

## Gamification in thoracic surgical education: Using competition to fuel performance

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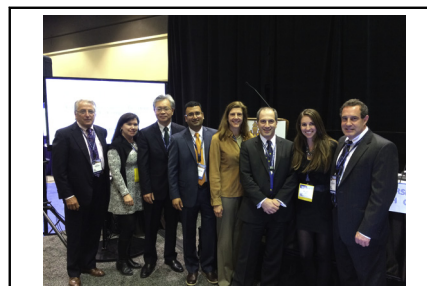
### ABSTRACT

**Objectives:** In an effort to stimulate residents and trainers to increase their use of simulation training and the Thoracic Surgery Curriculum, a gamification strategy was developed in a friendly but competitive environment.

**Methods:** “Top Gun.” Low-fidelity simulators distributed annually were used for the technical competition. Baseline and final video assessments were performed, and 5 finalists were invited to compete in a live setting from 2013 to 2015. “Jeopardy.” A screening examination was devised to test knowledge contained in the Thoracic Surgery Curriculum. The top 6 2-member teams were invited to compete in a live setting structured around the popular game show *Jeopardy*.

**Results:** “Top Gun.” Over 3 years, there were 43 baseline and 34 final submissions. In all areas of assessment, there was demonstrable improvement. There was increasing evidence of simulation as seen by practice and ritualistic behavior. “Jeopardy.” Sixty-eight individuals completed the screening examination, and 30 teams were formed. The largest representation came from the second-year residents in traditional programs. Contestants reported an average in-training examination percentile of 72.9. Finalists reported increased use of the Thoracic Surgery Curriculum by an average of 10 hours per week in preparation. The live competition was friendly, engaging, and spirited.

**Conclusions:** This gamification approach focused on technical and cognitive skills, has been successfully implemented, and has encouraged the use of simulators and the Thoracic Surgery Curriculum. This framework may capitalize on the competitive nature of our trainees and can provide recognition of their achievements. (*J Thorac Cardiovasc Surg* 2015;150:1052-8)



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### Central Message

Focused on technical and cognitive skills, gamification may capitalize on the competitiveness of our trainees to fuel performance.

### Perspective

In an effort to stimulate residents and trainers to increase their use of simulation training and the Thoracic Surgery Curriculum, a gamification strategy was developed. Focused on technical and cognitive skills, this has encouraged the use of simulators and the Thoracic Surgery Curriculum. This framework may capitalize on the competitive nature of our trainees to improve their performance.

See Editorial Commentary page 1059.

See Editorial page 1038.

Thoracic surgical education has undergone a fundamental transformation in the past several years. Our profession has faced internal and external challenges, including duty-hour restrictions, generational expectations, competing interests

in our educators, increased public scrutiny on outcomes, and a declining pass-rate on the board examination.<sup>1-4</sup> In response, thoracic surgical organizations established the Joint Council on Thoracic Surgery Education, Inc (JCTSE)

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**Abbreviations and Acronyms**

AATS	= American Association for Thoracic Surgery
ABTS	= American Board of Thoracic Surgery
ACGME	= Accreditation Council for Graduate Medical Education
ITE	= In-Training Examination
JCTSE	= Joint Council on Thoracic Surgery Education
SESATS	= Self-Education Self-Assessment in Thoracic Surgery
STS	= Society of Thoracic Surgeons
TSC	= Thoracic Surgery Curriculum
TSDA	= Thoracic Surgery Directors Association
TSRA	= Thoracic Surgery Residents Association

in 2008.<sup>5</sup> The mission of JCTSE is to advance thoracic surgical education by revising and upgrading the educational systems in our specialty. Efforts by the JCTSE have been innovative and include the development of learning and content management systems, resident course curricula, technical and cognitive simulation, and, importantly, faculty training as educators. Further, the JCTSE developed and implemented a new Thoracic Surgery Curriculum (TSC) in 2010, which was made available via an online learning and content management system in 2013.

Key concepts in our educational system have been identified that may benefit from a “new look.” For many years, the acquisition of technical and cognitive skills for the cardiothoracic surgery trainee was not constrained by the restriction of hours in the hospital. In the past decade, the advent of work-hour restrictions has had a measurable effect on thoracic surgery training.<sup>6,7</sup> Further, general surgery training historically provided predictable exposure to vascular surgery and cardiothoracic surgery. The endovascular approach to vascular disease and the attrition of cardiothoracic surgery rotations nationwide has further eroded the development of open surgical skills, critical to training in our specialty. Currently, more than 80% of general surgery residents seek additional training, leading to an increasingly top-heavy system, and one in which more junior-level operative exposure is limited.<sup>8,9</sup> These issues in part have led to the development of the integrated cardiothoracic residency, which remains a work in progress.

In an effort to stimulate residents and trainers to increase their use of simulation training and the TSC, a gamification approach in a friendly but competitive environment was proposed. Gamification is a process by which users are encouraged and enticed to perform tasks by incorporating elements of game design.<sup>10</sup> Gamification has been successfully used in a multitude of health care initiatives with success.<sup>10,11</sup> As has been done in the research environment, technical and

cognitive challenges were devised to heighten the awareness of all aspects of thoracic surgical education. In this study, we report the development of our gamification strategy, the competitions, and the impact of such an approach.

**METHODS**

The institutional review board at the University of Washington granted an educational waiver for analysis of these activities. In addition to distribution of simulators by the Thoracic Surgery Directors Association (TSDA), financial support for these contests was sought from several sources, including in-kind grants from industry, unrestricted educational grants from industry, support from the American Association for Thoracic Surgery (AATS) Graham Foundation, and support from the JCTSE for conduct of the skills and cognitive assessments, onsite competitions, and subsequent data analysis.

**“Top Gun”**

In the past 3 years, the TSDA distributed a low-fidelity coronary anastomosis simulator (Chamberlain Group, Great Barrington, Mass) to all first-year cardiothoracic residents in traditional 2- and 3-year training programs. An instructional video and a validated assessment form were included.<sup>12,13</sup> The methodology for the “Top Gun” competition has been previously described.<sup>14</sup> Notifications were sent to all program directors and coordinators by JCTSE, and to all thoracic surgery residents by the Thoracic Surgery Residents Association (TSRA). An announcement was present on the TSC homepage in 2015, and during resident events at the Society of Thoracic Surgeons (STS) 51st annual meeting. All first-year traditional-track (2- or 3-year) residents were invited in 2013 and 2014; fourth-year integrated residents and residents from Canadian programs also were invited in 2015. Participation was voluntary. Briefly, residents were asked to submit an anonymous baseline performance of an end-to-side coronary anastomosis using 4-mm synthetic vessels to a secure online Web site. Program directors assigned a faculty mentor to coach the resident in his or her performance. After a period of training, the residents submitted a final performance of the anastomosis. The same 3 judges completed all the evaluations in a blinded fashion. The top 5 performers were invited to participate in a live competition at the AATS annual meeting, which was the venue in each of the past 3 years.

At the AATS annual meeting, during the welcome reception in the exhibit hall, each resident was provided a private table, with video broadcast of their performance on monitors in the room. Three judges trained in technical skills assessment completed the evaluations. Audience members were able to directly observe the performances, or view them on a video screen. The best performer was awarded the “Top Gun” prize.

**“Jeopardy”**

In an attempt to foster the use of the TSC, a cognitive competition was conceived. A screening examination was developed using the TSC learning management system. A 60-item examination, consisting of 25 cardiovascular, 25 thoracic, and 10 congenital questions, was derived from the question bank of more than 1500 questions. All Accreditation Council for Graduate Medical Education (ACGME)-approved thoracic surgery residents in any year of training (integrated or traditional-track) were invited to participate, whereas advanced trainees in congenital heart, intensive care, or non-ACGME fellowships were excluded. Contestants had 20 minutes to complete the quiz, and were asked to identify an individual a priori with whom to create a 2-member team from a single institution. Notifications were sent to all program directors and coordinators by JCTSE and to all thoracic surgery residents by the TSRA. An announcement was present on the TSC homepage in 2015, and during resident events at the STS 51st annual meeting. Participation was voluntary, and the screening examination was anonymous. Each institution could have multiple teams,

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