

A High-Definition Video Teaching Module for Thyroidectomy Surgery

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OBJECTIVE: With the changing landscape of postgraduate surgical education to competency-based curricula, there emerges a need for alternative forms of training. Video teaching modules have been shown to be effective tools in surgical education, complementing traditional postgraduate curricula. There is a lack of validated modules described in the literature, specifically for teaching thyroidectomy. The primary objective of this study was to develop and validate a high definition video-based teaching module instructing thyroidectomy surgery to Otolaryngology—Head and Neck Surgery trainees.

DESIGN: This prospective study included intermediate to senior Otolaryngology—Head and Neck Surgery residents. Each participant first performed a thyroid lobectomy, serving as the initial assessment. After a washout period of at least 3 weeks, each participant was given the teaching module. The 15-minute module was developed using a 3-camera system and detailed a step-by-step approach to the surgery. After exposure to the module, each trainee performed the same procedure. Recordings of both procedures were deidentified and reviewed by a blinded, independent evaluator. Scoring was done using the Observational Clinical Human Reliability Assessment (OCHRA) system.

SETTING: University of Alberta Hospital and Royal Alexandra Hospital, Edmonton, Alberta, Canada.

PARTICIPANTS: A total of 6 intermediate to senior Otolaryngology—Head and Neck Surgery residents entered and completed the study.

RESULTS: The mean error rate was 8.8 errors per procedure before module exposure and 4.5 errors per procedure after exposure, representing a 49% decrease in error occurrence ($p < 0.05$). The mean staff takeover event rate was 10.5 takeovers per procedure prior to module exposure and

5.0 takeovers per procedure after exposure, representing a 52% decrease in error occurrence ($p < 0.05$).

CONCLUSION: High-definition video teaching modules are a useful complement to traditional surgical training. In a climate where new innovations for teaching thyroid surgery are needed, properly constructed and validated video teaching modules can serve as important tools in supplementing traditional surgical training. (J Surg Ed ■■■■■. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: thyroidectomy, education, teaching, video, surgery, otolaryngology

COMPETENCIES: Practice-Based Learning and Improvement, Medical Knowledge, Patient Care

INTRODUCTION

Internationally, postgraduate surgical curricula have steadily implemented competency-based training over the past 20 years.^{1,2} In 2013, the Accreditation Council for Graduate Medical Education (ACGME) along with specialty groups in the United States, developed outcomes-based milestones as a framework for determining resident and fellow performance within the 6 ACGME Core Competencies: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice.³ These specialty-specific milestones now serve in residency program accreditation, providing transparency in competency evaluation within surgical programs, and supplying timely and accurate feedback to resident and fellow learners regarding their performance. In 2013, the Royal College of Physicians and Surgeons of Canada announced its plans to switch residency training from the traditional time-based model to a competency-based curriculum. Expected to commence in 2017, this initiative will also rely on outcomes-based milestones as a core form of learner evaluation and feedback.² These examples, along with countless others

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internationally, reflect a paradigm shift in graduate surgical education.⁴

When adopting a milestone-based framework for graduate surgical education, a unique set of challenges become apparent. Perhaps most importantly, residents will need to devote time to continually receive formative feedback while achieving the required milestones. This, in combination with increasing resident work hour restrictions, means that residents are unable to rely solely on traditional means of surgical training—in the operating theater with one staff surgeon. To this end, there emerges a demand for supplemental educational tools for surgical training. The development and use of video teaching modules has been shown to enhance resident learning and act as a valuable adjunct to traditional surgical curricula.⁵

Graduating residents in the field of Otolaryngology—Head and Neck Surgery (OHNS) are required to have mastered a large breadth of surgical procedures. Thyroidectomy is a core procedure and an example of one that requires a step-wise approach while demonstrating practiced surgical skill. A number of assessment tools for thyroidectomy have been described,⁶⁻⁸ however, there are no validated teaching modules for the purpose of education and training of residents. This study aimed to design and validate a high-definition video teaching module for instructing thyroidectomy to OHNS residents.

METHODS

Study Design and Participants

Ethics approval was obtained from the Health Research Review Board at the University of Alberta (Pro00057475). Participants were recruited for this prospective study and data acquisition proceeded for a period of 1 year. Recruitment was based on resident postgraduate year (PGY). Inclusion criteria for the study were intermediate to senior (PGY-3 to PGY-5) OHNS resident trainees at the University of Alberta. A total of 6 trainees met inclusion criteria and were subsequently contacted by e-mail. Trainees were assured that their participation in the study would not affect their advancement in the residency program or have any bearing on their curricular assessments. Informed consent was obtained with a 100% recruitment rate (Table 1).

TABLE 1. Study Participants and Corresponding Year of Training

Postgraduate Year (PGY)	Number of Resident Trainees (N = 6)
PGY 3	3
PGY 4	2
PGY 5	1

High Definition Video Teaching Module Creation

The high definition video teaching module was designed using a similar strategy as that employed by Mendez et al in 2014—a 3 camera system allowing for multiple vantage points.⁵ The 3 cameras used included a handheld camera (Nikon D4, Lens: AF-S NIKKOR 24-70 mm f/2.8G ED), a surgical head camera (Integra DLX Ultralite Pro HD Camera), and an overhead operating room camera (Stryker StrykeCam HD, 1/2.8-type Exmor CMOS). Module footage was obtained from 3 thyroidectomy surgeries completed by a single, fellowship-trained head and neck oncologic surgeon at the University of Alberta Hospital with a high-volume thyroid surgery practice (>80 thyroid surgeries per year). A surgeon volume threshold of 25 thyroidectomies per year has been associated with improved patient outcomes.⁹

A hierarchical task analysis (HTA) was carried out to determine the component steps of the operation (Appendix). This method of defining the tasks and subtasks necessary to perform a surgical procedure has been used extensively for open as well as laparoscopic operations.^{10,11} After completion of the HTA, the teaching module was developed using iMovie 10.1.3. Video footage and instructional content validity was ensured through the consultation of 5 fellowship-trained head and neck surgeons with high-volume thyroid surgery practices.

The final module was 15 minutes in duration and included instructional text detailing appropriate surgical steps and relevant anatomy.¹² Video length has been shown to be the most significant indicator of learner engagement.¹³ Shorter videos, lasting 0 to 3 minutes, have the highest level of engagement. For this reason, the module was divided into 7 sections, each no longer than 3 minutes in length (Appendix).

TABLE 2. Categorization of Error Types. Types 1 to 6 are Procedural Errors. Types 7 to 10 are Executional Errors

Error Classification	Pattern of Failure
1	Step is not done
2	Step is partially completed
3	Step is repeated
4	Second step is done in addition
5	Second step is done instead of first step
6	Step is done out of sequence
7	Step is done with too much force or speed
8	Step is done with too little force or speed
9	Step is done in wrong orientation or direction
10	Step is done with the wrong object

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