EDUCATION

To the point: a primer on medical education research

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This article, from the To the Point series prepared by the Association of Professors of Gynecology and Obstetrics Undergraduate Medical Education Committee, provides educators with an introduction to medical educational research by describing the framework of educational scholarship, discussing the similarities and differences between clinical and educational research, reviewing the key steps in educational research, and providing examples of well-designed studies in the field of obstetrics and gynecology.

Key words: educational scholarship, medical education, medical students, obstetrics and gynecology, research methods, residents, simulation, study design

The optimal approach to medical education should involve selecting the best educational interventions based on evidence. A rigorous, evidence-based approach to medical education has the potential to improve the student's competency as well as to directly benefit patients. This connection between patient care and medical education underlies the importance of conducting and reporting quality medical education research.

Although most clinician educators are exposed to epidemiology and clinical research methods during medical school and residency training, a similar exposure to educational research methods is lacking. Therefore, the goal of this article was to provide clinician educators with an introduction to medical education research by describing the framework of educational scholarship, discussing the similarities and differences between clinical and educational research, reviewing the key steps in educational research, and highlighting examples of well-designed educational studies in the field of obstetrics and gynecology.

The framework of educational scholarship

Prior to 1990, the dominant view of a scholar was to be a researcher in the basic science or clinical domains, and publication was the only measure of scholarly productivity.[1] *Scholarship Reconsidered: Priorities of the Professoriate*,[1] a groundbreaking report commissioned by the Carnegie Foundation and authored by Earnest Boyer,[1] ignited a national dialogue that changed our understanding of what defines scholarship and how it can be measured.

Boyer[1] proposed a broader view of scholarship by dividing it into 4 categories: discovery (the pursuit of new knowledge), integration (synthesizing new knowledge into the broader context), application (applying new knowledge to solve problems), and teaching (transferring new knowledge to educate and entice future scholars). This division of the intellectual functions of scholarship opened the door for all academicians to have equal standing in the role of the professoriate. In that vein, Boyer urged, "While not all professors are likely to publish with regularity, they, nonetheless, should be first-class scholars."[1]

This new paradigm of scholarship required a universal standard by which the quality of scholarship in each domain could be assessed. This issue was addressed in a second Carnegie Foundation report, which defined 6 standards for assessing scholarly work: clear goals, adequate preparation, appropriate methods, significant results, effective communication, and reflective critique.[2]

A systematic approach to the assessment of teaching involving each of these standards of scholarship opens the door for faculty to engage in educational research. Therefore, the remainder of this article will discuss how research methods once reserved only for the scholarship of discovery can now be applied to the scholarship of teaching. We will demonstrate how the traditional research framework can be adapted to allow educators to establish the efficacy of their teaching methods and products.

Clinical research vs educational research

Clinical and educational research use the same fundamental principles but may differ in their terminologies. Both clinical and educational research can be broadly categorized as either empiric or nonempiric. Empiric research involves collection of new data from firsthand observation, such as in a study of an intervention, whereas nonempiric research involves locating and comparing existing data, such as a systematic review of the literature.

Similarly, both clinical and educational research can be categorized as either basic or applied. Basic research explores a general theory and may not have immediate or clear implications for practice, whereas applied research involves a specific population and has immediate and clear implications for practice.[3]

Similar to clinical research, educational research involves 3 basic types of study methods: quantitative, qualitative, and mixed methods. Quantitative studies are hypothesis driven. They are used to identify association and/or causation and involve collection of data for discrete

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Received Oct. 13, 2011; revised Dec. 8, 2011; accepted Dec. 21, 2011.

The authors report no conflicts of interest.

Reprints not available from the authors.

0002-9378/$36.00

http://dx.doi.org/10.1016/j.ajog.2011.12.025

TABLE 1
A comparison of applied educational and clinical research study designs

Applied educational research design		Applied clinical research design
Experimental	↔	Experimental
Posttest-only control group	↔	Randomized controlled trial (RCT)
Group A: R ----------X----------O		
Group B: R ----------O		
Pretest/posttest control group	↔	RCT
Group A: R------- O_1 ---------X----------O_2		
Group B: R -------O_1----------O_2		
Solomon 4 group	↔	2 × 2 factorial RCT
Group A: R--------- ----------X----------O_2		
Group B: R ----------O_2		
Group C: R------- O_1 ---------X----------O_2		
Group D: R -------O_1- ----------O_2		
Quasiexperimental	↔	Observational
One-shot case study	↔	Case series
X----------O		
One group pretest/posttest	↔	Longitudinal
O1----------X----------O2		
Posttest-only nonequivalent group	↔	Cohort
Group A: X----------O		
Group B: X----------O		
Alternative treatment posttest-only nonequivalent group	↔	Cohort
Group A: X_1----------O		
Group B: X_2----------O		

X represents an exposure of a group to an experimental variable or event, the effects of which are to be measured; O represents an observation or measurement; R indicates random assignment; the Xs and Os in a given row are applied to the same specific persons.

Nuthalapaty. Primer on medical education research. Am J Obstet Gynecol 2012.

variables. The results of a quantitative study are communicated through reporting of statistical analyses.[3]

By comparison, qualitative studies are descriptive and have an exploratory focus. They provide insight into attitudes, behaviors, values systems, concerns, motivations, aspirations, culture, or lifestyles through the analysis of unstructured information.[3] Qualitative research typically involves gathering information through methods such as participant observation, structured interview, focus groups, or analysis of documents and materials.[4] Accordingly, the results of a qualitative study are communicated in a case-report or narrative format.

Mixed-method research involves not simply collecting both qualitative and quantitative forms of data but also using them in tandem to create a stronger study.[4] For example, a mixed-method design may involve observations and interviews (qualitative data) combined with surveys (quantitative data). These data can then be analyzed to look for convergence of findings or integrated to reinforce complementary findings.

The differences between applied clinical research and applied educational research begin to emerge in their terminologies for comparative effectiveness study designs. Applied clinical research study designs are clearly stratified into experimental studies (randomized trials) or observational studies (case-series, case-control, and cohort), whereas, instead of experimental and observational, applied educational studies are categorized into experimental and quasiexperimental studies. Table 1 provides a linkage map that compares the primary types of applied clinical and applied educational research study designs (readers should make note of the unique annotation system used to describe educational study designs[5]). Most clinical educators' familiarity with applied health research designs can help ease the transition to understanding the educational research process. Readers interested in gaining more in-depth knowledge about educational research study designs should consult the text of Creswell.[4]

The educational research process

The educational research process consists of 7 sequential steps (Figure). The first step in the process is formulation of the research question. The inspiration for the best research questions is most often real-life experience. Every interaction with learners, curricular innovation, or faculty development intervention has the potential to lead to scholarly investigation. Inspiration can be converted into a structured research question using the PICOT[6] format, which breaks a research question into 5 components (Table 2). The PICOT format's value, however, extends beyond framing the research question. Many research reports in medical education lack essential elements, such as descriptions of study design, setting, participants, study intervention, and comparison group.[7] Using the PICOT format when writing educational research reports has been associated with better overall reporting quality and better reporting of key methodologies in the final dissemination of the scholarly work.[8]

Once the preliminary research question is formulated, the FINER criteria can be applied to determine the quality of the research question (Table 2). As depicted in the Figure, the literature review