Evaluation of a Web-Based Training Module in Teaching Interpretation of Laryngeal Stroboscopy

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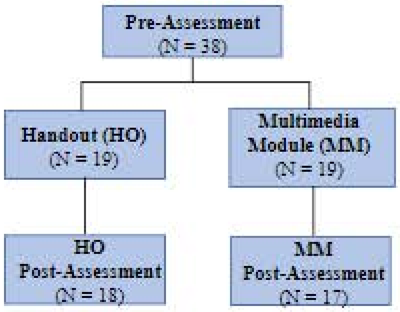
INTRODUCTION

- Otolaryngology training programs must balance the competing demands of resident education, service obligations, and work-hour constraints.
- Some specialties are exploring web-based courses and multimedia modules as adjuncts to the traditional educational model of apprenticeship and didactics.[1]
  - Residents show improved procedure proficiency and case preparation after using e-learning tools.
  - Residents express high satisfaction with multimedia teaching technology.[2-4]
- Web-based teaching modules are a potential solution to some of the challenges of providing opportunities for resident learning.[5]

- **The purpose of this study is to evaluate the efficacy of a web-based multimedia training module among a cohort of otolaryngology residents. We hypothesized that the use of a multimedia module will improve rating scores and participant confidence compared to standard text materials on stroboscopy.**

METHODS

- Three training programs with fellowship-trained laryngologists on faculty participated over a three month period in 2018.
- Resident trainees completed:
  - A pre-training assessment consisting of five stroboscopic exams consisting of multiple choice questions on perceptual voice evaluation (PVE) and stroboscopic findings.
  - A survey evaluating exposure to and confidence in stroboscopy interpretation.
- Participants were randomized (**Figure 1**) to receive teaching materials in the form of:
  - Written handout (HO) – text and still images, or
  - A multimedia module (MM) – narrated text with embedded audio and video files.
- After reviewing the training materials, participants completed a post-training assessment, consisting of five unique stroboscopic exams.



- Three fellowship-trained laryngologists completed the assessments, generating a key for comparison.
- Mean scores were calculated for overall test scores as well as subset scores in perceptual voice evaluation, laryngoscopy, and stroboscopy.
- Scores were compared by PGY and by institution using ANOVA. Post-hoc Tukey tests were performed for multiple comparisons when indicated.

RESULTS

- Thirty-five of 47 invited residents (74.4%) completed the pre- and post-training assessments.
- Twenty-six (68.4%) respondents reported having had didactics on stroboscopy.

	Total	Perceptual Voice	Laryngoscopy	Stroboscopy
Pre-assessment				
Mean (SD)	56.5 (11.9)	68.5 (10.6)	70.2 (12.8)	45 (17.8)
Post-assessment Handout				
Mean (SD)	61.6 (5.4)	68.8 (11.0)	66.8 (6.4)	55.5 (8.2)
Post-assessment Module				
Mean (SD)	67.0 (7.6)	77.3 (10.6)	69.3 (8.9)	61.9 (10.8)

Table 1. Pre- and post-assessment scores shown as percentage (%) correct out of 126 points.

- Post-assessment scores did not show a significant difference in scores by post-graduate year (p = .75) or institution (p = .17). Neither subgroup showed an increase in laryngoscopy-specific scores (HO = 66.8 ± 6.4, p = .47 ; MM = 69.3% ± 8.9, p = .52).

RESULTS (CONTINUED)

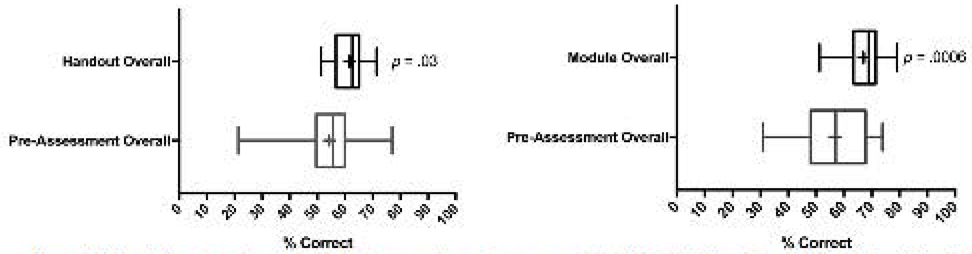


Figure 2 (above). Paired analysis demonstrated an overall mean improvement of 7.4% in the HO cohort and 10.3% in the MM cohort. Box whisker plots shown with mean denoted as "+".

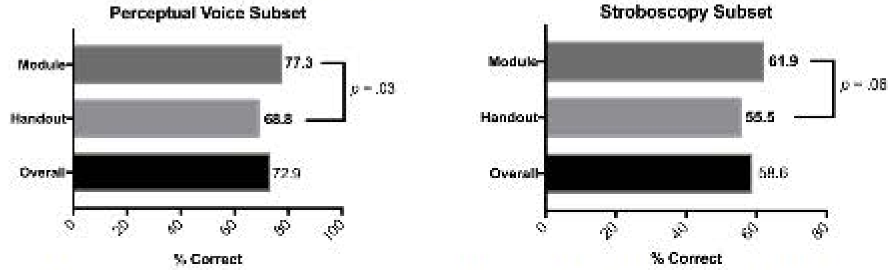


Figure 3 (above). Subset analysis demonstrated higher scores for the MM cohort for PVE (HO = 68.8% ± 11.0; MM = 77.3% ± 10.6) and stroboscopy-specific items (HO=55.5% ± 8.2; MM = 61.9% ± 10.8).

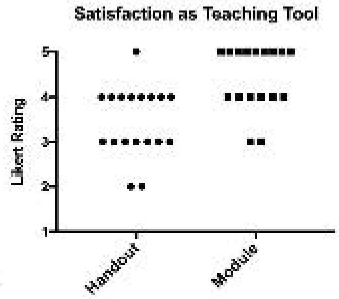


Figure 4 (right). On a 5-point Likert scale, residents reported improved confidence in stroboscopy interpretation (p < .0001), irrespective of cohort (p=.62). Residents rated MM (median=5) more favorably as a teaching tool compared to HO (median = 4, p =.001).

DISCUSSION

- Stroboscopy is an important tool in the evaluation of dysphonic patients. Previous studies have demonstrated a lack of confidence among trainees in stroboscopy interpretation.[6] To our knowledge, there are few available online resources for learning stroboscopy.[7] In other specialties, the uses of e-learning modules has been successfully employed to enhance the trainee learning experience.[8-11] Given the inherent audiovisual component to stroboscopy interpretation, we posit that a multimedia module would be effective in teaching basic concepts in stroboscopy.

- Residents demonstrated improved scores and confidence after training with both the HO and the MM materials.
- The MM appeared to be more effective than the HO in conveying concepts in perceptual voice evaluation and stroboscopy-specific items.

  - Improvement in overall scores was higher in the MM group (10.3 vs 7.4%, p = 0.006).
  - There was no difference in pre- and post-assessments for laryngoscopy specific items in either group. This likely reflects earlier exposure to and training in flexible laryngoscopy.
  - The improvement in PVE scores was significantly higher in the MM group, supporting the hypothesis that audiovisual materials are more effective in teaching concepts in voice evaluation.
  - The increase in stroboscopy-specific scores approached, but did not reach, statistical significance, and may have resulted from low subgroup numbers.
  - The MM was rated more favorably than the HO, with higher post-training confidence scores by the tested residents.

CONCLUSION

Use of both written handout and multimedia module improved scores and confidence in interpreting laryngeal stroboscopy. The multimedia module was more effective in perceptual voice evaluation and stroboscopy-specific items, and was rated more favorably by residents indicating that web-based modules may be an ideal adjunct modality for teaching stroboscopy.

REFERENCES

1. Jokinen E, Mikkola TS, Harkki P. Evaluation of a Web Course on the Basics of Gynecological Laparoscopy in Resident Training. *Journal of surgical education.* 2017;74(4):717-723. 2. Hearty T, Maizels M, Pring M, et al. Orthopaedic resident preparedness for closed reduction and pinning of pediatric supracondylar fractures is improved by e-learning: a multisite randomized controlled study. *The Journal of bone and joint surgery. American volume.* 2013;95(17):e1261-1267. 3. Hindle A, Cheng J, Thabane L, Wong A. Web-Based Learning for Emergency Airway Management in Anesthesia Residency Training. *Anesthesiology research and practice.* 2015;2015:971406. 4. Mitchell JD, Mahmood F, Wong V, et al. Teaching concepts of transesophageal echocardiography via Web-based modules. *Journal of cardiothoracic and vascular anesthesia.* 2015;29(2):402-409. 5. Whitson BA, Hoang CD, Jie T, Maddaus MA. Technology-enhanced interactive surgical education. *The Journal of surgical research.* 2006;136(1):13-18. 6. Jones JW, Perryman M, Judge P, et al. Resident Education in Laryngeal Stroboscopy and Perceptual Voice Evaluation: An Assessment. *Journal of voice : official journal of the Voice Foundation.* 2018. 7. Poburka BJ, Bless DM. A multi-media, computer-based method for stroboscopy rating training. *Journal of voice : official journal of the Voice Foundation.* 1998;12(4):513-526. 8. Tarpada SP, Hsueh WD, Gibber MJ. Resident and student education in otolaryngology: A 10-year update on e-learning. *The Laryngoscope.* 2017;127(7):E219-e224. 9. Poon C, Stevens SM, Golub JS, Pensak ML, Samy RN. Pilot Study Evaluating the Impact of Otology Surgery Videos on Otolaryngology Resident Education. *Otology & neurotology : official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology.* 2017;38(3):423-428. 10. Cabrera-Muffly C, Bryson PC, Sykes KJ, Shnayder Y. Free online otolaryngology educational modules: a pilot study. *JAMA otolaryngology-- head & neck surgery.* 2015;141(4):324-328. 11. Bell DS, Fonarow GC, Hays RD, Mangione CM. Self-study from web-based and printed guideline materials. A randomized, controlled trial among resident physicians. *Annals of internal medicine.* 2000;132(12):938-946.

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