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Original article

Development of an Online Learning Module to Improve Pediatric Residents' Confidence and Knowledge of the Pubertal Examination

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A B S T R A C T

Purpose: Pediatric residents must know how to perform pubertal examinations. The initial objective of this study was to evaluate pediatric resident knowledge and comfort related to the pubertal examination and to determine whether and why these examinations are avoided. The subsequent objective was to develop and assess a learning module (LM) addressing identified education gaps.

Methods: A learning needs assessment (LNA) was administered to residents in four Canadian pediatric training programs. Identified themes and knowledge gaps were used to develop an online, case-based LM. A randomized assessment of the LM was conducted among residents from nine training programs across Canada.

Results: Sixty-four residents completed the LNA. About 52% reported discomfort introducing the pubertal examination, 50% reported a lack of confidence related to the examination, and 56% reported having avoided a warranted examination. Ninety-seven residents participated in the LM assessment. The baseline results were similar to those from the LNA in terms of discomfort, lack of confidence, and avoidance related to pubertal examinations. However, the intervention group showed improvement on a knowledge assessment compared with control group ($p < .001$). Confidence levels also improved in the intervention group LM ($p < .01$). Most residents (95%) stated they found the LM to be useful.

Conclusions: Residents report being uncomfortable with and avoiding the pubertal examination and have significant knowledge gaps. The online, case-based LM used in this study improved the knowledge and confidence related to this aspect of pediatric care and may be an effective adjunct to pediatric training.

IMPLICATIONS AND CONTRIBUTION

Assessment of pubertal development is part of routine pediatric care. However, little is known about pediatric resident knowledge or comfort related to puberty examinations. A needs assessment demonstrated discomfort, knowledge gaps, and avoidance of examinations. A learning module addressing these concerns was developed and shown to improve knowledge and confidence.

It is imperative that pediatric residents, our future pediatricians, are trained to perform accurate and compassionate puberty staging examinations. The puberty staging examination or Tanner staging determines the degree of development of secondary sexual characteristics in boys and girls through assessment of female breasts, male genital, and pubic hair

Conflicts of Interest: The authors have no potential conflicts of interest to disclose.

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development. Testicular volume is the first sign of puberty in males [1], whereas it is not included in the Tanner staging scale, assessment of testicular volume is also an essential component of the puberty examination. Altogether, the puberty examination (sometimes referred to as sexual maturity rating) is an integral part of comprehensive health care for children and adolescents [2,3], which, if neglected or done inaccurately, could lead to negative consequences for patients. There are conflicting data on the reliability of self-assessment and parental assessment of a child's pubertal status [4–6], highlighting the importance of ensuring clinicians are competent in conducting staging assessments as part of physical examinations. Missed precocious puberty could lead to compromised final height, have a negative psychosocial impact, or lead to other morbidity or mortality depending on the underlying cause. Lack of identification of delayed puberty can also lead to missed opportunity to diagnose underlying disorders, such as inflammatory bowel disease or anorexia, have negative psychosocial impact and result in late introduction of hormone replacement for those who require it. Alternatively, normal pubertal development is a reassuring sign of normal growth and development.

Despite its importance, we found few data regarding whether trainees perform or avoid warranted pubertal examinations, their comfort level performing the examinations or their proficiency. The data that were available focused on genital examinations, as opposed to pubertal assessments, and rarely indicated whether the examinations were warranted. The reported rates of genital examinations by pediatric residents and clinicians varied greatly and have been reported to be as low as 16% by pediatric residents during well-child visits [7–11]. We found limited published information on clinicians' knowledge of the puberty staging examination. Research that specifically addressed the Tanner system (the standard pubertal rating system for sexual maturation) suggested possible knowledge gaps. About 16% to 39% of pediatric residents and social service physicians incorrectly assigned a Tanner stage of 0, which is not part of the 1 to 5 staging system, to describe prepubertal status [11,12]. Moreover, data were lacking regarding how trainees discuss or introduce the puberty staging examination, obtain permission to conduct it, or were educated about this aspect of the physical examination during their training.

Taken together this scarcity of information highlights an education gap and a need for intervention. The initial aim of this study was to conduct a learning needs assessment (LNA) of pediatric residents in programs across Canada to determine their knowledge of and comfort with performing a pubertal examination. The subsequent aim of the study was to develop and assess the impact of a web-based learning module (LM) addressing education gaps identified during the LNA.

Methods

This project protocol was reviewed and approved by the Canadian Pediatric Program Directors Research Group (CPPD-RG) and by the Research Ethics Board at the Hospital for Sick Children, Toronto, Canada.

Learning needs assessment design and administration

Input on perceived learning needs, barriers, and educational gaps related to the pubertal examination among pediatric residents were solicited from five pediatric endocrinologists, five pediatric endocrinology fellows, and one pediatric resident at the Hospital for Sick Children, Toronto, Canada. Pediatric training objectives from the Royal College of Physicians and Surgeons of Canada were also reviewed [13]. Identified themes, concerns, and training objectives were used to direct the content of an LNA questionnaire. Multiple choice and open-ended questions were drafted that assessed residents' previous education and experience with the puberty staging (Tanner) examination and their knowledge of the examination. Images were used to assess the residents' ability to accurately identify the five Tanner stages. Multiple choice (Likert-type) rating scales assessed both comfort introducing the examination and confidence performing the examination. Barriers to conducting the pubertal examination were explored in the questionnaire. Before its administration, three pediatric endocrinologists reviewed the questionnaire for content validity and three pediatric endocrinology fellows completed the questionnaire and provided feedback regarding face validity and readability/usability. The questionnaire was revised based on feedback provided and then administered to pediatric residents as detailed in the following section.

Population. Four English-speaking pediatric residency programs that differed in size and geographic location were selected for participation in the LNA. Programs were contacted through the CPPD-RG and agreement to participate was secured before administration of the LNA.

Data collection. The LNA was administered in paper format at two programs and by email at the other two programs. The program director or an assigned delegate administered the LNA. The paper format surveys were administered during an academic teaching session, and all residents were invited to participate. The electronic surveys were sent by email to all the general pediatric residents. All data provided to the authors were anonymous. Data collection occurred from April to July 2013.

Data analysis. Descriptive statistics were determined for each category. Nominal variables were compared for level of training, size of residency program, experience participating in a Pediatric Endocrine rotation, and level of confidence using the chi-square test. Qualitative analysis of open-ended questions was performed to identify themes regarding knowledge and comfort; deficiencies, barriers, and enabling factors were identified. Data were analyzed using SPSS version 22, and 2-tailed p value $< .05$ was considered statistically significant.

Learning module development and assessment

The findings of the LNA informed the development of five learning objectives for the LM. These objectives addressed (1) knowledge of the age of onset of puberty; (2) recognition of the first signs of puberty; (3) Tanner stages for breast development in females, pubic hair development in females and males, and measurement of testicular volume in males; (4) important elements of introducing the pubertal examination; and (5) potential consequences of omitting a warranted pubertal examination. Articulate Storyline (articulate.com) was used to create an online, case-based, interactive LM. Two cases were used to demonstrate the importance of identifying precocious and delayed puberty. Short videos demonstrated how the pubertal examination can be introduced to patients and discussed how a measuring tape can be used to estimate testicular volume if an orchidometer is not