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Journal Watch From ACE (Alliance for Clinical Education): Annual Review of Medical Education Articles in Emergency Medicine, 2010–2011

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This review, sponsored by the Alliance for Clinical Education, highlights selected medical education articles published in Emergency Medicine journals typically not read by clinician-educators in other specialties. The authors are members of the Clerkship Directors in Emergency Medicine.

A literature search was conducted using PubMed using the subject terms *Medical Students, Internship and Residency, Clinical Clerkship, Medical Education, Undergraduate Medical Education, Graduate Medical Education, Continuing Medical Education*, and then combined with the term *Emergency Medicine*. The search was limited to full, English language original publications published between January 1, 2010, and December 31, 2011. We excluded the following journals, which have medical education contributions that are read across specialties: *Academic Medicine, British Medical Journal, Lancet, Medical Education, Medical Teacher, Journal of the American Medical Association, New England Journal of Medicine, and Teaching and Learning in Medicine*. Two independent searches were performed by Dr. Ko and Dr. Poznanski and a total of 136 articles met the aforementioned criteria.

The 136 articles were reviewed by all six authors for potential inclusion in this review. Fifty-six articles were chosen for

secondary formal review based on quality of study and potential interest to educators outside Emergency Medicine. These articles were broken up into three groups, and two authors independently reviewed each article. Each article was critiqued and scored on study design, data analysis, outcome measurements, relevance, and innovation, with weight given to the last two items. Emphasis on generalizability and potential interest to educators of other disciplines was noted by the reviewers. After this review and consensus discussions, 12 articles that were thought to highlight the most relevant and rigorous studies focusing on a wide spectrum of medical education topics were selected for inclusion in this review.

PROGRAM/CURRICULUM DEVELOPMENT

1. Friedman S, Sayers B, Lazio M, Friedman S, Gisoni MA. Curriculum design of a case-based knowledge translation shift for Emergency Medicine residents. *Academic Emergency Medicine* 2010;17:S42–8.

Despite the abundance of evidence available to clinicians, the ability to transfer that evidence-based information to the practice environment (i.e., knowledge translation) is inconsistently taught and applied. In this prospective, observational, cohort study involving emergency medicine residents, the authors design, implement, and evaluate a case-based knowledge translation curriculum that enables a resident to practice

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evidence-based medicine (EBM) in a clinical environment. The curriculum was developed using Kern's six-step design process. It included an asynchronous EBM tutorial prior to assigned emergency department (ED) shifts during which residents contributed to patient care via formal literature searches related to active management questions, a presentation of the evidence to the ED team, and logs of cases and EBM searches. The curriculum was evaluated by a pre- and postintervention self-assessment completed by the resident. Data from 41 knowledge translations shifts revealed that an EBM search was completed on 80 patients, with 13 of these (16.3%) leading to a change in management by the primary ED team. Prior to curriculum implementation, the residents felt that this experience might change their future clinical practice, and there was no significant change in this perception after implementation. This study has a small sample size, was completed at a single institution, and is limited by both recall bias and Hawthorne effect. This pilot study did not address the quality of the searches made or the significance of changes in clinical management, disposition, or ED length of stay. However, the authors did demonstrate that it is feasible to implement a novel experiential learning model promoting regular integration of EBM knowledge and skills into clinical practice. Although further study of its true effect on patient outcomes is needed, a similar curriculum is likely applicable to various programs and specialties.

2. Ilgen JS, Takayesu JK, Bhatia K, et al. Back to the bedside: The 8-year evolution of a resident-as-teacher rotation. *Journal of Emergency Medicine* 2011;41(2):190–5.

Senior residents often assume the role of bedside educators when supervising medical students and junior residents. Wide variability exists, however, in how residency programs prepare their residents to become teachers. This article provides an 8-year retrospective look at the evolution of one program's Resident-As-Teacher curriculum with insights into the lessons learned from their successes and failures. In 2002, a month-long Resident-As-Teacher rotation was created for PGY4 Emergency Medicine residents. During teaching-only shifts in the Emergency Department (ED), the resident presented brief didactic sessions, wrote and reviewed evidence-based handouts, supervised junior residents with invasive procedures, and conducted bedside teaching. In addition, during residency conference days, the resident led small-group discussions for the PGY1 class as well as presented a lecture in a large-group didactic setting. Over time, the residents felt that the rotation strayed from the original objective, which was to teach residents how to provide bedside clinical teaching. It instead became focused more on making new handouts and participating in clinical care when the ED was extremely busy. In response, the program's current Resident-As-Teacher rotation now has a consistent schedule with an assigned resident for backup coverage, a clear role with no direct patient care responsibilities, and an emphasis toward teaching about actual patient cases at the bedside and at sign-out rounds. A sample schedule and structured teaching evaluation form are included (as appendices). Although

novel, this Resident-As-Teacher rotation may not be feasible for all residency programs because of limited resources or time. As an alternative the authors suggest incorporating at least a few dedicated teaching-only shifts into the senior residents' regular clinical schedules to allow development of these skills.

3. Tintinalli JE, Shofer F, Biese K, et al. Toward a new paradigm: Goal-based residency training. *Academic Emergency Medicine* 2011;18 Suppl.2:S71–8.

There is great variability in clinical experiences among learners throughout the course of a 3-year residency training program in Emergency Medicine. This study quantitatively looked at variability in numbers and types of encounters among residency graduates. This was a retrospective analysis of three cohorts of residents (2003–2008) at one residency program to track their individual Emergency Department (ED) clinical encounters at their two training sites extracted from hospital electronic medical records. International Classification of Diseases (ICD-9-CM) codes were used for clinical conditions seen and triage Emergency Severity Index (ESI) levels used as a proxy for patient acuity. A total of 25 residents and 120,240 total ED clinical encounters were recorded, with a median of 4,836 encounters seen per resident during the 3 years. There was 30 to 60% variability in clinical encounters between individual residents, with the maximum variation (between the most productive and least productive residents) corresponding to roughly 1 year of clinical residency training. There was also significant variability seen in the number of pediatric encounters (<12 years old) and care of time-sensitive critical illnesses. The authors also listed a number of high-risk disorders that were not seen by the entire cohort of residents during their training. Length of training and clinical rotations are inadequate proxies for actual patient encounters in assessing competencies. In light of work-hour restrictions, there is more emphasis on tracking what learners are actually seeing and not seeing during their clinical training. This study is important in quantifying the significant variability in clinical encounters seen by residents. This can be addressed through more detailed clinical tracking systems and a focus on goal-based competencies.

4. Wang EE, Dyne PL, Hongyan D. Systems-based practice: Summary of the 2010 Council of Emergency Medicine Residency Directors Academic Assembly Consensus Workgroup—Teaching and Evaluating the Difficult-to-teach Competencies. *Academic Emergency Medicine* 2011;18:S110–20.

Of the six general competencies developed by the Accreditation Council for Graduate Medical Education, systems-based practice (SBP) has arguably been the most difficult to teach and evaluate in Emergency Medicine (EM) residency programs. In 2010, a consensus working group representing the Council of Emergency Medicine Residency Directors (CORD) met to discuss current and preferred regional methods for teaching and assessing SBP. They also sought to develop consensus within the CORD community with respect to EM-specific SBP domains and link these domains to specific SBP educational and evaluative methods. Consensus was developed using a

modified Delphi method. Expert modeling, informal small-group discussion, and formal small-group activities were considered to be the optimal methods to teach SBP, and direct observation methods were the preferred methods of evaluation. The working group developed a taxonomy of domains that were felt to be most essential and reflective of the practice of EM: multitasking, disposition, and patient safety. Each domain was linked to ideal learning formats as well as observable tasks for evaluative purposes. Finally, the authors concluded that SBP competency evaluation might be difficult to perform independently of the other five general competencies.

CLINICAL SKILLS TEACHING/PROCEDURAL COMPETENCY

5. Perez E, Rabrich J, Shah KH. Medical student procedures and attending faculty exposure. *Emergency Medicine Journal* 2011;28:33–36.

This study investigated the impact of continuity between teacher and student on the performance of procedures during an Emergency Medicine (EM) clerkship. This was a retrospective observational study from July 2004 to March 2007. Attendance and procedure logs of medical students were reviewed. Those students who worked four or more shifts during the month with a particular attending (study group, $n = 63$) were compared to those students who worked fewer than four shifts with any particular attending (control group, $n = 81$). The mean number of procedures performed in the study group (12.9, 95% CI [11.7, 14.0]) was higher than in the control group (6.3, 95% CI [5.4, 7.2]). This study suggests that improved continuity between teacher and student increases number of procedures performed. Subsequent work has further identified potential benefits of continuity in EM education (*Teaching and Learning in Medicine* 2012;24:194–9). These include improvements in feedback and the teacher-learner relationship. A trend towards hospitalists and shift work across many specialties may impact continuity between teachers and students. Monitoring the educational impact of changes in clinical staffing models will be important to maintain and improve medical student education.

6. Seufert TS, Mitchell PM, Wilcox AR, et al. An automated procedure logging system improves resident documentation compliance. *Academic Emergency Medicine* 2011;18:S54–8.

The Accreditation Council for Graduate Medical Education requires the documentation of procedural training of resident physicians. Various tracking methods are utilized by programs. Typically, some form of active logging by residents is performed. Trainee compliance with this requirement has been noted to be low. Electronic medical records (EMR) and health information technology have the potential to improve the recording process. This study evaluated the effect of a novel automated procedure logging (APL) system on the number of procedures logged by Emergency Medicine residents. The APL software was created specifically for the study institution. It has the ability to automatically identify procedure notes in the EMR and

upload the needed information to the web-based residency management system used at the study institution (New Innovations, Uniontown, OH). The study was a before-and-after study of resident procedures logged during two 6-month periods (pre-APL and post-APL). Procedures logged increased from 10.0 per day to 26.8 per day during the study period (M difference = 16.8), 95% CI [15.4, 18.2], $p < .001$. Further, postautomation procedure logs were more likely to be complete and accurate. This study highlights a potential pathway to more efficient and accurate procedural documentation through the use of integration of technology and may be of value for all specialties.

7. Grief R, Egger L, Basciani R, Lockey A, Vogt A. Emergency skill training—A randomized controlled study on the effectiveness of the four-stage approach compared to traditional clinical teaching. *Resuscitation* 2010;81:1692–7.

Training students and residents to perform procedures has become important as healthcare systems increasingly focus on patient safety. The traditional two-stage approach, “see one, do one,” has been replaced by the “4-stage approach” despite a lack of evidence demonstrating its superiority. The 4-stage approach includes a teacher demonstrating a skill at its original speed without commentary, repeating the procedure while describing and explaining the steps necessary to complete it, the student explaining the procedure step by step while the teacher performs it, and the student performing the procedure while explaining the steps. This study is a randomized, controlled, single-blinded parallel group trial to evaluate the acquisition of cricothyroidotomy skills among medical students on animal models. Students were randomized into four groups: traditional teaching, no Stage 2, no Stage 3, and the 4-stage approach. Each group received Stage 1 instruction via a video of the procedure and also practiced Stage 4 a minimum of 10 times with feedback. The primary outcome of the study was the ability of the students to successfully perform a percutaneous needle-puncture cricothyroidotomy timed by research assistants blinded to the groups. A total of 128 students (32 per group) were randomized and completed the study. After the intervention, there were no statistically significant differences found between groups for the performance of a cricothyroidotomy. All groups demonstrated a similar decrease in performance time from the first through the fourth attempt. This was a single institution study, skills assessed in a simulated setting only, and neither long-term knowledge retention nor translation to a real clinical setting was assessed. This study highlights that the method used to teach a procedural skill is less important than providing adequate time for the learners to practice the skill in a controlled setting. Because all groups received directed feedback with each Stage 4 attempt, it may be that this component of skill acquisition is most important rather than the randomization allocation.

SIMULATIONS

8. Adler MD, Vozenilek JA, Trainor JL, et al. Comparison of checklist and anchored global rating instruments for

performance rating of simulated pediatric emergencies. *Simulation in Healthcare*. 2011;6:18–24.

Many tools have been utilized for performing simulation-based assessment. Checklists are frequently used as they produce objective, reliable data, and easily reproducible scores. Well-written checklists also have the advantage of high inter-rater reliability and favor thoroughness without regard to the timing of recorded actions. Weaknesses of checklists include the inability to convert all learning objectives into a dichotomous answer. Global assessments have the advantage of capturing specific performance information, yet have the disadvantage of requiring more advanced rater training to prevent concerns about interrater reliability. This study was a two-group randomized trial design with a waitlist control condition to compare the psychometric performance of a checklist and a Global Performance Assessment Tool (GPAT). Seventy-seven Emergency Medicine residents were randomized, with 69 completing the study, to receive a single-day simulation-based educational intervention followed by immediate assessment or delayed assessment. Two raters independently completed both the checklist and the GPAT. The primary outcome was the summary score of the instruments obtained for the evaluation cases. The main contributors to score variation were the resident and the interaction between the resident and the case. These two factors accounted for 79 to 83% and 92 to 94% of the variation, respectively. As the instrument sought to detect differences between learners, the significant variations indicated the desired outcome. Score variation due to interrater reliability contributed little (0–4.5%). Both the checklist and the GPAT performed in a similar fashion with high reliability. Although this study was limited by a small sample size, both tools were able to detect a deficiency in resident knowledge in the management of pediatric cases with a high level of reliability. This allows evaluators to collect reproducible data for the population in concern. This work could assist other educators in the design and evaluation of similar tools to assess medical learners.

9. Auerbach M, Kessler D, Foltin JC. Repetitive pediatric simulation resuscitation training. *Pediatric Emergency Care* 2011;27:29–31.

Educators are challenged to implement novel yet effective learning tools due to work-hour restrictions and other factors leading to diminishing trainee exposure to various high-stakes clinical scenarios (such as pediatric resuscitations). High-fidelity simulation provides a safe and controlled environment that allows learners to gain necessary and missing experiences; however, the authors propose that the traditional method of debriefing does not allow the learner to complete key components of Kolb's adult experiential learning cycle, namely, an active experimentation phase. In this prospective study, residents completed either standard pediatric simulation (STN) training (scenario-debriefing) during the first 6 months of the study, or repetitive pediatric simulation (RPS) training (scenario-debriefing-scenario), during the second 6 months of the study. Participants subsequently completed an anonymous survey to

compare the effectiveness of the two methods with respect to self-reported knowledge, skills, and attitudes. The RPS group more frequently reported strong agreement that "the simulation experience improved their knowledge and skills" ($p = .005$ and $.022$) and that the debriefing was of higher quality and "a good teaching method" ($p < .005$) despite the simulation scenarios being briefer in order to accommodate two scenarios within a single session. Although this data implies that the opportunity to immediately apply skills learned in a simulated patient encounter leads to improved knowledge and skill, there were several limitations. Data were not collected concurrently, creating a historic control when comparing STN and RPS groups. In addition, the difference in timing of data collection allowed for possible bias secondary to increased experience of the resident. Despite these limitations, the authors have proposed a novel adjustment to improve the efficacy and appeal of simulation training as a learning tool by allowing immediate application of the knowledge and skills discussed during debriefing. Further studies could assess this format's contribution to improve retention and overall performance.

QUALITY IMPROVEMENT AND PATIENT SAFETY

10. Ilgen JS, Bowen JL, Yarris LM, Fu R, Lowe RA, Eva K. Adjusting our lens: Can developmental differences in diagnostic reasoning be harnessed to improve health professional and trainee assessment? *Academic Emergency Medicine* 2011;18 Suppl.2:S79–86.

Cognitive theories suggest that problem-solving strategies and clinical reasoning skills depend on clinical expertise and case complexity. This study assessed whether the encouragement of different modes of reasoning would also improve these skills. In this prospective, single-site, cross-sectional study, 115 subjects (26% response rate) were enrolled. The subjects were novice (medical students), intermediate (PGY1 and 2), and expert clinicians (PGY3 and faculty) from Emergency Medicine and Internal Medicine who answered 12 online case-based questions with six simple and six complex cases. The participants were instructed to approach the questions using one of two modes of reasoning (analytic vs. nonanalytic) with a stratification scheme where each mode had three simple and three complex cases. The nonanalytic reasoning section instructed participants to list their quick first-impression diagnosis, whereas the analytic reasoning section explicitly asked participants to perform a careful, directed search throughout the case. Using a fixed-effects model of analysis of variance, simple case complexity and expert clinical experience were expectedly found to be associated with greater diagnostic accuracy, $F(2, 112) = 22.4, p < .001$, and $F(1, 112) = 368.3, MSE = 19.1, p < .001$, respectively. Of interest, diagnostic accuracy and reliability (expert clinicians could be discriminated from novices) were greatest when participants were instructed to follow a directed, analytic approach. Furthermore, the authors found that simple cases most reliably discriminated among novices, complex cases

most reliably discriminated among intermediate clinicians, and neither case type reliably discriminated among expert clinicians independent of the mode of reasoning. These results provide useful insight to guide educators in the design of tests to assess different learner levels in their diagnostic and reasoning skills.

11. Pines JM, Prabhu A, McCusker CM, et al. The effect of ED crowding on education. *American Journal of Emergency Medicine* 2010;28:217–20.

Increasing Emergency Department (ED) volumes and crowding has been a problem in academic tertiary-care hospitals, and its negative affects on attending physician's ability to engage in bedside and clinical teaching has been suggested. The authors performed a prospective cross-sectional study over a 5-week period in an urban, academic ED to test the impact of ED crowding measures on the quality of resident and medical student education. Attending physicians were assessed using a 5-point scale over four domains (teaching, clinical care, approachability, and helpfulness) by learners using a validated instrument tool (ER Score for teaching on individual patients). After each teaching encounter, the learner filled out the survey with the maximum score of 20 (5 point for each domain). A total of 43 residents and three medical students assessed 34 teaching attendings in 352 separate patient encounters. The four ED crowding measures at the time of the survey as defined by the authors were (a) waiting room numbers, (b) ED occupancy as a percentage of total ED beds occupied, (c) number of admitted patients in the ED (ED boarders), and (d) patient-care hours (sum of total hours all patients had spent in the ED). The median ER Score was a 16/20, and using logistic analysis, the authors found no correlation between ER Score and ED crowding levels or between individual ED crowding and individual attending scores. Using adjusted analysis, the authors did not find an association

between ED crowding measurement association and each attending assessed. The limitations of the study are the single institution and limited sample size, primarily of residents and very few medical students. This study suggests that despite the increased demands on attending physicians from increased clinical volumes, measurements of teaching assessments do not show a correlation between quality of teaching interactions and ED crowding.

12. Dhingra KR, Elms A, Hobgood C. Reducing error in the Emergency Department: A call for standardization of the sign-out process. *Annals of Emergency Medicine* 2010;56:637–42.

Seventy percent of all sentinel medical errors arise from communication breakdowns, and 50% of these errors occur during the handoff of care. This consensus paper highlights the elements, contents, and methods needed to ensure an appropriate sign out process between Emergency Medicine providers. The elements of a standardized sign-out include appropriate content, communication techniques, environmental controls, team-based training, and education. Communication techniques include SBAR (situation, background, assessment, recommendation) and repeat back techniques. Written or electronic formats of communication also play a vital role in the transfer of information. Environmental controls should focus on the reduction of interruptions. Teamwork plays a significant role in error reduction and team-training exercises for sign-outs, based on the example of the MedTeams Project modeled after the aviation industry. Formal education on the importance of the sign-out process is essential for both experienced emergency physicians and emergency and nonemergency resident learners. The authors argue that a standardized sign-out system would promote safer care and allow focused research to be performed during these transitions.