

Videotape feedback in teaching laryngoscopy

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Purpose: To evaluate if videotape feedback provides educational insights for students learning laryngoscopy that they would not otherwise perceive.

Methods: Twenty-six medical students were videotaped while performing laryngoscopy for oral intubation. Before and after reviewing their performance on the videotape, they answered a standardized questionnaire assessing the adequacy of positioning, head movement during laryngoscopy, degrees of neck flexion and head extension, time elapsed, and whether the laryngoscope contacted the upper lip or teeth. After the review, they were asked if being videotaped was distracting, whether it provided new instructional insights and, if so, which was most important.

Results: Only 4% of students felt that initial head and neck positioning was suboptimal and this increased to 38% after videotape review ($P = 0.029$). The perceived inadequacy of positioning seemed related to initial overestimation of head extension ($34.0 \pm 15^\circ$) compared with that seen on videotape ($21.5 \pm 13.5^\circ$, $P = 0.003$). The estimated duration of laryngoscopy was underestimated (55 ± 32 sec vs. 75 ± 29 sec, $P = .024$) before videotape review. Although 26.9% (7/26) of students admitted feeling distracted by the video camera, all felt the experience had educational value.

Conclusion: Videotape feedback changed students' perception of how they performed laryngoscopy. In particular, head extension was overestimated and duration of laryngoscopy underestimated.

Objectif : Évaluer si le feed-back par vidéocassette procure aux étudiants en apprentissage de la laryngoscopie une perception de l'intubation qu'ils ne pourraient obtenir autrement.

Méthodes : Vingt-six étudiants en médecine ont été filmés sur vidéocassette pendant une laryngoscopie pour intubation orale. Avant et après avoir assisté à leur prestation sous vidéocassette, ils ont répondu à un questionnaire standard sur la validité de la position, les mouvements de la tête pendant la laryngoscopie, le degré de flexion du cou et d'extension de la tête, le temps écoulé et si le laryngoscope faisait contact avec la lèvre supérieure ou les dents. Après avoir visionné la cassette, on leur a demandé si le fait d'être filmé les avait dérangés, si cette méthode favorisait, oui ou non, l'approche pédagogique à l'intubation et, le cas échéant, qu'est-ce qui pour eux était le plus important.

Résultats : Avant la représentation de la vidéocassette, seulement 4% des étudiants pensaient que la position de la tête et du cou était inadéquate ; cette proportion passait à 38% après la représentation ($P=0,029$). La perception qu'ils avaient d'une erreur de position semblait en rapport avec une évaluation initiale exagérée de l'extension céphalique ($34,0 \pm 15^\circ$) comparativement à ce qu'ils voyaient sur la cassette ($21,5 \pm 13,5^\circ$ $P=0,003$). La durée de la laryngoscopie était sous-estimée (55 ± 32 sec vs 75 ± 29 , $P=0,024$) avant la représentation de la vidéocassette. Bien que 26,9% (7/26) des étudiants aient admis avoir été distraits par la camera, tous pensaient que l'expérience avait une valeur pédagogique.

Conclusion : Le feed-back sur vidéocassette a changé la perception qu'avaient les étudiants de leur performance en laryngoscopie. L'extension de la tête et la durée de la laryngoscopie ont été particulièrement sous-estimées.

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TEACHING airway management skills is one of the most important educational responsibilities of the Anaesthesia department in University Hospitals. However, objective, critical examination of the way that these skills are learned has not been well reported. In the surgical literature, Reznick¹ has urged that teaching surgical technique should be recognized as a challenge in adult learning, with emphasis on structural goals, and providing objective feedback. As a form of feedback, he notes review of videotaped performance to have high reliability and validity, particularly if conducted in a clinically realistic setting. In teaching surgical technique to plastic surgery residents² and trauma resuscitation skills to team members,³ videotape feedback was strongly felt by the learners to accelerate learning. In the latter case, objective improvement in timed performance of critical tasks was improved.

In the Anaesthesia literature, videotape feedback has been shown to improve the time efficiency of anaesthetic inductions by trainees with various levels of experience.⁴ To our knowledge, this feedback technique has not been reported with regard to teaching airway management skills. We chose to provide such feedback to medical students learning tracheal intubation during a 10 day rotation in Anaesthesia. Specifically, we wished to compare their perceptions of elapsed time, patient positioning and laryngoscope manipulation during intubation with what they observed on a videorecording of the procedure.

Methods

Twenty-six consecutive third year medical students rotating through their two-week Anaesthesia training period at the SMBD-Jewish General Hospital from April, 1995 through January, 1996 participated in the study. None had experience with laryngoscopy before the rotation. All were shown a standard teaching videotape demonstrating the technique at the start of their rotation. All had practised the technique on a mannequin and/or patients several times before being videotaped. With institutional ethics board approval, informed consent was obtained from ASA class 1 or 2 patients scheduled for elective surgery with oral endotracheal general anaesthesia. Patients were excluded from study if, based on history or physical examination, the attending anaesthetist suspected difficulty with tracheal intubation. The students also gave their written consent to be videotaped. Each student was videotaped once, after two to nine days of intubating experience, at a time based on the availability of the investigator. After review, all videotapes were erased.

Each student was videotaped throughout one attempt at tracheal intubation, whether successful or not. Patients were preoxygenated for at least two minutes. Induction drug and dose were at the discretion of the attending anaesthetist. Succinylcholine was always used. All intubations were performed with a Macintosh #3 laryngoscope. The duration of laryngoscopy was defined as the time from placing the laryngoscope in the patient's mouth until it was withdrawn, whether by the student or by the supervising anaesthetist who had taken over the attempt. All videorecording was performed by the same investigator (KK), independent of the supervising anaesthetist. The video camera viewing angle was from the right side of the patient's head and neck. Immediately after terminating laryngoscopy, the student was asked to fill out a questionnaire reviewing the procedure ("PRE" video review, Figure 1). They were asked to estimate the duration of laryngoscopy (seconds) and degree of neck flexion and head extension at the time of intubation (degrees from horizontal). Students' qualitative impressions of whether the patient was in the "sniffing position" at the outset, whether the position changed during the procedure, and whether contact was made with the upper lip or teeth were also sought.

The videotape was then reviewed immediately on a video monitor, in private, with only the student and investigator present. Based on the videorecording, the student answered the questionnaire a second time ("POST" review) and the duration of laryngoscopy was timed with a stopwatch. The recording was repeated as many times as necessary to allow the student to answer the questionnaire, without prompting from the investigator. Students were asked if they felt

LARYNGOSCOPY QUESTIONNAIRE	PRE	POST
1. Was the patient in optimal "sniffing position" at the outset?		
2. Did the patient's head position change during laryngoscopy?		
3. Estimate the number of degrees of:		
a) Neck flexion		
b) Head extension		
relative to the horizontal at the time of intubation.		
4. Estimate the time in seconds from inserting the laryngoscope until it was withdrawn.		
5. Did the blade contact the patient's incisors during laryngoscopy?		
6. Did the blade contact the patient's upper lip during laryngoscopy?		
7. Did you find being videotaped distracting?		N/A
8. Was being videotaped useful to you?		N/A
9. If so, what was the most useful insight gained?		

FIGURE 1 Questionnaire given to students immediately after intubation (PRE) and repeated after videotape review (POST).

distracted by the videotaping, whether they learned anything from it and if so, to describe the most important insight they gained.

Continuous variables are expressed as mean \pm SD and were compared with Student's two-tailed unpaired t-test. Non-parametric data were analysed by the Mann Whitney U-test. Significance was ascribed at the $P = 0.05$ level.

Results

Although only one of the students (4%) had the initial impression the patient was not in the "sniffing" position, on review of the tape this proportion increased to 10/26 (38%), ($P = 0.0029$).

When asked to quantify positioning during laryngoscopy, there was marked consistency in estimating neck flexion ($25.8 \pm 12.5^\circ$ PRE, $26.9 \pm 11.4^\circ$ POST, $P = 0.319$). However, there was overestimation of head extension ($34.0 \pm 15.0^\circ$ PRE, $21.5 \pm 13.5^\circ$ POST, $P = 0.0028$) before videotape review. (Figure 2).

The duration of laryngoscopy was underestimated and was reported as 55 ± 32 sec PRE while actually lasting 75 ± 29 sec on POST ($P = 0.0235$). All patients maintained oxygen saturations $\geq 90\%$ during laryngoscopy.

Videotape review made no difference in the students' perception of head and neck movement during laryngoscopy (11/26 answered "yes" PRE, 16/26 POST, $P = 0.179$). Nor did it affect awareness of laryngoscope contact with the upper teeth (14/26 PRE, 18/26 POST, $P = 0.335$) or contact with the upper lip (3/25 PRE, 3/25 POST, $P = 0.992$). None of the patients suffered dental or lip trauma.

Seven of the 26 students (26.9%) felt that being videotaped was distracting. However, all found it provided useful instructional feedback once the tape had been reviewed. When asked to specify the most useful insight gained from the video review process, 11/26 (42%) felt it related to the technique of manipulating the laryngoscope or endotracheal tube, while 11/26 (42%) felt it related to positioning of the head and neck. Four students (16%) made miscellaneous comments such as better appreciating the duration of laryngoscopy or overall technique.

Discussion

The results demonstrate a gap between medical students' perception of their performance and what was demonstrated on videotape. This was most striking with regard to positioning of the patient and duration of laryngoscopy.

In designing the study, we followed the principles of effective videotape feedback described by Steinert⁵. These include describing the feedback procedure in advance, conducting the review in a private and non-critical atmosphere, and reviewing what was learned from the questionnaire. The items on the questionnaire were chosen to be as specific as possible, and to be readily answerable based on the content of the videotape. This lessens the effect of interindividual observer bias, as noted by Liu.⁶ By using each student as his own control, however, we intended to eliminate the effects of observer bias and focus on changes in the student's own perception of his performance - i.e. learning. For this reason, students recorded their own estimates rather than measurements of the patient's head and neck angles. While these could have been measured on the video monitor screen afterward, this would have tested the students' accuracy in estimating angles rather than changes in perception brought about by videotape review. The duration of laryngoscopy was the only variable measured objectively on the videotape, rather than being estimated, because of the clinical importance of elapsed time.

All students had previously been instructed in how to position the patient's head and neck for laryngoscopy, and almost all (96%) felt that they had done this adequately when first questioned. Despite this, 38% considered that positioning had not been optimal when it was shown on videotape. Although major anaesthesia textbooks suggest flexion of the neck and extension of the head of patients prior to laryngoscopy, the extent of these manoeuvres is not quantified.^{7,8} Interindividual differences make strict guidelines neither possible nor desirable. Horton *et al.*,⁹ in conducting a survey of 10 senior anaes-

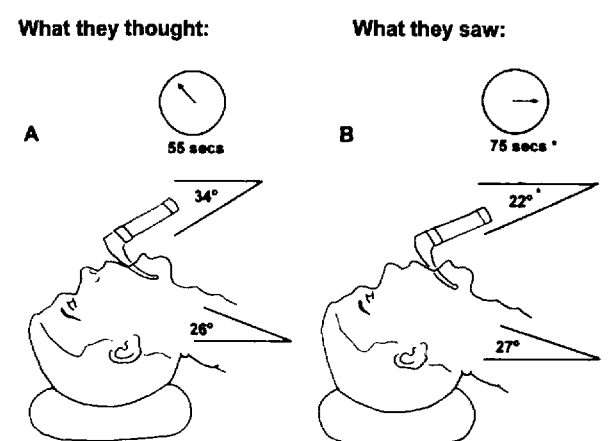


FIGURE 2 Schematic representation of students' impressions of patient positioning and elapsed time. A= prior to videotape review (PRE). B= after videotape review (POST).

* $P < 0.05$ PRE vs. POST.

thetists performing 100 uncomplicated laryngoscopies, measured mode values of 35° for neck flexion and 20° for head extension. These values are close to the videotape – based estimates in the present study, suggesting that the students' estimates of such angles were not grossly inaccurate. Horton's study also noted that the degree of neck and head angulations at the time of glottic exposure increased by approximately 5° each compared with the position at the start of laryngoscopy. All angle estimates in our study were based on the position when optimal view of the vocal cords was achieved.

When asked to quantify separately the degree of neck flexion and head extension at laryngoscopy, head extension was overestimated. This may be because, at laryngoscopy, students were looking down onto the patient's head while the video camera afforded a side view which enabled more accurate estimation. However, estimates of the extent of neck flexion were unaffected by looking at the videotape and this may be explained by the routine use of a 6 cm-thick donut-shaped head support in all patients. By placing these headrests, students may have had more visual and tactile input into sensing the degree of neck flexion. Better understanding of head positioning, particularly head extension, was cited by 42% of the students as the most useful benefit of videotape review.

The most clinically striking finding of the study was that the average duration of laryngoscopy was 75 sec *vs* an estimated 55 sec, a 36% difference. The absolute numbers will not surprise those involved in medical student training, but they underscore the need for disciplined preoxygenation and vigilance on the part of the supervising anaesthetist to avoid problems with oxygenation, haemodynamics and oral trauma. With such precautions, no untoward events occurred with these patients but stress levels in the anaesthetist were not assessed. However, the fact that students underestimated the duration of laryngoscopy has distressing implications. In debriefing the students it was emphasized that persistent attempts at intubation by inexperienced operators are more hazardous than abandoning laryngoscopy in favour of manual ventilation.¹⁰

Factors affecting the perception of passage of time have been reported in the psychological literature. Laboratory studies have shown that when time intervals are estimated retrospectively, rather than prospectively, there tends to be considerable underestimation in the elapsed time, particularly if the time interval is > 30–40 sec.^{11,12} When time elapsed is estimated retrospectively, as in our study, the inaccuracy can be further compounded in proportion to the degree of distraction or stress of the subject.¹¹

In contrast to the perception of elapsed time, viewing the videotape did not affect students' awareness of patient head movement or laryngoscope contact with the patient's lip or teeth during the procedure. Because these are student perceptions and not objectively validated, we do not know whether this is due to accurate student self-assessment for these factors or inaccuracy in interpreting the videotape.

As noted by Steinert,⁵ being videotaped can be "anxiety-provoking" to the subject: 27% of students described being videotaped as "distracting" to some extent, despite previous reassurance about the confidential and educational nature of the recording. Upon completing review of the videotape, there was unanimous opinion that the experience had been useful. The degree of discomfort may have been underestimated, and its utility overstated, both in deference to the efforts of the videographer. Student anxiety may also have been heightened because they were videotaped performing laryngoscopy on a patient in the operating room rather than on a mannequin. However, videotape feedback has validity as an assessment tool, i.e. it measures performance that is clinically relevant, only to the extent that it reproduces "clinical realism."¹

Reviewing performance of laryngoscopy on videotape provides insights that students do not otherwise appreciate. All students appreciated the experience of the videotape feedback. The underestimation of head extension and duration of laryngoscopy suggest that these points deserve emphasis during instruction in the technique of tracheal intubation.

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