A Pediatrics-Based Instrument for Assessing Resident Education in Evidence-Based Practice

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Objective.—The principles of evidence-based practice (EBP) are a mandated component of the pediatric residency curriculum; however, a pediatrics-based assessment tool validated with pediatric residents does not exist.

Methods.—We designed an assessment instrument composed of items in 4 categories: 1) demographics; 2) comfort level; 3) self-reported practice of EBP; and 4) EBP knowledge. This last section required participants to identify best evidence and most appropriate study design by using pediatric-based scenarios, develop searchable questions, and use existing published research to address diagnostic and treatment issues. Four groups completed the instrument: preclinical medical students (MS-2), incoming pediatric interns (PGY-1), incoming second- and third-year pediatric residents (PGY2-3), and expert tutors (expert). We determined internal consistency, interrater reliability, content validity, item difficulty, and construct validity.

Results.—Fifty-six subjects completed tests (MS-2, n = 13; PGY-1, n = 13; PGY2-3, n = 22; expert, n = 8). Internal reliability was good, with Cronbach's $\alpha = .80$. Interrater reliability was high ($\kappa = 0.94$). Items were free of floor or ceiling effects. Comfort level and self-reported practice of EBP increased with expertise level and prior EBP experience ($P < .01$). Scores on the knowledge section (out of 50 ± SD) rose with training level (MS-2: 14.8 ± 5.7; PGY-1: 22.2 ± 3.4; PGY2-3: 31.7 ± 6.1; experts: 43 ± 4.0; $P < .01$). Scores also correlated with prior EBP education.

Conclusions.—We have developed a reliable and valid instrument to assess knowledge and skill in EBP taught to pediatric residents. This instrument can aid pediatric educators in monitoring the impact of the EBP curriculum.

KEY WORDS: evidence-based medicine; evidence-based practice; pediatrics; postgraduate medical education; undergraduate medical education

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Evidence-based practice (EBP) refers to the use of the current best evidence in making decisions about the care of individual patients.[1] In the last 2 decades, the teaching and practice of EBP have risen to high priority in the academic medical community and in the field of pediatrics.[2] The Accreditation Council for Graduate Medical Education (ACGME) recognizes the importance of EBP and the need for residents to be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices (the practice-based learning and improvement competency).[3] The Academic Pediatric Association also encourages pediatric residency programs to focus on the content and skills of EBP.[4]

As pediatric educators implement training in EBP, they need instruments to evaluate the impact of these new curricula.[5] In a 2006 systematic review, Shaneyfelt and colleagues[5] identified 104 unique reports of instruments evaluating EBP where there was sufficient description to permit analysis and quantitative results. Only half of the instruments demonstrated at least 1 type of validity, whereas very few instruments documented multiple forms of validity evidence. No instrument validated with pediatric residents established multiple forms of validity. Specifically, the Berlin and Fresno questionnaires were noted to be the instruments that evaluated all components of EBP knowledge, but even those instruments are not ideal.[5,6] The Berlin questionnaire restricts assessment to EBP applied knowledge. The Fresno questionnaire requires considerable time and expertise to grade. Increasing scores on the Berlin and Fresno examinations did not differentiate amongst levels of resident learners.[5–7]

Pediatric educators who implement EBP curricula need instruments to document the EBP ability of individual trainees and to assess the success of new curricula. Cognitive science suggests that the context in which information is learned plays a role in its accessibility.[8] It would follow that an assessment instrument whose clinical examples are true to a residents' actual practice can result in more accurate assessment in which less effort is devoted to decoding the clinical information and more effort is devoted to the EBP principles. In the review of Shaneyfelt and colleagues,[5] we note that there were multiple examples of instruments for all of the major surgical and medical specialties except for pediatrics, where there was only 1 validated with pediatric residents. Our aim was to develop and validate an instrument based on pediatric content for assessing EBP knowledge of pediatric residents.

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METHODS

Setting

The development and validation of the instrument was carried out in a large academic hospital. The institutional review board at Columbia University approved the study. The pediatric residency program is composed of 20 residents a year, totaling 60 residents in all. Approximately 25% of these residents are male. The EBP curriculum in our residency program uses the *Users' Guides to the Medical Literature: A Manual of Evidence-Based Clinical Practice* as the core text.[9] Pediatric residents receive a weekly teaching conference emphasizing key EBP concepts, including how to properly evaluate published articles. Third-year residents are also taught to incorporate EBP into their "grand rounds" lecture by being assigned an EBP mentor who helps them appraise and assimilate published literature.

Instrument Development

Conceptual Model

Our conceptual model of EBP expertise was developed during a series of meetings of the investigators, local EBP experts, and clinical educators. It held that with increasing education in EBP, practitioners would 1) report increasing comfort with EBP techniques (comfort with EBP); 2) have increasing self-efficacy with the use of EBP concepts and methods (self-reported practice of EBP); and 3) show measurably improved knowledge and skill in using the concepts of EBP to solve realistic patient problems (knowledge).

Item Development

We wrote demographic, comfort level, and self-reported practice of EBP questions based upon our conceptual model. Based on the social cognitive theory of self-efficacy, questions concerning comfort level and self-reported practice of EBP are important as they are likely to correlate with actual behavior. If a person perceives himself/herself to be capable of performing in a certain manner, then he/she is more likely to attain that goal.[10] For these questions, we relied heavily on unpublished questions developed by Dr John Frohna when at the University of Michigan (J. Frohna, personal communication, July 2006). He used these questions as the tool to assess his residents' comfort level and self-reported practice of EBP, both before and after evidence-based medicine (EBM) teaching sessions. For the knowledge portion of the instrument, we developed items according to a content map based on our residency program's curriculum and a core text.[9] Although core texts on EBP usually specify 4 major types of questions, we focused on *diagnosis* and *therapy* as being most relevant to general pediatricians. Ideas for questions also came from previous validated questionnaires like the Fresno and Berlin questionnaires.[6,7] We wrote open-ended questions to ensure a higher order of thinking.[6]

Local EBP experts revised each draft by using the Delphi method.[11] According to their feedback, we eliminated or edited items to decrease ambiguity and to ensure content validity. We developed scoring criteria for the knowledge items based upon key words and correct calculations. Most questions scored out of 5 points, with partial credit given for incomplete answers.

Instrument Description

The instrument divides into 4 parts: demographics, comfort level, self-reported practice of EBP, and EBP knowledge. The section on basic demographic information asks about the participant's age, gender, previous education, and prior EBP exposure. The comfort level section asks 6 Likert-type items, such as comfort in one's ability to generate a clinical question, access a computer database like Medline, or critically appraise an article dealing with a new therapeutic intervention (Figure 1). The section on self-reported practice of EBP asks 7 items, such as how often one searches articles to answer a clinical question or generates clinical questions applicable to his or her patient's diagnostic or therapeutic plan.

The final section, which is also the bulk of the instrument, is EBP knowledge. There are 10 constructed response questions. We wrote 2 versions of the questions that tested identical concepts. Having 2 knowledge question sets allows us to administer the assessment twice without the user being able to rely on superficial similarity. In the validation study, each set was done by half of the participants.

The 10 questions are organized around 2 pediatric clinical scenarios: a "therapy" scenario (eg, which drug to use in asthma or which rehydration therapy to use for gastroenteritis) and a "diagnosis" scenario (eg, which diagnostic test to use for a urinary tract infection or which screening criteria to use to predict serious bacterial illness in babies).

For the therapy scenario, the participant must answer where one would search for the best evidence, how to form a searchable question, and what is the best type of study design to answer the clinical question. Then, 2 abstracts from the medical literature are provided. The participant must answer which abstract better answers the question and, based on the abstract, what is the number needed to treat (ie, to prevent one hospitalization). We believe that using published abstracts requires trainees to understand the validity of the published study and its relevance to the care of his or her patient. All abstracts are credited to their respective authors. Subjects are also asked to define key EBP concepts in both the therapy and diagnosis scenarios.

For the diagnosis scenario, the participant must answer again where one would search for the best evidence, how to form a searchable question, and what is the best type of study design to answer the clinical question. They are then provided with an abstract and asked the probability that the presented patient has the disease based on the pretest likelihood, the likelihood ratios, and the provided Fagan nomogram.

Validation

Subjects

The subjects for the validation study represented 4 levels of expertise: