

Quantitative Assessment of a Case Based Digital Learning Curriculum for Testicular Cancer



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OBJECTIVE	To address information overload for trainees, a concise electronic case-based urology learning program (CBULP) was developed. Previous qualitative assessments suggested CBULP's potential efficacy/utility. Herein we assess CBULP more stringently by evaluating test performance before/after reviewing a CBULP curriculum covering core concepts in testicular cancer.
METHODS	Eleven of 33 CBULP testicular cancer cases were strategically selected for this curriculum. A 26 question multiple-choice test was developed to assess fundamental knowledge about testis cancer tumor biology and evaluation/management. Pretest was administered to PGY4/PGY1 residents at 2 pilot urology-training programs, and medical students interested in Urology. Participants were given 4 weeks to review the curriculum and the test was then repeated. A control group (4 PGY1s) was administered the pretest and repeat test in an analogous manner without provision of the CBULP curriculum.
RESULTS	Twenty individuals took the pretest (7 medical students, 8 PGY1s, and 5 PGY4s), and 17 (85%) took the post-test (5 medical students, 8 PGY1s, and 4 PGY4s). As expected, PGY4s performed significantly better than the other 2 groups on the pre- and post-test. However, significant improvement in test performance was seen across all groups that utilized the CBULP curriculum ($P < .02$), with highest increase demonstrated by PGY1 residents (4.75 more questions correct, $P = .002$). The control arm did not demonstrate significant improvement ($P = .20$).
CONCLUSION	Significant improvement in test performance was observed after completion of the CBULP testicular series. This study suggests that CBULP can be an efficacious and clinically useful educational resource for urologic residents and students interested in the field. UROLOGY 135: 28–31, 2020. © 2019 Elsevier Inc.

Work hour restrictions have reduced time available for didactics and teaching rounds, and residents are now less immersed in the field during the training experience.¹⁻⁴ Decreased time in the hospital could potentially allow for more time for trainees to read and independently develop knowledge base at home. However, an ever growing body of literature and plethora of resources has resulted in information overload, and many trainees feel overwhelmed as they try to structure an individualized learning program.⁵ The ideal solution to this dilemma would be a readily accessible clinically-based resource that provides a concise and comprehensive review of topics that trainees could utilize in a group or individual setting.^{6,7}

Case Based Urology Learning Program (CBULP) has been designed to address the issues highlighted above. In previous studies, we performed qualitative assessment of CBULP with encouraging feedback.^{4,6,8} Specifically, we established that trainees, ranging from medical students to fellows, find CBULP cases to be concise, efficacious, and comprehensive enough to provide valuable information. A major limitation of earlier studies was that they were qualitative in nature, with subjective survey data reported by individual users.

In this study, our objective was to design a specific topic-based curriculum (testicular cancer) and to determine whether review of a strategically selected cohort of CBULP cases can improve trainees' knowledge of basic and advanced concepts. We also aimed to conduct a more stringent evaluation of this approach by assessing pre- and postcurriculum scores among trainees, with a control arm that did not have access to the resource. We hypothesized that a CBULP based testicular cancer curriculum would provide a quantifiable improvement in knowledge base for residents in urology and students interested in the field.

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MATERIALS AND METHODS

Fellowship trained urologic oncologists were recruited to write clinical cases related to testicular cancer, with focus on the basic principles of the disease process and the fundamentals of patient evaluation and management. Thirty-three such clinical cases were produced, and 11 were strategically selected to develop a concise yet comprehensive curriculum highlighting core concepts in pathophysiology, natural course of disease, and evaluation and treatment of testicular cancer. **Table 1** provides a complete list of core topics and the number of cases that address each topic. In addition, a 26 question multiple choice assessment was developed to evaluate the listed concepts (**Supplemental material**). A pretest was administered to medical students interested in urology and to PGY1 and PGY4 residents at 2 participating institutions (Cleveland Clinic and University Hospitals—Cleveland Medical Center). A control group comprised of 4 PGY1s was also given the tests, without access to the CBULP curriculum. A total of 20 individuals took the pretest (7 medical students, 8 PGY1s, and 5 PGY4s). Participants were not notified of their pretest scores. Four weeks were allotted for trainees to review the curriculum at their own leisure, other than the controls, who were encouraged to utilize any other resource of their choosing prior to taking the post-test. Trainees were then given 2 weeks to take the post-test. The answer key was distributed after the post-test was completed by all participants to optimize the final learning experience. Statistical comparisons were performed using the paired *t* test.

Sample cases from CBULP can be reviewed in the Resident's Corner in Urology (available at: <http://www.goldjournal.net/content/residents>). The testicular cancer case series and other clinical cases can be made available to readers on request.

RESULTS

A total of 20 individuals took the pretest (7 medical students, 8 PGY1s, and 5 PGY4s), and 17 completed the curriculum and

Table 1. CBULP testis cancer curriculum

Core Concepts	Number of Cases That Cover Each Concept
Presentation	2
Signs and symptoms	
Staging	6
Tumor markers	5
Risk factors	3
Histology and pathology, including teratoma	6
MGCT	3
i) Stage 1	
(1) Low risk	
(2) High risk	
ii) Stage 2	
Seminoma	3
i) Stage 1	
ii) Stage 2	
RPLND	3
Chemotherapy, postchemotherapy RPLND, and IGCC risk stratification	7
Late relapse	1

IGCC, International Germ Cell Consensus.

post-test (5 medical students, 8 PGY1s, and 4 PGY4s) representing an 85% completion rate. As seen in **Figure 1**, greatest improvement was seen among the PGY1 residents (categorical urology residents) who utilized the CBULP curriculum. This group answered 4.75 more questions correctly in the post-test than the pretest ($P = .005$). In comparison, the control group did not see a significant improvement in their scores ($P = .20$). Not surprisingly, the PGY4 group started off at the highest pretest score of 18 correct answers (69%), and improved to 21 correct answers (85%, $P = .002$) after completing the curriculum. Overall, all groups that utilized the CBULP curriculum performed statistically better on the post-test, and every participant answered more questions correctly in the post-test than the pretest.

Improvement was seen in content related to the majority of targeted subtopics, with highest increase in cases involving International Germ Cell Consensus risk stratification for advanced disease (pretest average 60%; post-test 90%; $P < .05$) and post-chemotherapy relapse (pretest 55%; post-test 80%, $P < .05$). No improvement was seen in questions related to disease presentation (eg, question 16; pretest 85%; post-test 83%; $P > .05$). Question 6, which covered the topic of teratoma and its potential long-term sequelae, had the lowest pre- and post-test scores (pretest 35%; post-test 33%; $P > .05$).

DISCUSSION

With the establishment of work hour regulations in 2003, there has been a substantial change in surgical residency curricula around the country.^{1,2} Focus has shifted from providing dedicated didactics and Saturday morning lectures to optimizing hands-on clinical experience, surgical skills, professionalism, and communication skills.³ While these core competencies are emphasized by the ACGME, the limited time in hospital has transferred a great deal of the burden of forming a strong and comprehensive knowledge base to the trainees. Despite the fact that trainees have increased time outside the hospital, the paralyzing sea of literature and extracurricular demands leave trainees overwhelmed with confronting new concepts and mastering them in close correlation with their clinical skills.

In general, trainees prefer to learn from resources that are concise, clinically correlated, and readily available when they are ready to learn.^{5,7} Case-based learning has gained traction across various specialties and trainee levels.^{4,9,10} Active learning curricula have shown to have a higher satisfaction rate from trainees, while maintaining high transmission rate of information.^{7,11} In a 2017 study, Inra et al evaluated a new curriculum for gastroenterology fellows, which was largely based on case-based learning. They found that their trainees performed significantly better in multiple domains, with other areas also demonstrating a positive outcome.⁴ Furthermore, the fellows preferred the interactive, case-based method over the traditional didactic curriculum. In addition to the findings from this study, our previous studies have shown that the CBULP cases can be reviewed in 5-10 minutes or less, and almost all trainees reported that the cases illustrate the fundamentals of evaluation and management and the basic principles of the disease process, which are the

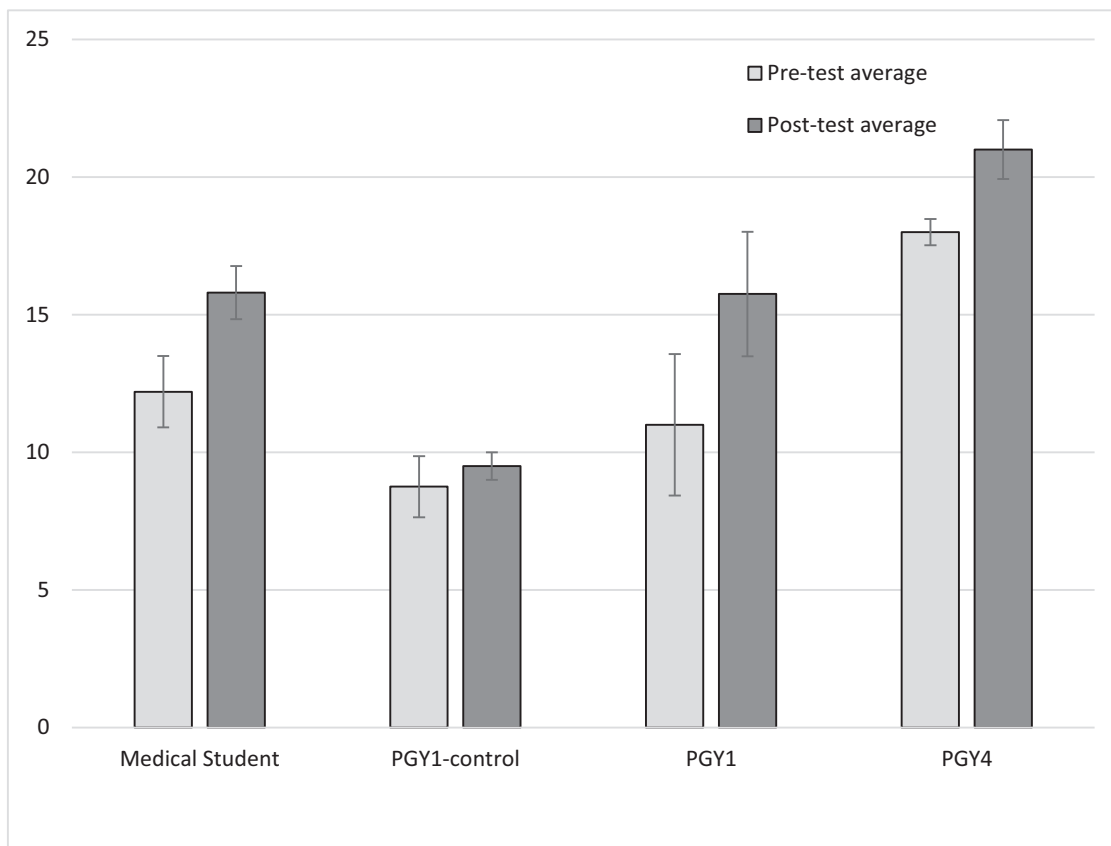


Figure 1. Mean number of correct responses with standard deviation for a 26 item test before and after completing the case based urology learning program (CBULP) testicular cancer curriculum. Medical students were those rotating on Urology and candidates for residency training. PGY, postgraduate year of residency training.

primary objectives of this resource.^{6,8} Based on this feedback, we have continued to expand the CBULP series.

While our previous studies suggested that CBULP can serve as an effective learning resource based on its concise design, ease of access, clinical correlation, and relevance of information for trainees at all levels, our previous analyses were survey-based qualitative assessments, and we have never performed a stringent study to objectively determine the impact on core competency for trainees who use this program.^{6,8} Therefore, in this study we aimed to design a curriculum covering core concepts in testicular cancer that was entirely based on strategically selected CBULP cases. We assessed core concepts in the field before and after trainees utilized the curriculum comprised of 11 cases, which, based on previous experience, should only take 1-2 hours to review. We compared the results from this group to a control group that was allowed to use traditional resources between the pre- and post-tests, but did not have access to the CBULP-based resource. A multiple choice test was specifically designed to assess the entire core concepts defined in this curriculum.

Overall, our data suggest that there was significant improvement in performance in all tested groups from medical students to PGY4 trainees. Performance was improved most in PGY-1 residents, with an average increase in correct answers by approximately 5%, or 18%

($P < .05$), likely reflecting their lower baseline knowledge about testis cancer and their motivation to improve upon this. In contrast, the control group did not demonstrate a significant increase in their pre- and post-test scores ($P = .20$). Pre- and post-test scores were highest in PGY4 residents, as expected, reflecting their experience in the field. Questions related to teratoma and advanced testis cancer tended to be the most difficult on the pretest, perhaps reflecting the relative infrequency of these conditions within general urologic practice. For teratoma, the unique and unusual characteristics of this disease process are also likely a contributing factors. While, the post-test showed substantial improvement in scores for advanced testis cancer, performance regarding teratoma and its potential sequelae remained poor even after exposure to the curriculum suggesting that the items designed to cover core concepts about this topic were not effective.

As Table 1 demonstrates, the selected cases cover a wide spectrum of topics, which include disease presentation, staging, histology, evaluation, treatment, recurrence, and salvage therapy. Based on our previous studies and the current findings, this curriculum may serve as a readily accessible and organized approach for concept review and reference in the clinical setting. Our previous survey studies also suggest that most trainees enjoy the interactive aspects of CBULP, which presents each case in a Socratic

manner. In addition, majority of trainees (78.57%) are able to complete each case in 10 minutes or less.⁶ Similar curricula in other urologic diseases may offer a comprehensive resource that can be used by clinicians across all levels of training.

While our studies suggest that CBULP offers a potentially useful resource for initial learning and subsequent review, we believe that the resource has natural limitations. During development of the cases, a concerted effort was made to keep each case as concise as possible, with focus on the main learning points related to the pathophysiology of the disease process and the fundamentals of evaluation and management. As a result, trainees and staff may feel the need to supplement the cases with recent literature or selective reading in textbooks, or group discussion. We have attempted to address this potential shortcoming by attaching supplemental resources such as pertinent review articles at the end of each case to allow for more in-depth study should the learner choose to pursue this. In the future, we hope to create similar courses in other urologic malignancies and general urology topics that can be supplied to practitioners on a wide scale. In our experience, and through discussion with colleagues in the field, we have found that one useful format for the CBULPs is to utilize them in weekly conferences or small group settings, taking advantage of their Socratic structure, and to supplement this with expert opinion from the faculty. In this manner more recent developments in the field and various alternate perspectives can be discussed to provide a more complete learning experience.

Ultimately, we feel that CBULP may also prove useful for preparation for examinations such as the oral boards. The structure of each item, which includes a series of open ended questions presented in a clinical context are designed to challenge the trainee to rely on their fund of knowledge, rather than fall back on various test taking skills that may be utilized in a traditional multiple-choice format. In addition, the comprehensive articles and chapters offered at the end of each case may allow a trainee to immediately address knowledge gaps after self-assessment.

CONCLUSION

A subject oriented case-based curriculum on testis cancer improved trainee performance across all levels of training.

Based on the findings from this analysis and from our previous studies, we believe that CBULP offers a concise and well-rounded clinically based curriculum for trainees. Further curricula are in development and additional studies will be needed to allow for comparison between the CBULP approach and other traditional and innovative efforts to improve urologic education, with focus on making such resources as concise and comprehensive as possible.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.urology.2019.10.002>.

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