Effective Medical Education Resource Design and Integrative Learning: A Lesson in Autosomal Recessive Polycystic Kidney Disease

Fred P. Gonzales III, B.S., Naoko Hara, B.S., Miriam D. Post, M.D., and Lisa M.J. Lee, Ph.D.
Department of Cell and Developmental Biology, University of Colorado School of Medicine, Aurora, CO USA

Abstract

Autosomal Recessive Polycystic Kidney Disease (ARPKD) is the most common ciliopathy affecting children and has variable presentation based on the type of mutation in the PKHD1 gene. Health care practitioners must be aware of the varying phenotypes and pathophysiology during embryonic development so that proper management and counseling options may be considered. With limited instructional contact hours during training, effective online learning resources are becoming increasingly important. The objective of this project was to create an interactive, online learning module to provide a comprehensive and integrated report about ARPKD and to evaluate its educational value at different stages of training. The module was created using an actual ARPKD case integrated with step-by-step, normal development tutorial and self-assessment tools that provide instant feedback for reinforcement of the material. The module was provided to first-year medical students, graduate students, and pathology residents in various years of training. The educational value of the module was evaluated by a self-reporting and quantitative comparison between pre-test and post-test scores, as well as feedback before and after utilizing the module. The retention study was conducted forty days after completion of the module to determine the long-term educational value of this learning modality. The results show that the interactive and clinically oriented module effectively promoted learning and retention and was positively reviewed by all students in all stages. Online learning modules that present clinical cases in a highly integrated manner are shown to promise as an effective undergraduate and graduate medical education tool.

Methods

Module Creation: In order to create a comprehensive resource, many departments across the University of Colorado’s Anschutz Medical Campus were consulted. The module was constructed using Articulate Storyline, software that provides interactive presentation, interaction, and test options. Each slide was presented with audio narration (Figure 1)

Module Testing: Pathology residents/fellows and 1st-year graduate students in the Master of Science in Modern Human Anatomy at CU were recruited for study participation (Figure 2). The tests, surveys, and modules were accessible online so that all participants could access their asynchronously (COMRE sample category protocol TA/162).

Results

Highly interactive and clinically oriented modules promote learning and retention among graduate students in the health sciences and medicine when compared to baseline knowledge. Overall, both cohorts showed an increase in ARPKD knowledge after interacting with the module. This knowledge was retained thirty days after module interaction with little deterioration. It is expected that the pathology cohort’s increase across the tests would be statistically significant if more residents had participated in the study. It is interesting to note that the anatomy students’ scores were comparable to that of the pathology residents and fellows. Their limited exposure to clinical terminology and scenarios did not seem to put them at a disadvantage when it came to this rare congenital disease.

Feedback on the module was generally positive and the participants’ self-reported learning of ARPKD aligns with their test scores. It is impressive that all of the participants would suggest the use of this module to their peers, whether in part or in whole, indicating they found this type of module to be a valuable resource in the training. Most of the participants agreed that the interactive nature of the module kept them engaged in the content, likely helping them to learn and retain the information better compared to a straightforward presentation of the material.

Conclusions

Acknowledgements

We thank Dr. Mike Pascoc, Dr. Melissa Cadnapaphornchai, Dr. Ann Schirzinger, and Dr. Rod Smith, Noah J. Lopez, and April-Dawn Knudsen for their contributions to the modules creation. We also thank the Modern Human Anatomy program for the many opportunities it grants its students.