CCUS resources and trained faculty.

Saint Louis University School of Medicine

A Multi-Modal Learning Approach to a Pulmonary Disease and Critical Care Core Curriculum Course

Program Director: Ravi Nayak, MD

Associate Program Director: Edward Charbek, MD; Setu Patolia, MD

PROGRAM DESCRIPTION

The program combines vigorous didactic instruction with diverse educational experiences. The subspecialty program consists of 36 months of clinical training. Rotations at SSM Health Saint Louis University Hospital and Mercy Hospital include the medical intensive care unit; consultative pulmonary medicine; ambulatory services; anesthesiology service; and pulmonary function, exercise, and sleep laboratories. Each year we accept four fellows to our ACGME accredited fellowship program.

BACKGROUND

Our pulmonary disease and critical care medicine core curriculum lecture series aims at providing a framework for fellows to learn the essential principles and practice of pulmonary disease and critical care medicine, make available to the fellows learning resources on Blackboard, and be able to harness and share the knowledge and expertise of our faculty in the different areas of pulmonary disease and critical care medicine. The ultimate aim was to have a 100% board pass rate throughout the years.

METHODS

The non-credit course consists of the following learning activities: 1. Didactic sessions (i.e., seminars, lecture, workshops, etc.) delivered by speakers with expertise in the particular pulmonary disease or critical care medicine topic. 2. Self-study sessions during which the fellows read clinical guideline/s, practice parameter/s, review article/s, chapter/s, etc. pertaining to a pulmonary topic on her/his own. 3. Group practice sessions for interpreting pulmonary diagnostic tests. 4. Mini-board review sessions. The schedule of didactic sessions can be found under the folder titled “DEV Pulmonary Disease and Critical Care Medicine Core Curriculum Schedule” on Blackboard, and is also posted on the Division of Pulmonary, Critical Care, and Sleep Medicine conference schedule bulletin board. The venue for the lectures will be the Herbert Sweet Library, Division of Pulmonary, Critical Care, and Sleep Medicine.

The objectives of this course included to be able to: A) describe the structure and function of the respiratory system, B) explain the pathophysiology of common pulmonary disorders, C) identify and describe the pathology of common pulmonary diseases, D) list the indications, describe the technique, explain the complications, and interpret the results of diagnostic procedures employed in pulmonary medicine, E) enumerate the risk factors, describe the clinical features, and understand the principles of diagnosis, prevention, and management of common lung diseases, F) list the indications, describe the techniques, explain the complications, and interpret the results of certain diagnostic procedures employed in the medical intensive care unit, and G) enumerate the risk factors, describe the clinical features, and understand the principles of diagnosis, prevention, and management of some acute disorders afflicting critically ill patients in the MICU.

The fellows have the opportunity to discuss their feedback, comments, and suggestions anonymously regarding the PUD-CCM Core Curriculum Course with the combined pulmonary disease and critical care medicine fellowship coordinator at the end of the academic year. Lecture topics and speakers are modified based on the fellows’ anonymous recommendations. A speaker evaluation is handed to fellows after each lecture and a summary of the evaluations and comments are sent to the speakers as a direct feedback aiming at improving the quality of the lectures.

All lectures are recorded on Tegrity and made available for fellows to review at any time especially for Fellows that are on night float rotation or rotating at one of our affiliate hospitals. The topics are added/removed based on the fellows input. Weekly announcements are sent via e-mail to all faculty and fellows reminding them of the following week’s topic and suggested readings are made available for fellows before the lecture. We call it

a multi-modal approach because we incorporate both passive (lectures) and active (problem set, board review questions) teaching styles; print and audiovisual media (Tegrity); and assess various levels of competence from simple recall of facts to application of knowledge by problems solving (case discussions).

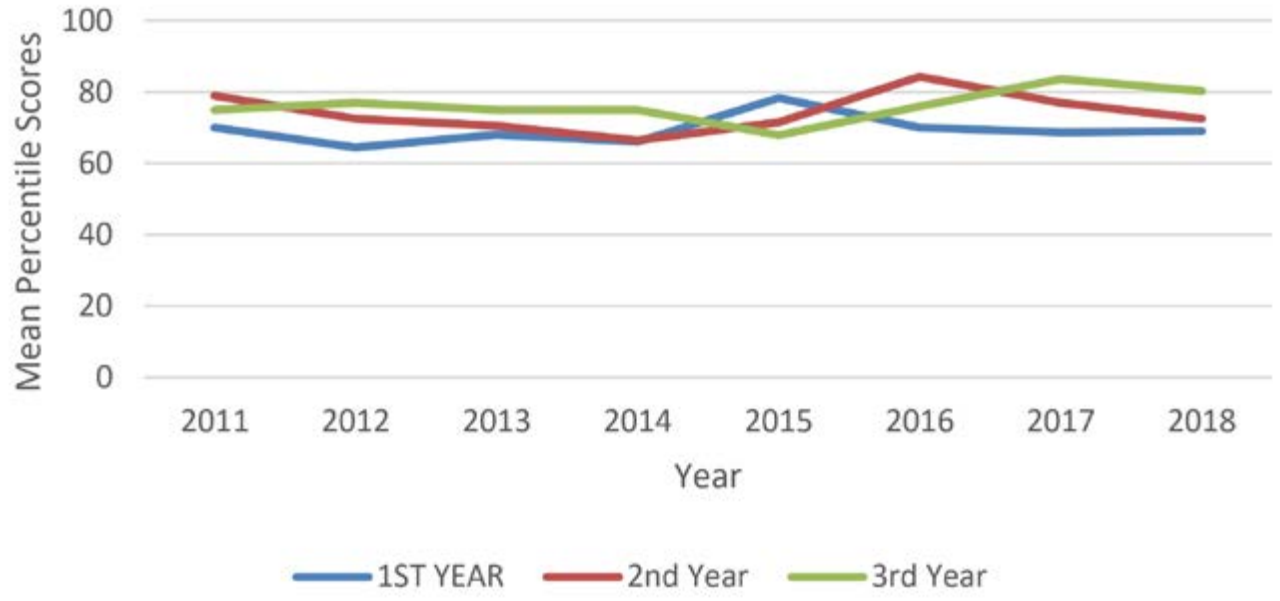
RESULTS

We had 100% ABIM Pulmonary and Critical Care board passing rate since the course was created. Our in-training mean percentiles scores divided by year of fellowship have improved since this educational course was implemented in our fellowship (Figure 1).

CONCLUSION

This course transformed our didactic fellow teaching into a well-structured curriculum. This has resulted in improved fellows' in-training and board scores as well as increased fellows' participation and input into their own education. Given the success of this course, we are attempting to develop a similar curriculum to improve fellows' teaching in the ambulatory clinic.

Figure 1: In-training exam mean scores trend since the course started



SUNY Stony Brook University Medical Center

A Critical Reading and Research Methodology Curriculum for Adult Pulmonary Critical Care Fellows

Authors: Abigail Chua, MD, MPH; Christopher Rosenberg, MS2; Paul Richman, MD

Program Director: Rajeev Patel

Associate Program Director: Sahar Ahmad, MD

PROGRAM DESCRIPTION

SUNY Stony Brook University Medical Center offers a dedicated curriculum specifically designed to promote practical and evidence-based understanding of pulmonary and critical care medicine. Stony Brook University Hospital and Northport VA Hospital are the main sites for clinical training. Stony Brook University Hospital is the only level one trauma and tertiary care hospital on Eastern Long Island. Fellows receive a dedicated full-year faculty-mentored clinical or basic science research in the second year of training.

BACKGROUND

Post-graduate medical trainees most often learn how to critically read their journals by attending seminars on evidence-based medicine and participating in journal club, either at their institution or online via a professional society. The primary aims of a journal club are to help trainees stay current with recently published research and improve upon the physician's critical appraisal skills. These skills include gaining an understanding of study design, epidemiology, and biostatistics; learning how to integrate new information into clinical practice; and solidifying lifelong learning habits.[1] A variety of studies have been published to help residency and/or fellowship programs devise an effective journal club for trainees.[2,3,4] While these studies contributed important findings to the field of medical education, none to date has introduced both a standardized reading curriculum and journal club, and none of these educational programs used validated tools to directly assess their benefit in the education of post-graduate medical trainees. We expect that publication of our study will provide a standardized methodology for teaching these skills.

This is a prospective interventional study with no control arm. The intervention is an educational curriculum, described below. Subjects who agree to participate (current fellows) will take a skills test and survey before and after the intervention. The investigators will be blinded to the identity of the fellows taking the test.

METHODS

We are offering our fellowship trainees a one-year learning curriculum on how to critically read articles in the medical literature. This study itself will measure the change in each fellow's score on a test assessing their skill at critically appraising medical research studies, before and after engaging in the curriculum.

The learning curriculum consists of two parts:

1. **Passive learning:** fellows will read a monograph on how to critically appraise a medical research article, a detailed glossary on the application of statistical tests, and eight short articles selected from a series published in the Journal of the American Medical Association (JAMA) that serves as a guide on how to critically read clinical literature.

2. **Active learning:** Each fellow will be assigned two medical journals for a three-month period, on a rotating basis. Every two weeks, he/she will write a three- to four-paragraph journal-club-style synopsis of an important paper in one of the two journals, focusing on methodology, main findings, sources of bias, and statistical analysis. The synopsis will be made available to all the division's fellows and faculty, as an "issue" of the journal club. Faculty will be asked to provide feedback about the quality of one synopsis in each issue.

An identical pre-test and post-test composed of multiple-choice questions will be administered one year apart. Four domains of study appraisal, based on a summary article in the JAMA series, are addressed: Study Design, Quality of Data, Data Analysis, Interpretation of Results. Twenty hypothetical research studies ("vignettes") were written, each with an MCQ item. The vignettes and questions were revised in an iterative consensus-driven process focusing on clarity, degree of

difficulty, and absence of ambiguity. Construct validity of the tests will be determined in a pilot study before administering it to the fellows in this study. Each student's scores on the pre-test and post-test will be compared using a paired t-test.

Before each administration of the test, the fellows will complete a survey in which they self-rate their competence in seven skills related to critical reading, estimate the number of journal articles they read monthly before and after their curriculum, and their overall level of satisfaction with the learning curriculum using a five-point Likert scale.

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University of California, San Francisco

Implementation of a Novel Fellowship Coaching Program to Improve Professional Development, Personal Satisfaction and Wellbeing

Authors: James Frank, MD; Lekshmi Santhosh, MD; Antonio Gomez, MD; Neil Trivedi, MD; Priya Shete, MD; Nirav Bhakta, MD, PhD

Program Director: James Frank

Associate Program Director: Lekshmi Santhosh

PROGRAM DESCRIPTION

The UCSF Fellowship in Pulmonary and Critical Care Medicine focuses on developing future academic leaders, innovators, and educators who reflect the compassion, diversity, and excellence we value. Because of our focus on research and service career development, most fellows opt to stay for an optional fourth year. We support all fellows for as long as is necessary to achieve their post-fellowship career goal.

BACKGROUND

Coaching has been increasingly recognized as an approach to personal and professional development that can contribute to improved performance, personal satisfaction, professional development, and wellbeing. Coaching outcomes in task-oriented and non-task-oriented job functions support a role for this type of intervention as a means to improve performance. Coaching that emphasizes positive psychology and approaches to promote emotional intelligence has been associated with improved personal satisfaction and may enhance resilience to future stressful circumstances.

Although coaching has not been thoroughly studied in graduate medical education, we hypothesize that implementation of a structured, individual coaching program would improve fellows' self-reported overall satisfaction with program training and the educational environment, as well as scores on metrics of trainee wellbeing. Pulmonary and critical care medicine has been recognized as the specialty with the highest risk of burnout. Although data on burnout during fellowship training are lacking, practice habits and coping strategies developed during training might predict future burnout. Moreover, anxiety regarding career path options may contribute to personal dissatisfaction. Therefore, we further hypothesize that coaching will improve fellows' satisfaction with early career choice and training path (professional development).

METHOD

We designed an individual coaching program for our PCCM Fellowship Program. The fellowship focuses on training fellows in research, education, or service-based careers and includes 21 ACGME learners. Using available literature, resources, and local expertise from within the medical school faculty, a coaching position job description was developed and an open search was conducted. The goal is for three coaches to work with seven fellows each, thus spanning the three ACGME years. Coaches meet with fellows at least once monthly throughout the academic year, and the agenda of most meetings includes program-guided suggestions. This includes positive psychology techniques, approaches to improve emotional intelligence and in the third year, leadership skills will be emphasized. Coaches are allowed to deviate from the suggested agenda if they chose. Additional meetings can occur at the request of the fellow or coach. The initial coach meeting occurred on the first day of fellowship. The general focus of the coach meetings over the course of the first year is outlined in Figure 1. Areas of focus include residency-to-fellowship transition, work-life integration, career choice, mentor selection, clinical evaluations, and available resources. Coach meeting structure centers around individual goal-setting based on mutual knowledge of the fellow's personal and career objectives.

METHODS

Because the time commitment required of coaches to work with seven fellows is significant, implementation of the coaching program included salary support provided by a grant from the Nina Ireland Program in Lung Health and an agreement with divisional and departmental leadership. Training for coaches included two 90-minute sessions focused on positive psychology, learner engagement, and self-reflection. Faculty development sessions for coaches also included

two days of training in relationship-centered communication, giving and receiving feedback, and training in diversity, equity, and inclusion. The latter included discussion of implicit bias, privilege, microaggression, and allyship.

CONCLUSIONS

Implementation of a fellowship coaching program focused on developing a deep mutual understanding of each fellows' career objectives, clinical performance, and positive psychology is feasible in an academic program oriented toward clinical and research training. The primary outcomes of interest for this project include overall program satisfaction among fellows, and fellow wellbeing as assessed on ACGME surveys. Fellow satisfaction with career choice, career development options, and procedure-related competency will also be assessed. Metrics will be compared with historical data from before program implementation. Ultimately other outcomes such as burnout and professionalism will be examined.

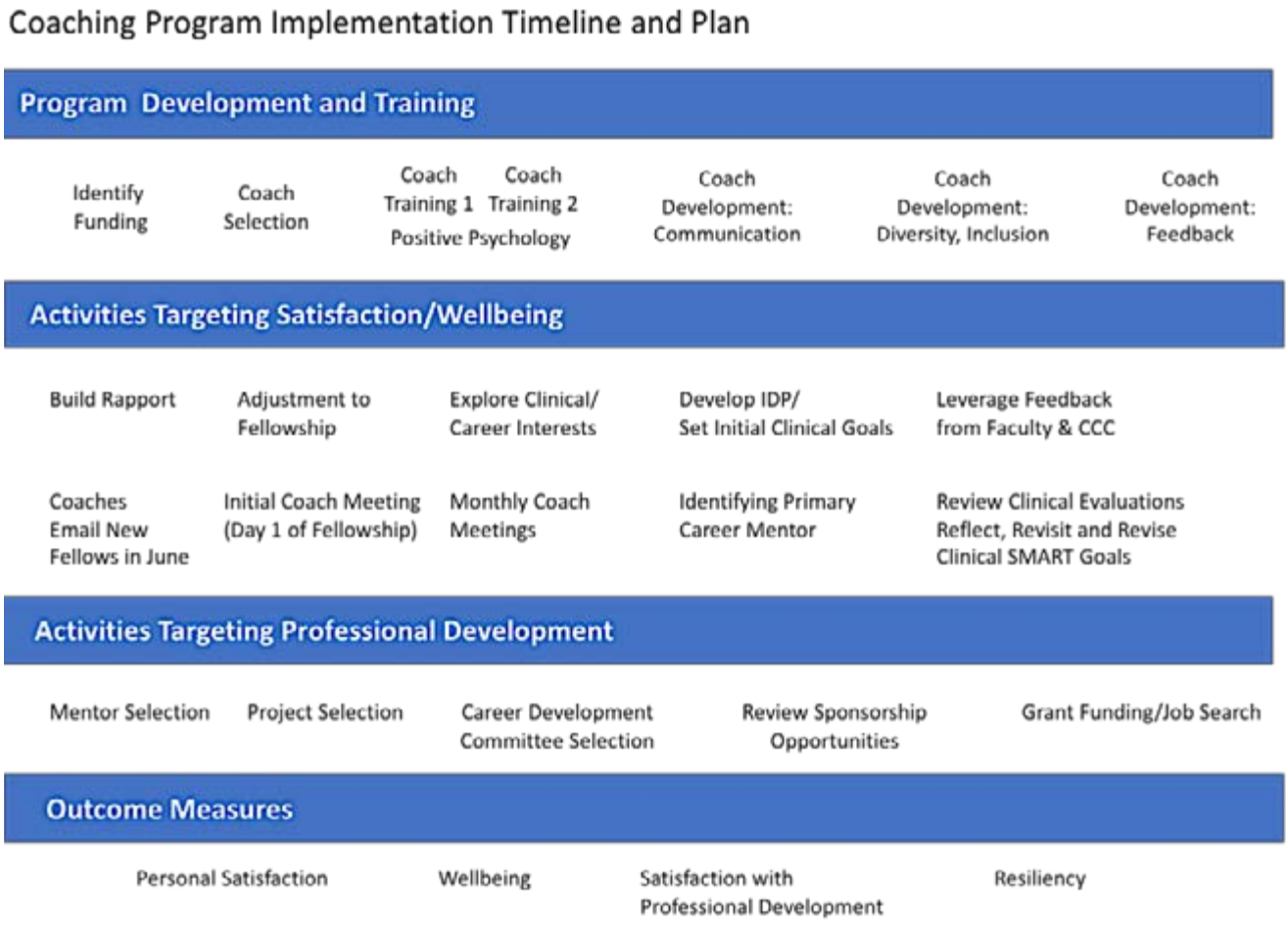


Figure 1: Coaching Program Development and Implementation, Objectives and Outcome Measures. IDP = Individual Development Plan, CCC = Clinical Competency Committee.

University of Cincinnati

Educational Quality Improvement for the Adult Learner: Implementation of a Structured, Self-Directed, Fellow-Driven Outpatient Pulmonary Curriculum

Authors: Malik M. Khurram S. Khan, MD; Patrick Kosciuk, MD; Adam G. Cole, MD

Program Director: Peter Lenz

Associate Program Director: Adam Cole

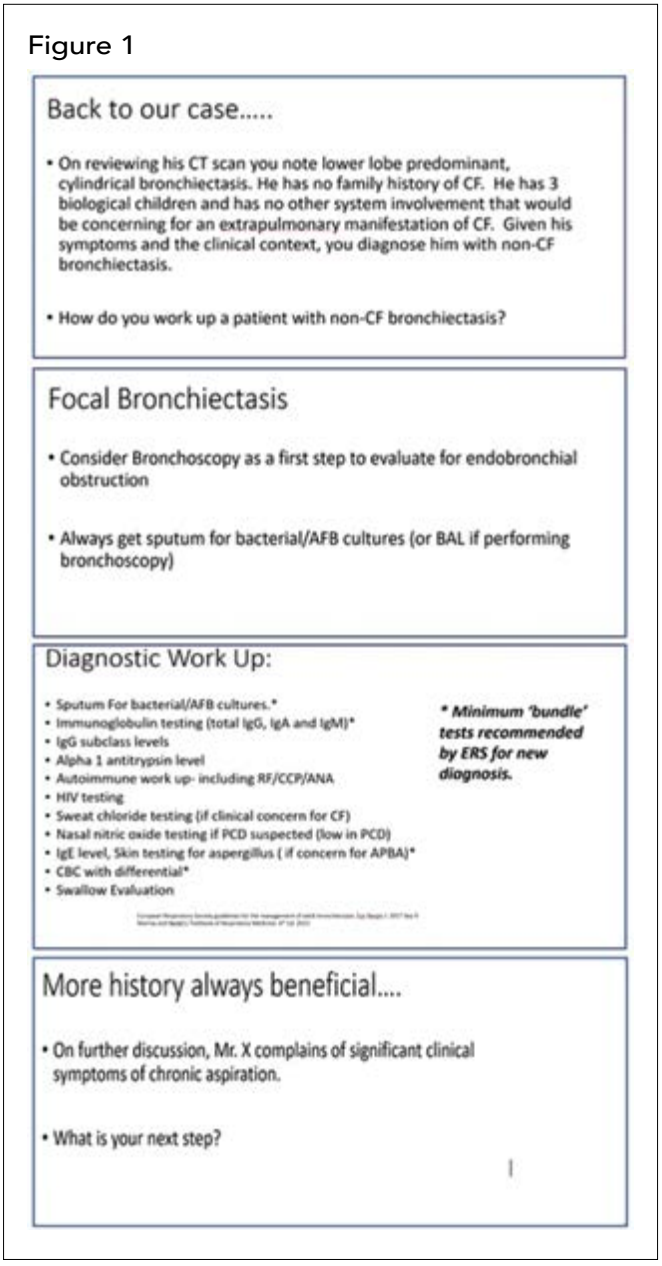
BACKGROUND

As part of pulmonary fellowship training, the ACGME requires a continuity ambulatory clinic experience that exposes trainees to the breadth of the subspecialty. However, for many programs, much of the clinical time during training is inpatient focused. For programs with at least 24 months of clinical rotations, the minimum ambulatory requirement is one half-day clinic per week for 24 months during the 36-month fellowship1. This amounts to less than five percent of the total training time. The next accreditation system (NAS) of the ACGME focuses on milestone assessment in core competency areas during training as a roadmap for progression to independent practice. Some core competencies are inherently outpatient focused.

Ensuring that trainees are adequately supported on the path towards independent practice in the context of limited clinical time is challenging. A supplemental outpatient curriculum is likely to be useful in meeting this need. One approach has been described by Kassutto and colleagues, who developed a structured outpatient curriculum based on small-group discussion of clinical scenarios. However, while effective, this curriculum is dependent on a time commitment from attending physicians, and this can be difficult for some divisions to guarantee and is dependent on multiple factors. Currently our training program's outpatient curriculum is primarily experiential, with limited structured topic-based learning. Adult learning theory suggests that adult learners tend to prefer material that immediately relevant to their craft. Additionally, adult learners tend to be internally motivated and are often self-directed.

Applying these principles, we created and implemented a supplemental outpatient pulmonary curriculum using specific, self-directed, learning modules. The learning modules focused on the diagnosis and management of outpatient pulmonary conditions, placing emphasis on relevance to fellows' future practice.

Figure 1



METHODS

After a needs assessment, modules on high-yield topics were created in PowerPoint format and designed to be viewed in slideshow mode (Figure 1- selected slides from one of the modules). Board-style questions (Figure 2- sample question) were written and prior to the dissemination of each module, five questions were sent to fellows via SurveyMonkey. Fellows were given automatic feedback on their answers, but the results were entirely anonymous. The board-style questions would be distributed approximately one week before the module. After the first four modules (COPD, asthma, non-cystic fibrosis bronchiectasis, and pulmonary function testing/physiology), educational efficacy was assessed with a short survey.

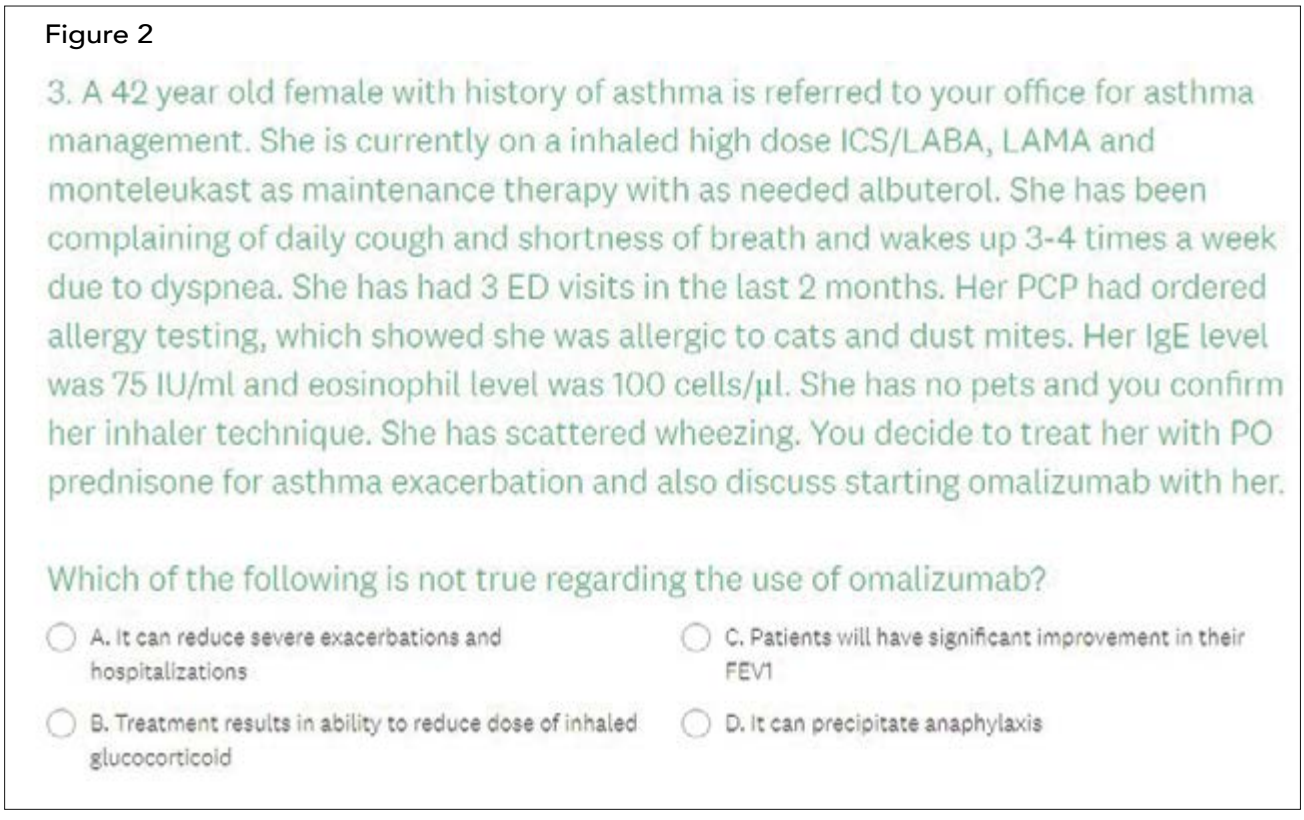
RESULTS

A pre-curriculum survey of fellows revealed that 81% felt that the current outpatient clinic had prepared them well for independent practice, but only 45% agreed or strongly agreed that they were satisfied with the current structure and education in the outpatient clinic. Total response to the aggregate pre-test board style questions was 82%. Responses to the survey regarding the effectiveness of this style of curriculum showed that 100% had reviewed the modules and believed email was the best format for distribution, and 62.5% had occasionally or most of the time used the modules as a reference when caring for patients in the clinic. Furthermore, 87.5% believed that this curriculum had slightly improved and 12.5% believed that it had significantly improved their confidence in the independent outpatient clinical management of the topics addressed in the modules.

CONCLUSIONS

Preliminary feedback from our fellows suggests this is form of outpatient curriculum is a reasonable supplement to fellows' experiential clinic learning. This type of curriculum may be helpful for other programs where attending physician constraints preclude a more extensive outpatient educational session before each clinic.

Figure 2



University of Colorado School of Medicine

Enriching Career Development Through Implementation of a Peer-Mentoring Program Within the Pulmonary and Critical Care Fellowship

Authors: Bridget A. Graney, MD[1,3]; Tristan Huie, MD[1,2]; Anna Neumeier, MD[1,3]

[1]Division of Pulmonary Sciences and Critical Care Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO, USA; [2]Division of Pulmonary, Critical Care and Sleep Medicine, Sleep & Behavioral Health Sciences Section, National Jewish Health, Denver, CO, USA; [3]Division of Pulmonary, Critical Care and Sleep Medicine, Denver Health, Denver, CO, USA

Program Director: Tristan Huie

Associate Program Director: Anna Neumeier

PROGRAM DESCRIPTION

The combined Fellowship in Pulmonary and Critical Care Medicine at the University of Colorado provides 18 months of clinical training in pulmonary, pulmonary subspecialty, and critical care medicine at seven clinical sites merged with 18 months of rigorous research. Fellows have the opportunity to complete a fourth year dedicated to research. The goal of the fellowship is to train future academicians as scientific investigators, clinician educators, or clinical leaders.

BACKGROUND

A key component of early career development is mentorship. Adequate mentorship can improve early career advancement and professional success. Learning how to serve as a mentor is a requisite skill for trainees, but there are few formal educational avenues to obtain necessary knowledge and skills to be an effective mentor. Peer mentoring, through a reciprocal interactive relationship, provides an opportunity to develop confidence and skills as mentors while providing support and overcoming barriers that might exist with hierarchical relationships. We describe the implementation of a structured peer-mentoring program initiated in the 2017-2018 academic year, designed to enhance opportunities for fellows' professional and educational development for both members of the peer-mentoring pair.

METHODS

Second- and third-year (senior) fellows were invited to serve as peer mentors for first-year (F1) fellows in the training program. Interested senior fellows were paired at random with an F1. The goals of the peer-mentoring program were to: 1) increase scholarly output in the form of abstract submission (the majority being case reports reflective of the clinically intensive first fellowship year) and presentation at an international conference for F1s, 2) provide a structured experience to increase knowledge and skills of mentoring for senior fellows, and 3) assess attitudes about the value of peer mentoring within the training program.

RESULTS

During both the 2017-2018 and 2018-2019 academic years, all F1 fellows (n=7/year) participated. During 2017-2018, all F1s submitted and had abstracts accepted at an international conference; two F1s had no prior experience submitting an abstract. To date for 2018-2019, all F1s submitted an abstract and for six out of seven, this was their first experience writing and submitting a case-report abstract to an international conference. Over one-third of senior fellows who participated in both academic years had no prior mentoring experience. Attitudes about the program were universally positive. All fellows (senior and F1) that participated in both academic years agreed or strongly agreed with the following: 1) the peer-mentoring program was valuable for developing and practicing mentoring, or receiving peer-mentoring, respectively, and 2) developing mentoring skills is valuable for future careers in academic medicine. Fellows also universally agreed that the opportunity to participate at an international conference is a valuable experience for career development.

CONCLUSION

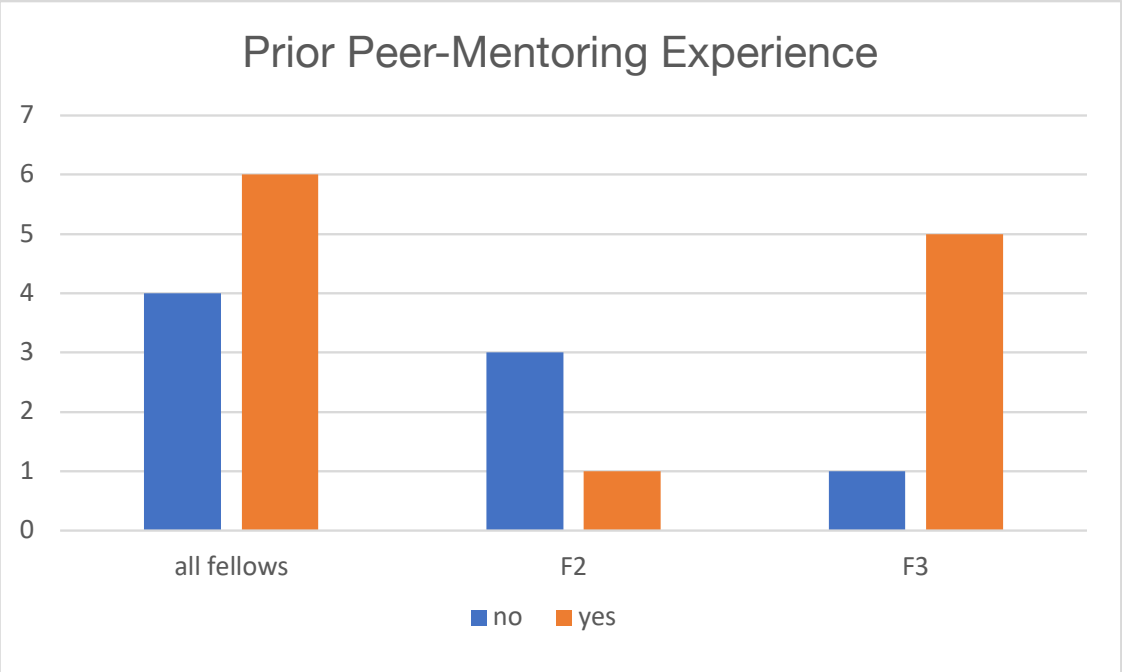
This structured peer-mentoring program within an academic training program created a multidirectional opportunity for fellow professional development. The program provided a highly valued opportunity to learn, practice, and improve mentoring skills

for senior fellows and a highly valued opportunity to increase scholarly output, increase attendance and participation at international conferences, and receive peer-mentorship for F1s. Implementing peer-mentoring programs can enrich the career development of trainees as they prepare for careers in academic medicine.

Learners' rated statements using a 4-point Likert scale where 1= strongly disagree, 4= strongly agree

Fellows statements	Mean (SD)
I plan to have a career in Academic Pulmonary Critical Care Medicine	3.45 (0.65)
The opportunity to present at International meetings and publish is valuable for my career aspirations	3.9 (0.33)
I liked the opportunity to work with a co-fellow on an academic project (first year fellows)	3.8 (0.41)
My senior fellow was a valuable resource and mentor (first year fellows)	3.71 (0.61)
Developing mentoring skills is valuable for my career (senior fellows)	3.9 (0.33)
This project provided a valuable opportunity to mentor (senior fellows)	3.55 (0.52)

Figure 1:



University of Missouri-Columbia

Individualized Advanced Bronchoscopy Course for Pulmonary and Critical Care Fellows

Authors: Mohammed Alnijoumi, MD; Armin Krvavac, MD; Ramez Sunna, MD

Program Director: Ramez Sunna

BACKGROUND

Flexible fiberoptic bronchoscopy procedures are an essential component of pulmonary and critical care fellowship training programs. Recent advancements in technology have resulted in the introduction of new bronchoscopic techniques. These advanced bronchoscopic techniques are rapidly becoming standard in everyday practice, especially in diagnosing lung cancer. In our study, we evaluate the comfort level in performing electromagnetic navigational bronchoscopy (ENB) and endobronchial ultrasound (EBUS) procedures among fellows.

METHODS

We instituted an annual Advanced Bronchoscopy Course for our pulmonary and critical care fellows in the fall of 2017. Pre-course and post-course surveys of the participants were performed to assess their comfort level in performing the procedures taught. ENB is the cornerstone of our course, and EBUS bronchoscopy was introduced in the following year. The course included brief lectures and five different hands on learning stations using simulation and cadavers: an ENB planning station, ENB guided transbronchial biopsy station, ENB-guided percutaneous biopsy station, linear EBUS station, and a radial EBUS station. Each station had one faculty preceptor and one learner at a time to provide individualized teaching and instruction to participants as they rotated through the stations.

RESULTS

Results from the first course in 2017 revealed a significant correlation between the number of ENBs performed prior to the course and the comfort level with ENB (Pearson correlation 0.847, P-value 0.001). However, this correlation was weaker and not statistically significant prior to the 2018 course (Pearson Correlation 0.562, P-value 0.057). Interestingly, the comfort level with ENB decreased from a mean of “comfortable” on 2017’s post-course assessment to “neutral” by 2018’s pre-course assessment despite an overlap of eight participants between the two courses. There was a significant improvement in comfort level between pre- and post-course assessments in both years in the procedural components of ENB and EBUS bronchoscopy (Figures 1 and 2). When the procedural components were pooled to assess the overall comfort for advanced bronchoscopic procedures, there was a significant improvement in comfort level in performing ENB and EBUS bronchoscopy.

CONCLUSION

Advanced bronchoscopy training is a step above the current recommended bronchoscopic training. It encompasses mastering different steps within the procedure to ensure safety and accuracy. Our data exhibits a significant increase in the comfort level performing advanced bronchoscopy among fellows who completed the annual training course. Furthermore, comparison of data from 2017 to 2018 suggests that this effect from training may not be sustained, thus supporting the implementation of continuing education. We believe that an annual advanced bronchoscopy course for fellows will help establish the foundation for such education.

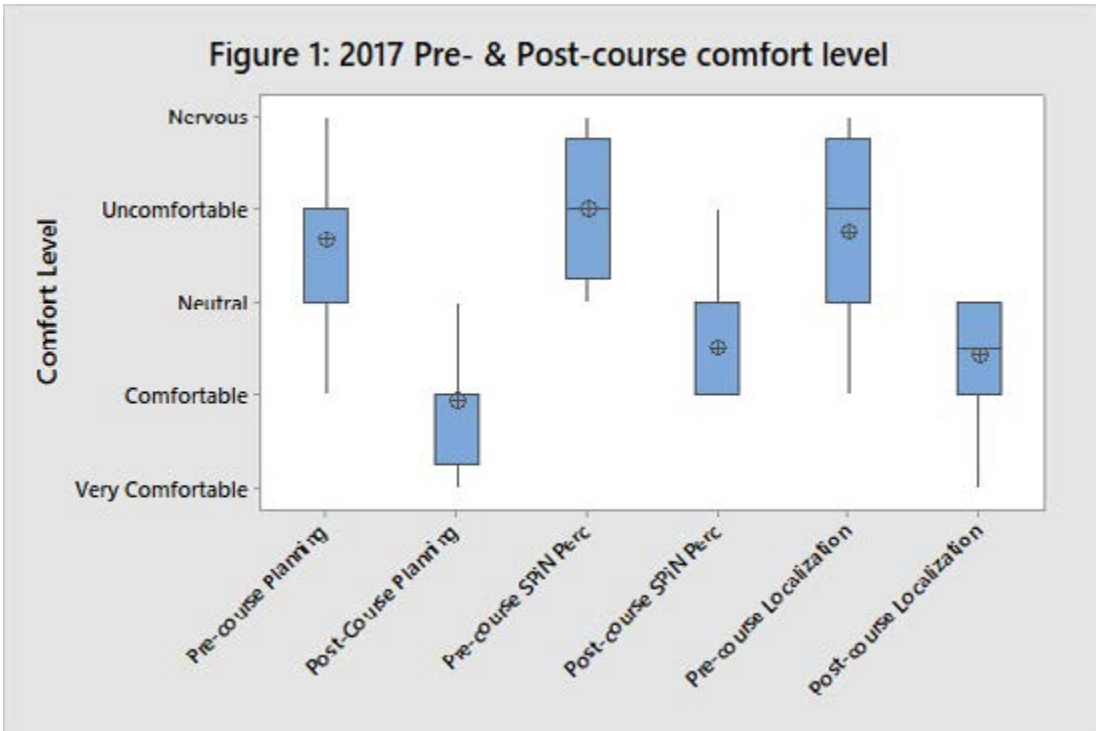


Figure 1: 2017 Pre- & Post-course comfort level
Comfort Level
Nervous
Uncomfortable
Neutral
Comfortable
Very Comfortable
Pre-course Planning
Post-Course Planning
Pre-course SPiN Perc
Post-course SPiN Perc
Pre-course Localization
Post-course Localization

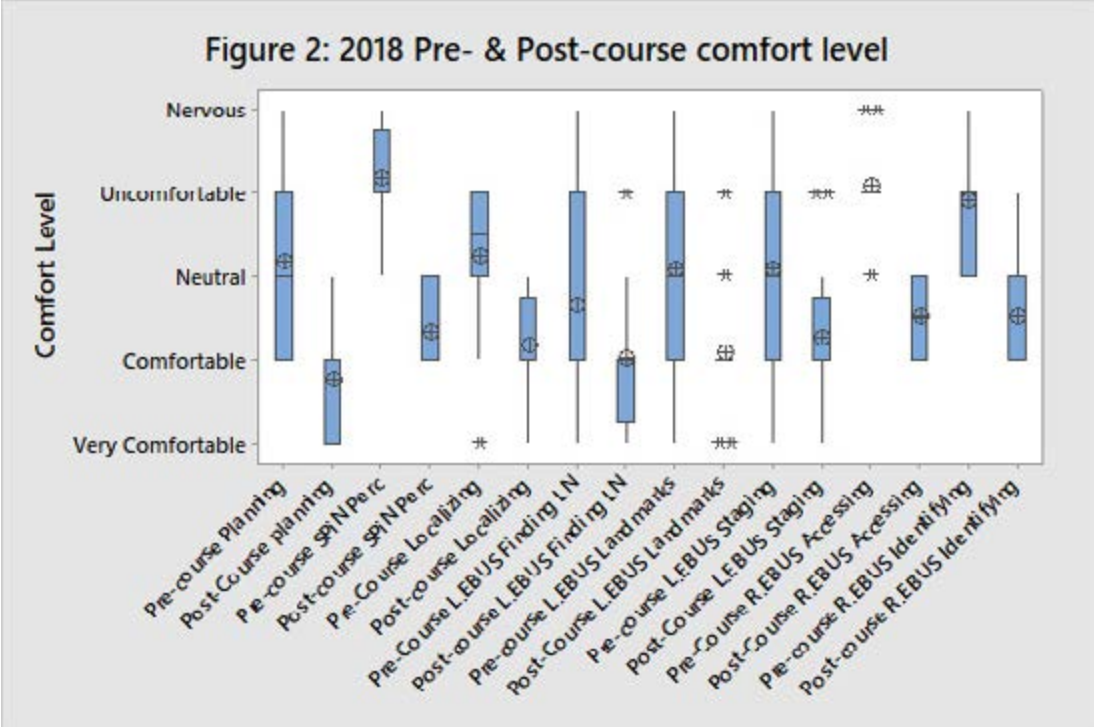


Figure 2: 2018 Pre- & Post-course comfort level
Comfort Level
Nervous
Uncomfortable
Neutral
Comfortable
Very Comfortable
Pre-course Planning
Post-Course planning
Pre-course SpiN Perc
Post-course SpiN Perc
Pre-Course Localizing
Post-course Localizing
Pre-Course L.EBUS Finding LN
Post-course L.EBUS Finding LN
Pre-course L.EBUS Landmarks
Post-Course L.EBUS Landmarks
Pre-course L.EBUS Staging
Post-Course L.EBUS Staging
Pre-course R.EBUS Accessing
Post-course R.EBUS Accessing
Pre-course R.EBUS Identifying
Post-course R.EBUS Identifying

University of New Mexico School of Medicine

Use of Novel Technology to Help Train Fellows Fight an 'Old' Exposure

Authors: Akshay Sood, MD, MPH; Nour Assad, MD; Kyla Le Suer, BS, RRT; Jolene Walker, RN; Bruce Wissore, JD, PhD; Sarah Salveson, BS; Brian Soller, PhD; Rachelle Rochelle, MPA; Stephen Murillo, BA; Summers Kalishman, PhD; Charles Pollard, BS; and William Cotton Jarrell, CMSP

Program Director: Helen Busby, MD

PROGRAM DESCRIPTION

Ours is a combined pulmonary and critical care fellowship training program at the only tertiary care academic medical center in a minority-majority, rural, and impoverished state. Our program offers specialized clinical training in pulmonary hypertension, cystic fibrosis, occupational medicine, ECMO, interventional pulmonology, and the care of critically ill patients, as well as research and educational opportunities. The program includes a tertiary care VA hospital that receives referrals from all over the state.

BACKGROUND

The recent re-emergence of pneumoconiosis has created a challenge for pulmonary fellowship training programs in the U.S. On the one hand, the number of miners requiring specialized care has increased, and on the other hand, the multidisciplinary expertise needed has decreased. The impact is greatest on academic pulmonary programs that serve rural mining communities, where the need for multidisciplinary expertise is the greatest. This challenge demands innovative training strategies at the University of New Mexico, which is located in a pneumoconiosis mortality hotspot region.

The Miners' Wellness TeleECHO (Extension for Community Health Outcomes) Clinic jointly set up by the university and a community-based miners' hospital in New Mexico provides structured longitudinal telementoring to pulmonary fellows, utilizing the expertise of and curriculum established by rural and academic clinical providers, respiratory therapists, benefits counselors, attorneys, miners, and home health professionals. Our approach towards educating a new generation of fellows in providing multidisciplinary care to miners is innovative. Although the ECHO model uses telecommunications technology, it provides structured long-term telementoring, an approach that differs from traditional telemedicine where providers assume typically short-term care of individual patients. Further, unlike traditional didactic lectures or webinars, ECHO provides real-time, interactive discussion of cases with expert panels; thus, the discussions are highly contextualized, which fulfils key learning theory principles.

METHODS

Since July 2016, the well-studied and -replicated evidence-based ECHO model has been used by the bimonthly Miners' Wellness TeleECHO Clinic to train fellows. Our ECHO model is based on the following key principles: 1) The model utilizes technology such as multipoint video conferencing, and the Internet to leverage scarce mentoring resources by inviting expert stakeholders in national pneumoconiosis mortality hotspots to telementor fellows. 2) It uses a disease-management model that is proven to improve outcomes in other disease states by reducing variation in processes of care and sharing best practices. 3) It uses the principle of case-based learning. Fellows study with guidance from mentors, based on discussion, questions and investigation of patient cases under their care. Over time with iterative practice and feedback, fellows gain additional knowledge and skills, and assume more independence. 4) It creates a virtual community of practice. The emphasis of the group is on reciprocity in sharing of information and skills; and promoting trust and respect, acknowledging that all participants bring some unique expertise. The philosophy supported is one in which "all teach and all learn." By interacting on a regular basis, the community of practice members increase the knowledge and expertise of pulmonary fellows, but also increase their own knowledge and expertise in a way that is meaningful and relevant to all participants. 5) It uses an Internet-based database (iECHO) to monitor outcomes; the limited outcomes data that we have collected (Table 1) indicate that our teleECHO sessions are rated as "very good" to "excellent" for relevance and delivering balanced

and objective evidence-based contact by the attendees.

CONCLUSION

Our intervention is innovative since it (i) targets barriers perceived by fellows in order to improve the care of miners; (ii) creates a virtual multidisciplinary community of practice; (iii) uses technology to leverage scarce national mentoring resources; and (iv) uses a model that is well studied in other complex diseases. Our intervention is topical and highly significant since it addresses an emerging epidemic which other training programs have largely ignored. Our intervention's high potential impact is related to (i) the hub and spoke site presence in national pneumoconiosis mortality hotspots (Figure 1); and (ii) possible future expansion to other fellowships in these hotspots. Our approach may help ensure delivery of high-quality interdisciplinary care to miners in pneumoconiosis mortality hotspots in the U.S.

Figure 1

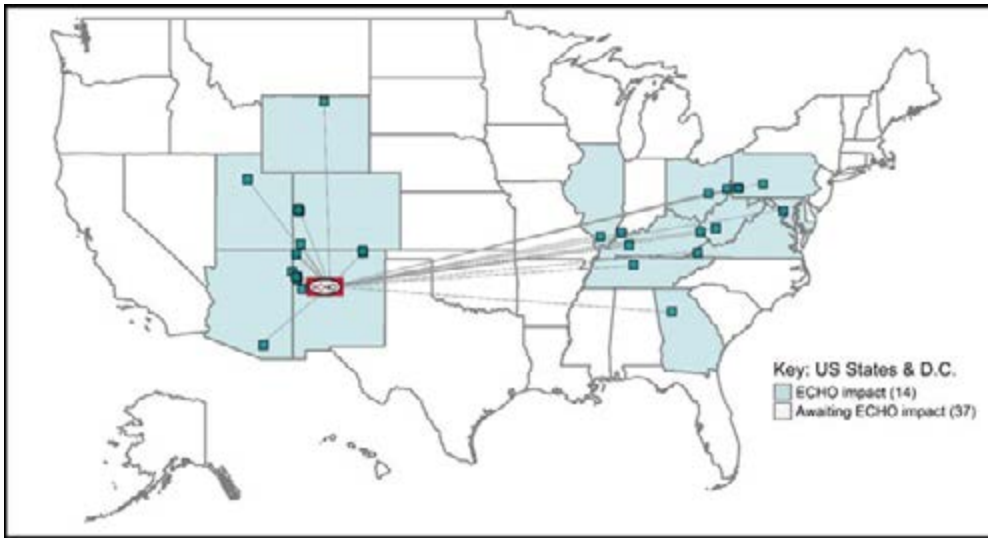


Table 1: Our evaluation of the Miners' Wellness TeleECHO Clinic indicates that the program is rated 'very good' to 'excellent' by the session attendees (Data from 1/11/17 – 2/14/18)

Evaluation Question	Mean Score ± SD (scores from 1 to 5 ranging from poor to excellent respectively)
How well were the stated objectives met?	4.3 ± 0.6 (n=104)
How well did the clinic deliver balanced and objective evidence-based content?	4.4 ± 0.6 (n=104)
How well were the opportunities to ask questions?	4.4 ± 0.7 (n=104)
How relevant was the presentation to the clinic's objective?	4.4 ± 0.6 (n=104)

University of Pittsburgh Medical Center

Balancing Confidence and Competence: The Dunning-Kruger Effect Among Critical Care Fellows Enrolled in a Mechanical Ventilation Course

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Program Director: Bryan McVerry

PROGRAM DESCRIPTION

The Clinician Educator Track at the University of Pittsburgh Medical Center is a four-year program, inclusive of time spent working towards a master's degree in medical education. In contrast to the traditional physician-scientist pathway, the Clinician Educator Track includes additional clinical time to help refine teaching skills, promote patient safety/quality initiatives, and develop simulation to enhance teaching. There is also a strong emphasis on scholarship and leadership.

BACKGROUND

In 1999, psychologists David Dunning and Justin Kruger described a disconnect between confidence and competence now known as the Dunning-Kruger Effect. They outlined the "above-average effect" in which individuals with low competence overestimate their knowledge and develop inflated self-confidence. Once these individuals receive training, they become aware of their limitations. This study explores the role of the Dunning-Kruger Effect among fellows enrolled in a mechanical ventilation course.

METHODS

First-year critical care and pulmonary-critical care fellows from several academic medical centers were enrolled in a mechanical ventilation course between 2017 and 2018. Pre- and post-course data was obtained, including self-reported confidence levels from 1 to 5, with 1 denoting "complete novice" and 5 "expert." Subjects completed a ventilator waveform examination prior to and following the course, scored out of a maximum 100 points. Confidence scores were converted to a "low" (raw score of 1), "medium" (raw score of 2), and "high" (raw score of 3/4/5) scale. Test scores were converted to a 1-5 scale using the equation "competence = [test score/25] + 1." A Confidence-Competence Ratio (CCR) was generated using the equation "CCR = confidence / competence," with scores =1 suggesting the learner is well-calibrated, <1 suggesting under-confidence, and >1 suggesting over-confidence.

RESULTS

Thirty-eight and 37 fellows were included in pre- and post-test analyses, respectively. Test scores improved significantly between pre- and post-tests (15.3±11.5 versus 39.8±19.8, $p<0.001$). Within the pre-test group, confidence was unrelated to test performance as there was no significant difference in test scores among those who reported their confidence as "low," "medium," or "high" (12.1±10.1, 16.0±11.4, 17.1±14.5; $p=0.637$). Similarly, within the post-test group, there was no significant difference in test scores among those with different levels of confidence (31.5±19, 40.8±20.9, 42.6±19.1; $p=0.528$). However, CCRs decreased significantly between the pre- and post-tests (1.3±0.6 versus 0.9±0.4; $p=0.0002$), as shown in Figure 1. This suggests that fellow confidence and competence became better calibrated after the course.

Demographic information, including gender, was collected for a subset (n=29) of our study population. Eighteen males and eleven females were analyzed as subgroups. Test scores improved significantly between pre- and post-tests among both men (17.7±12.4 versus 39.9±14.5, $p<0.001$) and women (10.1±9.8 versus 32.6±20.3, $p<0.005$). There was a significant difference between men and women for pretest scores ($p=0.0231$) that was not detected for post-test scores ($p=0.4070$). There was no significant difference noted between pre- and post-test CCRs among men (1.1±0.5 versus 0.9±0.2, $p=0.151$), though there was a significant difference

noted among women (1.5±0.7 versus 0.9±0.7, p=0.003). As illustrated by Figure 2, males were better calibrated both before and after the course, with most CCRs hovering around 1. In contrast, women were relatively over-confident prior to the course and under-confident following the course, as all women with post-test scores exceeding the mean score of 32.6 had a CCR of <1.

CONCLUSION

Novice learners may have difficulty gauging their own competence, resulting in overconfidence. Our findings illustrate a disconnect between confidence and competence among first-year fellows participating in a mechanical ventilation course, as predicted by the Dunning-Kruger Effect. We demonstrate that learners became better calibrated regarding their skill level after completing the course, as measured by our novel Confidence-Competence Ratio. Interestingly, there appeared to be a greater disconnect between confidence and competence among female participants. This may reflect the lower test scores noted among women both pre- and post-course. Further studies should be done in larger learner populations. Overconfident individuals may lack insight into their learning needs and may be less likely to take advantage of available educational opportunities. Our findings may have implications on prioritizing pre-clinical training for critical care and pulmonary-critical care fellows.

Figure 1

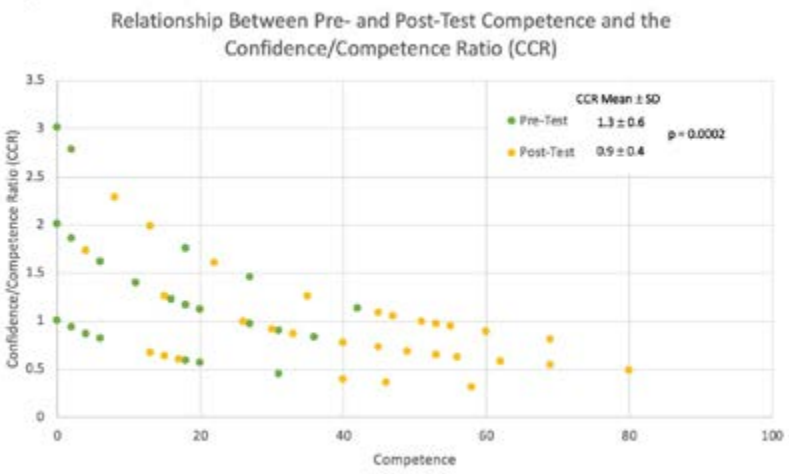
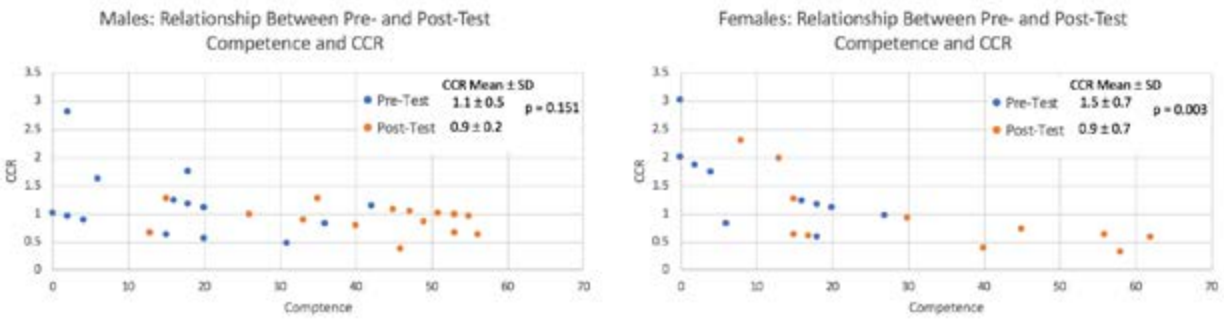


Figure 2



University of Southern California

Feasibility of an Adjunct Critical Care Ultrasound Curriculum Delivered Through a Social Media Platform (Facebook)

Authors: Shiqian Li; Alfredo Lee-Chang; May M. Lee

Program Director: May Lee

PROGRAM DESCRIPTION

Our fellowship program is a clinically oriented, rigorous, 36-month ACGME accredited program. Fellows rotate through three teaching hospitals, each providing a unique experience in different hospital systems: LAC+USC Medical Center, Keck Hospital, and Norris Cancer Hospital. The fellowship program is designed to provide each trainee with a range of exposure in the diagnosis and management of diverse and complex pulmonary diseases, the experience and skills required of an intensivist, and the opportunity to develop research interests.

BACKGROUND

Critical care ultrasound (CCUS) is an important skill for critical care physicians. Currently, there is no standard approach to teaching CCUS. This study investigates the feasibility of using a social media platform to provide an adjunct CCUS curriculum and evaluating its impact on fellow's interest in content and knowledge acquisition.

METHODS

All University of Southern California PCCM fellows were provided the usual CCUS curriculum, and all took a pre-knowledge assessment quiz. Part of the usual curriculum is a two-day hands-on boot camp attended by first years. After the boot camp, all fellows were invited to join a private CCUS Facebook group which provided 41 core skills divided into five systems delivered over 20 weeks. Posts included quizzes, cases, images, movies, and management-type questions along with links to webpages and articles. The number of views and usage was monitored. Enrollment was voluntary. A post-intervention survey gauging the effectiveness of Facebook as an educational platform was distributed. A post-knowledge assessment quiz was given to all fellows at the end of the academic year.

RESULTS

Usage: (Figure 1) 10 of 21 fellows (47.6%) participated in the Facebook group, with three first year (30%), 4 second year (40%), and two third year (20%) fellows. Of the 41 posts, the mean number of posts viewed was 24 with a range of 8 to 36. The majority of those that participated continued to follow along. Survey: 90% responded to the post-intervention survey; 44% responded they would participate again in a Facebook education group with 33% responding maybe; 56% responded Facebook was an effective platform for delivering content; 89% responded the content was moderately to very useful; 56% responded it enhanced their CCUS education with 44% stating it motivated them to learn more. Pre- and post-testing: (Table 1). Pre- and post-test scores were compared using paired t-tests. The average pre- and post-intervention raw score means (of a total 41 questions) for those who did not participate (control) were 35.4±2.9 and 38.2±1.75 (p=0.005) those who participated (intervention) 37.56±1.94 and 38.0±1.50 (=0.602). Among first-year fellows only, pre- and post-intervention raw score means among controls were 33.0±1.73 and 37.0±1.00 (p=0.020) and intervention were 36.3.0±2.52 and 37.7±0.58 (p=0.383).

CONCLUSION

Our principal aim was to determine the feasibility of using social media to implement an adjunct critical care ultrasound curriculum. Among a heterogeneous group of fellows at different years of training, the overall responses from the post-intervention survey were positive. Most of the fellows who participated would join a similar group again if given the choice in the future, and a small majority believed that the medium was an effective learning tool. We did not find a significant improvement in knowledge

based on our pre- and post-test assessment in our intervention group. Those who chose to participate in the Facebook group had a higher baseline mean score compared to those that did not join. This self-selected group that participated in the Facebook intervention may have had more interest in critical care ultrasound to begin with as reflected in their higher baseline scores. This could also suggest that there was less overall knowledge to gain from the adjunct curriculum compared to those who did not join the Facebook group.

Despite the test data, we do believe that social media may be an acceptable platform to deliver an adjunct CCUS curriculum; however, we do not believe curriculum delivery via social media should replace a traditional curriculum. For learners, social media is easily accessible, widely available, has a potential broad reach, and may motivate increased interest in learning. Its potential uses warrant further study.

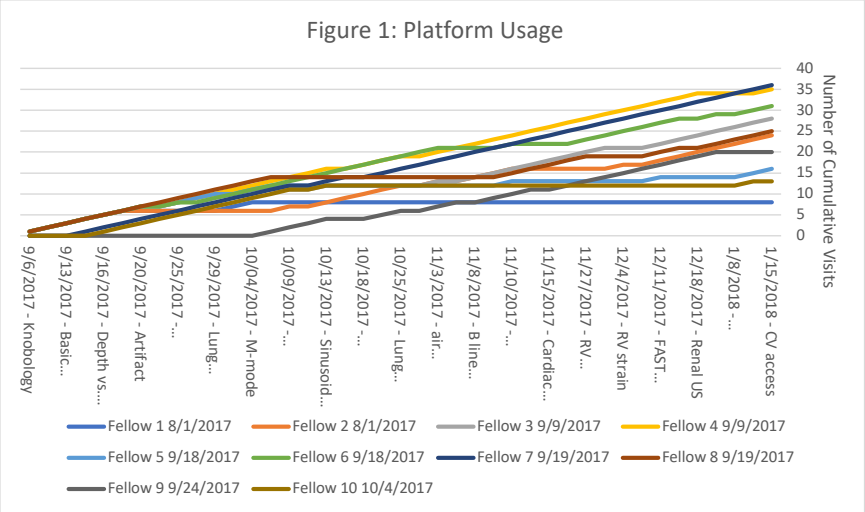


Table 1: Pre and Post Test Results

Group	Raw Pretest score means* (SD)	Mean pretest percent correct		Raw Posttest score means* (SD)	Mean posttest percent correct	p-value of pre and post test comparisons
All years control (n=11)	35.40 (2.91)	86.3%		38.20 (1.75)	93.2%	0.005
All years intervention (n=9)	37.56 (1.94)	91.6%		38.00 (1.50)	92.7%	0.602
First years control (n=3)	33.00 (1.73)	80.5%		37.00 (1.00)	90.2%	0.020
First years intervention (n=3)	36.33 (2.52)	88.6%		37.7 (0.58)	92.0%	0.383

*out of a total 41 questions

University of Michigan

Implementation of a Facilitator-Actor-Based Communication Curriculum to Enhance Pulmonary and Critical Care Fellows' Skill in Delivering Serious News

Authors: M.P. Mendez; J.J. Osterholzer; P.J. Choi; J.I. McSparron

Program Director: Kevin Chan

Associate Program Director: Jakob McSparron

PROGRAM DESCRIPTION

The University of Michigan offers a three-year ACGME-accredited pulmonary and critical care medicine fellowship program that provides an exceptional clinical and research experience in a rich academic environment. Our program currently accepts six trainees annually (five PCCM for three years of training and one critical care medicine for two years of training) that participate in clinical work and research at both the Michigan Medicine and the Ann Arbor VA Hospital.

BACKGROUND

New pulmonary and critical care fellows caring for seriously ill patients often feel inadequately prepared to deliver serious news or carry out related goals of care conversations, especially under stressful circumstances. Ineffective physician communication adds to this distress, especially when patients and families do not understand basic information about their (or their loved ones') illnesses and treatments and when physicians miss opportunities to address family concerns and attend to family emotions. To address this training gap, we initiated a pilot communication skills training program with first-year PCCM fellows at the University of Michigan in July 2018. Educational content was developed in collaboration with Vital Talk, a non-profit organization specializing in clinical communication skill training.

METHODS

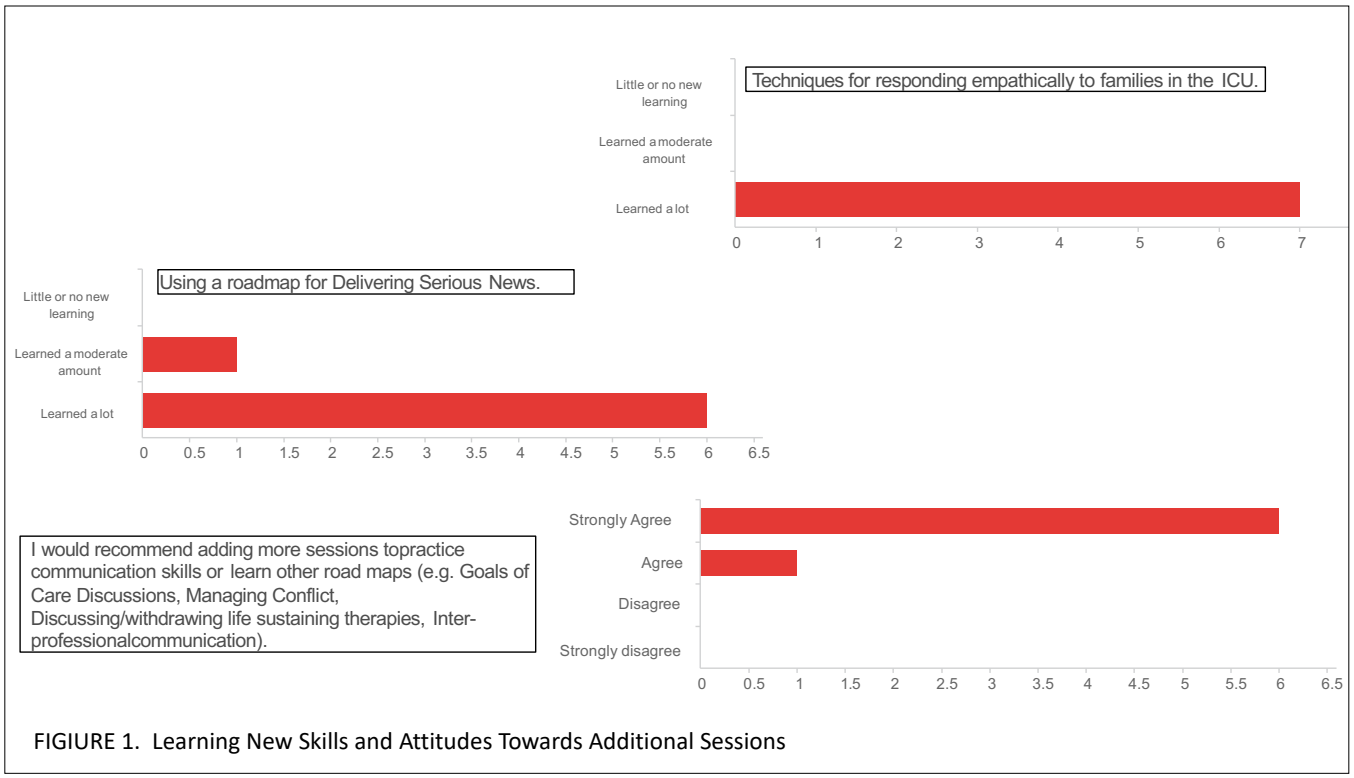
A cohort of seven PCCM fellows was exposed to a four-hour communication skills workshop during their orientation week prior to assuming clinical duties. In this curriculum, brief didactic components were used to teach: 1) a communication skill (Ask-Tell-Ask), 2) a set of tools (NURSE statements) used to empathically respond to emotion, and 3) a conversational "roadmap" (GUIDE) for delivering serious news. Learners first observed an experienced clinician demonstrate these techniques and then practiced them using drills followed by facilitated role-play-based conversations with highly trained patient actors. Facilitators helped each trainee identify a specific communication skill to improve upon and provided opportunities to "rewind" a conversation in order to further test and refine specific communication techniques. A nine-question post-course survey was used to assess the value of the training.

RESULTS

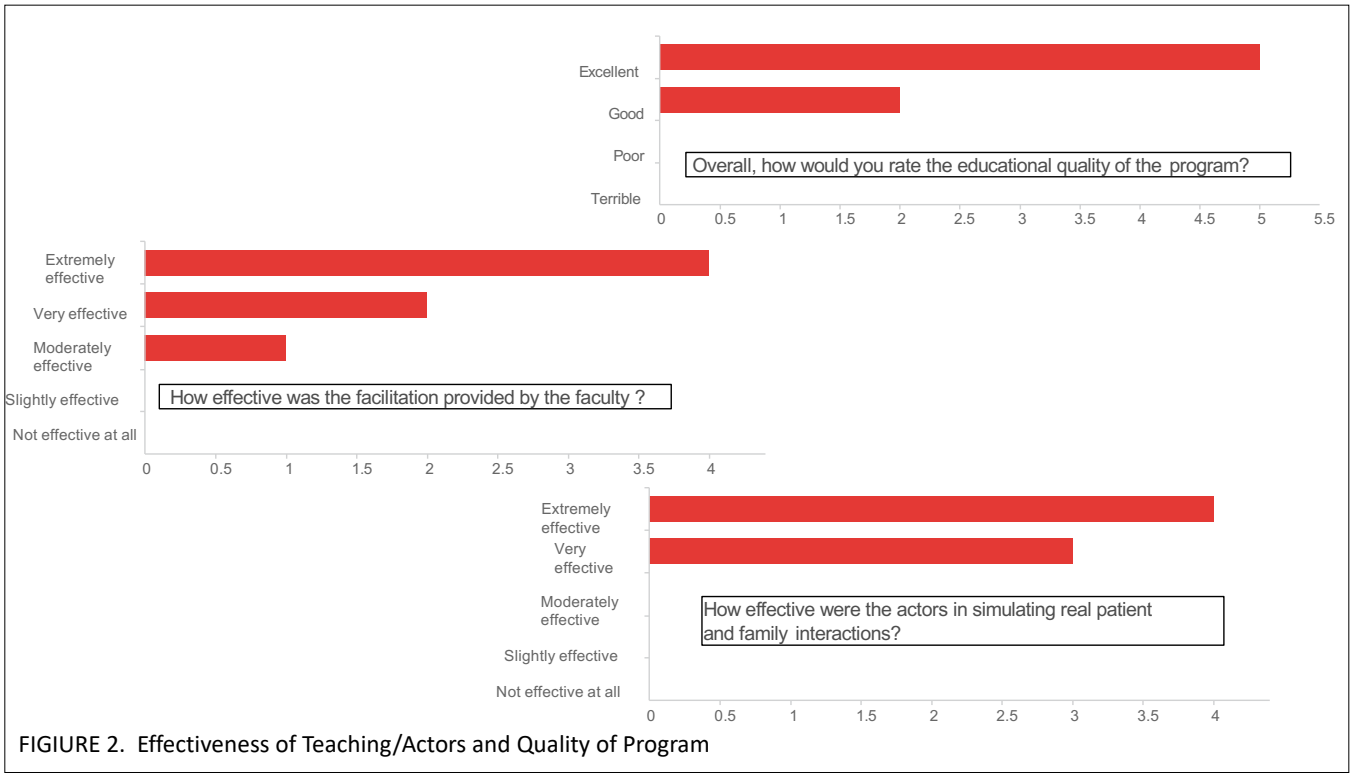
All seven fellows completed the survey and rated the educational quality of the program as "excellent" (5) or "very good" (2). Fellows indicated that they "learned a lot" about techniques to empathically respond to emotion (7/7); the use of GUIDE as a roadmap for delivering serious news (6/7); and how to implement these techniques in the simulation sessions (5/7). Additional findings showed that the majority of fellows viewed the facilitators and patient-actors as "highly or very effective" and that fellows would recommend adding more workshops to practice communication skills or learn other conversation roadmaps.

CONCLUSION

Implementation of a pilot communication skills curriculum designed to enhance a fellow's ability to deliver serious news was viewed favorably by a cohort of first-year PCCM fellows at the University of Michigan. In response to this initial assessment, this program is being renewed and expanded to include other fellowship programs.



FIGIURE 1. Learning New Skills and Attitudes Towards Additional Sessions



FIGIURE 2. Effectiveness of Teaching/Actors and Quality of Program

Weill Cornell Medicine

A Palliative Care Curriculum for Pulmonary Critical Care Fellows

Authors: Bradley Hayward, MD; Anna Finley, MD

Program Director: Meredith Turetz, MD

PROGRAM DESCRIPTION

The fellowship program offers a structured curriculum with 18 months of clinical rotations on our inpatient and outpatient pulmonary consultation service, bronchoscopy/procedure service, and in the medical and other intensive care units. As part of the three-year curriculum, we offer 18 months of protected research time for our fellows to develop their academic interests in the laboratory or on clinical projects. The goal is to produce well-rounded academic pulmonary/critical care physicians.

BACKGROUND

Pulmonary/critical care medicine physicians provide a great deal of palliative medicine in the medical intensive care unit as well as in the outpatient pulmonary clinic setting, including management of pain and burdensome symptoms, navigating complex psychosocial family dynamics, and discussing goals of care in high-stakes situations. The ACGME mandates that pulmonary/critical care fellows must be able to manage inpatients and outpatients with “end of life issues and palliative care” and also address “psychosocial and emotional effects of critical illness on patients and their families.” A recent literature review on palliative care training in pulmonary/critical care fellowship revealed articles about communication training but no formal palliative care curriculums were found. Anecdotally, many pulmonary/critical care medicine fellows also feel that they receive little if any formalized palliative care training, as is the case in our program.

METHODS

We received grant support from the Ho Chiang Foundation and IRB approval. A MICU faculty member with formal palliative medicine training and a palliative medicine attending physician designed a six-session curriculum given to our pulmonary critical care fellows to cover basic palliative medicine topics over a nine-month period. Topics were selected to meet self-identified needs identified in a pre-study meeting with the fellows. Active MICU patient cases from preceding weeks were then paired before an assigned lecture which correlated with one of the six pre-designed curriculum objectives. These objectives were 1) care of the actively dying patient, 2) withdrawal of life-sustaining treatment, 3) communication with patients and families including breaking bad news and running family meetings, 4) care of the geriatric ICU patient, 5) ethics in the ICU, and 6) prognostication. Lectures were taught by the faculty members of this study. Fellows filled out pre- and post-surveys that addressed their skill and comfort level with each facet of palliative care for analysis. Additionally, debriefing and emotional support was provided by the faculty after the didactic sessions for the fellows relating to their experiences surrounding death and dying in the MICU.

CONCLUSION

The curriculum was completed, and the data was processed. The sample size is small (12 fellows), but there was a trend toward fellows showing increased knowledge of palliative care and increased comfort with these topics.

NOTES

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