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Validity evidence for Surgical Improvement of Clinical Knowledge Ops: a novel gaming platform to assess surgical decision making

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Abstract

BACKGROUND: Current surgical education curricula focus mainly on the acquisition of technical skill rather than clinical and operative judgment. SICKO (Surgical Improvement of Clinical Knowledge Ops) is a novel gaming platform developed to address this critical need. A pilot study was performed to collect validity evidence for SICKO as an assessment for surgical decision making.

METHODS: Forty-nine subjects stratified into 4 levels of expertise were recruited to play SICKO. Later, players were surveyed regarding the realism of the gaming platform as well as the clinical competencies required of them while playing SICKO.

RESULTS: Each group of increasing expertise outperformed the less experienced groups. Mean total game scores for the novice, junior resident, senior resident, and expert groups were 5,461, 8,519, 11,404, and 13,913, respectively ($P = .001$). Survey results revealed high scores for realism and content.

CONCLUSIONS: SICKO holds the potential to be not only an engaging and immersive educational tool, but also a valid assessment in the armamentarium of surgical educators.
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Sound clinical judgment is a crucial part of surgical competency. As a classic saying in surgery goes, an operation calls for 75% decision making and 25% dexterity.[1] Expert surgeons have ranked clinical judgment over operative skill as the most important attribute for a surgical trainee.[2] These priorities are reflected in the way surgeons are certified by the American Board of Surgery; candidates are interviewed and assessed on their ability to safely navigate various patient scenarios both inside and outside the operating room. However, surgical education curricula have emphasized mainly the acquisition of technical skill rather than clinical and operative judgment. In recent years, there has been a growing interest and focus on the nontechnical abilities of a surgeon. Yet at present, there still exists a deficiency of resources and tools to teach and assess surgical decision making.[3,4]

SICKO (Surgical Improvement of Clinical Knowledge Ops) is a novel Web-based gaming platform created to address this critical need. The aim of this pilot study was to

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determine whether SICKO holds potential not only as an engaging educational program but also as an assessment tool for surgical decision making. Overall score and survey questions were analyzed to collect validity evidence for the use of SICKO as an assessment for surgical decision making.

Patients and Methods

Description of Surgical Improvement of Clinical Knowledge Ops

The SICKO gaming platform was created with the support of a Stanford Continuing Medical Education grant and is the second and more sophisticated iteration of the original Septris engine, which was initially developed to teach clinicians how to treat sepsis.[5] SICKO as an educational tool applies gamification techniques to train learners in the workup and operative management of classic surgical diseases. The game engages and motivates learners by providing an immersive, interactive, and media-rich user interface, utilizing a point system to reward or penalize right or wrong actions, offering instant positive and negative feedback at key decision points, and graduating players to levels that feature more difficult cases. SICKO also features a log system that tracks all the actions of a player: what, when, and to whom various diagnostic tests and interventions were applied. Answers to intraoperative case scenario questions are also recorded. To reinforce teaching points, all actions and answers, as well as their associated consequences, are compiled into a final end-of-game report for the learner to review. The technical specifications of the platform have been described elsewhere.[6]

Gameplay of SICKO is as follows: the player is presented with acutely ill virtual patients whose cartoon faces appear on a game screen like falling Tetris tiles (Fig. 1). Their deteriorating vital signs are displayed real time in a header above and an accompanying clinical vignette is provided in a medical chart to the right. A dashboard at the bottom allows the player to select various diagnostic and treatment modalities to diagnose, stabilize, and definitively cure the patient. Test results such as laboratory values and radiographic images are posted in the chart as they are ordered, with points rewarded for ordering relevant key tests. As the player initiates the appropriate interventions, the patient's health, as reflected by the position of the cartoon tile, is boosted upward; conversely, if inappropriate or harmful actions are chosen, the patient's status further plummets. Once the player has decided to operate on the patient, the game transitions to an "operating room mode" where the player is tested on intraoperative decision making in response to changing clinical scenarios as well as surgical technique. The player receives ongoing, immediate, and educational feedback (both positive and negative) based on his or her treatment choices. As in real life, the player toggles back and forth between 3 "falling" patients at a time, challenging him or her to effectively triage and prioritize attention and care to the sickest patient. The game itself is comprised of 3 levels of increasingly complex clinical scenarios; players must successfully heal the patients in each round before advancing to the next.

SICKO was created with the intention of assessing the construct of surgical decision making. Test content, including case scenarios and intraoperative decision-making questions, was written by 3 of the authors: a senior academic board-certified general surgeon and educator (J.N.L.), a junior academic board-certified general surgeon and educator (D.T.L.), and a senior general surgery resident (J.P.). Cases were chosen to be representative of commonly encountered general surgery diagnoses and basic surgical procedures using evidence-based guidelines. Cases were vetted and revised in an iterative process by this panel. An early version of SICKO was also tried by 2 senior surgical residents and an attending surgeon. If there was challenge to the case scenario content or intraoperative questions

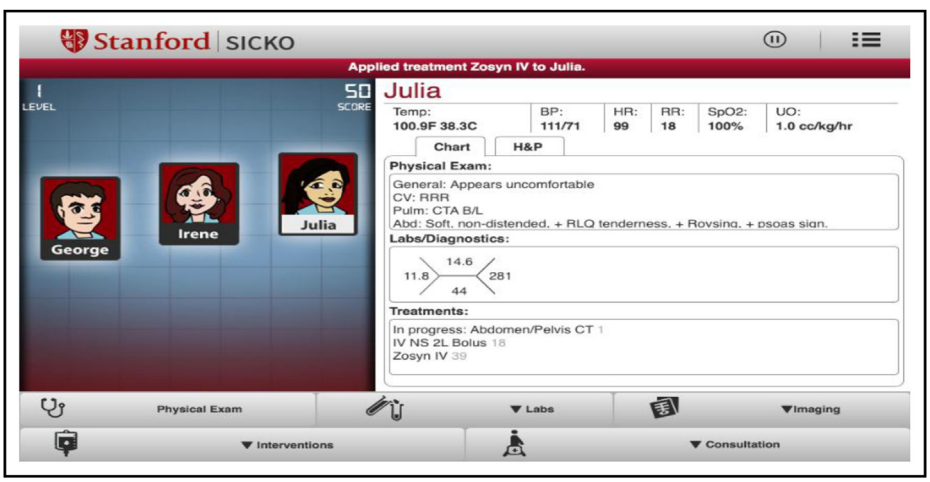

Figure 1 Gameplay interface of SICKO.