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International Conference
May 15 - May 20
DENVER

Innovations in Fellowship Education

2015 Highlights Book

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PROGRAM OVERVIEW

The American Thoracic Society (ATS) greatly values a strong fellowship program as a means of academic and clinical success. In an effort to recognize programs that go above and beyond to implement exceptional practices, the ATS Training Committee developed the Innovations in Fellowship Education Award Program. All pulmonary, critical care, sleep and allergy fellowship programs (adult and pediatric) were invited to submit one abstract showcasing a novel and innovative best practice method.

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? Was this program able to sustain over time?
3. **Transferability**: how easily might this educational program be able to be used by other programs?
4. **Outcomes**: are there reported outcomes or plans to measure them?

The goal of this program is to honor fellowship programs that demonstrated educational excellence and share these best practices with other programs across the country.

All abstracts that were received are published within this booklet. The ATS Training Committee would like to thank all the programs that submitted an abstract and applauds them for their innovative and outstanding work!

CONGRATULATIONS

The ATS Training Committee reviewed and ranked the abstracts based on four categories of excellence. The committee is pleased to honor the following top programs:

- **Baylor College of Medicine**
- **Jamaica Hospital Medical Center**
- **University of Arizona Medical Center**
- **University of North Carolina***
- **University of Washington**

** University of North Carolina selected as the top Innovation abstract of 2015*

University of North Carolina

Chapel Hill, NC

An Interactive Web-based Cardiopulmonary Exercise Test Curriculum

Program Director: Ashley G. Henderson, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Kimtuyen Nguyen MD, Lydia Chang MD

RATIONALE

Cardiopulmonary Exercise Testing (CPET) is a required core competency for Pulmonary/Critical Care Medicine trainees. It is one of the eight procedures in pulmonary medicine for which the ACGME mandates documentation. Survey of current fellows at UNC revealed that they have performed and interpreted an average of 2.1 studies (range 0-4) and this low testing volume affects competency for independent monitoring and interpretation of cardiopulmonary exercise tests (CPET). We implemented a novel CPET curriculum involving three interactive online modules to help improve fellows' understanding and comfort of all aspects of CPET.

METHODS

All fellows in the Pulmonary/Critical Care fellowship program at UNC were asked to fill out a questionnaire using a five point Likert scale regarding their comfort level with CPET. A pre-test was also administered to evaluate baseline understanding of the principles of CPET supervision and interpretation. Fellows were then able to access online interactive modules for CPET training. The first module addressed basic exercise physiology, the clinical indications and contraindications for ordering a CPET, and guidelines for supervising CPET. The second module focused on understanding the data obtained during CPET. In the third module, systematic interpretation of CPET data was taught using case-based scenarios. The three modules were posted sequentially over a three-week period. At the end of the three weeks, fellows were asked again to fill out the same questionnaire and a post test. Their questionnaire as well as pre and post test scores were analyzed using the paired t-test.

RESULTS

Seven out of nine fellows at UNC fully participated in the training course (3 first year fellows, 3 second year fellows, and 1 third year fellow.) Average pre-training comfort level with various aspects of CPET was 2.2 ±0.8 on the 5 point Likert scale and increased to 4 ±0.4 after completing the online modules ($p = 0.0001$). Mean pre-test score improved from 47% to a mean of 67% on the post-test ($p=0.01$). Results are further shown in Table 1 and Figures 1&2.

CONCLUSION

Implementation of a novel CPET curriculum consisting of three interactive web-based modules resulted in a significant increase in fellows' comfort level with CPET as well as objective improvement in knowledge base and understanding of CPET performance and interpretation. We expect and are already starting to see an increase in the amount of CPET appropriately ordered, and this in turn will further increase the fellows' learning opportunities and help sharpen their expertise.

Table 1: Survey and Test Scores Before and After Online Curriculum

	Before		After	
Fellow	Survey	Test	Survey	Test
1	1.4/5	5/15	3.2/5	9/15
2	3/5	6/15	4.2/5	5/15
3	2/5	5.1/15	4.25/5	9.1/15
4	2.75/5	7/15	4/5	12/15
5	3.25/5	11/15	4.5/5	13/15
6	1.8/5	6/15	3.9/5	11/15
7	1.3/5	9/15	3.75/5	11/15
Average	2.2/5	7/15	4/5	10/15
STD		2.2		2.6

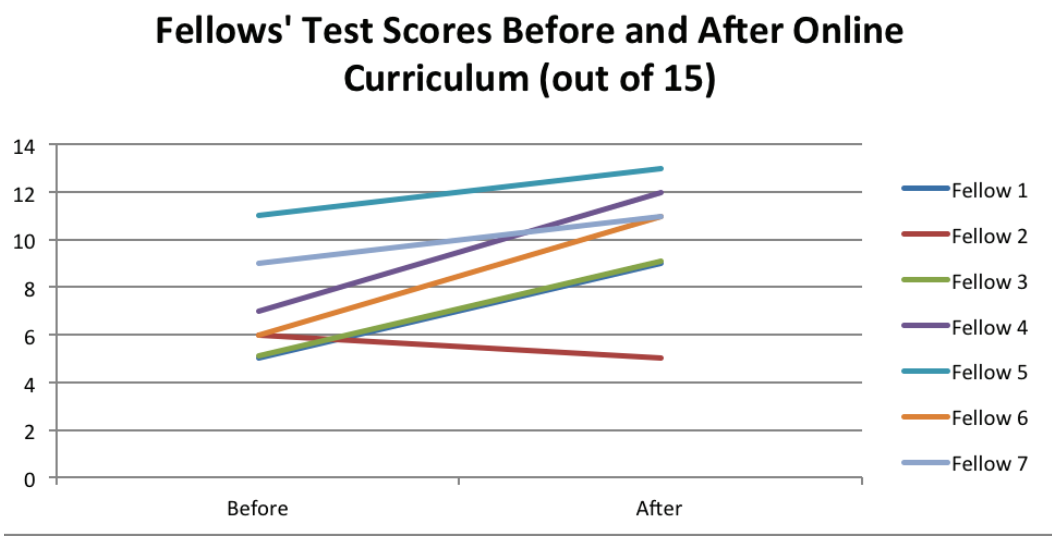


Figure 1

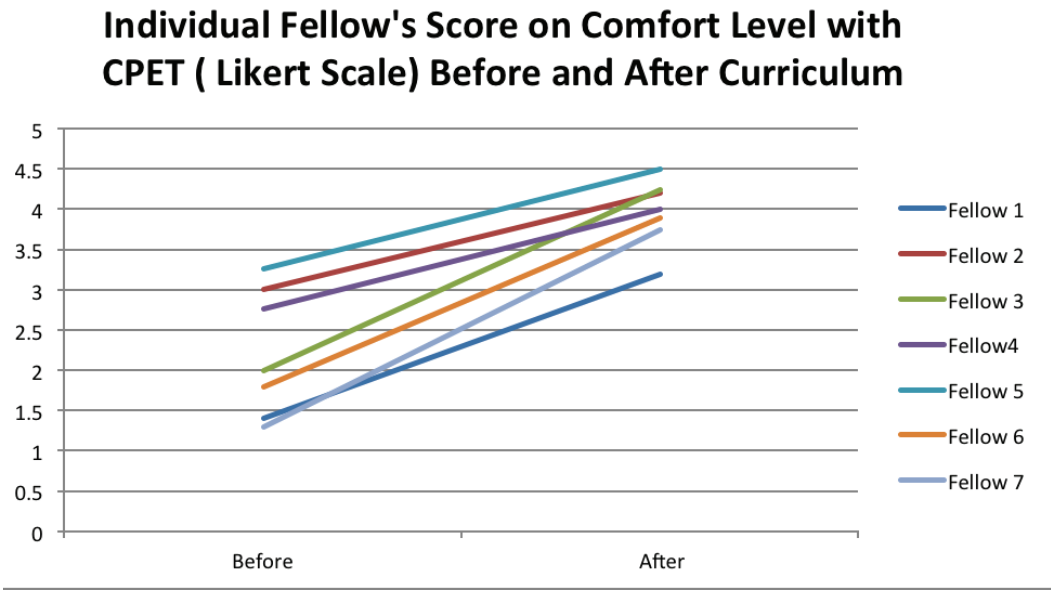

Individual Fellow's Score on Comfort Level with CPET (Likert Scale) Before and After Curriculum
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Before
After
Fellow 1
Fellow 2
Fellow 3
Fellow4
Fellow 5
Fellow 6
Fellow 7

Figure 2

Baylor College of Medicine

Houston, TX

Beyond Board Review: Team Based Learning in a Pediatric Pulmonology Fellowship Program

Program Director: Jennifer A. Rama, MD
Type of Program: Pediatric Pulmonary Medicine
Abstract Authors: Jennifer A. Rama MD, Priya Garg MD, Dorene R. Balmer PhD

BACKGROUND

Enhancing teamwork skills among subspecialty fellows may enhance learning and is critical to leading a multidisciplinary medical team and demonstrating competencies required by the Accreditation Council for Graduate Medical Education (ACGME). However, fellows have limited opportunities to develop teamwork skills in a structured setting during fellowship. Team based learning (TBL) is an instructional method that allows the learner to apply current knowledge to new situations and to move away from just acquisition of facts. It is highly relevant to the practice of medicine as physicians routinely utilize critical thinking and function in multi-disciplinary teams. TBL has improved learning outcomes in large-scale undergraduate health sciences and residency settings yet has not been studied in smaller fellowship programs. The purpose of this project is to describe our experiences and process outcomes using a novel application of TBL during monthly board review in a pediatric pulmonology fellowship program.

METHODS

Previously, fellows conducted board review by giving a didactic lecture. After consulting with TBL experts, the program director (JR) implemented TBL in each of its 3 phases [1] Pre-class study phase; fellows read pertinent material prior to board review [2] Readiness assurance phase; fellows answer 5 more basic board questions individually and again as a team. Questions in this phase were more likely to involve straightforward recall. [3] Application of concepts phase; fellows answer 5 more difficult board questions in teams and simultaneously display the team's consensus answers. Questions in this phase required more critical thinking and application of knowledge. (Table 1) The sequence of instruction allowed the fellow to progress through lower to higher levels of learning as designated by Bloom's taxonomy.[1] Three teams were formed based on continuity clinic assignments. Each team included one first, second, and third year fellow to match the level of training across teams and to promote clinic team identity and cohesiveness.

Fellows completed an evaluation survey prior to TBL implementation and after 1-, 6- and 15-months post TBL. We used Mann Whitney test to compare medians based on a likert-type scale. After 15 months, the fellows also completed the team performance survey[2], an 18 item survey, previously shown to be valid and reliable among medical students.

RESULTS

Fellows (n=9) reported increases in critical thinking (p=0.01), test taking skills (p=0.01), group discussion (p=0.04), and interaction among colleagues (p=0.02) during the TBL format compared to lecture. These increases were sustained over 6 and 15 months. (graph1) The lowest scoring item on the team performance survey (scale 0 to 6) was peer feedback on team performance (4.83, SD +1.17 n=6). Otherwise, averages on the team performance survey were consistent with high quality team interactions and ranged from 5.33 (SD+ 0.82) to 5.8 (SD_+ 0.41) All fellows preferred TBL over lecture at 1-, 6- and 15-months post TBL.

CONCLUSIONS

TBL transformed board review from passive to active learning and was highly favored by fellows. TBL fosters skills useful not only for board preparation but also for developing the critical thinking and teamwork abilities of a competent physician. Future directions include monitoring for an effect on fellows' scores on Subspecialty In-Training and Pulmonology Board examinations over time.

REFERENCES

1. Jim Simbley and Sophie Spirdonoff, 'Why TBL Works' <http://www.teambasedlearning.org/Resources/Documents/TBL%20Handout%20Aug%2016-print%20ready%20no%20branding.pdf> [Accessed December 1, 2014.]
2. B. M. Thompson, R. E. Levine, F. Kennedy, A. D. Naik, C. A. Foldes, J. H. Coverdale, P. A. Kelly, D. Parmelee, B. F. Richards, and P. Haidet, 'Evaluating the Quality of Learning-Team Processes in Medical Education: Development and Validation of a New Measure', Acad Med, 84 (2009), S124-7.

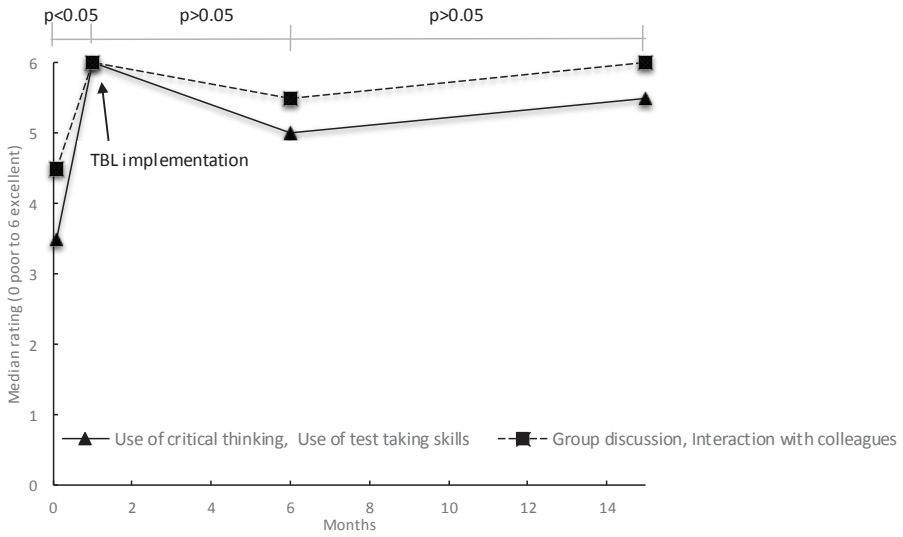
Table 1: TBL Application to a Pediatric Pulmonary Fellowship Board Review Course

Phase 1 Pre-Class Study This phase places accountability on the fellow to be prepared to make meaningful contributions to the team and to optimize learning in class.	• Fellows complete relevant reading assignments prior to Board Review session. • Pertinent components of ABP Pulmonary Board Review Content Outline emailed at least 1 week in advance.
Phase 2 Readiness Assurance Individual and team readiness assurance allows the learner to work individually and within teams and to learn from the collective knowledge of the group. Immediate feadback allows the teams to assess their level of function in problem solving and communication and reinforces the value of working together. Total time 30 minutes.	• First activity is the individual readiness assurance test (iRAT); Fellows answer Pediatrics Review Education Program (PREP*) Pulmonology 5 easy level questions individually. 10 minutes. • Second activity is the team readiness assurance test (tRAT); Same 5 questions taken as a group using the immediate feedback assessment technique (IFAT), a card with an opaque coating that fellows scratch off to find the correct answer.[3] • If the team is incorrect, they continue to discuss the question, and sequentially select the other choices until they arrive at the correct answer. 10 minutes. • Short review of major teaching points and discussions among fellows and faculty. 10 minutes.
Phase 3 Application of Concepts Learning takes place within teams and across teams to solve more complex problems through critical thinking and application of knowledge. Key components of this phase are the 4 S's. Failure to follow any one of the 4 S's diminishes discussion and learning.[4] Total time 30 minutes.	• **S**ignificant problem: Answering practice board questions simulate the reality of preparing for and taking the Boards. • **S**ame problem: 5 difficult level PREP* Pulmonology questions are taken as a team. 10 minutes. • **S**pecific choice: Team decides on answer for each questions. • **S**imultaneous reporting: Teams display their answers with colored letter cards after prompted by the facilitator. • Discussion: Teams explain the reasoning for their answers. Short review of major teaching points and discussions. 20 minutes.

[3] Available from: http://www.epsteineducation.com/home/about/default.aspx

[4] Parmelee, D.X. and L.K. Michaelsen, *Twelve tips for doing effective Team-Based Learning* (TBL). Med Teach, 2010. **32**(2):p. 118-22

Graph 1: TBL Process Outcomes over 15 months



Jamaica Hospital Medical Center

Jamaica, NY

Innovative Research Curriculum to Formalize and Encourage Clinical Research in a Community Based Pulmonary Fellowship Program

Program Director: Craig Thurm, MD
Program Type: Pulmonary Medicine
Abstract Authors: Khalid Sherani, MD, Abhay Vakil, MD, Alan Fein, MD, Kelly Cervellione

BACKGROUND

Pulmonary trainees are required to study research methodology and conduct research studies as part of the ACGME training requirement. Community hospital-based fellowship programs often face unique challenges in fulfilling this requirement. Some of these challenges include lack of optimal dedicated research time, regular established training for research methodology and busy research mentors. Our Pulmonary Medicine fellowship program was founded in June 2011. We report our unique programmatic development to overcome these barriers, thereby, generating a favorable environment for the fellows to conduct high quality research.

METHODS

We developed a research committee in June 2013 with a primary aim of facilitating research activities and enhancing the research-related educational experience. The research committee consists of the program director, chairman of the research department, chief-fellow and two research coordinators. The committee interviews all the fellows at beginning of their fellowship to know their research interests. It also interviews the faculty members to discuss their ongoing research projects and introduces them to the research ideas and interests of the fellows. The committee serves as a bridge to develop a research-related relationship between the faculty members and the fellows. The committee meets every month to discuss progress of the ongoing research projects.

In addition the committee, in accordance with the ongoing research projects and the interests of the fellows, schedules biweekly conferences. Statistical aspects related to ongoing research projects are discussed during these conferences. The committee has developed a research curriculum which is imparted to the fellows during a scheduled conference once a month. This curriculum involves the basics of conducting clinical research and biostatistics. Experts from multiple disciplines (statistics, library, laboratory technicians, research pharmacy etc.) involved in clinical research at our hospital are involved in educating the fellows during these conferences.

The committee also schedules biweekly conferences where fellows are encouraged to present interesting case reports and abstracts for submission to national and international conferences as well as journals. All faculty members are present during such conferences and help in editing the abstracts, papers and case reports.

RESULTS

After the establishment of the research committee and implementation of the curriculum and various conferences the involvement of fellows as well as faculty members in research-related activities has increased. The number of ongoing research projects and submissions as well as presentations at national and international conferences has increased tremendously. At the same time submission of case reports and papers for publication as well as number of publications has increased. Fellows now feel confident in conducting clinical research as well as in statistically analyzing/interpreting the data independently. They also feel more satisfied with the excellent research experience that they have at our pulmonary fellowship program. (See table 1 for details)

Table 1: Research related variables during one academic year before and after establishment of research committee and implementation of research curriculum

	Before establishment of research committee	After establishment of research committee
Faculty members involved in research projects*	20 %	80 %
Number of ongoing research projects	4	12
Number of presentations at national conferences	6	18
Number of presentations at international conferences (outside USA)	0	7
Number of publications+ in Pubmed indexed journal	0	4
Fellows satisfied about their research experience at our program#	25 %	100 %
Fellows feeling confident about conducting independent research after graduation#	25 %	75 %

*Total number of faculty members in Pulmonary, Critical Care Medicine and Thoracic Surgery – 8
+ Published or accepted
# Total number of fellows - 4

CONCLUSIONS

Establishment of a research committee with a research curriculum is a simple, yet effective way to enhance research experience and training of the fellows; especially in community-based pulmonary programs.

University of Arizona Medical Center

Tucson, AZ

Advanced Airway Management in Critical Care Fellowship Training

Program Director: James Knepler MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Bhupinder Natt MD, Joshua Malo MD, Linda Snyder MD, James Knepler MD, Kenneth Knox MD & Jarrod Mosier MD

BACKGROUND

Airway management in the intensive care unit is often challenging as many patients have limited physiologic reserve and are at risk for clinical deterioration if an airway is not quickly secured. In academic medical centers, ICU intubations are often managed by trainees, making airway management education paramount for pulmonary and critical care trainees.

In order to improve airway management education for our trainees, we developed an 11-month simulation-based curriculum (Table 1). The curriculum emphasizes both recognition of anatomically and physiologically difficult intubations and use of various techniques including appropriate mask ventilation, supra-glottic devices, direct laryngoscopy, video laryngoscopy, fiberoptic intubations and emergent surgical airways, to minimize patient risk and increase the likelihood of first-attempt success.

METHODS

Training is provided in small group sessions twice monthly using a high-fidelity simulation program under the guidance of a core group of 2-3 advanced providers. The curriculum is designed with progressively more difficult scenarios requiring critical planning and execution of airway management by the trainees. Trainees consider patient position, pre-oxygenation, optimization of hemodynamics, choice of induction agents, selection of appropriate devices for the scenario, anticipation of difficulties, back-up plans and immediate post intubation management. Each scenario is followed by a critique and discussion session led by the attending physician. The curriculum is flexible, allowing for scenarios to be added or changed as needed. The trainees are administered a 20-question baseline evaluation at the beginning of the first academic year, and a 20-question evaluation at the conclusion of the curriculum. Clinical performance is monitored through a continuous quality improvement program.

RESULTS

16 fellows have completed the program since July 1, 2013. Of these 8 improved their follow-up score, 3 were unchanged, and 5 scores declined. Median baseline test score was 13/20 (11-15.5/20) and median follow-up score was 15/20 (14-16.5/20). In the 18-months since the start of the program (July 1, 2013-December 31, 2014), first-attempt success has improved from 74% (358/487) to 82% (305/374) compared to the 18-months prior to the institution of the curriculum ($p=0.006$). During that time there were no serious complications (death or neurologic injury) related to airway management by trainees and desaturation rates decreased from 26% to 17%, ($p=0.002$). Other complication rates are low, including an aspiration (2.1%), esophageal intubation (2.7%), dental trauma (0.8%), and hypotension (8.3%).

CONCLUSIONS

An intensive airway curriculum is associated with improved trainee knowledge base and first-attempt success rate for intensive care unit intubations. Such a curriculum holds the potential to improve patient outcomes.

Table 1: Curriculum

Month	Scenario(s) of Respiratory Failure	Specific Teaching Objectives (non-exhaustive)
1	Airway anatomy, Algorithms, pre-intubation preparation and device demonstration	Anatomy and Physiology review, pre-intubation "checklists", ability to demonstrate the use of available airway devices.
2	Sedation for an upper GI endoscopy leads to respiratory failure.	Use of bag-mask ventilation, oral/nasal airways and supra-glottic device. Benzodiazepine/Narcotic reversal.
3	a. Patient with hepatic Encephalopathy b. Patient with rheumatoid arthritis presents with CVA and respiratory failure. c. Pregnant patient in third trimester develops eclampsia	a. Proper positioning, anticipated laboratory abnormalities, question of GI bleed, choice of induction agents, choice of device. b. Cervical immobility, pretreatment options for intra-cranial injury, choice of device, pre-oxygenation and apneic oxygenation. c. Patient positioning, anticipate laboratory abnormalities, pre-oxygenation, choice of induction agent, choice of device and tube size.
4	Crash Airway in a patient from wards	Intubation during 'code blue'
5	Massive upper GI bleed	Device choice, lens contamination in fiberoptic devices, induction agents, blind airway
6	Morbidly obese patient with pneumonia	Patient position, pre-oxygenation, choice of medications, device selection
7	Post H1N1 pneumococcal pneumonia with severe hypoxemia and hypotension	Pre-oxygenation, RSI, early definitive airway and positive pressure ventilation, immediate post intubation management.
8	Severe Upper Airway Obstruction	"Awake Intubation", fiber-optical device usage, sedation options
9	Can't Intubate / Can ventilate scenario	Navigation of the difficult airway algorithm ("plan B, C, etc."), supraglottic devices
10	Can't Intubate / Can't ventilate scenario	Navigation of the difficult airway algorithm, supraglottic devices / surgical airway
11	Hypoxemic, hypotensive patient with unrecognized tracheal stenosis	Multiple attempts, multiple providers, surgical airway

University of Washington School of Medicine

Seattle, WA

Creation of a Global Health Pathway within the Pulmonary and Critical Care Fellowship Training Program

Program Director: Mark Tonelli, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Tyler J. Albert, MD, Engi F. Attia, MD, Mark R. Tonelli, MD, MA, T. Eoin West, MD, MPH

RATIONALE

25 million people die annually of treatable respiratory illnesses, severe illness and serious infections worldwide. The University of Washington (UW) Division of Pulmonary and Critical Care Medicine (PCCM) has instituted a Global Health Pathway (GHP) in the Fellowship training program, leveraging Seattle's position as a global health leader to train Fellows to tackle the burden of lung disease globally.

EDUCATIONAL STRATEGY

Integrated within the PCCM Fellowship training program, the GHP augments trainees' clinical and research education. GHP trainees complete the comprehensive clinical pulmonary training curriculum required of all fellows. Subsequently, GHP Fellows select from a Research (Clinical Outcomes, Basic Science, or Translational) or Clinician/Educator Track to provide a focus for GHP activities. They participate in the PCCM core global health lecture series and semi-annual global health journal club. The GHP facilitates trainee participation in the month-long UW Integrated Residency Global Health Leadership Course and numerous multidisciplinary Department of Global Health seminars. GHP trainees in a Research Track are also required to complete the UW courses "Research Methods in Developing Countries" and "Responsible Conduct of International Research."

EXPERIENCES

During clinical training, GHP Fellows may participate in local internationally-oriented experiences, attending tuberculosis, immigrant, or travel clinics at UW. Two UW centers based in the Division of PCCM – the International Respiratory and Severe Illness Center (INTERSECT) and the Firland Northwest Tuberculosis Center – facilitate networking opportunities for GHP Fellows in the UW Department of Global Health, PATH, the Bill and Melinda Gates Foundation, Health Alliance International, International Training and Education Center for Health, and other Seattle-based international programs. These connections offer a rich selection of skilled mentors across a wide range of disciplines to foster trainees' academic career development. During their research or clinician-educator training period, GHP trainees undertake a 1-2 month international elective to initiate original projects. Funding is provided by the PCCM division, INTERSECT, and other UW sources. For research trainees, this sets the stage for submission of career development award applications to support continued lung-related global health research. For clinician-educator trainees, this serves as a critical opportunity to establish key relationships and define an educational project that can be built upon in the ensuing years.

EXPECTED IMPACT AND OUTCOMES

The GHP focuses on development of clinical excellence, knowledge of global health systems and research methods, and international scholarly activity that will prepare graduates for academic faculty positions. Although still in its early stages, the GHP has fostered development of Fellow projects with great potential to impact lung health globally, including creation of a mechanical ventilation and respiratory care training program in Cambodia, investigation of the effects of indoor air pollution on influenza in rural Senegal, and determination of the prevalence of and risk factors for chronic lung diseases among HIV-infected adults and adolescents in Kenya. GHP Fellows have already presented their work at multiple international conferences, including the American Thoracic Society International Conference and the International Primary Care Respiratory Group conference. Highlighting their collective productivity, several abstracts have been submitted to 2015 conferences, such as the Conference on Retroviruses and Opportunistic Infections. Original, peer-reviewed manuscripts stemming from these timely and important projects are nearing completion. Additionally, GHP Fellows have been awarded funding from NIH, foundational and institutional sources, preparing them to submit strong applications for mentored K-level Career Development Awards.

INNOVATION

The GHP is among the first PCCM global health training programs in the US. It leverages the highly successful training platform of the UW Division of PCCM and Seattle's global health infrastructure to nurture the development of a new generation of internationally-focused clinicians, educators, and researchers to tackle the global burden of respiratory disease and critical illness.

Cleveland Clinic

Cleveland, Ohio

Teaching Mechanical Ventilation in the Era of 300 Modes of Ventilation

Program Directors: Eduardo Mireles-Cabodevila, MD (CCM) and Rendell W Ashton, MD (PCCM)
Associate Program Directors: Aanchal Kapoor (CCM) and Neal F Chaisson (PCCM)
Type of Programs: Critical Care Medicine and Pulmonary and Critical Care Medicine
Abstract Authors: Eduardo Mireles-Cabodevila, MD, Aanchal Kapoor, MD, Abhijit Duggal, MD, Neal F Chaisson, MD, Rendell W Ashton, MD, Deborah A Rathz, MD, Sudhir Krishnan, MD, Matthew Jurecki RRT, Carla Wollens RRT, Robert L Chatburn MMHS RRT-NPS

INTRODUCTION

Education in Mechanical Ventilation is one of the cornerstones of critical care training. Today's technology has developed rapidly, flooding the bedside with new ventilator features and modes. We have identified more than 300 different names for modes of ventilation on ventilators used in the United States alone. Currently, there is no universally used vocabulary or taxonomy, the most cited book of mechanical ventilation has more than 1500 pages and our faculty knowledge on mechanical ventilation is heterogeneous. In this challenging educational context, we designed a course that would allow our trainees to learn the basic concepts of mechanical ventilation using a standardized taxonomy, recognize each mode's technological features, and then apply the mode of ventilation to a patient based on their goals of clinical care.

METHODS

The course curriculum was developed by the authors of the abstract; these are Pulmonary and Critical Care Medicine physicians and respiratory therapists. The course had 3 components (Figure 1). The first component was an online interactive course consisting of 11 narrated and illustrated modules. Each module had quizzes, links to advanced reading and online simulators. The course used a published method (Respir Care. 2014 Nov; 59(11):1747-1763) to describe and classify each mode of mechanical ventilation. The second and third components were delivered in a single 8-hour simulation course. The course design is depicted in Figure 1. The simulation course began with a 45 min lecture reviewing the main concepts from the online course. This was followed by six skill stations were the fellows had hands-on experience with ventilator and circuit assembly and recognizing ventilator modes based on waveforms using lung simulators. Each station had a poster highlighting each mode's characteristics and clinical goals. After the skill stations and a break, each team assembled into groups where they were exposed to four clinical scenarios (ARDS, obstructive lung disease and emergence from neuromuscular blockers and dysynchrony). These scenarios used high fidelity lung simulators connected to a ventilator and a mannequin. The team received basic clinical information and managed the patient. The instructor followed a predefined algorithm which aimed to train the fellows on specific learning goals. Each scenario was hands on, encouraging open discussion amongst peers, and included time for targeted debriefing.

We evaluated the trainee knowledge using a multiple choice test. The test was reviewed and internally validated by the members of the course. The test was delivered electronically before we released access to the online course, one month before the simulation course (baseline test). The day of the simulation, all the trainees did the same test before (pre simulation test) and after the simulation course (post simulation test). Trainees input regarding course satisfaction was assessed via an anonymous survey and a Likert scale.

Data analysis: We collected test scores, level of training and whether they completed, partially completed or did not do the online modules. One-way analysis of variance was used to assess the effect of online module completion on test score. Matched pair analysis was used to assess the group score effect of module training and simulation.

RESULTS

We trained a total of 39 trainees (12 critical care fellows, 24 pulmonary and critical care fellows, 2 nurse practitioners and 1 resident). The online course was completed by 14 (35%) trainees, 12 (30%) completed it partially and not done by 13 (33%) trainees, and completed it. Trainees who completed the online modules had a significant improvement in knowledge scores before the simulation course and had higher scores than those that partially or did not completed the online modules (figure 2 and table 1). The simulation course increased the knowledge score across all groups. The mean increase in knowledge was significant between the baseline test

and the post simulation testing (Mean difference: 2.96 points, P=0002). The survey results demonstrated that fellow's satisfaction with the teaching methods was very high.

CONCLUSIONS

We demonstrated that the use of online education with a hands-on simulation course leads to significant improvements in knowledge on mechanical ventilation. The course is novel as it blends theory and practice using simulation. Further, we describe a simple teaching model based on the fundamental concepts of mechanical ventilation, a standardized taxonomy to recognize each mode technological features, and application based on clinical goals helps simplify teaching. This approach allowed training of large group of fellows, in a relatively short period of time, while increasing knowledge even in those without prior studying. The course is scheduled to be repeated annually.

Figure 1: Mechanical Venilation Course Design

Knowledge Test

▽

Online Course Outline	
Module 1	Introduction to Mechanical Ventilation
Module 2	The breath
Module 3	The assisted breath
Module 4	Volume or Pressure control
Module 5	Trigger and cycle events
Module 6	Machine vs patient events
Module 7	Spontaneous or mandatory breaths
Module 8	Breath Sequences
Module 9	Ventilatory patterns
Module 10	Targeting schemes
Module 11	Mode classification

▽

Simulation Course Outline

Knowledge Test

Lecture: Online Course Summary and Key Concepts

6 Skill Stations
1. Pressure support
2. Volume control
3. Pressure control
4. VC+ A.K.A. PRVC
5. IMV
6. Ventilator assembly

20 min per station

Lunch

4 simulations
1. Normal physiology with increasing respiratory effort
2. Obstructive physiology
3. ARDS physiology
4. Synchrony-dyssynchrony

Simulation 1-3 each 30 minutes
Simulation 4 1.5 hrs.

Knowledge Test

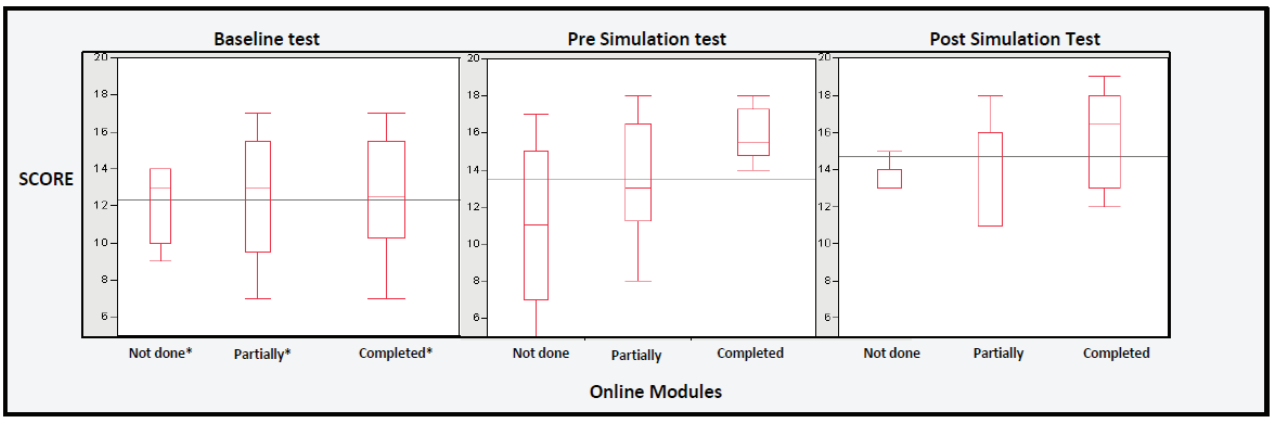


Figure 2. Effect of Online Modules and Simulation Testing on Mechanical Ventilation knowledge
The box plot represents: Vertical line within the box is the subgroup mean. The box represents the 75th and 25th quartiles. The whiskers extend to the upper and lower data points. The *dark horizontal line* represents the group mean. * In the baseline test, no group had done the online modules; we present the data to demonstrate the effect of each group.

TABLE 1: Knowledge test scores Online Modules and Simulation Testing

	KNOWLEDGE TEST SCORE		
ONLINE MODULES	**Baseline test score€ (n= 28)**	**Pre Simulation Test Score (n= 37)**	**Post Simulation Test Score(n= 36)**
Not done	12.1 ± 2	10.6 ± 4.7	13.5 ± 1.9
Partially completed course	12.5 ± 3.4	13.3 ± 3.2	14.5 ± 2.5
Completed	12.3 ± 3.3	15.8 ± 1.4*	15.9 ± 2.3**
Group mean	12.3 ± 3	13.5 ± 3.8	14.7 ± 2.4

All values are mean ± SD.
€ At baseline, no team had done the test.
*Difference between Online Modules not done vs completed P=0.0004
** Difference between Online Modules not done vs completed P=0.0096

Columbia University

New York, NY

Flipping Journal Club

Program Director: Vivek Moitra, MD
Type of Program: Critical Care Medicine
Abstract Authors: Vivek Moitra MD, Alan Gaffney MD, Rima Rahal MD, Jack Louro MD, Jason Alexander MD, Daniela Darrah MD, May Hua MD

BACKGROUND

Journal club is an integral part of our critical care fellowship curriculum. In order to increase attendance and to promote interactive participation, we changed our journal club format from the "traditional classroom" approach to a "modified flipped classroom" approach. In the classic model of a flipped classroom, the student watches a video lecture (content acquisition is self-paced) prior to class. Classroom time is then dedicated to student-centered activities such as problem-based learning and inquiry-oriented strategies.1 In our modified approach, in lieu of a video lecture, the journal article to be discussed was read in advance and a short on-line quiz was completed prior to class. Our aim was to compare attendance rates at journal club between the years 2010 and 2014 and to survey responses (self assessment of understanding of material prior to class, attentiveness during class, ability to re-teach after class, involvement during class and command of the subject matter at the end of class) of our fellowship group between "traditional classroom" classes and "modified flipped classroom" classes during 2014.

METHODS

The modified flipped classroom journal club curriculum design incorporated the following four activities:

Activity 1: Critical care faculty identification of key journal articles to be discussed throughout the year. Journal articles were then grouped by subject area. Core journal club faculty developed five questions for each article.

Activity 2: Five questions (in the form of a quiz) for each article were distributed to fellows one week prior to journal club via an online platform, ProProfs. This platform has the ability to track rates of participation and quiz performance (Figure 1).

Activity 3: Classroom activities focused on completing each section of a standardized journal article assessment form (downloaded from www.bestbets.org) by the group with the direction and help of a faculty member. The completed form for each session was transcribed by one member of the group and placed online (Appendix 1).

Activity 4: Fellows were encouraged to use the transcribed form to facilitate discussion of the article with residents and medical students.

The traditional classroom classes consisted of didactic lectures on echocardiography and ultrasonography.

To evaluate this novel method of conducting journal club, we compared attendance from the modified flipped journal club for the year 2014 to attendance from a traditional journal club from the year 2010 over the same months of the calendar year. We also distributed two surveys consisting of five questions rated on a five-point Likert Scale (Appendix 2) to the fellows in 2014, asking them to evaluate the modified flipped journal club and a traditional classroom model. We compared these survey ratings using a Wilcoxon signed-rank test.

RESULTS

Our fellowship class included 55% males and 45% females. Ages ranged from 30-35 years. Attendance at journal club increased from a mean of 65% in 2010 to 100% in 2014.

The total scores (highest possible = 25 points) for the survey of the modified flipped journal club ranged from 20 -25 points with a mean of 22 points. The total score for the traditional classroom echocardiography teaching ranged from 7-25 with a mean of 13 points. We used a Wilcoxon paired signed- rank test to individually compare the survey scores and found a mean of 10.78 points higher rating allotment to the Journal club survey across all questions ($p < 0.05$).

CONCLUSIONS

Our modified flipped journal club is an interactive method to teach journal articles. Implementation of this innovative educational curriculum has been associated with increased attendance, participation, and a reported understanding of information as well as a reported increased ability to re-teach material to residents and medical students.

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Appendix 1

"Homework": This is a sample of portions of what would be completed by every fellow during journal club. Form accessed from www.bestbets.org

How do you rate this paper? 7/10

1.0 OBJECTIVE AND HYPOTHESIS

1.1 Are the objectives of the study clearly stated?	Yes – association between Cl-restrictive IVF strategy and AKI in critically ill patients

2.0 DESIGN

2.1 Is the study design suitable for the objectives?	Yes – Single-center "before and after" study over set time period. Somewhat suitable – time changes not accounted for in study design.
2.2 Who/what was studied?	Mixed medical/surgical ICU patients, no exclusion criteria
2.3 Was this the right sample to answer the objectives?	Sort of – there is some misclassification bias – some patients may have received Chloride-containing IVF pre-ICU and you don't know who those patients are from the paper.
2.4 Is the study large enough to achieve its objectives? Have sample size estimates been performed?	No power calculation, no sample size estimate was made
2.5 Were all subjects accounted for?	Yes
2.6 Were all appropriate outcomes considered?	Primary – Increase in creatinine (baseline to peak), Secondary – need for RRT, need to stay in ICU. Could have also considered 28-day mortality
2.7 Has ethical approval been obtained if appropriate?	Yes – IRB approved, no consent needed.
2.8 Were the patients randomized between treatments?	No
2.9 How was randomization carried out?	N/A
2.10 Are the outcomes clinically relevant?	Yes

3.0 MEASUREMENT AND OBSERVATION

3.1 Is it clear what was measured, how it was measured and what the outcomes were?	Yes – creatinine, RIFLE criteria outcome
3.2 Are the measurements valid?	Yes – for the people who did not have their baseline creatinine assumed, probably valid. For those who had baseline assumed
3.3 Are the measurements reliable?	Yes
3.4 Are the measurements reproducible?	Probably
3.5 Were the patients and the investigators blinded?	No – not at all.

4.0 PRESENTATION OF RESULTS

4.1 Are the basic data adequately described?	Yes
4.2 Were groups comparable at baseline?	Yes – table 1 (possibly different in admissions with metabolic diagnoses)
4.3 Are the results presented clearly, objectively and in sufficient detail to enable readers to make their own judgment?	Yes – decrease in "Injury" by RIFLE criteria, decrease in amount of increase in creatinine (0.1).
4.4 Are the results internally consistent, i.e. do the numbers add up properly?	Yes
4.5 Were side effects reported?	No complications

5.0 ANALYSIS

5.1 Are the data suitable for analysis?	Yes
5.2 Are the methods appropriate to the data?	Cox-regression – it's ok.
5.3 Are any statistics correctly performed and interpreted?	Yes

6.0 DISCUSSION

6.1 Are the results discussed in relation to existing knowledge on the subject and study objectives?	Yes – discussion based on animal and previous human studies
6.2 Is the discussion biased?	Yes. Limitations – not mentioned the non-randomized design, didn't discuss difference in Loss/ESRD categories

7.0 INTERPRETATION

7.1 Are the authors' conclusions justified by the data?	Not really. Seems like there are many confounders – the experimental group received much more fluid
7.2 What level of evidence has this paper presented? (using CEBM levels)	
7.3 Does this paper help me answer my problem?	No – 2B

How do you rate this paper now? 7-8/10

8.0 IMPLEMENTATION

8.1 Can any necessary change be implemented in practice?	Not really, practically
8.2 What aids to implementation exist?	Not too much
8.3 What barriers to implementation exist?	Lack of reliable data to suggest a change

Appendix 2
Survey

1) When arriving at the beginning of lecture, how well did you feel you understood the material that was to be covered during lecture?

1	2	3	4	5
Not at all		Somewhat		Very Well

2) Did you have any periods of inattentiveness or dozing off during the discussion?

1	2	3	4	5
Not at all		Somewhat		Alert and Involved

3) How comfortable are you re-teaching the material to a student at the end of the lecture?

1	2	3	4	5
Not at all		Somewhat		Very comfortable

4) How involved were you and your colleagues in the lecture?

1	2	3	4	5
Not at all		Somewhat		Very much

5) How much command of the subject matter do you feel like you have at the end of the lecture?

1	2	3	4	5
Not at all		Somewhat		Very Well

Figure 1

✔ Correct — Points earned: **20 / 20**

Q.1) **In which of the following countries was this study conducted?**

- **A.** a) Turkey
- **B.** b) Greece ✔ (your answer)
- **C.** c) Netherlands
- **D.** d) England

✔ Correct — Points earned: **20 / 20**

Q.2) **Which of the following measurements was used to determine neurological recovery?**

- **A.** a) Cerebral Performance Category ✔ (your answer)
- **B.** b) Functional Health Status Score
- **C.** c) Prognosis after Resuscitation Score
- **D.** d) Brain Arrest Neurological Outcome Scale

✔ Correct — Points earned: **20 / 20**

Q.3) **The addition of which of the following protocols to epinephrine was used in the intervention group?**

- **A.** a) Vasopressin 40 IU x 1; Hyrdrocortisone 100 mg TID
- **B.** b) Vasopressin 20 IU x 1; Methylprednisolone 100 mg x 1
- **C.** c) Vasopressin 20 IU per CPR cycle; Methylprednisolone 40 mg x 1 ✔ (your answer)
- **D.** d) Vasopressin 40 units per CPR cycle; Hydrocortisone 100 mg TID

✔ Correct — Points earned: **20 / 20**

Q.4) **What percentage of patients in the intervention group had survival to discharge with a favorable neurological recovery?**

- **A.** a) 6%
- **B.** b) 14% ✔ (your answer)
- **C.** c) 22%
- **D.** d) 26%

✔ Correct — Points earned: **20 / 20**

Q.5) **Which of the following statements is true?**

- **A.** a) The control group had more infectious causes for a cardiac arrest.
- **B.** b) The control group had less metabolic causes for a cardiac arrest.
- **C.** c) The control group had less renal causes for a cardiac arrest.
- **D.** d) The control group had more respiratory causes for a cardiac arrest. ✔ (your answer)

Henry Ford Hospital

Detroit, MI

Bringing Simulation-Based Communication Training Back to the Real World

Program Director: Geneva Tatem, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Rana Awdish MD, Michael Mendez MD, Geneva Tatem MD, Maria Kokas PhD, Kristen Chasteen MD, Dana Buick MD

RATIONALE

Even as more trainees benefit from simulation-based communications training, the struggle to bring the skills to the bedside remains. In an effort to more consistently utilize the communication skills taught during the training in clinical practice, our institution developed three unique adjuncts to the training.

1. Faculty trained in real-time feedback
2. Faculty led pre-session huddle and post-session debrief
3. An integrated smart phone App for real-time recall of skills

EDUCATIONAL STRATEGY

The Caring Conversations Program at Henry Ford was created to bridge this gap in training. The program focuses on communication skills training for complex, often difficult conversations. It allows trainees to practice new skills, and receive real-time feedback prior to taking those skills to the bedside.

The teaching method includes highly skilled facilitators (RA, DB, KC, MM) and specifically trained improvisational actors guiding the learner through progressively more complex learning opportunities. Cases are structured to keep trainees on their 'learning edge' and are practiced in a high-impact, yet safe-to-experiment environment; self-discovery is fostered; and in-unit real-time feedback is integrated for each trainee. Each program element is structured to optimize compatibility with clinical and patient needs and trainee behavioral change.

In order to bridge skills to the bedside, faculty members are trained to give real time feedback with gradually increased degrees of autonomy during family meetings. By training faculty in the same method as the trainees, the language around the skills is consistent, as is the communication model. During the family meeting time-out, trainees are asked to self-identify a skill prior to an encounter, and during the post-meeting debrief, faculty offer formative feedback and guide the learner to self-identify a stuck-point and a strategy for addressing it in future encounters. A Caring Conversations App was developed to allow the trainees to access the tools in real time prior to the encounter, available on iTunes and GooglePlay.

IMPLEMENTATION

Since 2013, all medical critical care fellows at Henry Ford have participated in 1-3 day workshops where they have an opportunity to practice specific communication skills (Table 1). In addition, all PGY2 Internal Medicine residents participate in three 2.5 hour sessions in which they practice in three areas – 1) Responding to emotion with empathy, 2) Discussing serious news, and 3) Eliciting patient values. Beginning in 2014, critical care faculty began receiving specific training teaching in real time (Table 2) through workshops led by the Caring Conversations faculty. Since 2013, 60 internal medicine residents and 30 critical care fellows have participated in the Communication Skills program. Since 2014, 11 faculty have participated in the Teaching in Real Time program. Figure 1 shows the number of times the Caring Conversations mobile App has been accessed since its inception. Figure 2 illustrates the widespread dissemination of programmatic content via the App. From the small group of US residents who have undergone training, the App has spread organically onto multiple continents. Figure 3 illustrates time per visit on the App ranges from 10 seconds to over 30 minutes, suggesting some are using the content for a quick refresher, while others are reading the content in its entirety.

Table 1. Trainee Communication Skill
Responding to Emotion with Empathy
Discussing Serious News
Eliciting Patient Values
Navigating Patient and Family Conflict
Support and Presence through Death and Dying
Table 2. Faculty Skill - Teaching in Real Time
Establishing a Learning Goal in Real Time
When to intervene in Real Time
Giving Feedback in Real Time

Figure 1. Visits to Caring Conversations App

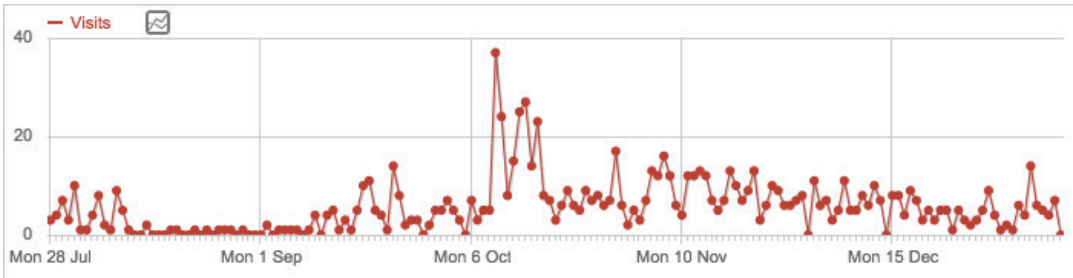


Figure 2. Visits to Caring Conversations App by location since July 2014

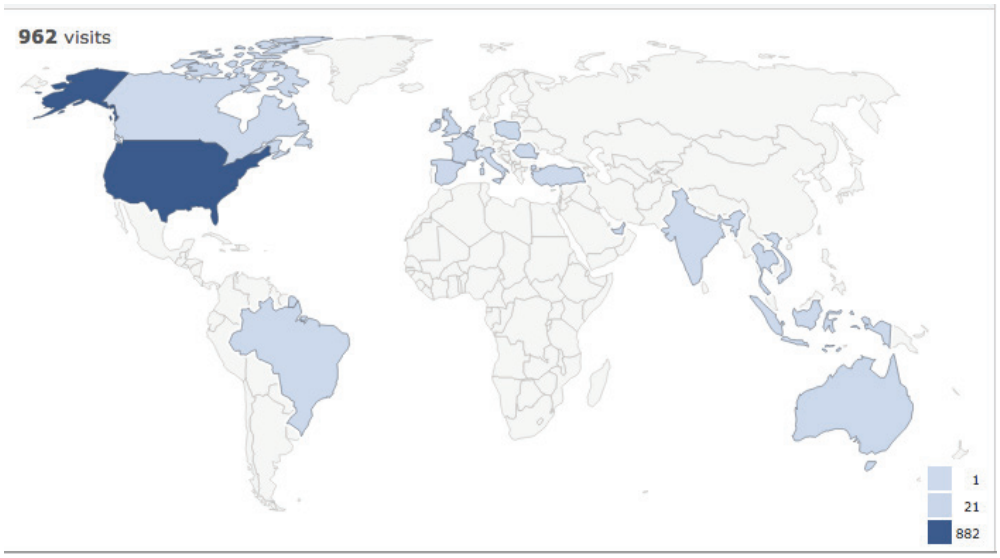
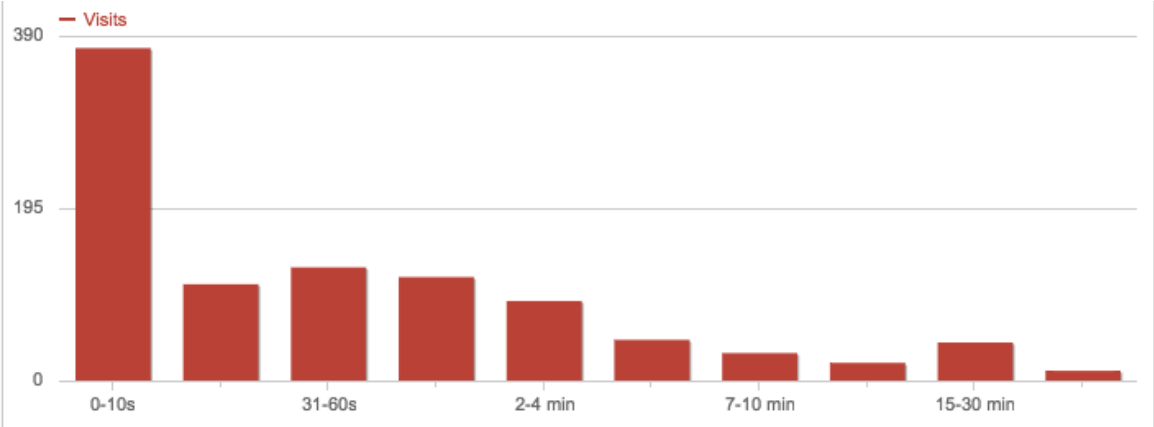


Figure 3. Time spent on Caring Conversations App



Time per visit

Mayo Clinic

Rochester, MN

Incorporation and Impact of a Formalized Mentoring Program for first year fellows in Pulmonary and Critical Care Medicine Fellowship Training

Program Director: Kannan Ramar, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Darlene R. Nelson, MD, Travis Wilson, MD, Karen Swanson, MD, Kianoush Kashani, MD, Kannan Ramar, MD

INTRODUCTION

Mentorship is vital to success in any field of medicine. It is recognized as an important influence on career selection, academic advancement and productivity, promotion and satisfaction. Despite this, mentorship is often undervalued in academic medicine and, the development of these vital relationships is challenged by increasing clinical, research and administrative demands. To address these issues, we devised and incorporated an innovative mentorship program for our first year fellows. The program was designed based on results from a comprehensive mentoring survey administered to current faculty, fellows and past fellows. The survey assessed the current state of 'mentoring' and identified barriers and characteristics needed to help promote an effective mentoring relationship. We then evaluated the impact after successfully implementing the mentorship program.

METHOD

A baseline survey was conducted among current fellows (n=16) and faculty (n=50), and past fellows (n=19) within the PCCM division to assess the importance of mentorship and identify barriers to successfully implement an effective mentorship program. Surveys were received from 62/85 participants (72.9%). A formalized mentoring program was then initiated for the incoming first year PCCM fellows to help meet the following objectives: goal setting, career planning, address work-life balance, increase the fellows' academic productivity and career satisfaction during fellowship.

Initially, the fellows' career interests and plans, goals and objectives with the mentorship, along with their personality characteristics were identified by the program leadership to aid in pairing them with interested faculty. A one hour mentoring workshop was conducted at the beginning of the program for both mentors and mentees. (Table 1) Effectiveness of the program was assessed through quarterly surveys, a validated evaluation form (Berk 2005), semi-structured interviews at the end of one year and review of fellows' curriculum vitas for publications.

RESULTS

Baseline mentoring surveys identified several themes. First, mentoring was identified as important in medicine (100%) and influenced career choice (60%). Areas of greatest perceived importance were in academic promotion (77%), career planning (80%), and goal achievement (80%). Past fellows expressed a desire to have been matched with a mentor during fellowship (90%) and preferred more help with career planning (56%). Among current fellows, 28% did not identify a mentor and 90% desired more help with career planning. Faculty and fellows differed in the perceived benefit of mentoring related to institutional politics (74% faculty vs. 56% fellows) and work-life balance (85% fellows' vs 55% faculty), demonstrating how the focus of mentoring relationships may change over time. Several barriers to effective mentorship were identified, including lack of familiarity with faculty interests, not knowing how to initiate a mentoring relationship and time commitment. (Chart 1) These barriers were addressed as we devised and incorporated our mentorship program for the first year fellows.

Mentoring effectiveness was assessed after one year using a previously validated tool (Berk 2005). This scale assesses twelve essential mentoring characteristics and can be used to help evaluate and provide feedback on mentoring. The median score and interquartile range for each item is listed in table 2. Academic productivity over the first year of fellowship increased (18 vs 2 publications, p=0.02) after the initiation of the mentoring program. Semi-structured qualitative interviews demonstrated increased satisfaction by all fellows involved. Statements from involved fellows included "My mentor provided a safe environment for me to ask questions and discuss big decisions," "I would not have had the opportunities or productivity I have had without my mentor."

CONCLUSIONS

We successfully developed and incorporated an effective mentorship program for our PCCM fellows after identifying and addressing barriers. It is now an established and integral part of our PCCM fellowship program.

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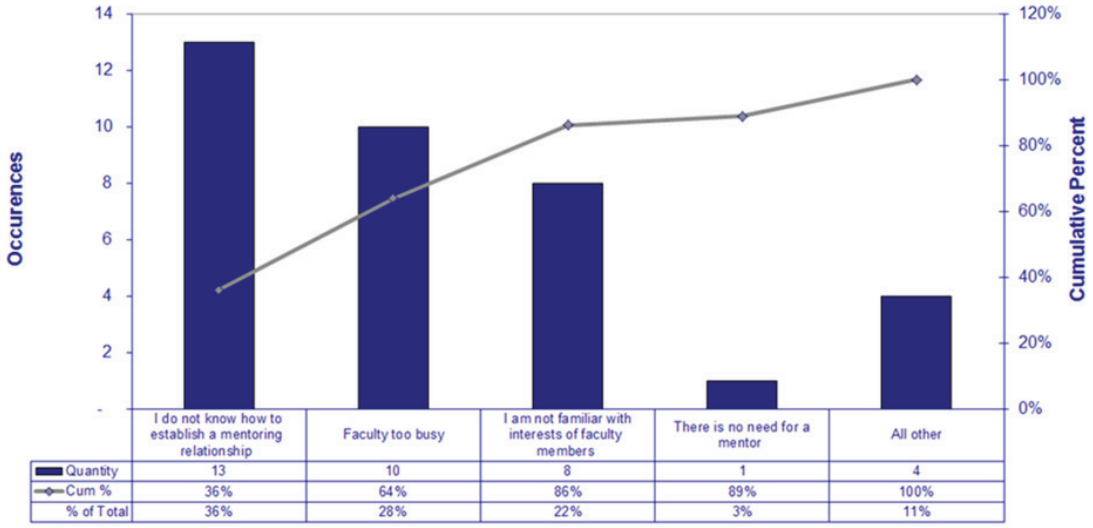
Table 1: Mentoring Program Characteristics

Characteristic	Value
# of Fellows	6
# of Mentors	6
Duration of program	12 months, with option to continue
Frequency/length of meetings	1 x monthly, 30-60 minutes
Mentoring workshop	60 minutes
Total time commitment	7-13 hours

Table 2: Mentoring Evaluation Tool (Berk 2005)

Mentoring characteristic	Median (IQR)
Accessible	5 (4.75-5)
Professional integrity	5 (5-5)
Content Expertise	5 (3.75-5)
Approachable	5 (5-5)
Supportive and Encouraging	5 (5-5)
Instructive and Useful Critique	5 (5-5)
Increased motivation	5 (5-5)
Helpful in providing direction	5 (5-5)
Answering questions satisfactorily	5 (5-5)
Acknowledge my contributions	5 (5-5)
Suggested approachable resources	5 (5-5)
Challenged me to extend abilities	5 (5-5

Chart 1: Fellow perceived Barriers to Mentorship (Pareto chart)



Mayo Clinic

Rochester, MN

Instituting Resilience Training to Address Stress and Burnout Among Critical Care Fellows

Program Director: Kianoush Kashani, MD
Program Type: Critical Care Medicine
Abstract Authors: Perliveh Carrera, MD, Alice Gallo De Moraes, MD, Amit Sood, MD, Kannan Ramar, MD, Kianoush Kashani, MD

BACKGROUND

Studies have shown that distress symptoms are commonplace among physicians. Burnout is a psychological syndrome arising in response to chronic emotional and interpersonal stressors on the job. In a study by Embriaco, 50% of intensivists exhibited burnout and those with high burnout levels reported conflicts with coworkers.1 Moreover, stress symptoms and depression have been associated with lowered standards of patient care and serious medical mistakes.2 Given the negative impacts of stress and burnout on a person's well-being, initiatives have been described to help reduce its deleterious effects using resilience training with encouraging results.3 We started resilience training for critical care fellows using the Stress Management and Resiliency Training (SMART) program as an innovation to help decrease stress and improve burnout symptoms.

METHODS

A survey was conducted between March and September 2013 on 58 critical care fellows enrolled in the Pulmonary and Critical Care Medicine, Critical Care Medicine, Critical Care Anesthesia, and Neurology Critical Care fellowship programs at Mayo Clinic, Rochester.

The survey was a composite of the Gratitude Questionnaire-Six Item Form (GQ-6), Satisfaction with Life Scale (SWLS), Subjective Happiness Scale (SHS), abbreviated Maslach Burnout Inventory (MBI) scale, and Perceived Stress Scale-14 item (PSS-14).

After one year, fellows who completed a brief course were resurveyed to assess the impact of the SMART program in their perceived stress, burnout, and overall quality of life.

Twenty-one first year Critical Care fellows went through the program. SMART program is a single, 90-minute session training adapted from the Attention and Interpretation Therapy (AIT), a structured form of therapy developed at the Mayo Clinic aimed to decrease stress and enhance resilience. The program consisted of handouts and presentation tackling causes of stress. It introduced ways of framing one's mindset to reduce stress awareness by attention training, which consisted of focusing on the novel and shifting one's attention from inward to outward. Higher principles of gratitude, compassion, acceptance, meaning, and forgiveness were instilled to guide interpretations. Finally, fellows were provided with structured relaxation training by utilizing paced breathing meditation and taught to practice deep diaphragmatic breathing.

RESULTS

There were differences in stress levels, gratitude, happiness, satisfaction with life, and burnout based on age, gender, type, and stage of fellowship on linear regression analyses. Graduating fellows had significantly higher aMBI scores compared to other groups.

Wilcoxon signed-rank testing for fellows who completed the SMART program training showed no significant change in both SWLS and aMBI scores. The PSS-14 score was significantly higher after the SMART program ($p < 0.0001$). Both GQ-6 ($p < 0.0001$) and SHS ($p = 0.04$) scores were significantly lower after the resilience training.

The SMART program evaluation was favorable with 67% expressing that their ability to deal with stressful situations have been strengthened and provided them with tools to avoid burnout. 61% have reported they still use the techniques they learned after one year.

CONCLUSIONS

One year after the SMART program, burnout and satisfaction scores remained the same while stress measures trended up. This may suggest that the initiative helped mitigate higher burnout levels as fellows advanced through training. Our innovative SMART program improved the fellows perceived abilities to deal with stressful situations, along with preventing burnout.

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Medical University of South Carolina

Charleston, SC

Variability in Structure of University Pulmonary/Critical Care Fellowships and Retention of Fellows in Academic Medicine

Program Director: Nicholas Pastis, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Nandita Nadig, MD, Allison Vanderbilt, MD, Dee Ford, MD, Lynn Schnapp, MD, Nicholas J Pastis, MD

INTRODUCTION

The past decade has witnessed tremendous change in graduate medical education based on mandates by the Accreditation Council for Graduate Medical Education (ACGME).Despite ACGME guidelines, individual fellowship programs are challenged to find a format which meets the ACGME requirements, grooms fellows to be trusted clinicians, and encourages them to enter academic careers. While requirements exist for program structure and for amounts of training time, there can be significant leeway in how programs achieve these requirements. Little is known about this variability or the implications of different training strategies on the retention of fellows in academic medicine. This study was undertaken as part of an internal effort to evaluate and revise the program structure of the pulmonary and critical care (PCCM) fellowship at the Medical University of South Carolina (MUSC). We conducted a survey of 40 US PCCM program directors at major academic centers to use as a guide for tailoring the structure of our program with the goal of enhancing retention of fellows into academic medicine.

METHODS

A 30-item survey was developed through rigorous internal review and was administered via email to select (40) programs that were in similar structure to MUSC. The survey questions defined variations in the training structure (clinical, research, educational) of PCCM programs and identified factors associated with retaining fellows in academic medicine. Descriptive statistics, cronbach's alpha, correlations, and repeated measures analysis of variance (ANOVA) were calculated. All data was analyzed in SPSS 21.0.

RESULTS

Twenty-one fellowship directors out of the 40 (52% response rate) completed the survey. Program directors reported that within the past 5 years, 38% of their fellows remained in academic medicine and 20% remained in academics with significant research focus. The Pearson's correlation revealed a statistically significant relationship between the percent of fellows who obtained a master's degree and the percent of fellows who graduated and remained in academics ($rs = .559$, $p < .008$). The survey also revealed statistically significant relationships between scholarly requirements (grant proposals, peer reviewed original research projects) and the percent of fellows who graduated and remained in academics. Based on these results, the internal program structure at MUSC was substantially revised to increase the focus on research and grant funding opportunities. Revisions included offering clinician scientist training for two of the five third year fellows committed to pursuing grant funding opportunities. This change has led to a fourth year of fellowship for research and a Master's of Science in Clinical Research (MSCR) during that time for those two fellows. Previously, only 1 fellow in the past 10 years achieved grant funding and pursued a fourth year with a MSCR. In addition to these changes, the fellow conferences were modified to provide feedback via the biannual research work-in-progress conference and the institution of regular research mentorship committee meetings.

CONCLUSIONS

This survey offers some insights that may be useful to fellowship program directors desiring to increase retention of fellows in academic medicine. In particular, advanced education in research was associated with academic retention. We will be prospectively evaluating whether enhanced research curriculum (research training, mentorship and regular peer/faculty feedback) leads to increased retention of fellows in academic careers.

The Perelman School of Medicine at the University of Pennsylvania

Philadelphia, PA

Implementation of an Outpatient Pulmonary Fellowship Curriculum

Program Director: Maryl Kreider, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: SM Kassutto, MD, CJ Dine, MD, M Kreider, MD, RJ Shah, MD

RATIONALE

The Accreditation Council for Graduate Medical Education has set forth core competencies and curricular milestones for trainees in pulmonary medicine. These milestones require that fellows work, communicate and transition care effectively "across multiple health care settings," assimilate evidence from the literature into clinical practice, and demonstrate competence in the diagnosis, care, and treatment of patients with over sixty different clinical conditions in various disease stages.

The medical knowledge and patient care competencies outline many topics and disease states that are primarily seen in the outpatient clinic. However, most clinical training currently occurs in the inpatient setting. To the best of our knowledge, no standardized outpatient pulmonary curriculum is currently available for pulmonary fellowship training. We hypothesized that a structured case and evidence-based outpatient curriculum will provide a more robust and educational outpatient experience for the pulmonary fellow as assessed by a survey of trainees following the curriculum's implementation.

EDUCATIONAL STRATEGY

The outpatient fellows' curriculum consists of thirty minute case-based conferences held bi-weekly before clinic. The pulmonary faculty of the Perelman School of Medicine at the University of Pennsylvania authored and facilitated the conferences. Faculty followed a teaching script format based on the previously published "Yale Office-Based Medicine Curriculum." The conferences were open to all fellows, regardless of training cohort.

A list of twenty core topics was generated based on fellow feedback and current expected pulmonary fellowship trainee competencies (see Table I). The teaching scripts with answers to case-based questions and citations to key references in the literature were provided at the end of each conference.

IMPLEMENTATION AND EVALUATION

Prior to the curriculum's implementation, study participants were asked to complete an electronic survey regarding impressions of the existing outpatient pulmonary fellowship curriculum and provide a self-assessment of individual competence as outpatient pulmonologists. Participants were surveyed at six month intervals thereafter. Conference attendance was also tracked and correlated with participant survey responses.

Twelve (71%; 4 female, 8 male) out of seventeen eligible fellows agreed to participate. Five (42%) of the participants were first year fellows and seven were from upper year cohorts. When asked on the pre-implementation survey about likelihood to attend a pre-clinic conference dedicated to outpatient pulmonary medicine topics, 92% (n=11) of fellows agreed or strongly agreed that they were likely to attend and 10 (82%) fellows felt that outpatient pulmonary clinic is crucial to overall pulmonary fellowship education. However, only 6 fellows (50%) agreed that the current instruction and teaching on clinically relevant outpatient pulmonary topics was adequate and only 5 (42%) fellows indicated that their current outpatient educational experience had prepared them well for independent pulmonary practice. Attendance among all fellows at the first six conferences was 55%. Among first year fellows, attendance was 92%. Assessment of the curriculum is ongoing. However, the pre-implementation survey results and conference attendance suggests that the curriculum's content and structure satisfies an otherwise unmet educational need.

CONCLUSIONS

There is a need to provide more robust training in outpatient pulmonology for the fellowship trainee. Case-based conferences are a feasible method for introducing a structured curriculum to address this educational need.

Table 1. Topics Included in Outpatient Pulmonary Fellows Curriculum

COPD I	•Approach to inhaled medical therapies
COPD II	•Advanced therapies including chronic azithromycin, roflumilast and lung volume reduction surgery
Oxygen delivery equipment/Inhaler Techiniques	•Review of oxygen delivery modalities and instructional approaches for teaching patients proper inhaler technique
Pleural Effusion	•Outpatient management of pleural effusion and indications for indwelling pleural catheters
Asthma in pregnancy	•Therapeutic approaches for the pregnant patient with asthma
Chronic Venous Thromboembolic Disease	•Review of management strategies and indications for lifelong anticoagulation
Introduction to Lung Transplantation	•Indications for lung transplant referral
Asthma	•Review of step-up asthma therapy and approach to severe, poorly controlled disease
Chart Documentation	•Instruction on how to communicate effectively to other health care providers through the written note
Management of Bronchiectasis	•Review of differential diagnosis, airway clearance techniques and therapeutic approaches in bronchiectasis
Chronic Cough Management	•Diagnostic and therapeutic strategies for chronic cough
Pulmonary Hypertension Management	•Review of initial evaluation of pulmonary hypertension for the general pulmonologist
Introduction to Interstitial Lung Disease	•Initial diagnostic approach and differential considerations in ILD
Reactive Airways Dysfunction Syndrome	•Evaluation and treatment strategies
Outpatient Pulmonary Palliative Care	•Approach to medical management of dyspnea at the end of life
Initial Evaluation of Hemoptysis	•Diagnostic and therapeutic strategies for patients with hemoptysis
Evaluation of the Pulmonary Nodule	•Review of Fleischner Society Criteria and indications for tissue biopsy
Chronic Non-Invasive Ventilation	•Management of Chronic Respiratory Failure
Sarcoidosis	•Therapeutic strategies and monitoring practices
Neuromuscular Pulmonary Disease	•Initial evaluation and differential considerations

The University of Texas at MD Anderson Cancer Center

Houston, TX

Implementation of a Regional Procedural "Boot Camp" for Incoming Pulmonary & Critical Care Fellows

Program Director: Saadia A. Faiz, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Sujith V. Cherian, George A. Eapen, Rosa Estrada-y-Martin, Mark Warner, Carlos A. Jimenez, Bela Patel, Lara Bashoura, Amit D. Parulekar, MD, Donald R. Lazarus, MD, Roberto F. Casal, MD, Saadia A. Faiz, MD

BACKGROUND

Pulmonary & Critical Care Medicine is a procedurally oriented subspecialty that typically deals with acutely ill patients. In addition to expanding their medical knowledge base, new fellows are expected to quickly adapt to a new environment as well as unfamiliar technology and procedures. Most fellows are expected to start functioning competently and efficiently within days of starting their fellowships. Although close attending supervision may be present, many procedures are typically learned on the job and on human subjects. This naturally creates anxiety for the fellow, places a training burden on patients and may potentially impact patient comfort and safety. Consequently there is a growing impetus for fellowship programs to not only orient their trainees to the new environment but also provide them with basic training in these new procedural skills prior to patient exposure. There are multiple different approaches to procedural training, which may include didactic lectures, various forms of simulation and animal lab training. The goal of such training is obviously not to generate expertise, but rather to familiarize the trainee with the procedural equipment and techniques and possibly reduce the stress levels of the trainee as they start their clinical training. Therefore, we sought to create a regional introductory one day course to familiarize incoming trainees with the procedural aspects of Pulmonary and Critical Care Medicine.

METHODS

Instructional methods included a didactic portion and in vivo wet lab stations with porcine models. The course site was the University of Texas MD Anderson Cancer Center (MDACC), and the participants included primarily first year fellows from the University of Texas at Houston Health Science Center (UTHSC), Baylor College of Medicine (BCM), and the University of Texas Medical Branch at Galveston. The instructors were attending physicians from MDACC, UTHSC and BCM.

The didactic portion started with a pre-test, followed by concise lectures and post-test. The pre-test and post-test both consisted of 12 multiple choice questions distributed between procedural aspects of sedation, bronchoscopy and pleural interventions. Lectures were focused on procedural indications and contraindications, techniques, complications and management. The topics included the following: pleural procedures, anatomy of the mediastinum and tracheobronchial tree, moderate sedation and topical anesthesia, basic diagnostic bronchoscopic procedures such as bronchoalveolar lavage (BAL), endobronchial biopsy(EBBx), transbronchial needle aspiration(TBNA), and transbronchial biopsy(TBBx), bronchoscopy in special situations (mechanical ventilation, difficult airway), and advanced diagnostic bronchoscopy (electromagnetic navigation and endobronchial ultrasound).

The hands on portion included 4 stations with small groups (2 to 4 trainees) with one attending instructor per station. An hour was allotted at each station. The stations included: basic bronchoscopy (split between a mannequin model for tracheobronchial anatomy and a porcine model for BAL and EBBx), basic bronchoscopy with fluoroscopy for TBBx and TBNA, common pleural procedures (thoracentesis and chest tube) and indwelling pleural catheters. Group size was limited in order to maximize interaction and individual time at each station. The fellows were given formal goals and objectives for each station and tested on the objectives at the end of each session and graded as satisfactory, needs improvement or unsatisfactory by the instructor at the end of each station. Feedback from the trainees was also obtained immediately after each station to assess if the instructor was knowledgeable on the subject matter, if the instructor encouraged and answered questions, if the session content met educational goals, and if adequate time was allotted for the session.

RESULTS

Over a three year period, 38 fellows participated in the course (Table 1). With the exception of thoracentesis, only a minority of the trainees had done any of the procedures prior to attending the course. Prior to fellowship, a few had attended a formal procedure course with 11% for airway endoscopy and 5% for pleural procedures.

The average score on the pre-test was 66% (range 33 to 100) and the post-test was 86% (range 58 to 100). The majority of fellows did better on the post-test (66%), but there was no difference in 26%and 8% did worse.

For the skills portion of the course, most trainees performed well at all stations except the bronchoscopy with fluoroscopy station (TBBx and TBNA) for which the majority needed improvement (Figure 1). Common pleural procedures and the bronchoscopy mannequin station were mastered more easily that the porcine model for bronchoscopy and indwelling pleural catheter.

Feedback obtained from the trainees after the course was overwhelming positive, and in each category they reported that it exceeded their expectations. Majority of the fellow also indicated that their comfort and confidence with pulmonary procedures increased following course completion.

CONCLUSIONS

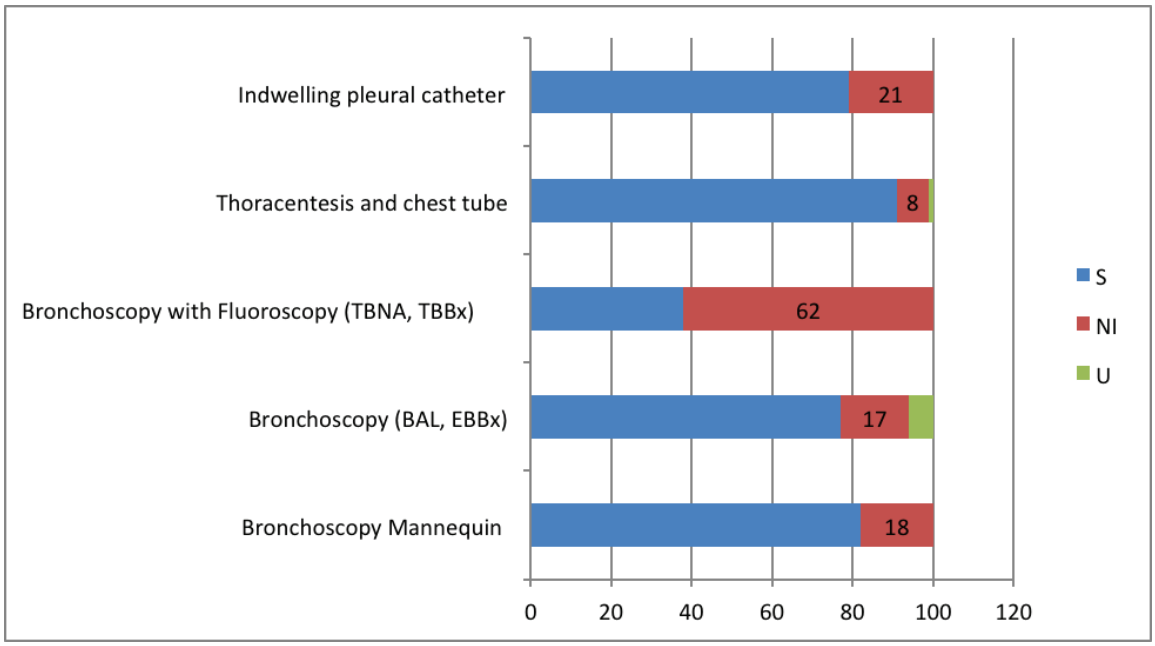
Familiarization with basic pulmonary procedures can be achieved with a single day immersion introductory course. A combination of didactic, simulation and in vivo training may be required as these different techniques are complementary and provide additive value. Formal goals and objectives for the training as well as knowledge and skills assessment tools should be utilized to achieve optimal outcomes. Self-reported trainee confidence and comfort was improved with the training and knowledge based testing also demonstrated improvement. The institution of a short, goal oriented introductory procedures course can have significant impact reducing the training burden on patients and possibly improve patient safety and quality of care.

Table 1: Trainee Demographics

	N (N=38)	Percent
Institution		
Baylor College of Medicine	20	53
University of Texas at Houston	14	37
University of Texas at Galveston	4	10
Fellowship		
Pulmonary & Critical Care	36	95
Critical Care	2	5
Year of course		
2012	15	39
2013	12	32
2014	11	29
Bronchoscopy prior to course*	7	18
Thoracentesis prior to course*	14	37
Chest tube prior to course*	5	13

*Greater than 10 procedures prior to course

Figure 1 Average score on skills station



S=Satisfactory, N=Needs Improvement, U=Unsatisfactory

TBNA = Transbronchial needle aspiration, TBBx = transbronchial biopsy,
BAL = bronchoalveolar lavage, EBBx = endobronchial biopsy

Tulane University

New Orleans, LA

Innovative Clinical Research Certificate for Pulmonary and Critical Medicine Fellowship Trainees

Program Director: Jaime Palomino, MD
Program Type: Pulmonary Diseases, Critical Care & Environmental Medicine
Abstract Authors: Fayez Kheir, MD, MSCR, Jaime Palomino, MD

RATIONALE

The Accreditation Council for Graduate Medical Education (ACGME) requires that pulmonary and critical care training programs advance fellows' knowledge of the basic principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care. Furthermore, most training programs require that each fellow should be involved in a research activity leading to an abstract presentation in a national meeting or a manuscript submission into a peer reviewed journal. The experience on how to best attain such a core requirement in training varies with each institution. Recently, a survey of fellows training in pulmonary and critical care medicine showed an increase from 35% in 2006 to 48% in 2009 among third year fellows doing research.[1]

EDUCATIONAL STRATEGY

To facilitate the entry of fellows interested in academic medicine into clinical research, our program started supporting a certificate in clinical research through Tulane University School of Medicine since 2012. The curriculum is designed to provide pulmonary and critical care trainees with some fundamentals of clinical research .It provides scholars with an introduction to research design, regulatory issues, statistical concepts and data management.

The certificate curriculum is a one-year program offered during the second year of fellowship for one fellow interested in pursuing an academic career. It consists of 5 courses (13.0 credit hours total) covering basic biostatistics, epidemiological methods, ethics and responsible conduct of research, and protocol writing (Appendix 1). This certificate program is modeled after the Clinical Research Training Courses offered by the National Institutes of Health (NIH) Clinical Center.

RESULTS

This is the third year of the program and so far only 2 fellows had completed the clinical research certificate. We will continue to collect data on the number and quality of scholarly research activities as well as the career fellows chose to pursue after certificate completion during upcoming years.

CONCLUSIONS:

By fostering a certificate that emphasizes on basic principles in clinical research, trainees will enhance their knowledge and skills in such a field. In addition, our model can be adapted in a fellowship training program seeking a high standard of training and academic productivity for their upcoming fellows.

REFERENCES

1. Choi AM, Reynolds HY, Colombini-Hatch S, Rothgeb A, Blaisdell CJ,Gail DB. NHLBI workshop: respiratory medicine-related research training for adult and pediatric fellows. Lung 2009; 187:347–366.

Appendix 1: Courses for CLinical Research Certificate

Biostatistics (3 credits)

This course will introduce fellows to statistical methodology in the health field. Topics covered include presentation of data (graphs and tables), descriptive statistics, concepts of probability, estimation of parameters, hypothesis testing, simple linear regression, correlation, and the analysis of attribute data.

Epidemiology (3 credits)

The purpose of this course is to prepare fellows to interpret epidemiologic data and understand and apply epidemiologic approaches to the investigation of health outcomes.

Responsible Conduct of Research/Ethics (1 credit)

This course will cover basic principles of bioethics and their specific application to clinical research. Special attention will be paid to the ethical obligation of the researcher to the participant within the broader framework of patient care and the ethics of caring. Specific challenges of vulnerable populations and research in a global community will also be considered. This course will also cover differences between clinical research and clinical practice, responsibilities regarding data records, data ownership, collaborative and multi-site issues and authorship. Substantive information will be provided about how to conduct clinical research in an ethical manner, especially in the complex and competitive research environment. This course will define research misconduct, falsification and fabrication, with numerous examples to assist in areas that may not be regulatory. Conflict of interest issues present some of the most complex and potentially volatile challenges in the area of clinical research will be covered as well.

Topics in Clinical Research (3 credits)

In this course, fellows will study IRB relations and regulations, discuss the required elements in a clinical research contract and the responsibilities of the clinical researcher, identify effective use of research personnel, and develop negotiating skills to facilitate support for clinical research. The course will also encompass the principle of randomization and “intention-to-treat” analysis in experimental studies, integration of clinical trials and lab support, specimen collections and laboratory problem based learning. A researcher/clinician centric insight into the logistics of technology transfer and intellectual property (IP) development will be studied. The practical aspects of technology transfer in an academic context will be investigated. Discussed topics will include local academic tech transfer policy, related procedures and available resources. Career pathways and opportunities open to the clinical researcher in the academic and private sector will be explored and discussed.

Protocol Design and Writing (3 credits)

Core course discussing the elements of effective research design, including the basic concepts in clinical trials, the main aspects for different types of trials such as proof of principle stage, Phase I, II, III and IV, and understanding good clinical research methodology. Course will introduce and address issues, idea and outline of design methodology that cover planning, conducting, analyzing, and assessing clinical trials. Concepts and principles of study finance, costing and budgeting will be discussed.

University of Toronto Interdepartmental Division of Critical Care Medicine

Toronto, Ontario

Integrated Research and Education: Building Capacity for Multi-system Point of Care Ultrasound in Adult Critical Care Medicine

Program Director: Andrew Steel, MD
Program Type: Critical Care Medicine
Abstract Authors: Alberto Goffi, MD, Warren Luksun, MD, Ghislaine Douflé, MD, Simon Abrahamson, MD

BACKGROUND

The use of Point of Care Ultrasonography (POCUS) has increased dramatically in critical care medicine. Although many organizations provide training standards and guidelines, increased research is needed to refine training requirements. We developed an expanded, multi-system POCUS program to meet these clinical and academic needs.

Our clinical programs include medical, surgical, and subspecialty (cardiovascular, neurosurgical, trauma, ECLS, solid organ/heme transplantation) patients, and, as such, we planned to develop advanced ultrasound modules involving these areas.

One hurdle faced by our program is 5 geographically separate sites. This necessitated developing tools for remote quality control, case reporting, and feedback.

METHODS - EDUCATION

For the past five years, using evidence and guideline based standards for training, we have developed a ultrasound curriculum that incorporates multi-system point of care ultrasonography (Table 1). The current structure includes a Basic (Year 1) and an Advanced (Year 2) program. Both Basic and Advanced programs are longitudinal with concurrent evaluation (Table 2).

Varied educational modalities were incorporated to improve trainee satisfaction and performance. Fundamental theory is taught via didactic lectures and pre-readings. Subsequent skills and knowledge are acquired in hands-on sessions with simulation and standardized patients. Group sessions are provided for image interpretation and bedside technical skills.

Written and performance based examinations are utilized. Multiple choice/short answer exams and script concordance testing are used to evaluate diagnostic and therapeutic integration of ultrasound findings compared to practitioners and experts.

Off-the-shelf, publically available solutions are used to submit saved clips. Portfolio evaluation is conducted by physicians with formal training/certification in echocardiography or POCUS.

RESULTS

This is the fifth year of our program, and 26 fellows are participating this year.

Four months into this year's curriculum, we have completed the introductory workshops and lectures on lung ultrasound and focused cardiac ultrasound (basic left and right ventricular function, pericardium, and fluid responsiveness assessments). Lecture, small group, and workshop attendance exceeds 90%. More than 50% of trainees have uploaded clips and reports for the portfolios.

During the second half of the year, we will focus on image interpretation and bedside and simulated acquisition (supervised and self-regulated). In addition to baseline knowledge testing, trainees have undergone two rounds of script concordance assessment.

We will conduct the certification exam in April 2015.

We will use examination results and analysis of portfolios to develop learning curves and understand gains made by trainees.

CONCLUSIONS

Development of a multi-system, point-of-care ultrasonography educational program can be done with a concurrent research program. In addition to entry level ultrasound skills, this program offers a unique opportunity to develop an expanded skillset, including transcranial doppler, optic nerve ultrasound, transthoracic echocardiography, biliary ultrasound, and genito-urinary ultrasound.

The biggest barrier to implementation has been the high ratio of fellows to trained attendings. We will continue to build online content in the form of lectures, cases, exams, and portfolio submission to allow for increased distance supervision, sustainability, and transferability.

Future direction includes collaborating with World Interactive Network Focused On Critical Ultrasound (WINFOCUS) for certification. Accumulated evaluation data can be used to inform future training not only in our institution but also at others. We are specifically interested in the changes in judgement with script concordance test methodology exhibited by trainees as they progress through their fellowship.

Table 1: Components of Basic (Year 1) Program and Advanced (Year 2) Program

Basic POCUS (Year 1)	Advanced POCUS (Year 2)
• Focused Cardiac Ultrasound • Lung and Pleural Ultrasound • Ultrasound for Vascular Access • Ultrasound for Detection of Venous Thrombosis • Focused Assessment with Sonography for Trauma	• Limited Transthoracic Echocardiography • Urinary and Biliary Tracts • Transcranial Doppler • Optic Nerve Sheath Diameter Assessment • Airway Assessment with Ultrasound

Table 2: Longitudinal Curriculum and Evaluation

Longitudinal Curriculum	Longitudinal Evaluation

• Introductory workshop
  • 'Knobology'
  • Image acquisition and Interpretation
  • Hands-on scanning involving standardized patients and simulators
• Didactic lectures
• Weekly case discussions
• Hands-on supervised scanning sessions of critically ill patients
• Personal portfolios of ultrasound examinations
• Self-regulated online learning
	• Multiple choice and short answer examination
	• Script concordance testing
	• Supervised scanning sessions
	• Standardized reporting and submission of ultrasound findings
	• Minimum attendance requirements for sessions

Appendix 1: Example of Script Concordance Test

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

INITIALS _____

CASE 2

75 M - Ward consult for hypotension
- Dx Pneumonia
PMHx: G2 LV. COPD. HTN. Nursing home.

L SC CVC placed in ICU. NIV started
Lactate 5. ScvO2 55%
T 38.8 WBC 16

5 liters RL given thus far.

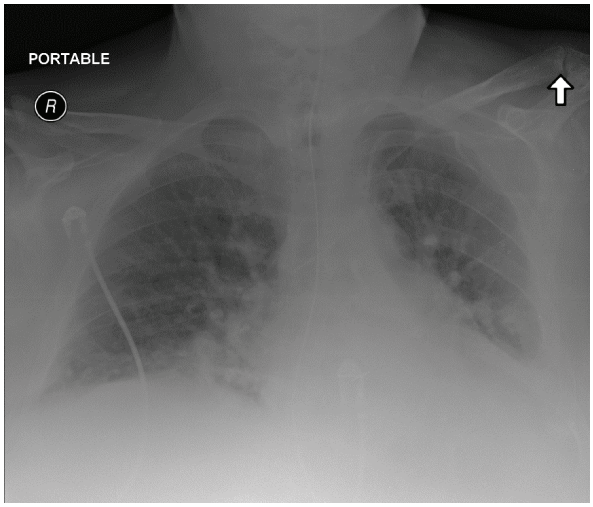
BP 90/50 Sinus Tachycardia HR 100
SpO2 94% @ 50% NIV 8/5

HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

CXR post-central line insertion

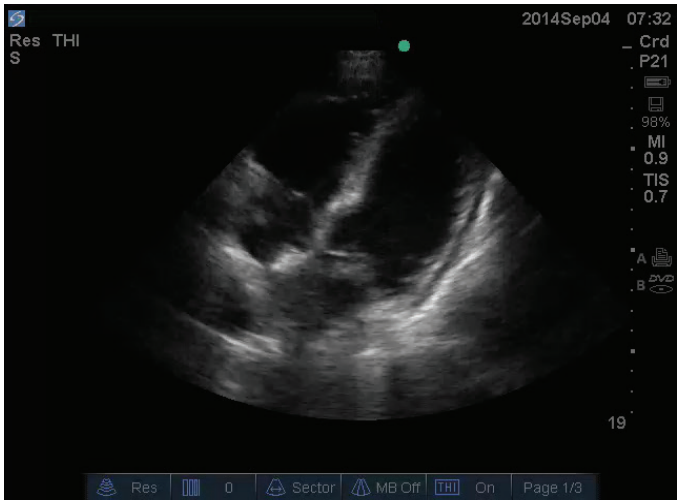


HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

You decide to perform a focused cardiac ultrasound assessment

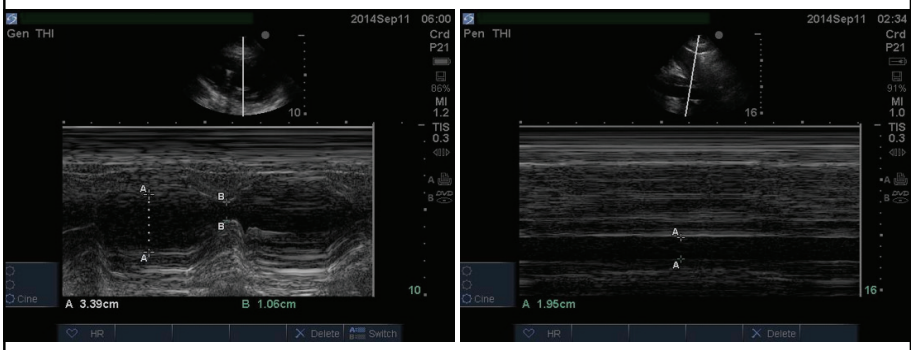


HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

You perform the following measurements:



HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

If you were thinking of…

	The hypothesis is almost eliminated	The hypothesis becomes less probable	The information has no effect on the hypothesis	The information supports your hypothesis	The information strongly supports your hypothesis
Vasodilatory Shock	-2	-1	0	+1	+2
Hypovolemic Shock	-2	-1	0	+1	+2
LV Dysfunction/Failure	-2	-1	0	+1	+2
Tamponade	-2	-1	0	+1	+2
RV Dysfunction/Failure	-2	-1	0	+1	+2
Pulmonary Embolism	-2	-1	0	+1	+2

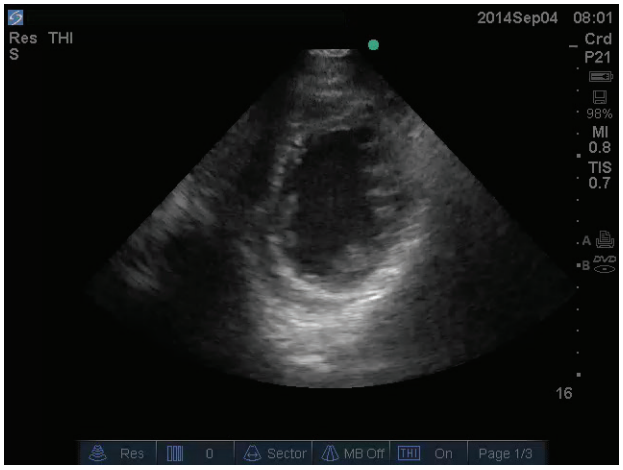
HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

Shortly thereafter (1)

Worsening metabolic acidosis and NIV Failure → ETT



HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

Shortly thereafter (2)

Seen in all lung fields bilaterally

HEART – CASE 2

UofT IDCCM
Critical Care Ultrasound Curriculum

Ver. 1.0/Oct 19th, 2014

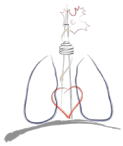
If you were thinking of…

	The plan is almost eliminated	The plan becomes less probable	The information has no effect on the plan	The information supports your plan	The information strongly supports your plan
Give fluids	-2	-1	0	+1	+2
Diurese	-2	-1	0	+1	+2
CT Imaging	-2	-1	0	+1	+2
Adding vasopressors	-2	-1	0	+1	+2
Adding inotropes	-2	-1	0	+1	+2
Prone	-2	-1	0	+1	+2
Cardiology consultation	-2	-1	0	+1	+2
Inhaled nitric oxide	-2	-1	0	+1	+2

HEART – CASE 2

Appendix 2: Sample of Focused Critical Care Ultrasound Report

UNIVERSITY OF TORONTO | Interdepartmental Division of Critical Care Medicine



UofT IDCCM Critical Care Ultrasound Curriculum

Focused CARDIAC Critical Care Ultrasound Report

PORTFOLIO CASE #		**Date** (DD/MM/YYYY)	

Operator	
☐ **Supervised exam**	☐ **Unsupervised exam**

Demographics	**Age** _____ **Gender** _____ Weight _____ kg Height _____ cm
Brief Clinical History	
Relevant investigations	

Vasopressors: Y ☐ N ☐ _____ **Inotropes**: Y ☐ N ☐ _____	Others:
BP: _____ / _____ / _____ **HR:** _____ **Rhythm:** _____ **CVP:** _____	

Respiratory		**Mode**: _____		
Unassisted breathing	☐	P_{peak}: _____	P_{plat}: _____	**PEEP** : _____
Positive pressure physiology	☐	Mean Paw: _____		$ETCO_2$: _____
ARDS	Yes ☐ No ☐	FIO_2: _____	RR: _____	V_T: _____/kg PBW

Patient position	☐ Supine	☐ Lateral [L or R]	☐ Prone	☐ Semi-recumbent

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CATEGORY/ INDICATION	☐ Code Blue	☐ Procedural	☐ Educational	☐ Other_____
	☐ Shock / Hypotension	☐ Resp. failure	☐ Other_____	

Views				
	☐ IVC	Not diagnostic ☐ 1 or ☐ 2	Limited ☐ 3	Adequate ☐ 4 or ☐ 5
	☐ S4C	Not diagnostic ☐ 1 or ☐ 2	Limited ☐ 3	Adequate ☐ 4 or ☐ 5
	☐ A4C	Not diagnostic ☐ 1 or ☐ 2	Limited ☐ 3	Adequate ☐ 4 or ☐ 5
	☐ PLAX	Not diagnostic ☐ 1 or ☐ 2	Limited ☐ 3	Adequate ☐ 4 or ☐ 5
	☐ PSAX	Not diagnostic ☐ 1 or ☐ 2	Limited ☐ 3	Adequate ☐ 4 or ☐ 5
	☐ Others _____	Not diagnostic ☐ 1 or ☐ 2	Limited ☐ 3	Adequate ☐ 4 or ☐ 5

	1	2	3	4	5
Grading Scale	No recognizable structures, no objective data can be gathered	Minimally recognizable structures but insufficient for diagnosis	Minimal criteria met for diagnosis, recognizable structures but with some technical or other flaws	Minimal criteria met for diagnosis, all structures imaged well and diagnosis easily supported	Minimal criteria met for diagnosis, all structures imaged with excellent image quality and diagnosis completely supported

Emergency Ultrasound Standard Reporting, ACEP 2011

1. Pericardium

EFFUSION: ☐ **No/Trace** ☐ **Mild Effusion (< 0.5 cm/posterior only/only in systole)**
☐ **Moderate Effusion (0.5-2 cm)** ☐ **Large Effusion (> 2 cm)**
☐ **Localized pericardial effusion** ☐ **Cannot determine**

Evidence of tamponade: ☐ IVC plethoric ☐ RA systolic collapse (>1/3 systole)
☐ RV diastolic collapse ☐ Cannot determine

2. LV global function

SIZE: ☐ **Small** ☐ **Normal** ☐ **Dilated** (> ~5 cm)
☐ **Markedly dilated** ☐ **Cannot determine**

LA (n.v. 19-39 mm): ☐ Dilated ☐ Non dilated ☐ Cannot determine

KINESIS: ☐ **Hyperdynamic (EF > 70%)** ☐ **Normal (EF 55-70%)**
☐ **Mild/moderate dysfunction (EF 30-55%)** ☐ **Severe dysfunction (EF < 30%)**
☐ **Cardiac standstill** ☐ **Cannot determine**

THICKNESS: ☐ Normal ☐ Mild-moderate hypertrophy (≥ 1 cm)
☐ Severe hypertrophy ☐ Cannot determine

3. RV global function

SIZE: ☐ **Small** ☐ **Normal** ☐ **Dilated (RVEDA/LVEDA >0.6)**
☐ **Markedly dilated (RVEDA/LVEDA > 1)** ☐ **Cannot determine**

RA: ☐ Dilated ☐ Non dilated ☐ Cannot determine

KINESIS: ☐ **Normal** ☐ **Mild/moderate dysfunction** ☐ **Severe dysfunction**
☐ **Cannot determine**

SEPTUM: ☐ **Normal** ☐ ☐ **Cannot determine**

THICKNESS: ☐ Normal (< 0.5 cm) ☐ Hypertrophic ☐ Cannot determine

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4. IVC	**DIAMETER: _____ mm**
	RESPIRATORY VARIATION ☐ **Cannot determine (mixed physiology)** - **Negative pressure physiology:** ☐ **≥ 40% Collapse** ☐ **< 40% Collapse** ☐ **No variation** - **Positive pressure physiology (VT > 8 ml/kg PBW):** ☐ **≥ 20% Distension** ☐ **< 20% Distension** ☐ **No variation**

5. Any other signs of heart pathology? Any other comments?	Major signs of valvular pathology? ☐ Y ☐ N ☐ Cannot determine MITRAL LEAFLETS: ☐ Normal ☐ Severely thickened/calcified ☐ Disrupted/Flail ☐ Hypomobile AORTIC CUSPS: ☐ Normal ☐ Severely thickened/calcified ☐ Disrupted ☐ Hypomobile Others (e.g. masses, aortic root/thoracic aorta dilatation, etc.)

IMPRESSION

_____

_____

_____

_____

Recommended action(s) based on findings

☐ No action or changes in management required at this time

PRELOAD ☐ Bolus IV fluids (patient likely fluid responsive) ☐ Diuresis/Decrease IV fluids

CONTRACTILITY ☐ Increase inotropic support ☐ Reduce inotropic support

LV or RV AFTERLOAD

☐ Increase systemic vascular resistance: _____

☐ Decrease systemic vascular resistance: _____

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☐ Decrease pulmonary vascular resistance: _____

☐ Surgical or procedural intervention: _____

☐ Comprehensive echocardiogram (Urgent ☐ When convenient ☐)

Reason: _____

☐ Referral to a consultant service

Reason: _____

☐ Additional lab or radiology study: _____

Reason: _____

☐ Other: _____

Transducer/System cleaned? ☐ Y ☐ N

Signature _____

Ultrasound-guided approach to undifferentiated shock

S. Abrahamson, E. Hockmann, A. Goffi

FLUID STATUS

1. **Hypovolemic/Congestive profile?**
   IVC

HEART

2. **Is there pericardial effusion + tamponade physiology?**
   Start with subxiphoid window
3. **Is there RV strain** (acute cor pulmonale, RV AMI, biventricular failure, chronic RV dyfunction)?
   Subxiphoid window → Apical window → PSAX (septal dyskinesia)
4. **If LV failure is present, is it the cause of shock ?**
   Apical window → Parasternal long & short axis windows
5. **Any other signs of heart pathology** (e.g. severe valvular dysfunction, LVOT obstruction, diastolic dysfunction, aortic dissection)**?**
   Signs of pre-existing cardiac disease?

EXTRA-CARDIAC ASSESSMENT

6. **Is the cause of the shock state other than cardiac in origin?**

A. LUNG US
- *PTX*
- *Interstitial syndrome*
- *Consolidation*
- *Massive pleural effusion*

B. VASCULAR US
- *DVT*
- *AAA*

C. ABDOMINAL US
- *Free fluid*
- *Signs of cholecystitis/biliary dilation*
- *Hydronephrosis*
- *Dissection*
- *Ischemic bowel*
- *Abdominal free air*
- *etc.*

REVIEW and MONITORING

7. **Inconclusive diagnosis?**
8. **Support for procedures and monitoring of response to treatment**

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University Of Wisconsin Madison

Madison, WI

Assessment Redesign to Include Milestones and EPAs, with Reduced Burden on Faculty

Program Director: Mark Regan MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Mark Regan MD, Jami Simpson MS

RATIONALE

The Next Accreditation System (NAS) education reform, issued by the ACGME, requires programs to assess fellow competency based on milestones and entrustable professional activities (EPA).This project identifies how we created NAS evaluations and direct observation tools (DOT) to meet the reform standards. We were aware this assessment redesign would be a dramatic change for our faculty, so we placed importance on minimizing the faculty burden when completing these assessments.

One of the strengths of our program is the high faculty to fellow ratio, which provides for aggregated assessments of fellows' performance. However, our staffing schedules are uncoupled (faculty rotate weekly on the services independent of fellow schedules), which can make it difficult for faculty to have enough interaction with fellows to provide a full evaluation. Other factors that lower evaluation completion rates include the length of evaluations and their accessibility, both perceived as placing additional burden on faculty. Together, these factors contributed to a low completion rate of fellow evaluations (76% in 2011-2012).

To address both the reform standards and low evaluation completion rates, we initiated a new evaluation deployment plan at the same time that we introduced the new assessment tools.

METHODS

In June 2012, we held quarterly Education Committee meetings to review NAS standards, select assessment tools to modify, and to create 8 EPAs and their curricular milestones. We created the milestones to progress in complexity: Level 1(PGY4), Level 2 (PGY5), Level 3 (PGY6, competent), Level 4 (Moving towards Mastery, faculty level) and Level 5 (Mastery, national recognition). We selected the following rotations to create the NAS evaluations: Critical Care Unit, Pulmonary Consults, and Advanced Pulmonary Service. Next, we created 5 direct observation tools (DOTs) to be used during a real-time encounter. Our DOTs are "google-forms" stored on a password protected site. The DOTs were stored on the home screen of Mini iPads provided to each fellow. Fellows were responsible for asking the faculty to complete the appropriate DOT depending on the procedure. The DOTs allowed us to remove questions from the monthly evaluation, making the evaluations shorter. Finally, instead of sending a NAS evaluation request to faculty after their one week rotation with the fellow, we solicited their general feedback about the fellow in an informal email. The attending faculty who worked with the fellow at the end of the month was given the cumulative weekly feedback email responses, and asked to complete the NAS evaluation and discuss the feedback with the fellow at the end of their monthly rotation.

To prepare the faculty for the implementation of the new plan, we conducted three Professional Development Training Sessions: 1. Introduce NAS, 2. Identify new Levels, 3. Practice using the DOTs.

RESULTS

By June 2013, and October 2014 we achieved an 86% and 100% completion rate of NAS evaluations respectively. This was a significant improvement over our baseline completion rate of 76% in 2012. We also averaged 1 DOT per fellow per clinical month, which we feel can still be improved upon with more frequent reminders to fellows.

CONCLUSIONS

We are quite pleased with the quality of the assessment data and encouraged by the adaptation and gradual increase in the usage of the DOTs. The previously used Likert scale was too subjective, allowing each faculty to use their own measures to gauge a fellow's competency. The new scale provides more specific / granular expectations for each level, standardizing the measures for each EPA. By eliminating the subjectivity of the scale, we collect better quality data from the NAS evaluations. Table 1 is a comparison of our previous evaluation tool's Likert scale and report versus the new milestones and summary graph.

Table 1: Comparison - 2012 Evaluation and report compared to 2014 NAS Evaluation and Spider Graph

2012 – Medical Knowledge section of the Pulmonary Consult Evaluation

Medical Knowledge
Residents are expected to demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care.

Scale

Questions

Report

	Needs remediation	Below PG-level	At PG-level	Above PG-level	
	1	2	3	4	Avg (Std):
6. Knowledge of pulmonary conditions, their processes and indications.			100.00%		3.00 (0.0)
7. Knowledge of relevant literature*			100.00%		3.00 (0.0)
8. Incorporation of knowledge base into clinical decision-making*				100.00%	4.00 (0.0)

2014 – Medical Knowledge Question from Pulmonary Consult Evaluation with Spider Graph

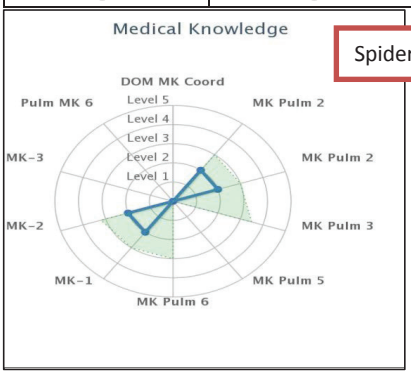
Question

1. Evaluate and Manage patients with acute/chronic lung disease

Scale and milestones

Level 1	Level 2	Level 3	Level 4	Level 5
-Develop a differential diagnosis for chronic lung conditions impacting patient. -Identify physiology for acute respiratory disease, abnormal gas exchange, and abnormal acid base. -Is able to provide basic interpretation of PFT	-Select appropriate tests -Narrow to specific differential diagnosis based on history and testing. -Advanced interpretation of a PFT -Initiate a basic/common treatment plan -Identify advanced invasive procedure options -Knowledge of the respiratory manifestations of non-lung disease.	- Adequately interprets chest CT scan and generates a robust differential diagnosis. -Determine when a patient needs invasive diagnosis. -Independently treat common lung disorders such as COPD and asthma. -Re-evaluate response to therapy and treatment. -Familiar with various options for medical therapy and related pharmacology.	-Acts as a role model to others on the health care team. -Teaches others -Identifies rare presentations of uncommon disorders. -Advanced understanding of pathophysiology and biology.	-Published -Organizes and leads the Pulmonary Consult Health Care team.
◯	◯	◯	◯	◯

Spider Graph report



Spider Graph representing data from a NAS Evaluation

Wake Forest School of Medicine

Winston-Salem, NC

Fellowship Academic Pathways: A Fellow-Centered Model for Academic Success During Fellowship

Program Director: Edward Haponik, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Matthew C Miles, MD, and Edward F Haponik, MD

BACKGROUND

Within the fellowship program requirements of the ACGME, there are few specific mandates on how scholarly experiences must be structured. In years past, our fellowship program utilized one training template for all fellows. Over the past ten years, 65% of our graduates entered non-academic clinical practice. Of the 35% who entered academic positions upon graduation, 82% were appointed to positions with the expectation of scholarly productivity. Recognizing the varied careers chosen by our graduates, we sought to redesign our fellowship schedule to provide greater matching of a fellow's career goals and interests with their fellowship experience, and to simultaneously increase the strength of faculty mentorship for career development.

METHODS

Beginning in July 2013 our training program established a fellow research committee composed of five academic faculty with current research funding. The role of this committee is to oversee the management of each fellow's scholarly experience during fellowship in a model we have named Academic Pathways (Figures 1 and 2). Meeting quarterly, the committee reviews proposed, ongoing, and recently completed projects with a focus on increasing the fellows' success in their stated career goals. The committee also acts to facilitate productive mentor/mentee interactions.

During the fall of the F-1 year, each fellow participates in a department-wide seminar on foundational research skills. At the end of this seminar, our division holds a Faculty Research Fair where areas of each faculty member's scholarly interest are displayed and discussed. After discussing areas of career and research interest with a potential mentor, the F-1 fellow submits a project idea in January. After review and feedback from the faculty research committee, the fellow and mentor prepare a formal project proposal for the F-2 year. During the F-2 and F-3 years, individual fellows' academic time may vary significantly. From a total of six months academic time in our Clinical Academic Pathway to as many as eighteen months in our Research Academic Pathway, quarterly reports on progress and evolving career goals help fellows remain task-oriented and personally invested in their ongoing projects. Furthermore, the academic pathway structure is flexible, allowing fellows to move from one pathway to another based on their evolving career goals and research interests. A longitudinal didactic curriculum in PCCM provides additional framework throughout the duration of training.

RESULTS

Key measures of success of our model include both tangible and intangible elements. Increased engagement of all faculty in fellow academic pursuits is not easily measured but contributes to a more exciting training environment for all. We continue to collect data on the number and quality of scholarly products generated by fellows and faculty and the ultimate career types chosen by fellows.

CONCLUSIONS

Over the last two years our program has implemented a flexible model of fellowship structure using a faculty research committee to tailor each fellow's evolving academic pursuits. Our structure provides a robust scholarly experience for fellows and promotes increased faculty engagement with fellow research activities through multiple levels of mentorship. We believe this model could be adapted for use at many other training sites desiring a new fellow-centered model of academic productivity.

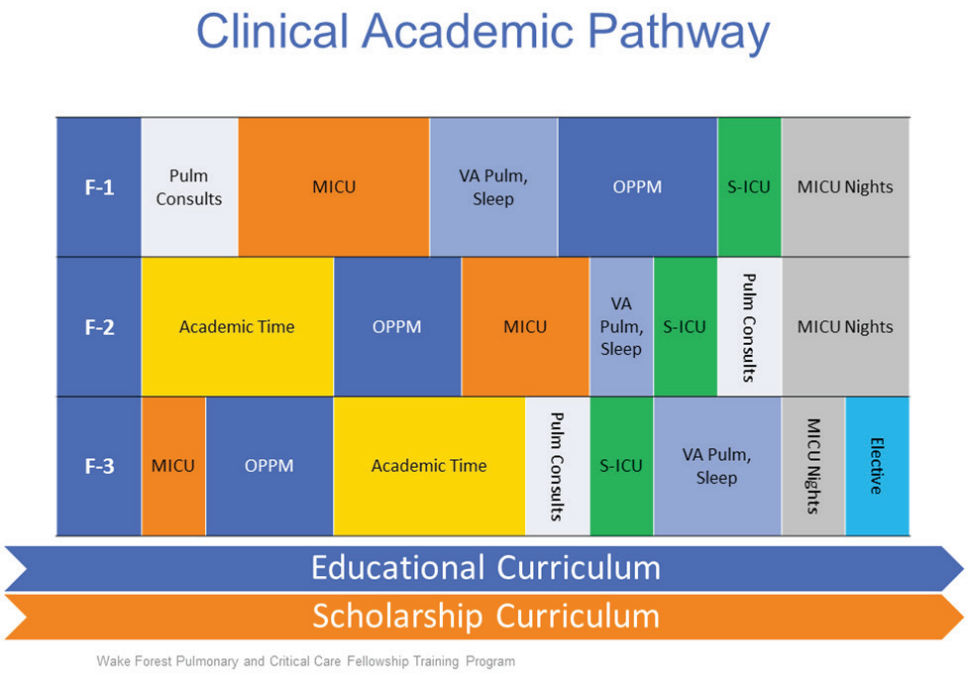


Figure 1. Wake Forest Clinical Academic Pathway Model. The usual Clinical Academic Pathway provides for six months' protected time during the 36-month fellowship. MICU = Medical Intensive Care Unit, VA = Veteran's Affairs, OPPM = Outpatient Pulmonary Medicine, S-ICU = Surgical Intensive Care Unit

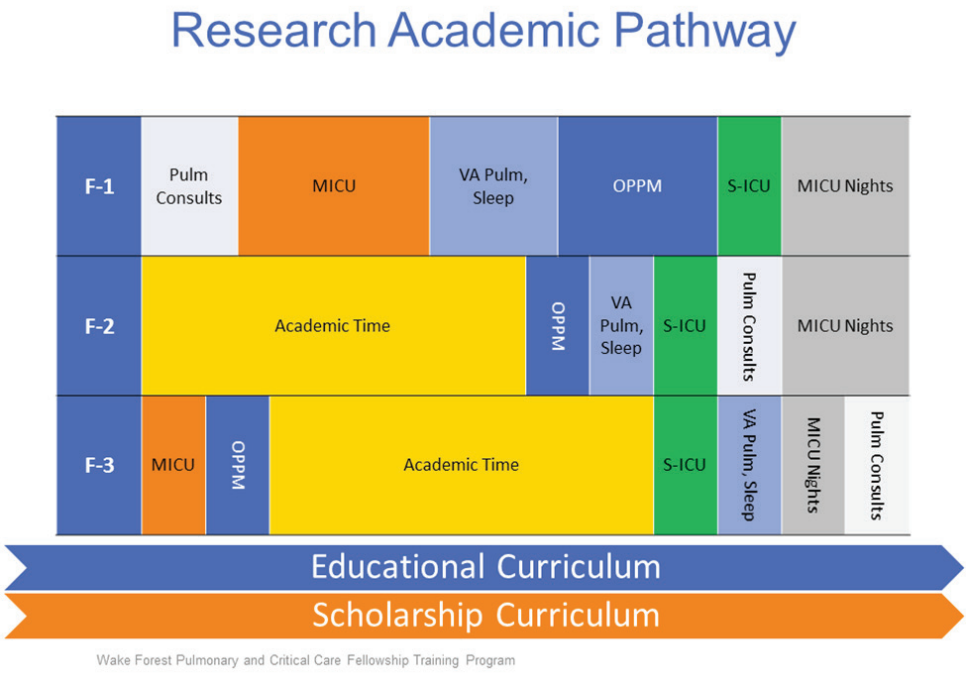


Figure 2. Wake Forest Research Academic Pathway Model. The usual Research Academic Pathway provides for twelve months' protected time during the 36-month fellowship. Up to 18 months' protected time can be arranged. MICU = Medical Intensive Care Unit, VA = Veteran's Affairs, OPPM = Outpatient Pulmonary Medicine, S-ICU = Surgical Intensive Care Unit

Yale University School of Medicine

New Haven, CT

Implementation of CHAT: CODES- a Collaborative Housestaff Assessment and Training: Communication skills Development Series

Program Director: Margaret Pisani, MD
Program Type: Pulmonary and Critical Care Medicine
Abstract Authors: Kathleen M. Akgün MD MS, Laura J Morrison MD, Shyoko Honiden MD MSc, Margaret Pisani MD MPH

RATIONALE

Effective communication with patients, their caregivers and teams are specific milestones for Internal Medicine Subspecialties put forward by the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Internal Medicine. In the context of the Next Accreditation System and entrustable professional activities (EPAs), heightened awareness of the need for objective trainee communication skills (CS) assessment is building. Exhibiting cultural sensitivity, expressing empathy, establishing therapeutic relationships and leading goals of care discussions are key components for demonstrating competent communication. Yet many fellow trainees have not had formalized opportunities to develop or practice these skills. To address this need, we implemented a CS workshop series for first year fellows from 4 internal medicine subspecialty training programs.

METHODS

We developed and implemented 3 sequential communication workshops during the trainees' first year of fellowship at Yale University School of Medicine. All fellowship program directors supported these sessions prior to implementation. Fellows were relieved of conflicting clinical responsibilities.

Each workshop is approximately 4 hours in length. The first hour is reserved for orientation, reflection on current communication challenges and skill building progress, and didactics; the second portion is 2.5 hours reserved for small group role play or standardized patient (SP) scenarios. Each small group includes 3-5 fellows and is facilitated by 1-2 faculty members from the participating subspecialties. Facilitators are provided a "Faculty Facilitator Guide" that includes goals for the session, teaching strategies, and clinical vignettes prior to the each session. Clinical vignettes were developed by a palliative care educational expert (LJM) based on specific learning objectives. Actor rehearsal was conducted for SP sessions. The final half hour is focused on individual reflection with personal action plans and a concluding large group discussion.

The first workshop (month 1) used role play for basic CSs for relationship building and breaking bad news; the second workshop (month 7) used SPs to focus on counseling patients about goals of care in the context of sharing prognostic information, and the third workshop (month 11) included more advanced CS focused on resuscitation status conversations. Surveys are administered to participants at the beginning and end of each workshop to assess self-reported comfort, attitude, knowledge and future goals regarding CS. Survey completion is voluntary and all responses are confidential.

RESULTS

Participants in workshop 1 included 19 first-year fellows from 4 clinical fellowships (Table 1). The majority were female (58%) and in their 4th post-graduate year. More than two-thirds of participants (13/19) reported prior CS workshops. Participants' goals included themes centered around breaking bad news (See Table). At the conclusion, participants reported workshop 1 helped them identify areas to improve CS, become comfortable with periods of silence and develop useful phrases such as "I wish". Several participants reported the role play felt artificial and were uncomfortable using this technique. Participants suggested shorter role play sessions and requested use of SPs. Participants also expressed interest in more outpatient scenarios and how to address the role of religion in decision making.

CONCLUSIONS

An interactive, multidisciplinary fellows' CS workshop is feasible. Participants were able to identify areas for focused improvement. Role playing was difficult for some participants who found it lacked authenticity. Future workshops will include SPs. Long-term follow up is necessary to determine if CS workshops lead to retention of these skills. Further work will determine if SPs can be used as a summative assessment of CS level for more advanced trainees, especially in the context of EPAs.

Table 1. Characteristics and goals of fellows participating in CHAT: CODES during Workshop 1 (n=19)

Participant Characteristics	N (%)
Fellowship training program	
Pulmonary, Critical Care and Sleep Medicine	5 (26)
Hospice and Palliative Medicine	2 (11)
Hermatology and Oncology	8 (42)
Geriatrics	4 (21)
Female gender	11 (58)
Post graduate year	
4	17 (89)
5	1 (5)
6+	1 (5)
Participation in communications skills workshops in the past, hours	
0	6 (31)
1-3	3 (16)
3+	10 (53)
Self-reported goals for communication skills workshop 1 (33 responses from 18 participants)	
Leading/improving family meetings/family dynamics	4 (22)
Breaking bad news skills	5 (28)
Checking for understanding	3 (17)
Expressing empathy, useful phrases	5 (28)
Legal issues (next of kin laws, liability in breaking bad news)	2 (11)

Notes

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