

# Ensuring Competency of Novice Laparoscopic Surgeons—Exploring Standard Setting Methods and their Consequences

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**OBJECTIVE:** Simulation-based assessment tools have been developed to allow for proficiency-based simulator training in laparoscopy. However, few studies have examined the consequences of different standard setting methods or examined what level of proficiency is considered adequate for trainees. The objectives of the present study were to explore the consequences of different standard setting methods and to examine the proficiency level that surgical trainees are expected to reach, before performing supervised surgery on patients.

**DESIGN:** Study participants undertook the Training and Assessment of Basic Laparoscopic Techniques test. The tests were video-recorded and rated using a simple scoring system based on number of errors and time. Participants were then asked to assess how high a score a novice should reach before performing supervised surgery on a patient. We then compared 3 methods of standard setting: expert performance level, contrasting groups method, and a modified Angoff method.

**SETTING:** The study was conducted at the Copenhagen Academy for Medical Education and Simulation. The academy provides surgical simulation training in laparoscopy for trainees at the hospitals in the Capital Region and the Zealand Region of Denmark.

**PARTICIPANTS:** Participants were recruited among surgical trainees in their first year of specialty training from surgery, gynecology, and urology departments. A total of 40 participants were included and completed the trial.

**RESULTS:** The different standard setting methods resulted in different pass/fail levels. At the expert performance level,

the pass/fail level was 474 points—the contrasting groups method resulted in 358 points and the modified Angoff method resulted in 311 points among experienced surgeons, and 386 points among trainees. The different proficiency levels resulted in a failure rate of 0% to 50% of experienced surgeons and a pass rate of 0% to 25% of novices. Novice laparoscopic surgeons set a higher pass/fail level than experienced surgeons did ( $p = 0.008$ ).

**CONCLUSION:** Required proficiency levels varies depending on the standard setting method used, which highlights the importance of using an established standard setting method to set the pass/fail level. (J Surg Ed ■■■■-■■■. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

**KEY WORDS:** laparoscopy, minimally invasive surgery, simulation, training, standard setting, medical education

**COMPETENCIES:** Practice-Based Learning and Improvement

## INTRODUCTION

The traditional Halsteadian approach to training surgeons includes having novice trainees participate in surgery and operating on patients. Recent research has questioned this method, as trainee participation in operations can prolong operations and affect patient outcomes, with an increased risk of postoperative complications.<sup>1</sup> Simulation-based training has been suggested as a way of improving surgical training by creating “pretrained novices.” This approach has been shown to have a beneficial effect on patient outcomes, such as reducing the risk of intraoperative and postoperative complications and reducing the number of errors, operative time, and length of stay.<sup>2-6</sup> There are currently

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several simulation-based tests for laparoscopic surgery, such as Fundamentals of Laparoscopic Surgery<sup>7</sup> for general surgeons, Laparoscopic Skills Testing and Training<sup>8</sup> for gynecologists, Program for Laparoscopic Urological Skills<sup>9</sup> for urologists, and Training and Assessment of Basic Laparoscopic Techniques (TABLT)<sup>10</sup> developed for all surgical specialties. Proficiency-based simulation training has gained ground in laparoscopic surgical skills training as simulation-based assessment has developed.<sup>11,12</sup> Setting a pass/fail level is a prerequisite for summative assessment of competency in proficiency-based training<sup>13</sup> and, along with exploring the consequences, is an essential part of gathering validity evidence for a simulation-based test.<sup>14,15</sup> However, defining the level of proficiency can be challenging and has been a focus of discussion in the literature of medical education and testing.<sup>13,16-18</sup> The decision on a standard setting method is ultimately a policy decision as there is no true pass score for a test.<sup>13</sup>

There are a variety of standard setting methods that use criterion-based standard setting methods to assess competency.<sup>19</sup> Criterion-based methods are either examinee-centered or test-centered.<sup>17</sup> Examinee-centered methods determine the ability of the students and use these observations to set a pass/fail level. Test-centered methods look at the test characteristics, such as difficulty and relevance, and set a pass/fail level according to these characteristics. To explore the consequences of different standard setting methods, we chose to compare 3 standard setting methods. We compared the average expert performance levels, the contrasting groups method, and the modified Angoff method. The average expert performance level is a method in which the pass/fail level is set at the median performance level of a group of experienced surgeons.<sup>20</sup> The contrasting groups method<sup>17</sup> sets the pass/fail level using the normal distribution of performance scores from 2 groups: competent and noncompetent. The pass/fail level is usually set at the intersection between the distributions of the 2 groups. The modified Angoff method consists of first asking judges to define a borderline student<sup>21</sup> and then determine the performance level of a borderline student on each item in a test. The items scores are averaged across different judges and a pass/fail level is set.<sup>17,19</sup> The Angoff method can include actual performance data from students presented to the judges, and it can be done through several iterations.<sup>22</sup>

Laparoscopic surgical training has involved different standard setting methods, including receiver operator curves,<sup>7</sup> a generalized examinee-centered method,<sup>23</sup> expert performance levels,<sup>24</sup> and the contrasting groups method.<sup>10</sup> However, few studies looked at the consequences of the pass/fail setting or the effect of the choice of the standard setting method.<sup>25</sup> The present study aimed to explore the consequences of different standard setting methods and to examine what level of competency was

perceived to be adequate to begin performing supervised surgery.

## MATERIAL AND METHODS

We used the TABLT test to explore our aim-of-study. The TABLT test is a training and testing tool developed for cross-specialty training in basic laparoscopic skills, including surgery, gynecology, and urology.<sup>10</sup> It consists of 5 basic tasks, which can be practiced on a portable laparoscopic trainer.<sup>26</sup> The tasks include basic hand-eye coordination, cutting, sharp dissection, blunt dissection, and an integrated task simulating a cyst removal. Task scores are calculated by taking the maximum time of 600 seconds and then subtracting the time spent on each task and an error-specific penalty. Errors are defined for each task and include dropping a bead, cutting outside a circle, or perforating a balloon. Each error adds a 20-second penalty in the scoring system. Using scores from a group of expert laparoscopic surgeons, a standardized task score is calculated for each task. The performance score is the sum of the 5 standardized task scores and range from 0 points to 708 points.

Participants from departments of surgery, gynecology, and urology were recruited as part of the process of gathering evidence for the TABLT test.<sup>10</sup> In total, 20 novices and 20 experienced laparoscopic surgeons participated in the study (Table). Novices were surgical trainees who had no prior operative experience in laparoscopy and less than 2 hours of experience practicing laparoscopy on a simulator. The experienced laparoscopic surgeons had performed more than 100 laparoscopic surgeries. All participants were asked to perform the TABLT test twice. The first attempt was done to help participants get used to the simulator and familiarize themselves with the TABLT tasks and the scoring system. The second attempt was video-recorded and rated using a simple scoring system based on number of errors and time. The ratings were recorded in a password-protected spreadsheet. The tests were supervised by one of the researchers (E.T.), who rated the tests on site. The videos were also rated by a blinded rater and used as part of establishing evidence of validity for the TABLT test.

**TABLE.** Participants Characteristics

	Novice	Experienced	Total
Number	20	20	40
Sex			
Male	7	13	20
Female	13	7	20
Range of age in years	24-31	31-58	24-58
Specialty			
Surgery	11	10	21
Urology	3	5	8
Gynecology	6	5	11

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