

APEP-Anesthesiology Preceptorship Enrichment Program: A Curriculum for First and Second Year Medical Students...An Early Look

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Original Article

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ABSTRACT

Background: The purpose of this educational innovation was to create a program for first and second year medical students (MS1s and MS2s) that would: (1) Provide students with early clinical exposure to the subspecialty field of anesthesiology, (2) Expose MS1s and MS2s to dedicated anesthesiologists serving as preceptors, (3) Enrich the students' basic science knowledge in a practical way using an integrated curriculum with clinical correlates and (4) Convey an accurate depiction of anesthesiology as a possible career choice

Methods: The Anesthesiology Preceptorship Enrichment Program (APEP) was designed for MS1s and MS2s as a seven month curriculum for each level, integrated with basic science course content. APEP students shadowed faculty from the Department of Anesthesiology (APEP preceptors). Guided by handouts, preceptors reviewed basic science concepts with clinical correlates. APEP encounters from October 2006-April 2007, October 2007-April 2008, and October 2008-April 2009 were documented and students completed a questionnaire about their experience.

Results:

After three years, APEP has become a successful program, as evidenced by the increasing numbers of interested incoming students, active students and returning students. According to the end of program questionnaire, 38-68% of the APEP students used the APEP handouts to guide discussions with their preceptor, enhance intra-operative teaching, and/or refer to while studying for basic science course exams.

According to the questionnaire, 71-80% of the APEP students were more interested in the field of anesthesiology after participating in APEP, 10-16% were neither more or less interested, and 4-19% were less interested.

Conclusions: Early clinical exposure to anesthesiology with APEP was viewed as a very positive experience, increasing interest in anesthesiology at the MS1 and MS2 level. The APEP handouts were deemed a useful aid for discussion and created opportunities for teaching clinical correlates of basic science knowledge.

Key Words: Anesthesiology, Education, Integrated Curriculum, Medical Student, Preceptorship.

INTRODUCTION

Although most clinical education occurs during the third and fourth years of medical school, there has been a trend to integrate clinical content into the first two years of medical school. Many schools offer courses during the first two years that focus on physical examination and doctor-patient relationships. Still other schools provide first and second year students with opportunities for community-based preceptorship experiences.¹ Most of these early exposures to clinical situations have been viewed as positive experiences by the students, improving student satisfaction with their medical school curriculum and with healthcare in general.^{2,3} Whether or not early clinical exposure to a particular field increases recruitment in that field has not been clearly defined.⁴ Almost all of the programs that offer medical students early clinical experiences have been in primary care. This study describes a novel program, the Anesthesiology Preceptorship Enrichment Program (APEP), which introduces first year (MS1) and second year (MS2) medical students to the field of anesthesiology.

APEP is a program created at our institution for first and second year medical students. The goals of APEP were to:

- 1) Provide students with early clinical exposure to the subspecialty field of anesthesiology
- 2) Expose first and second year medical students to dedicated anesthesiologists who serve as preceptors
- 3) Enrich students' basic science knowledge in a practical way using an integrated curriculum with clinical correlates
- 4) Convey an accurate depiction of anesthesiology as a possible career choice

Other minor goals were to assess student satisfaction of the new program and to provide anesthesia faculty with a more formal venue for teaching medical students.

MATERIALS AND METHODS

APEP was designed to be a seven month curriculum, running from October to April, for first and second year medical students, integrated with basic science course material. An e-mail was sent to MS1s and MS2s, inviting them to consider participating in APEP, especially if they were interested in surgery or anesthesiology as a career choice. Thirty-seven students in 2006-2007, forty-seven students in 2007-2008 and fifty-one students in 2008-2009 attended an introductory meeting about APEP, which comprised 14-19% of the combined MS1 and MS2 classes. This introductory meeting resulted in twenty-six active participants (APEP students) for 2006-2007 (21 MS1s and 5 MS2s), twenty-eight active participants for 2007-2008 (17 MS1s and 11 MS2s) and thirty-nine active participants for 2008-2009 (25 MS1s and 14 MS2s). Interest was gauged among anesthesiology faculty and twenty anesthesiologists committed to becoming APEP preceptors for 2006-2007, twenty-five for 2007-2008 and twenty-six for 2008-2009. Each preceptor was assigned one or two APEP students, and students had the opportunity to meet with APEP faculty up to seven times in a seven month period. An APEP faculty director and medical student liaisons were designated to oversee this new program.

The vast majority of APEP encounters included shadowing and discussion in the operating room. On rare occasion, encounters took place in the office setting, where student and preceptor would review intra operative events. The monthly interactions were guided by handouts that contained familiar diagrams from students' basic science lecture notes, enriched by clinical correlates from an anesthesiologist's perspective. (Appendix A). Only topics that had a logical clinical correlate that could be taught from an anesthesiologist's perspective were considered for the handouts. For example, when the students were learning pulmonary physiology in the classroom, the APEP handout for that month included a diagram of lung volumes and oxygen/hemoglobin dissociation curves and introduced mechanical ventilation as a clinical skills set. When the students were dissecting the head and neck in anatomy lab, the APEP handout for that month included descriptions of airway structures from anatomy course notes and introduced mask ventilation and direct laryngoscopy as a clinical skills set. The APEP handouts were intended to enrich the basic science knowledge in a unique and novel way for students during the first two years of medical school as well as offer a less varied teaching experience from preceptor to preceptor.

APEP ran from October through April each year. Each APEP encounter was documented and students were sent a questionnaire (Appendix B) at the end of the seven months. The questionnaire was designed by the APEP faculty director and intentionally included the medical students' name. Students were to fill out open ended questions about their individual APEP experience. Questionnaires were returned to the APEP faculty director who reviewed the students' comments. After questionnaires were collected, an e-mail was sent to the APEP students requesting if their de-identified comments could be used for the study. Because of the descriptive/evaluative nature of this study, the institutional review board granted an exemption for approval.

RESULTS

There were twenty-six active participants (APEP students) for 2006-2007 (21 MS1s and 5 MS2s), twenty-eight active participants for 2007-2008 (17 MS1s and 11 MS2s) and thirty-nine active participants for 2008-2009 (25 MS1s and 14 MS2s.) These APEP students met with their APEP preceptors during the seven month program, a majority of them meeting on multiple occasions. Almost all of the APEP encounters took place in the operating room. (There were rare occasions when the preceptor would meet with the APEP student in the office setting for discussion of the handouts.) Questionnaires were sent to students at the end of the seven months. Response rates for completed questionnaires were: 21/25 (84%) for 2006-2007, 8/26 (31%) for 2007-2008 and 25/39 (64%) for 2008-2009. Upon review of the questionnaire results and after an early assessment of APEP after three years, three major observations were made:

- 1) The overwhelming consensus was that APEP was a very positive experience. There were no negative comments about APEP on the questionnaires or negative verbal comments by the APEP students. 48% of MS1s in 2006-2007 and 65% of MS1s in 2007-2008 chose to stay in APEP for their MS2 year. They described APEP as "more than just a shadowing experience". The following comments were taken from the questionnaire survey:

"My preceptor explained how the ideas were applied in the O.R. I felt that I was being mentored and truly appreciated the interaction."

"We went over handouts and reviewed anesthesia-related pharmacology. I also got more experience in the O.R. and had the opportunity to intubate a patient. It was fantastic!"

"Seeing anatomy and physiology in action was incredible. I loved being able to see what I was learning in a real life setting, feeling like I was learning for a reason."

"Seeing the machines and drugs in context made the material easier to access. I also felt that getting to 'push' drugs into a patient on the table made the importance of anesthesia and pharmacology much more palpable. My preceptor taught me how to do a few minor procedures as well, which got me very excited about becoming a doctor. It's easy to lose that excitement when you are in a classroom all day."

"I learned a lot about what an anesthesiologist does during the cases. We talked about the handout material too, which was helpful. It was good to hear about it from someone who actually uses it on a daily basis."

"It was a chance to learn about interesting topics from an expert, in a non-pressured setting."

"I got a chance to experience the physiology I had just learned in lecture, applied in the management of a real patient."

"APEP helped me academically, it also allowed me to form a good relationship with a faculty member, something I think would be hard for MS1s to do without a program like this."

"One of the best things I got out of APEP was to have a chance to experience life as an anesthesiologist. I had access to the people I wanted to learn from at this stage of my education. It was one of the best parts of my year."

- 2) According to the questionnaire, about half of the APEP students (57% in 2006-2007, 38% in 2007-2008 and 68% in 2008-2009) used the handouts to guide discussions with preceptors, enhance intra-operative teaching, and/or refer to while studying for basic science course exams.

Questionnaire survey comments regarding the handouts included:

"The handouts were good to guide discussion."

"A good reference in that they consolidated the most important information in one area."

"The handouts allowed our preceptors to know what we were studying at each point in time".

"The handouts were useful. We had received the same handouts from our basic science professors, but when used in the OR, they made the information much more applicable and therefore easier to remember."

- 3) According to the questionnaire, a majority of the APEP students (15/21 or 71% in 2006-2007, 6/8 or 75% in 2007-2008 and 20/25 or 80% in 2008-2009) were more interested in the field of anesthesiology after APEP. Comments included:

"Yes, I am more interested in anesthesiology after having participated in APEP. I initially thought anesthesiology was interesting, but I also just wanted to spend more time in the operating room and watch surgeries. Now I am actually considering anesthesiology as a specialty."

"It did peak my interest. I like the nice mix of procedures and medical care involved in taking care of the patient, which kept the day interesting."

"I have always liked the excitement of the O.R. and I used to have no doubts about going into surgery. Now I have been exposed to the other side of the O.R., anesthesiology is a serious consideration of mine."

"I am more interested in anesthesiology. I like the operating room. I enjoy the physiology and pharmacology involved. I like the idea of having clearly defined, finite ways to aid patients."

A minority of students (2/21 or 10% in 2006-2007, 1/8 or 13% in 2007-2008 and 4/25 or 16% in 2008-2009) were neither more or less interested in anesthesiology after APEP.

According to the returned questionnaires, only a minority of students (4/21 or 19% in 2006-2007, 1/8 or 13% in 2007-2008 and 1/25 or 4% in 2008-2009) were less interested in anesthesiology after APEP. One student commented, "I am less interested in anesthesiology but not because of any negative experience with APEP. I think I would enjoy a situation with more patient contact and collaboration." Another less interested student indicated a strong preference for a surgical field, but thought that APEP was "a great way for a student to see surgical cases in various different specialties."

Many students appreciated the early exposure to anesthesiology, a unique subspecialty field that is often poorly understood by medical students. APEP often helped to clarify some students' misperceptions about practicing anesthesiology. One student wrote, "I saw how broad the field is...one can learn about many more things than only putting someone out".

Although APEP students were given the opportunity to meet monthly from October to April, the students would meet with their preceptor when convenient for both. APEP encounters were discouraged during basic science classroom/lab time so as not to distract the student from basic science coursework. In 2006-2008, there was not an organized way to document APEP encounters, although most APEP students met on more than two occasions with their preceptor. In 2008-2009, a better method for tracking APEP encounters became available and most APEP students met on more than 4 occasions during the seven month program. There was no correlation between the number of APEP encounters and the student satisfaction with APEP or the interest in the field of anesthesiology after APEP.

Although APEP faculty preceptors were not sent a questionnaire, their opinions about APEP were shared with the APEP faculty director. Many preceptors observed that APEP was a simple program requiring a reasonable time commitment, and they enjoyed the student encounters. Some preceptors commented that they often teach medical students in a sporadic fashion, and APEP allowed for a more structured involvement. APEP faculty preceptors were encouraged to include this unique teaching role on their curriculum vitas, providing a way for those teaching efforts to be recognized at the medical school level and departmental level.

DISCUSSION

Early clinical exposure is becoming a more common component of medical school curricula, offering many learning opportunities for first and second year medical students. Students have deemed early clinical exposure as valuable³ and report that it may even contribute to better satisfaction with their medical education.⁵ Those experiences often involve an experienced physician preceptor, and students have claimed that these interactions reinforce their decision to pursue a medical career.³ One study showed that early clinical exposure in internal medicine (2-month clinical preceptorship between MS1 and MS2 years) can lead to favorable educational outcomes. Students that participated in this early clinical experience received higher scores in subsequent clinical medicine courses (87% and 86% vs. 84% and 84%, p 's < .01) and received a higher percentage of honors grades in third year medicine clerkships (33% vs. 10%, p < .01).⁶ Some of these early clinical programs have integrated basic science content from the classroom into the clinical experience. This integration helps to promote synthesis of knowledge and facilitates retention.⁷ Most of these early exposure programs have been in primary care fields.

APEP was designed to offer early clinical experiences in anesthesiology, a subspecialty field to which most students don't have any exposure until they are MS4s. APEP also used an integrated curriculum with handouts to enhance classroom material in the operating room setting. This curriculum was simply designed by viewing the web-based medical student curricula, incorporating actual lecture notes and diagrams into handouts (with appropriate credit given to lecture note authors) and finding appropriate clinical correlates that lent themselves to intra-operative discussions. These handouts often guided discussion between the APEP student and faculty, making APEP more than a shadowing experience for most. Communication with the basic scientists proved helpful in order to explain the role of APEP as a way to enrich the basic science coursework, not replace it. The students appreciated seeing basic science topics come alive in clinical practice and their appreciation became evident upon reading the comments on the questionnaire. Further studies to assess if participation in APEP would contribute to higher scores on basic science exams covering anesthesiology-related concepts in physiology, pharmacology and anatomy are necessary and a method for doing so is being developed.

The questionnaire survey was intentionally designed to include the student's name. The APEP faculty director was interested in obtaining specific information about this new program so that changes could be made if necessary, including reassigning preceptors or contacting interested students. This could have created some bias to the individual responses if students felt pressured to give positive feedback. It is unclear if the students were aware that the APEP faculty director had access to their names on the questionnaire, as most forms were turned in to a third party and then presented to the faculty director. The students were also aware that their de-identified comments could be used for this study and they may have thought that their comments were de-identified for the faculty director. Now that APEP has proven to be a successful program after three years, and recruitment into anesthesiology is not a primary goal, an anonymous questionnaire including a *numerical* evaluation process is being designed for next year. The low response rate (31%) for the questionnaire in 2007-2008 was likely related to the delayed timing of the questionnaire. The questionnaire was electronically sent a week after the students had been released for summer break and many students did not receive or complete it. The following year's 68% response rate may be related to better timing of the questionnaire.

Although the majority of APEP students were more interested in anesthesiology following their preceptorship, it is unclear if this interest would generate better recruitment into the field. At the very least, APEP involvement may give the MS1s and MS2s an early head start on a career in anesthesiology and give them a contact person (APEP preceptor) for career guidance. Choosing anesthesiology early on may allow some time during the third and fourth years of medical school for students to focus on research projects in the field. Not all students were attracted to anesthesiology after APEP, but at least they became more aware of the anesthesiologist's role in healthcare. A student less interested in anesthesiology after APEP is not a failure of APEP, as one of the goals is to provide early exposure to the student so that they may make a better career choice.

Although recruitment was not a primary goal of APEP, future projects are necessary to assess if APEP involvement increases recruitment into anesthesiology. Although the national data shows an increase in students matching into anesthesiology over the past three years (increase from 3.2% to 4.2%), our institutional data does show a greater increase in the percentage of students matching into anesthesiology since APEP began in 2006, an increase from 5% to 9.4%.

After an early look at the first three years, APEP appears to be a very successful program for MS1s and MS2s. There has been a modification to the program over the last two years. During the last month of APEP (April) the APEP students are invited and encouraged to prepare a 5-10 minute presentation on an anesthesiology topic that has a basic science correlate. These presentations were viewed by anesthesiology faculty and evaluations were given to each student about their presentation skills. The students enjoyed this extra opportunity to learn how to convey anesthesia concepts that related to basic science coursework. This early clinical exposure to anesthesiology can enrich the basic science classroom experience and create interest in our field. APEP can be an inexpensive, low input/high yield program for preceptor and student that could easily be duplicated at other programs.

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APPENDIX A

APEP handouts

Actual APEP handouts contain diagrams, outlines and text taken directly from students' basic science lectures and notes. Due to the nature of this content, including copyright and authorship concerns, sample APEP handouts cannot be provided. Dated outlines and basic topics can be provided and are presented below. The APEP handout content corresponded to basic science course content during most months.

MS1:

OCTOBER: Vertebral column anatomy, spinal cord anatomy, dermatome chart, practical aspects as pertinent anatomy relates to neuraxial anesthesia, difference between spinal and epidural anesthesia

NOVEMBER and DECEMBER: Airway anatomy including cricoid/arytenoid/corniculate/cuneiform/epiglottic cartilages, clinical skills include direct laryngoscopy, intubation, fiberoptic view of relevant airway structures

JANUARY: Phases of the cardiac cycle, review of Wigger's diagram, arterial line/CVP/PAP waveform, basic EKG, calculation of/factors affecting/and measurement of mean arterial blood pressure

FEBRUARY: Oxygen/hemoglobin dissociation curve and factors affecting oxygen binding, pulse oximetry, carbon monoxide and capnography, lung volumes and capacities, mechanical ventilation

MARCH: Pulmonary ventilation/perfusion mismatch, hypoxemia, hypoventilation, intraoperative evaluation

APRIL: Review any of the above topics

MS2:

OCTOBER: Cardiac conduction abnormalities, EKG tracings, lead placement

NOVEMBER: Airway anatomy review, mask ventilation, direct laryngoscopy and intubation

DECEMBER: Oxygen/hemoglobin dissociation curve and shifts in curve, hemoglobin, capnography, pathophysiologic pulmonary conditions, lung volumes, mechanical ventilation

JANUARY: Pharmacology of antihypertensives, clinical hypertension, cardiac murmurs, perioperative management and evaluation of hypertension and cardiac murmurs

FEBRUARY: Sympathetic nervous system, sympathomimetics, cholinomimetics, muscle relaxation

MARCH: Benzodiazepines and other anxiolytics, sedatives, barbiturates

APRIL: Review any of the above topics

APPENDIX B

APEP questionnaire to students

Name _____ APEP Preceptor _____

- 1) Did you find your APEP preceptor available / approachable?

- 2) Was APEP more than just a shadowing experience? (Did you go over the handouts or learn anything for Step 1 or physiology, etc.?)

- 3) Were the handouts useful for anything other than APEP? (study tool?)

- 4) Did you meet with your APEP preceptor (even if it was simply attending a lecture that you were invited to) as often as was expected? (1-2 x per month) If not, why not?

- 5) What was the best thing you got out of APEP?

- 6) Are you more interested in the field of anesthesiology after your APEP experience? Why or why not? (You will not hurt my feelings if the answer is no...please be honest.)