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BRIEF REPORT

Rapid Sequence Information: A Game-Based Learning Approach to Reinforce Core Concepts in Anesthesiology Training

SUMAN M. ATLURI
AUTUMN H. SMITH

MAISIE L. JACKSON, MD
MEGAN E ATKINSON, MD

INTRODUCTION

Gamification and serious games have emerged as innovative educational tools for many disciplines, including medicine.¹⁻³ Gamification involves integrating methods such as points, rewards, and competition into nongame contexts to motivate and engage learners; this way, educational experiences can be more dynamic and enjoyable. This approach has been shown to improve overall learner competency and outcomes.^{1,3}

Serious games are applications that teach while simultaneously entertaining. They share key characteristics with gamification including goal-directed structure, rules, feedback mechanisms, and voluntary participation. However, serious games aim to cultivate problem-solving skills that can be directly applied in professional contexts. A 2024 systematic review highlighted that immediate feedback, time limits, and hints were the most effective elements for promoting engagement and learning.¹

While game-based teaching has demonstrated effectiveness in multiple contexts, its use in anesthesia education remains relatively unexplored.^{2,4,5} This study illustrates the development of an anesthesiology board game with elements of both serious games and gamification for clinical anesthesia first year (CA-1) residents. The game itself employed feedback opportunities at the end of each timed round, and the main playing

cards incorporated hints in the form of must-say phrases to emphasize specific associations. The objective was to reinforce key anesthesia topics while evaluating learner perspectives on the enjoyment and effectiveness of specific game design elements.

MATERIALS AND METHODS

Game Description

A board game titled *Rapid Sequence Information (RSI)* was designed specifically to reinforce knowledge pertaining to American Board of Anesthesiology (ABA) BASIC exam topics. OpenAnesthesia⁶ was chosen as a source for ABA BASIC keywords because it is a well-recognized keyword repository containing reference-validated explanations. The 2 physician authors created game cards using keywords for which a concise hint word or phrase could be used to emphasize an important association. OpenAnesthesia⁶ currently has 188 BASIC-level keywords, and 156 were chosen to create the RSI game cards. Additionally, 20 “Knowledge Check” cards were created using multiple choice questions (MCQs). These cards were developed using either ABA keywords⁶ as the foundation or were adapted from publicly available sample BASIC questions⁷ published by the ABA. The RSI game is a competition between 2 teams, each team having 2–6 players. The gameboard (Figure 1) is a track-based board that provides a linear progression for teams across spaces until 1 team

reaches the finish line. Card types for this game include the main-deck RSI game cards, “Knowledge Check” cards, “Good Planning” cards, and “Event” cards. Each game set also has a 1-minute timer, a buzzer, and player pieces to represent each team.

Full game rules are shown in Table 1. The game begins with a “Preoxygenation Round” in which each team is read 1 MCQ from a “Knowledge Check” card by the opposing team. If answered correctly, the team receives a “Good Planning” card to be used in later rounds. The game then proceeds with teams alternating turns during which they utilize the RSI game cards to quiz their own teammates (Figure 2). During their turn, 1 teammate starts the timer and then proceeds sequentially through the RSI card deck. Each RSI card includes a must-say phrase that must be stated while describing the keyword. Cardholders can use their anesthesia knowledge as well as the must-say phrase in their attempt to prompt their teammates to state the keyword. The cardholder then continues through the deck until the timer runs out. See Figure 2 for examples of cards and their must-say phrases.

When the timer ends, that team must tally the number of cards they completed successfully. To disincentivize skipping, 1 point for each skipped card is subtracted from the total points earned. The team then advances on the gameboard by the

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number of spaces equal to the score. Prior to the next turn, each team is encouraged to review the game cards from that round to ensure that all team members understood the concepts. Teams then continue alternating until the finish line is reached. Located periodically along the gameboard are “Event” and “Knowledge Check” spaces to make the game more entertaining and to test knowledge in a different manner. If a team lands on those, they must draw the card type at the beginning of their next round and complete the listed question/challenge before proceeding. “Knowledge Check” cards have MCQs, and “Event” cards were added for entertainment value with some giving the team an advantage and some posing a penalty (eg, “Suction not working, move back 1 space”).

Game cards were printed on cardstock, and each gameboard was custom ordered online for \$13.50. The total for each game including the cardstock, timer, buzzer, player pieces, and gameboard was approximately \$24.

Setting and Participants

The game was first played by 13 CA-1 residents during a scheduled weekday lecture slot. The group was divided and assigned to 2 tables, and then each table was divided into 2 teams. Each round of the game (ie, the time it takes for 1 team to reach the finish line) took roughly 30 minutes. The game has now been played for 2 total sessions at the creators’ institution for a total of 27 CA-1 residents and has been presented at a nearby institution during a similar didactic session for 11 CA-1 residents. Most recently, it was introduced as an educational session for residents and fellows (such sessions are open to all training levels) at the national 2025 American Society of Anesthesiologists meeting. Full participant demographics found in Table 3.

Survey Instrument

A brief survey was designed with 6 MCQ-type questions and 1 free-response question (Table 2) regarding participants’ perceptions, learning modalities

historically used for exam prep, and prior experiences with game-based learning.

RESULTS

Participant Characteristics

A total of 75 participants played the game across all venues, and 68 completed the postsession survey, giving a 91% response rate (see Table 3 for full survey results). Most respondents were CA-1 residents (61.8%), followed by second (11.8%) and third year clinical anesthesiology residents (10.3%), medical students (7.4%), interns (4.4%), and attending anesthesiologists (2.9%).

Prior Identified Study Methods

When asked about exam preparation approaches used prior to the intervention, the participants listed practice questions (94.1%), followed by textbooks (42.6%) and lectures (26.5%). Less common methods included ABA keyword review (17.6%) and games (2.9%).

Exposure to Game-Based Learning

Nearly half of participants (47.1%) reported that very few of their lectures (<5%) incorporated game-based elements, while 35.3% reported no exposure. Only 1.5% indicated that most of their sessions (>50%) used game-based learning.

Educational Impact of the RSI Game

Participants reported strong perceived knowledge gains from the RSI game. A combined 86.8% (95% CI, 76.4%-93.8%) agreed that the session improved their understanding of anesthesia keyword topics, and only 5.9% disagreed.

Engagement and Experience

During each 30-minute game, most participants completed more than 30 cards, and 27.9% covered more than 60 cards. Overall, 73.5% rated their experience as *fantastic*, and 19.1% rated it as *good*.

Because the RSI game was designed to reinforce BASIC exam content, subgroup analysis was also performed for CA-1 residents. Among CA-1s, 95.2% agreed that the session improved their understanding of keyword topics (95% CI, 83.8%-99.4%). Most CA-1 residents rated their experience positively with 83.3%

describing the session as *fantastic* and 16.7% as *good*. Prior exposure to game-based learning was notably limited with 64.2% reporting very few such sessions and 16.7% reporting none. There were no responses to the open-ended question asking for additional feedback.

DISCUSSION

The RSI game was strategically designed to involve rapid recall, teamwork, and immediate feedback, all of which have been identified as key elements in successful game design.¹ Furthermore, it was designed to be competitive and team-based, which has also been correlated with improved student performance. Results from the study survey indicated that even a short, low-resource teaching modality can enhance learner engagement; this is consistent with prior reports of higher satisfaction with game-based learning versus traditional instruction.⁴

Although game-based learning has gained traction in medical education, there is limited research specific to anesthesiology. One review article emphasized how interactive and feedback-driven teaching improves retention and clinical reasoning among anesthesia trainees.⁸ RSI incorporates these elements of effective teaching into a game format featuring time pressure, competition, and peer interaction during conceptual review. The use of ABA keywords as an educational tool has proven to be highly popular and effective. As examples, the OpenAnesthesia website⁶ utilized for the game is widely used, and the University of Kentucky’s YouTube channel⁹ contains keyword videos with thousands of views. The use of publicly available keywords in education is also correlated with decreased trainee stress and better exam performance.¹⁰ Leveraging familiar high-yield keywords with a thoughtfully designed game creates an engaging teaching method for trainees. The RSI game could be incorporated into future didactic sessions, board preparation workshops, or small group educational sessions focused on foundational topics.

Limitations and Future Directions

This study is limited by sample size and reliance on self-reported learning measures

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rather than objective performance outcomes. The survey was not validated or piloted prior to its use, so some trainees may have interpreted questions differently or provided inaccurate responses. Participant responses may have also been influenced by the novelty of the format. Despite these limitations, overall feedback suggested strong acceptability and educational value. Future work may incorporate longitudinal follow-up or preintervention and postintervention knowledge tests to evaluate the impact on trainee performance.

CONCLUSION

Game-based learning represents an exciting option for teaching anesthesia concepts while maintaining learner engagement. The RSI game provided a platform for reviewing important ABA BASIC examination content, making it an especially useful tool for CA-1 learning.

Going forward, expanding upon game concepts such as those used in RSI may have even wider reaching impacts for trainees of different levels or even different medical specialties.

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The authors are in the Department of Anesthesiology and Critical Care at Baylor College of Medicine in Houston, TX. Suman M. Atluri and Autumn H. Smith are Medical Students; Maisie L. Jackson is an Assistant Professor; Megan E. Atkinson is an Associate Professor.

Corresponding author: Maisie L. Jackson, Department of Anesthesiology and Critical Care, Baylor College of Medicine, 2002 Holcombe Boulevard, Houston, TX 77030. Telephone: (713)791-1414, extension 221314, Fax: (713)794-7674

Email Address: Maisie L. Jackson, maisie.jackson@bcm.edu

Abstract

Background: Gamification and serious games are emerging as educational tools to enhance learning in medical education. We developed a board game titled *Rapid Sequence Information* (RSI) to help teach residents about important American Board of Anesthesiology (ABA) keyword topics. The primary aim of this study was to determine how well a serious game can engage trainees while also assisting with board exam preparation.

Methods: A competitive board game was created using simple materials and game cards that quizzed participants on their knowledge of ABA BASIC exam

keywords. The game was played as part of the lecture series for clinical anesthesia first year residents at 2 different institutions as well as an educational session at the national American Society of Anesthesiologists meeting. A total of 68 participants completed a postgame survey.

Results: Among those who completed the survey, most reported little to no prior exposure to game-based learning (82%). The game was very well received: 73% of participants rated it as *fantastic* and a combined 86.8% (95% CI, 76.4%-93.8%) agreed or strongly agreed that the session improved their understanding of anesthesia-related topics.

Conclusions: Game-based learning is an innovative approach to medical education that is growing in popularity across many fields. Whereas its use in anesthesia education remains relatively unexplored, this study shows that games can be used to effectively engage anesthesia learners. The RSI game and others like it could be incorporated into resident didactic sessions, board preparation workshops, or small group teaching focused on foundational topics.

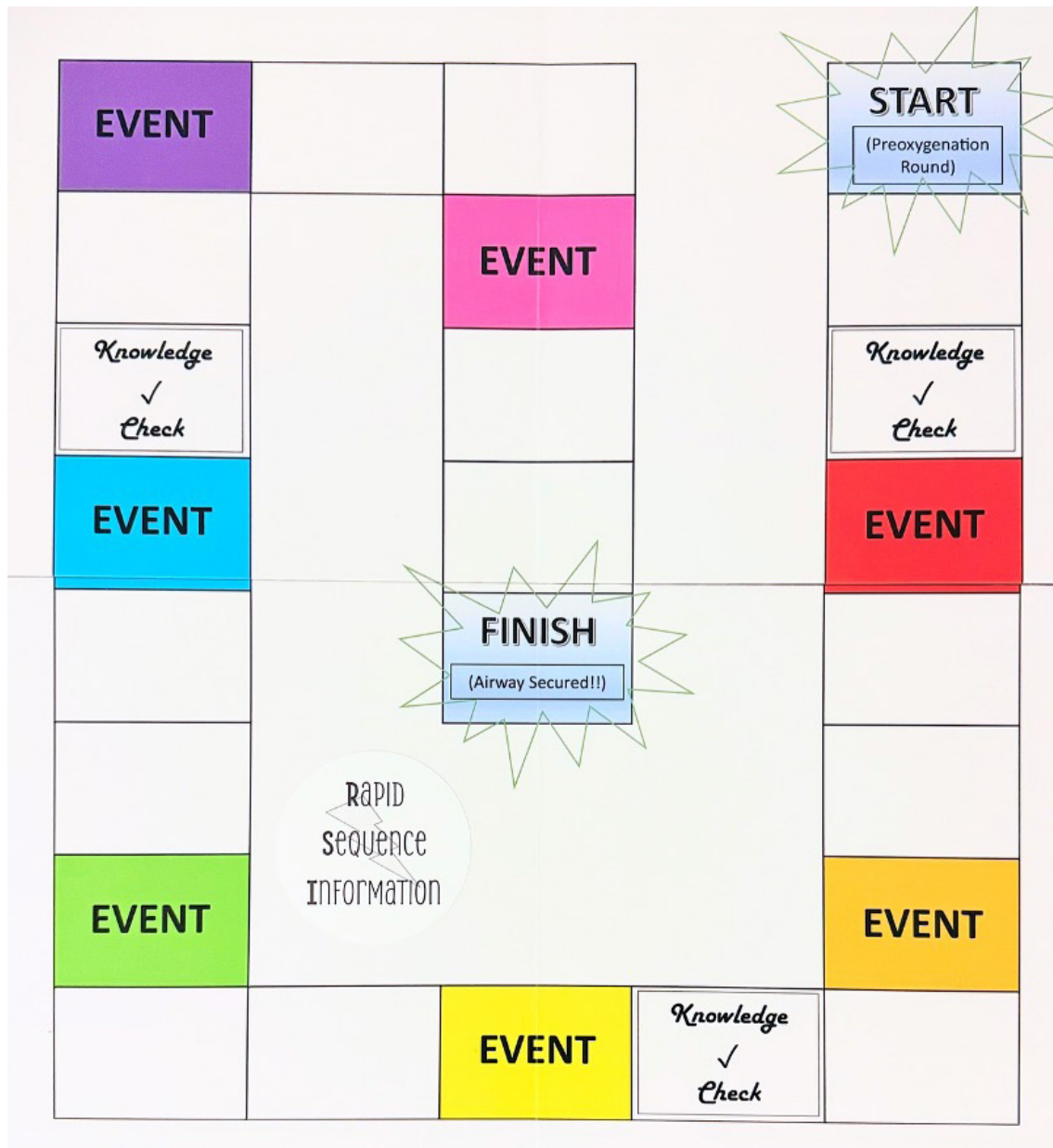
Keywords: Graduate medical education, game-based learning, serious games, anesthesia, ABA

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Figures

Figure 1. RSI gameboard. Custom-created and ordered for \$13.50 each. Prior versions were fashioned by hand for cost efficiency.

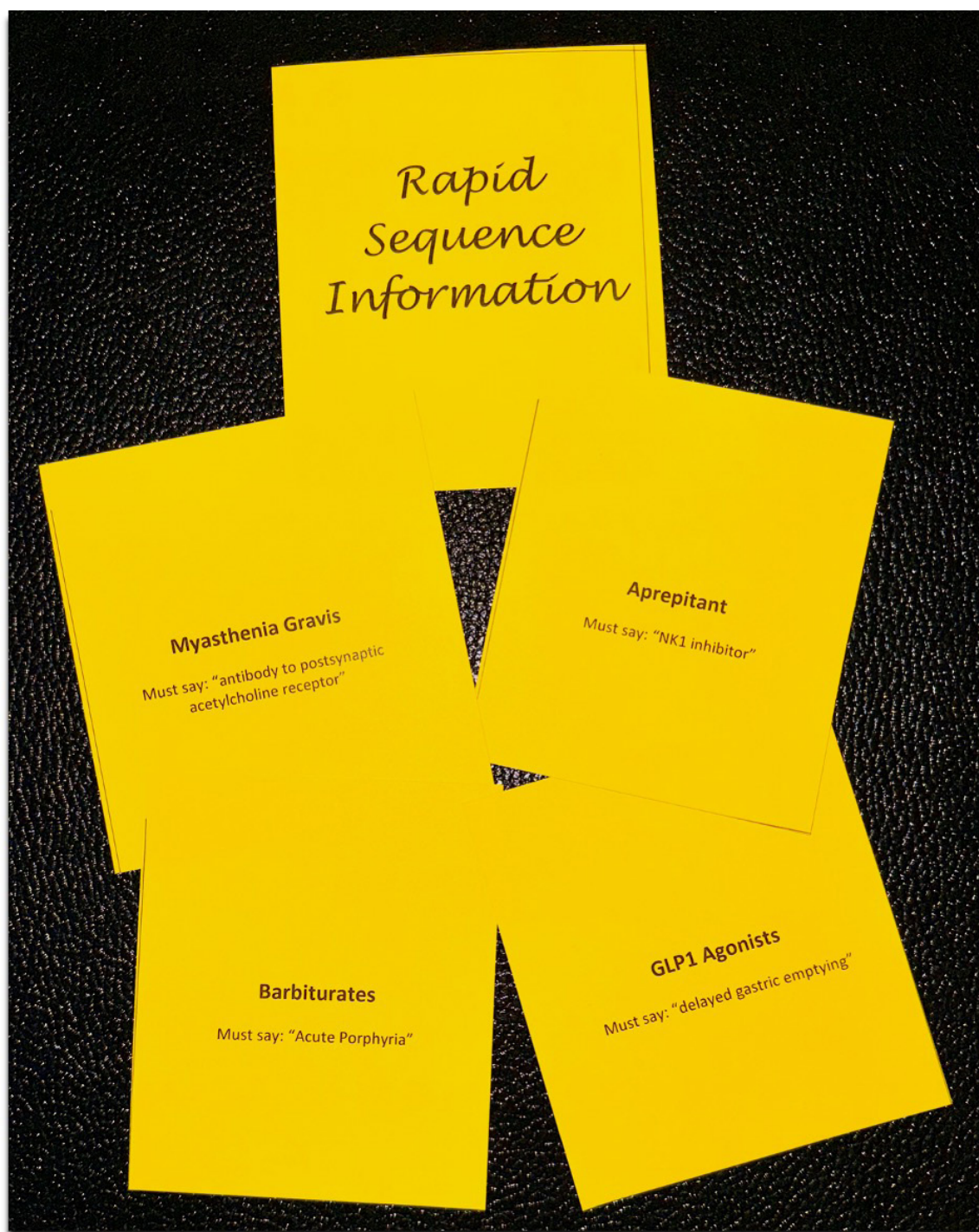


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Figures

Figure 2. RSI playing card examples. Cards were printed on cardstock and cut. Front of cards show the game name and back has the keyword and “must-say” phrase. We produced 156 unique game cards.



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Tables

Table 1. Rapid Sequence Information (RSI) Game Rules

Objective	Supplies	Directions
• Answer questions correctly and describe ABA keywords effectively to have your teammates guess them! • Deal with exciting “Events” along the way! • The team who reaches the end first and “secures the airway” wins.	• Two teams of 2–6 people each (ideally equal # on each team) • Game board • RSI cards • CHALLENGE cards • EVENT cards • GOOD PLANNING cards • 2 game pieces (1 to represent each team on the board) • Buzzer	1) Shuffle the various decks of cards and place next to the board. 2) Divide into 2 teams (each team chooses a game piece to represent them). 3) Game begins with a “Preoxygenation Round” in which <u>each</u> team will have a turn to answer a CHALLENGE card question (other team must read the question so that the answer isn’t seen by the team guessing). If the team answers correctly, they should collect 1 GOOD PLANNING card which may be used later to block an EVENT if desired. 4) The team with the youngest player starts the first round: the 1-minute timer is started, and a player from the team goes sequentially through the RSI cards deck and tries to get their teammates to name the ABA keyword/phrase on the card they’re holding as quickly as possible without saying a part of the keyword/phrase itself (that would be cheating). <u>HOWEVER, the clue-giver needs to say the “must say” description written at the bottom of the card.</u> **During their turn, a member of the opposite team will watch the clue-giver and hold them accountable to these rules using the buzzer. If the clue-giver <i>does</i> get buzzed for stating part of the keyword <u>or failing to utter the “must say” description</u>, they will lose 1 point for that play.** At the end of their turn (when timer runs out), the total number of RSI cards should be tallied (minus any points for getting buzzed or skipping which is also a minus-1 penalty). Additionally, the team should do a brief review out loud of all the cards from their turn and clarify the connection between the term and the “must-say” phrase for learning purposes. The team will then advance forward on the board (equal to the total score for the round) on the board. Both teams must complete their turn for the round to be considered over. NOTE: rotate each round such that different people take turns as the card reader. 5) If a team has landed on an EVENT space, on their turn they must pull the top EVENT card from the deck, read it, and then PROMPTLY START THE ROUND TIMER. Once the timer starts, they must either perform or block (if eligible to) that EVENT and then immediately continue with the remaining time left for their turn. 6) To reach the final space on the board, a given team must have earned a score equal to <i>or exceeding</i> the number of spaces required to get there from their previous turn (e.g., if they’re 2 spaces away on their prior turn, they need a score of 2 or greater). 7) Once a given team has reached the final AIRWAY SECURED space, they must also answer one final CHALLENGE question correctly to win the game.

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Tables

Table 2. Question Items from the RSI Game-Based Learning Survey

Question Number	Question Item	Answer Choices
Q1	What is your level of training?	Medical student CA-1 CA-2 CA-3 Attending Anesthesiologist Other
Q2	What methods of studying do you most commonly use for exam prep? Choose up to 3.	Lectures Textbooks Practice Questions ABA Keywords (from OpenAnesthesia or other sources) Interactive Games
Q3	Over the past year, how many of your lectures/didactics/Grand Rounds incorporated learning with a game-based format?	None (0%) Very few (5%) A decent handful (5%–20%) A lot (20%–50%) Most of them (>50%)
Q4	Rate your overall experience of the RSI game from very poor to fantastic (1-5):	Very poor — would not play again Okay — would consider playing again Neutral — I could take it or leave it Good – I enjoyed this experience Fantastic – I loved this game!
Q5	Did you feel the RSI game was able to increase your knowledge of the ABA keywords?	Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree!
Q6	Roughly how many keywords (ie, game cards) were you able to get through (roughly 30 min per game)?	0–15 16–30 31–45 46–60 >60
Q7	Any other feedback for the game or other study game ideas?	

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Tables

Table 3. Primary Results from the RSI Game-Based Learning Survey

Variable	Response Options	n (%)
Level of Training	CA-1	42 (61.8)
	CA-3	8 (11.8)
	CA-2	7 (10.3)
	Medical Student	5 (7.4)
	PGY-1	3 (4.4)
	Attending Anesthesiologist	2 (2.9)
	Other	1 (1.5)
Preferred Study Methods	Practice Questions	64 (94.1)
	Textbooks	29 (42.6)
	Lectures	18 (26.5)
	ABA keywords (from Open Anesthesia or other source	12 (17.6)
	Interactive Games	2 (2.9)
Exposure to Game-Based Learning in Lectures (Past Year)	Very few of them (<5%)	32 (47.1)
	None (0%)	24 (35.3)
	A decent handful (5%–20%)	11 (16.2)
	Most of them (>50%)	1 (1.5)
Overall Experience Rating for RSI Game (1–5)	5 - Fantastic — I loved this game	50 (73.5)
	4 - Good — I enjoyed this experience	13 (19.1)
Perceived Knowledge Gain from RSI Game	5 - Strongly agree	38 (55.9)
	4 - Agree	21 (30.9)
	1 - Strongly disagree	4 (5.9)
Number of Keywords Reviewed in Game Session	>60	19 (27.9)
	31–45	14 (20.6)
	16–30	13 (19.1)
	46–60	9 (13.2)
	0–15	5 (7.4)