

YOU SHOULD TRY THIS!

Evaluating surgical airway education intervention for medical students

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Implication Statement

A targeted surgical airway session with interactive lecture and teaching is useful in undergraduate medical education settings with limited prior critical care and otolaryngology teaching. This session allows students to learn basic surgical airway anatomy, devices, and clinical scenarios. It requires minimal personnel, utilizes online lecture resources, and uses cost-effective reusable products obtained largely from expired hospital inventory. The session aims to enhance clinical competency for learners in clerkship when caring for surgical airway patients. The participants in the session should be able to understand the anatomy of surgical airways, understand the steps of performing an emergency surgical airway, and assess and manage surgical airways.

Évaluation d'une intervention pédagogique sur les voies aériennes chirurgicales destinée aux étudiants en médecine

Énoncé des implications de la recherche

Une séance ciblée sur les voies aériennes chirurgicales, comprenant un cours magistral interactif et des activités pratiques, s'avère utile dans le cadre de la formation médicale de premier cycle, où l'enseignement en soins intensifs et en oto-rhino-laryngologie est souvent limité. Cette séance permet aux étudiants d'acquérir des connaissances sur l'anatomie de base des voies aériennes chirurgicales, les dispositifs utilisés et les situations cliniques associées. Elle nécessite peu de personnel, s'appuie sur des ressources pédagogiques en ligne et utilise du matériel réutilisable et économique, provenant en grande partie d'équipements hospitaliers périmés. La séance vise à améliorer les compétences cliniques des étudiants en stage lorsqu'ils prennent en charge des patients nécessitant une prise en charge chirurgicale des voies aériennes. Les participants à la séance devraient être capables de comprendre l'anatomie des voies aériennes chirurgicales, de maîtriser les étapes de la prise en charge chirurgicale d'urgence des voies aériennes, ainsi que d'évaluer et de gérer les voies aériennes chirurgicales.

Background

While most medical students will encounter a surgical airway patient during clerkship, surgical airway teaching is underrepresented in the Canadian undergraduate curriculum.^{1,2} Surveys of junior doctors demonstrate limited knowledge of surgical airway anatomy and reduced confidence in assessing and managing these airways.³ Learning about surgical airway patients can prevent complications and optimize care. Our objective was to improve medical students' comfort and knowledge of surgical airways using a brief, low-cost, low-resource intervention.

Description of innovation

Deliberate practice is effective in improving clinical skills learning in medical students.⁴ Our intervention applied this approach through skill repetition, focused teaching, and feedback with experts, while monitoring the knowledge and confidence of participants.

Queen's third-year clerkship students and early first-year residents were invited to participate in a modified survey by Roof et al.⁵ (supplementary material), which gathered data on surgical airway comfort and knowledge. Participants answered questions about learning experiences, comfort, basic facts, and case-based knowledge regarding surgical airway management.

Seventeen residents, and 45 third-year medical students completed the survey. Of the 45 medical students, 39 participated in our intervention before entering clerkship; residents did not participate in the intervention due to scheduling challenges. For intervention participants, the survey was also offered immediately after the intervention, and 6-9 months later, to assess longer-term retention.

The intervention included a lecture and simulation. A 45-minute lecture focused on tracheostomies but also included cricothyrotomies and laryngectomies. Learning topics included anatomy, indications for surgical airways, complications, troubleshooting, and decannulation. Videos from the National Tracheostomy Safety Project⁶ supplemented the lecture. A simulation allowed students to practice cricothyrotomies on 3D-printed larynxes with surgical

skin (Image 1). Students also learned about surgical airway tubes and accessories. The cost of supplies for all five stations was about \$300 for the surgical skin and 3-D larynx; the medical supplies were taken from expired hospital stock.

Image 1. Cricothyrotomy simulation setup



Outcomes

Comfort questions were scored on a scale of 1-5 (1= strongly disagree, 5= strongly agree) and analyzed using a two-tailed t-test comparing scores based on surgical airway learning. ANOVA with *post hoc* Tukey's test assessed comfort differences across groups. Knowledge questions were scored as correct or incorrect and analyzed across groups and within groups based on surgical airway experience using Chi-Square and Fisher's exact tests. This intervention improved participants' comfort and knowledge of surgical airways (Appendix A, Table 1).

Comfort scores were assessed between groups using ANOVA (df = 3, F = 293.69). Mean comfort scores of the intervention group immediately following the intervention 4.36 (SD = 0.90), and at follow-up 3.48 (SD = 1.31), were higher than baseline 1.85 (SD = 1.20) and were statistically significantly different (all $p < 0.001$). Likewise, the mean scores following the intervention and at follow-up were significantly higher (post-intervention $p < 0.001$, follow-up $p = 0.003$) than the mean score of residents 2.96, (SD = 1.51).

Knowledge scores of the intervention group were statistically significantly higher post-intervention for fact-based $X^2 (1) = 55.45$, $p < 0.001$, and case-

based scores $X^2(1) = 19.03$, $p < 0.001$, when compared to baseline. At follow-up, fact-based knowledge scores were statistically significantly higher than baseline $X^2(1) = 6.71$, $p < 0.001$, while case-based scores were similar $X^2(1) = 3.29$, $p = 0.069$. Immediate post-intervention scores were significantly higher than residents for fact-based $X^2(1) = 18.3$, $p < 0.001$, and case-based questions $X^2(1) = 4.43$, $p = 0.035$. At follow up, scores were statically similar to residents for fact $X^2(1) = 1.85$, $p = 0.17$, and base based questions $X^2(1) = 0.72$, $p = 0.396$.

Residents reported more learning experiences with surgical airways than medical students. These learning experiences were associated with higher comfort scores, but not knowledge scores.

Limitations and next steps

In this study, we observed an increase in comfort and knowledge in managing surgical airways following teaching involving an explanation and simulated practice. Following this study, the lecture has been incorporated into the Queen's clerkship curriculum, while the lecture and simulation has been added to our summer program offered to students interested in surgical specialties. We plan to extend our teaching to residents. We recognize that this study only reflects the experience of students from a single university and the limited efficacy of self-assessments.

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Conflict of Interest:

None.

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Appendix A.

Table 1 Surgical airway survey data

			Comfort scores				Knowledge Scores (fact-based)		Knowledge Scores (case-based)	
Group	<i>n</i>	Surgical airway exposure (%)	Group mean *	Exposure mean	No exposure mean	Within group p-value	% correct	Between group comparison p-value	% correct	Between group comparison p-value
Third-year baseline	46	19.6	1.85	2.53	1.68	<0.001	38.1	Resident 0.17	34.1	Resident 0.28
								Post-intervention <0.001		Post-intervention <0.001
								Follow up <0.001		Follow up 0.069
First-year resident	17	82.4	2.96	3.08	2.41	0.035	47.2	Baseline 0.17	42.1	Baseline 0.28
								Post-intervention <0.001		Post-intervention 0.035
								Follow up 0.17		Follow up 0.40
Third-year post intervention	39	25.6	4.36	4.53	4.30	0.030	74.9	Baseline <0.001	58.3	Baseline <0.001
								Resident <0.001		Resident 0.035
								Follow up 0.089		Follow up 0.51
Third-year follow up	12	25	3.48	3.93	3.32	0.040	61.1	Baseline <0.001	51.7	Baseline 0.069
								Resident 0.17		Resident 0.40
								Post-intervention 0.089		Post-intervention 0.51

* All groups are statistically different ($p < 0.05$) from one another