



Original contribution

# The effects of dynamic airway photographs on preoperative airway planning among a panel of anesthetists<sup>☆</sup>



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## Abstract

**Study objective:** To determine whether having preoperative airway photographs will change the preanesthetic airway plan.

**Design:** Questionnaire.

**Setting:** American academic medical center (Brigham and Women's Hospital, Boston MA).

**Subjects:** Twenty-five test subjects (American Society of Anesthesiologists 1-4) were enrolled to have their preoperative airway photographs taken as well as to have a customary preoperative history and physical examination. In addition, 15 anesthetists were enrolled to review the subjects' preoperative history, physical examination, and preoperative airway photographs.

**Measurements:** All 15 anesthetists were asked to fill out a survey for airway management for each test subject.

**Main results:** All 15 anesthetists completed the survey. Across all providers, plans were changed a median of 24% (95% confidence interval [CI], 12.7-38.6). Among attending anesthesiologists, airway management plans were changed 30% of the time (95% CI, 12.4-40.0), whereas among nonattending level providers, plans changed 24% of the time (95% CI, 12.0-38.8).  $\chi^2$  Tests found no difference between the percent change of airway plans between attending and nonattending level providers ( $P = .306$ ).

**Conclusions:** Our findings suggest that the addition of dynamic airway photographs to preoperative airway reports affects airway management plans among a variety of anesthesia care providers. In general, dynamic airway photographs can aid preoperative airway management planning.

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<sup>☆</sup> Disclosures: None.

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## 1. Introduction

Preoperative airway assessment is an essential part of the practice of clinical anesthesiology. Difficulty or failing to successfully intubate the trachea can be life-threatening and can lead to significant morbidity and mortality such as permanent brain damage and death [1,2]. Patients scheduled for elective surgery may be seen in a preoperative testing center for pre-anesthesia airway assessment. This assessment is recommended in the 2013 Practice Guidelines for Management of the Difficult Airway to anticipate patient needs before their procedure. This assessment can be used to improve resource utilization, reduce overall cost, and improve outcomes [3-5]. The bedside airway examination is important in predicting difficult intubation and is part of difficult airway algorithms and preoperative checklists [3,6]. Bedside airway examinations such as the Mallampati classification and thyromental distance have classically been used to predict the difficulty of intubation [7-9,14].

It is known that experienced clinicians use clinical information, including patient appearance and gestalt, in addition to the written airway descriptions to predict difficult airways [3,10]. Recent work has shown accurate classification of difficult intubation by computerized facial analysis, but this is not yet practical for widespread use [11]. The use of frontal and profile facial photographs has been shown to improve prediction of difficult airway vs Mallampati classification and thyromental distance alone [12].

### 1.1. Specific aims

We hypothesize that dynamic airway photographs—images of patients posing during the airway examination—would be a useful adjunct to our current preoperative evaluations. In this pilot study, we investigate the effect of dynamic airway photographs on preoperative airway planning among a panel of anesthesiologists.

## 2. Materials and methods

### 2.1. Study design, recruitment, and sample

The study protocol was approved by the institutional review board at Brigham & Women's Hospital. A study population of 25 subjects was recruited among patients undergoing evaluation at our institution's preoperative testing center. There were no exclusion criteria. Verbal consent was obtained for airway photography and chart review. Airway photographs were taken on an iPhone4 and securely transmitted to the electronic medical record via CliniCam [13]. The following 5 poses were used: frontal with mouth closed, frontal with mouth open, and tongue protruded, profile with neck in neutral, extended, and flexed positions (Fig. 1). A history and physical examination was continued in the center's usual

fashion by nurse practitioners and anesthesia residents under the supervision of their anesthesiology attendings. The preoperative evaluation generally included Mallampati classification, dental examination, neck range of motion, thyromental distance, and mouth opening. A portfolio was compiled of each patient's preoperative evaluation and photographs.

A panel of 15 anesthesiologists and nurse anesthetists was recruited from our department via e-mail to evaluate the effect of preoperative airway photographs on airway planning. Three panelists were recruited from each of the following 5 groups: junior resident (CA-1), senior resident (CA-2, CA-3), junior attending ( $\leq 10$  years of attending practice), senior attending ( $> 10$  years of attending practice), and nurse anesthetist. Verbal consent was obtained and the study staff administered a survey. Panelists were asked to review each patient's preoperative evaluation and to formulate an airway plan for general endotracheal anesthesia without rapid sequence intubation. The panelist was then shown the airway photographs and asked questions regarding their level of assurance of the airway examination, whether they would change their airway plan, and whether the new plan would require additional advanced airway equipment. Additional advanced airway equipment was defined as using any additional equipment that was not located in the anesthesia cart and readily available at the time of induction. Items that are readily available include laryngeal mask airway Unique sizes 3-5, Mac 3-4 laryngoscopes, Miller 1-2 laryngoscopes, bougie, oral airway device, and a nasal airway device.

If the provider elected to change their airway plan from a standard airway (using the equipment located in the anesthesia cart) to an advanced airway then they elected to use additional tools or equipment that was not readily available in the anesthesia cart including video laryngoscope (C-mac/Glidescope), flexible fiberoptic bronchoscope, troop pillow, or additional provider help.

Each panelist was asked to complete the survey for all 25 patients. No panelist had previously encountered any of the patients (Fig. 2).

### 2.2. Statistical analysis

Descriptive statistics were evaluated for patient characteristics known to predict difficult mask ventilation with difficult laryngoscopy [14,15]. These characteristics included age, sex, Mallampati classification, body mass index, history of intubation with advanced airway (use of any airway tool other than a Macintosh or Miller laryngoscope), sleep apnea, neck radiation changes, limited thyromental distance ( $< 6$  cm), presence of teeth, presence of beard, and thick neck. An airway risk score was calculated and used to stratify patients into categories predicting difficult mask ventilation with difficult intubation [15]. Descriptive statistics were also reported for a subgroup of patients for whom more than 50% of respondents indicated that they would change airway management. The median percent of each respondent's plans changed was

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