Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

Association for Academic Surgery

Tackling technical skills competency: A surgical skills rating tool

*Thomas J. Wade, MD, and Travis P. Webb, MD, MHPE**

Medical College of Wisconsin, Milwaukee, Wisconsin

ARTICLE INFO

Article history:
Received 6 January 2012
Received in revised form
1 April 2012
Accepted 14 May 2012
Available online 5 June 2012

Keywords:
Education
Technical skill
Rating
Evaluation
Competency

ABSTRACT

Background: The Accreditation Council for Graduate Medical Education common program requirements mandate a competency-based assignment of duties. To accomplish this, valid and reliable assessment tools must be developed to evaluate competence. This study evaluated a rating tool to assess competence in basic surgical suturing skills.

Methods: A technical skills exercise consisting of the closure of three incisions, 3 cm long, was devised in 2006. The incisions were closed with simple stitches with two-handed knots, vertical mattress stitches with instrument knots, and a running stitch with one-handed knots. Fifteen min were allotted for completion. A rating instrument with 17 competency markers worth 1 point and a global 5-point Likert scale competency score was used to evaluate the performance. Twelve first-week post graduate year 1 surgical residents completed the exercise in 2006, and 16 final-month post graduate year 1 surgical residents completed it in 2011. All tasks were scored on video review by two independent raters. Statistical analysis included descriptive statistics, t-score analysis, rank sum analysis, Cohen's kappa coefficient, and Cronbach's alpha.

Results: The mean total score (11.8 *versus* 13.9, $P = 0.002$) and median global competency rating (1 *versus* 3, $P < 0.001$) were lower for the first-week cohort. Cohen's kappa coefficient of inter-rater reliability was 0.77. Cronbach's alpha measure of internal consistency was 0.87.

Conclusion: This rating form is a valuable tool to evaluate technical skill competency. Construct validity was demonstrated with improvement in total score and global rating. Excellent internal consistency and inter-rater reliability were also demonstrated. This form may be used to assess technical skill competency in an efficient skills exercise.

1. Introduction

The adequate training of surgical resident physicians requires achieving competency in a number of areas. The Accreditation Council for Graduate Medical Education (ACGME) has identified six core competencies that must be documented and achieved during resident training [1]. An additional competency, technical skill, is vital in the training of surgical residents. Surgical training programs must ensure the technical skill of not only their graduating physicians but also residents at various stages in training. As the focus on competency-based training has increased, the assessment of

* *Corresponding author*. Division of Surgical Education, Medical College of Wisconsin, 9200 W Wisconsin Ave, Suite 3510, Milwaukee, WI 53226, USA. Tel.: +1-414-805-8622; fax: +1 414-805-8641.
E-mail address: trwebb@mcw.edu (T.P. Webb).

0022-4804/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
doi:10.1016/j.jss.2012.05.052

technical skills has become the subject of debate and experimentation [2–4].

The traditional form of technical skills training and assessment has been that of informal feedback from surgical staff. However, this subjective technique of formative assessment is known to be inefficient and inaccurate [5,6]. Subjective evaluations have been shown to poorly correlate with objective assessment tools [7]. In an effort to improve the assessment of technical skills, researchers have developed several methods. These methods include the development of objective checklists, global assessments, motion analysis, and use of virtual reality simulators [3]. These methods of assessment have been tested in a variety of settings including bench stations, animal laboratories, and the operative theater [2,3,8,9].

The 2011 ACGME common program requirements have mandated a competency-based assignment of duties and progression to independent practice [1]. This mandate is particularly important for residents in the first year of training. The ability to demonstrate and prove competence in basic surgical skills early in the intern year may allow for more rapid advancement through early technical skills training in the operating room. In order to satisfy these directives, valid and reliable assessment instruments must be utilized to determine resident competence in a variety of duties, including technical skills. Ideally, this assessment would involve a relatively low cost of materials and minimal faculty time commitment to perform. This study evaluated a novel rating tool to evaluate competence in basic surgical suturing skills in early trainees with an efficient assessment tool.

2. Methods

2.1. Protocol

A technical skills exercise consisting of the closure of three incisions was devised in 2006. The incisions were each 3 cm in length and required closure following specific instructions within an allotted time period of 15 min. All three incisions were made on single simulated skin and soft tissue pads that were randomly numbered for masking purposes (Fig. 1) The participants were provided surgical gloves, a needle driver, Adson forcep, scissors, and three nylon sutures. The three separate incisions were closed with simple stitches with two-handed knots, vertical mattress stitches with instrument knots, and a running stitch with one-handed knots respectively. These instructions were made available prior to and during the exercise. The exercise was recorded without audio or visual identifiers of the participants. The exercise was first completed by 12 residents in the first week of training in July 2006. This cohort was referred to as early learners. The results were provided to the participants for formative feedback. In 2011, the exercise was performed by 16 surgical residents in the final month of their first year of training. This cohort was referred to as late learners. The exercises were performed and recorded in groups of four, again with 15 min allotted per participant, with 1 h required for completion by the entire cohort of residents. The cost analysis of the program included the purchase of simulated skin pads, 3–0 nylon suture, and surgical gloves. The total participant and evaluator time commitment to complete this protocol was also calculated.

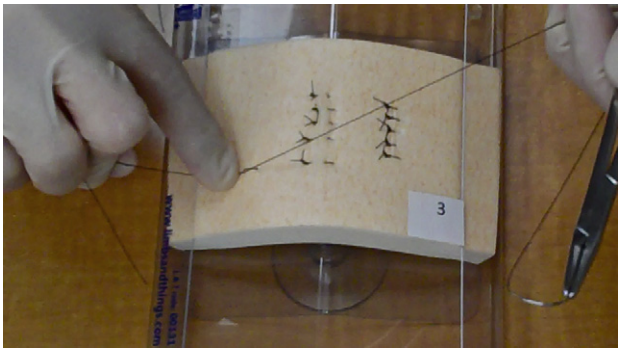

Fig. 1 – Suture exercise pad. (Color version of figure is available online.)

The video recordings were observed and graded by two evaluators with a rating tool developed at our institution (Fig. 2). The evaluators included an associate professor of surgery and a post graduate year 3 general surgery resident. The associate professor was an associate program director of the residency program and has completed a master's degree in health professions education. The resident was completing a 1-y research commitment focused on surgical education. The evaluators were selected because of their focus on resident education in general and the issue of competency-based training specifically. The grading was performed independently and the forms were collected upon completion of all assessments. The evaluators were masked to the identity of the resident. Each exercise was evaluated within 2 wk of exercise completion. The residents received there rating forms for formative feedback. The exercise was not used in a grading or testing manner.

2.2. Rating tool

The rating tool was developed through an iterative process of consensus-building based on the opinions of surgical faculty with leadership positions in the division of surgical education. The form was created with two purposes in mind: provide an accurate assessment of the learner's basic suturing skills and identify specific areas of technical skill to be improved upon through feedback and practice. The basic rating structure was initially based on that of other published assessment instruments with delineation of specific competency markers and a global assessment [10,11]. The competency markers were included to provide the specific cues for formative assessment and were chosen with the consensus of the three surgical educators. The rating tool consisted of four sections (Fig. 2). The first section included 17 competency markers worth 1 point each. Eleven competency markers were graded on video review. The remaining six markers were graded on suture pad observation and measurements. These markers were selected to evaluate basic technical skills that would be applicable to a broad base of operations. There were no specialty or procedure-specific markers. The second section recorded the time to complete the exercise. The third section was a global 5-point Likert scale competency score (1 = not competent, 5 = expert). Finally, a fourth section required written feedback for resident improvement.