

The Empiricists Strike Back

Medical Education 2012

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Everything we see hides another thing, we always want to see what is hidden by what we see. There is an interest in that which is hidden and which the visible does not show us.

René Magritte, on his painting *The Son of Man*

THE DISCIPLINE OF SEMIOTICS EXAMINES OVERT AND covert communication, investigating sometimes hidden messages as signs of something more profound. Medieval literature was written to be understood on both the literal level of the story and on a higher level of a moral or allegorical message. Representational art can be appreciated by reflecting not only on the image but also on a deeper message it may convey. The articles that comprise the 2012 JAMA medical education theme issue can also be considered on 2 levels.

The direct messages of the studies relate to 3 themes: the quality of the educational experience, improving the content of education, and evaluating current and future physicians. The studies by Lucas and colleagues¹ and Volpp and colleagues² address the quality of inpatient education from the attending and resident perspective, respectively. Although each focuses on a different place along the medical practice continuum, both represent a search for solutions to major changes that have taken place in inpatient training experience due to factors that include duty hour restrictions, quality improvement efforts, and the increased prevalence of hospitalists.³

Faced with a trend of shorter inpatient teaching attending durations, Lucas et al¹ assessed the effect on patients of 2-week vs 4-week rotations, whereas Volpp et al² studied whether establishing a mandatory protected sleep period at 2 institutions would change intern nap behavior while on call. Each study assessed outcomes deemed important: for Lucas et al, the primary outcome was 30-day unplanned patient return visits, similar to the 30-day readmission rate commonly used as a metric of hospital quality. Although the main goal was to establish whether shorter rotations could be implemented without a worse patient outcome, the study also evaluated whether there were benefits to the attending (such as less burnout) or harms to the educational experience (as assessed by medical students and residents). The findings of no evidence of harm to patients, but a trade-off between personal benefit to the attending at the

possible expense of a decrement in education quality, were important enough to result in a change in practice at the authors' institution, allowing attendings to choose their preferred rotation length. Volpp et al² focused on the amount of sleep achieved by interns while on call and found a clinically important improvement. As a secondary outcome, the study included 30-day patient readmissions, with a null finding that must be interpreted with much caution given the underpowering for this end point. Although the studies have limitations, it is notable that patient-related outcomes were recognized by the researchers as important to measure. The relationship between trainees and patients is further explored in the Viewpoint by Arora and colleagues,⁴ which addresses issues surrounding resident professionalism in the current training environment.

The second theme in this issue of JAMA, improving the quality of education, was addressed in a study by Kulier and colleagues,⁵ remarkable for its execution of a complex design in resource-limited countries. Evidence-based medicine (EBM) has been increasingly recognized around the world as a core model for education and practice. However, even under the best of circumstances, training in EBM can be a challenge to successfully implement, and those challenges are compounded in low- and middle-income countries. Kulier et al conducted a cluster-randomized, multisite, multinational study in such countries, testing an approach that combined electronic learning with integration of the teaching into clinical practice. The study found an improvement in knowledge, skills, and some aspects of the educational environment compared with an established but more passive set of curricular materials. The editorial by Prasad⁶ discusses the particular importance of adequate EBM training in developing countries. The Viewpoint by Rothberg⁷ presents approaches to establishing a resident research program that has the potential to pragmatically reinforce the concepts of EBM in clinical training.

Another aspect related to the quality and character of education is represented in the Research Letter by Kim and colleagues.⁸ The authors studied implementation of a mandatory policy requiring that all lectures to medical students include a disclosure of the lecturer's conflicts of interest. The authors found that this policy was associated with a more

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critical attitude toward industry among the students, but not with a change in attitudes about the influence of conflicts of interest on educators or educational content.

The third theme in this issue, evaluation, is addressed in studies by Eva and colleagues⁹ and Yeates and colleagues.¹⁰ Eva et al examined the process of evaluating medical school applicants used by McMaster University (the multiple mini-interview) with a goal of selecting those most likely to be successful, as defined by the value that the school places on communication, collaboration, and ethics. The process involves candidates rotating through a series of stations, with a short time to perform a task and immediate evaluation by an examiner. Using a metric of subsequent scores on Parts I and II of the Medical Council of Canada Qualifying Examination, the authors demonstrated signs of success when comparing accepted applicants (whether matriculated at McMaster or elsewhere) against those who were rejected by McMaster but who were but accepted elsewhere. In particular, there was better performance in the Part II examination subscores for Considerations of Legal, Ethical and Organizational aspects of practice and for Patient Interaction, consistent with the school's admission goals. As the authors acknowledge, the value of these findings is not in promoting a single approach to medical school admissions, but rather in demonstrating the feasibility of objectively studying whether a school's approach is accomplishing its goals. In an accompanying editorial, Kirch¹¹ broadens the context of this study by considering the overall goal of an admissions process and how this relates to anticipating the necessary capabilities of physicians who will be practicing in the future.

Yeates et al¹⁰ focused on the type of subjective observed performance evaluation that is common for physicians at all stages of training and practice. Their randomized study, conducted among 41 attending physicians in the United Kingdom observing videos of resident mini-clinical evaluation exercise performances, found signs of a potentially very important bias. Physicians who observed high-quality resident performances systematically scored subsequent borderline performances lower than those who had initially observed poor-quality performances. The possible implications are substantial, because such observed performances are a core component of student and resident evaluations. The findings suggest artifactual benefit or harm to the scoring of a trainee based on the quality of the preceding examinee. If such a bias exists, it may also operate in the type of admissions process used at McMaster.⁹

Future physicians are also the subject of the study by West and Dupras,¹² who assessed the career plans of internal medicine residents, particularly focusing on their intention to pursue primary care. Although the overall finding of relatively low interest in primary care is not surprising, what was striking was this was also true of residents enrolled in a primary care track, as well as of international medical graduates (IMGs). In an accompanying editorial,

Schwartz¹³ relates issues of the future of the primary care workforce to the future of graduate medical education funding. The Viewpoint by Traverso and McMahon et al¹⁴ considers some of the repercussions of an anticipated loss of IMGs from the medical workforce. In *A Piece of My Mind*, Rajput¹⁵ discusses his own experience as an IMG adapting to the United States.

The findings of all of these studies in this theme issue of *JAMA* have the potential to inform both the organization of medical education activities and the evaluation of current and future trainees. However, it is also valuable to view these reports on a second, less direct level, considering what messages they contain as signs about medical education research overall.

Historically, medical education was not empirically driven. Models of education have often been based on tradition within the medical field ("this is how I learned, and I came out great"), extensions of approaches from other disciplines and professions ("this is how pilots learn, and they come out great"), or intuition of what might work best or be most effective—all of which run counter to the tenets behind EBM. There is a parallel to clinical medicine, which has undergone a progression to more rigorous standards of evidence. The initial lag in evidence-based medical education may have first reflected a lack of consensus around the value of formal approaches to investigation, but later a lack of the necessary tools to conduct such investigations. As formal research into medical education questions began to develop, the methods were recognized as frequently inadequate, with calls for improvement in the quality of the research, in line with the improvements in study designs and execution that had developed in clinical medicine and epidemiology.¹⁶⁻¹⁸ Along with this came recognition of the importance of choosing the most relevant outcome metrics.^{19,20}

The result has been progressive sophistication in the methods of inquiry being brought to bear on medical education questions,²¹ reflected in this issue of *JAMA*. This year saw an unprecedented number and percentage of randomized trials among the submissions for the medical education theme issue, including 4 of the articles ultimately chosen for this issue. Moreover, the complexity of the approaches is a manifestation of the complexity of the problems being studied. These approaches include cluster randomization^{1,5} and crossover¹ designs, and multisite^{2,5} and multinational⁵ study populations. Lucas et al¹ chose a noninferiority design, an appropriate use of this approach given the pragmatic question being asked (Is a shorter attending rotation no worse than a longer one with respect to patient revisits, given a reduced risk of the adverse event of attending burnout?). Investigators chose patient-related primary or secondary outcomes^{1,2} or meaningful measures of educational achievement^{5,9} and focused on objective measurements.

These studies all have limitations, reflecting the unique challenges of this realm of research compared with, for example, clinical trials in cardiology or neurology. In medical education research, clinical outcomes are generally separated far in time from the educational interventions and so either cannot be measured or are more susceptible to intervening confounding. More easily assessed intermediate outcomes have not been clearly standardized. Educational interventions are rarely performed in clean experimental isolation, and possibilities of contamination or cointerventions are difficult or impossible to eliminate. Large sample sizes for adequate study power and conduct across multiple sites may not be feasible. Nevertheless, the authors of the studies in this issue of *JAMA* designed and executed trials to answer important practical questions, rather than only basing decisions to change inpatient durations, establish protected sleep time on call, or implement an e-learning EBM curriculum on unproven assumptions.

As with other disciplines, high-quality research comes at a price. The quality of medical education research has been shown to be directly related to the level of funding.^{22,23} It is notable that many of the studies in this issue of *JAMA* received external support, with sources including the World Health Organization,⁵ the Department of Veterans Affairs,² and national⁸ and regional¹ foundations. For such research to become even more prevalent will require a greater commitment to funding, along with more skilled researchers, with a pool that may be enhanced by residency research programs such as those described by Rothberg.⁷

An apple covering a face, what lies behind, a search for knowledge: similar to surrealists such as Magritte, researchers probing the questions of medical education are looking beyond the visible to see that which is hidden. These efforts are bringing an empirical evidence base to the important decisions guiding curriculum development and implementation, to the structure of didactic and clinical education, and to health care workforce issues, all with the ultimate goal of improving individual and public health. As with clinical research, qualitative and observational data will always be necessary components of this process, but the methods being used to answer these questions have become and will continue to be increasingly more sophisticated. This has the potential for more precise and informative answers, and for an expectation of empiricism as the norm rather than the exception in medical education.

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REFERENCES

- Lucas BP, Trick WE, Evans AT, et al. Effects of 2- vs 4-week attending physician inpatient rotations on unplanned patient revisits, evaluations by trainees, and attending physician burnout: a randomized trial. *JAMA*. 2012;308(21):2199-2207.
- Volpp KG, Shea JA, Small DS, et al. Effect of a protected sleep period on hours slept during extended overnight in-hospital duty hours among medical interns: a randomized trial. *JAMA*. 2012;308(21):2208-2217.
- Wachter RM, Vergheze A. The attending physician on the wards: finding a new homeostasis. *JAMA*. 2012;308(10):977-978.
- Arora VM, Farnan JM, Humphrey HJ. Professionalism in the era of duty hours: time for a shift change? *JAMA*. 2012;308(21):2195-2196.
- Kulier R, Gülmezoglu AM, Zamora J, et al. Effectiveness of a clinically integrated e-learning course in evidence-based medicine for reproductive health training: a randomized trial. *JAMA*. 2012;308(21):2218-2225.
- Prasad K. Teaching evidence-based medicine in resource-limited countries. *JAMA*. 2012;308(21):2248-2249.
- Rothberg MB. Overcoming the obstacles to research during residency: what does it take? *JAMA*. 2012;308(21):2191-2192.
- Kim A, Mumm LA, Korenstein D. Routine conflict of interest disclosure by pre-clinical lecturers and medical students' attitudes toward the pharmaceutical and device industries. *JAMA*. 2012;308(21):2187-2189.
- Eva KW, Reiter HI, Rosenfeld J, Trinh K, Wood TJ, Norman GR. Association between a medical school admission process using the multiple mini-interview and National Licensing Examination scores. *JAMA*. 2012;308(21):2233-2240.
- Yeates P, O'Neill P, Mann K, Eva KW. Effect of exposure to good vs poor medical trainee performance on attending physician ratings of subsequent performances. *JAMA*. 2012;308(21):2226-2232.
- Kirch DG. Transforming admissions: the gateway to medicine. *JAMA*. 2012;308(21):2250-2251.
- West CP, Dupras DM. General medicine vs subspecialty career plans among internal medicine residents. *JAMA*. 2012;308(21):2241-2247.
- Schwartz MD. The US primary care workforce and graduate medical education policy. *JAMA*. 2012;308(21):2252-2253.
- Traverso G, McMahon GT. Residency training and international medical graduates: coming to America no more. *JAMA*. 2012;308(21):2193-2194.
- Rajput V. Not born in the USA. *JAMA*. 2012;308(21):2197-2198.
- Carney PA, Nierenberg DW, Pipas CF, Brooks WB, Stukel TA, Keller AM. Educational epidemiology: applying population-based design and analytic approaches to study medical education. *JAMA*. 2004;292(9):1044-1050.
- Dauphinee WD, Wood-Dauphinee S. The need for evidence in medical education: the development of best evidence medical education as an opportunity to inform, guide, and sustain medical education research. *Acad Med*. 2004;79(10):925-930.
- Lim JK, Golub RM. Graduate medical education research in the 21st century and *JAMA* on call. *JAMA*. 2004;292(23):2913-2915.
- Kalet AL, Gillespie CC, Schwartz MD, et al. New measures to establish the evidence base for medical education: identifying educationally sensitive patient outcomes. *Acad Med*. 2010;85(5):844-851.
- Haan CK, Edwards FH, Poole B, Godley M, Genuardi FJ, Zenni EA. A model to begin to use clinical outcomes in medical education. *Acad Med*. 2008;83(6):574-580.
- Baernstein A, Liss HK, Carney PA, Elmore JG. Trends in study methods used in undergraduate medical education research, 1969-2007. *JAMA*. 2007;298(9):1038-1045.
- Reed DA, Kern DE, Levine RB, Wright SM. Costs and funding for published medical education research. *JAMA*. 2005;294(9):1052-1057.
- Reed DA, Cook DA, Beckman TJ, Levine RB, Kern DE, Wright SM. Association between funding and quality of published medical education research. *JAMA*. 2007;298(9):1002-1009.