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RESPIRATION AND THE AIRWAY

Anticipation of the difficult airway: preoperative airway assessment, an educational and quality improvement tool

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Editor's key points

- This study addresses the impact of a comprehensive airway assessment form, including all 11 ASA's airway risk factors, on resident education, while assessing is of questionable value.
- Completion of this specially designed airway assessment form led to significantly better documentation; however, it did not appear to have a clinically significant impact.

Background. Assessment of the potentially difficult airway (DA) is a critical aspect of resident education. We investigated the impact of a new assessment form on airway prediction and management by anaesthesia residents. We hypothesized that residents would demonstrate improvement in evaluation of DAs over the study duration.

Methods. After IRB approval, anaesthesia residents were randomized into two groups: control (existing form) and experimental (new form). Data were collected prospectively from August 2008 to May 2010 on all non-obstetric adult patients undergoing non-emergent surgery.

Results. Eight thousand three hundred and sixty-four independent preoperative assessments were collected and 8075 were analysed. The experimental group had the higher completion rate than the control group (94.3% *vs* 84.3%, $P=0.001$). DA prediction was higher for the control group (71.2%) compared with the experimental group (69.1%; $P=0.032$). A significant improvement in prediction rates was found over time for the experimental group (likelihood estimate=0.00068, $P=0.031$).

Conclusions. The use of a comprehensive airway assessment did not improve resident ability to predict a DA in an academic, tertiary-based hospital, anaesthesiology residency training programme.

Keywords: airway; education, medical students

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Airway management remains one of the most important responsibilities of an anaesthetist,[1] yet documentation of the clinical assessment, which is a professional requirement,[2] is often incomplete.[3] Poor airway management has been recognized as a serious patient safety concern for almost three decades,[4–7] highlighting the need for careful airway assessment before the induction of anaesthesia.[8–21] While improvements in patient monitoring,[22] airway devices,[23] and clinical protocols and training[24–30] have reduced the risk associated with an unpredicted difficult airway (DA), these changes have not reduced the incidence of unexpected DAs in clinical practice. Since the consequences of an unanticipated DA are potentially catastrophic, proper education and training are a continued necessity.

This study addresses this gap in knowledge by evaluating the impact of a comprehensive airway assessment form on resident education, while assessing is of questionable value.[8] We hypothesized that a new comprehensive airway assessment form would result in greater resident recognition of the 11 important airway features recommended by the ASA.[1] Based on this hypothesis, the overall aim of the present investigation was to document the effect of a more comprehensive airway assessment form on resident education.

Methods

This prospective, randomized, single-blind study was conducted from August 2008 to May 2010 at a Level 1 academic trauma center (Memorial Hermann Hospital, Texas Medical Center, Houston, TX, USA). After obtaining IRB approval (HSC-MS-07-0144), adult patients non-obstetric presenting for elective surgery requiring general anaesthesia, which did not already have their airway secured, were enrolled in the study. For patients who received more than one anaesthetic during the study period, data were collected independently for each anaesthetic encounter. Patients were provided

with a written document describing the study and gave a verbal consent to participate.

All residents enrolled at the University of Texas Medical School at Houston anaesthesia residency programme for the academic year 2008–9 were recruited at the start of the study. An additional 24 incoming residents were enrolled during the second academic year (2009–2010) of the study, giving a total of 91 residents (Fig. 1). Each resident provided a verbal agreement to be enrolled on the quality improvement project. One resident joined the programme off-cycle in March 2008 and was enrolled in the study as a CA 1 (a first year anesthesia resident) (experimental group) for the remaining 2008–9 academic year and was also enrolled for the second year. No residents dropped from, or transferred in or out of the programme. Residents were randomized into two groups—an experimental group, which used the comprehensive airway assessment form in addition to the existing anaesthesia record, and a control group, which only used the existing anaesthesia record. Randomization was performed after stratification by year of training and based on 1:1 randomization. Experimental and control residents had a one-on-one tutorial (1 day, 3–4 practice assessments) on how to complete the data forms, respectively, followed by 1 month of validation at the beginning of each resident's rotation. Afterward, once a month, the residents' assessments were audited for quality control.

The new comprehensive airway assessment form (Appendix 1) required a detailed assessment of the patient's airway history and physical examination compared with the existing anaesthesia preoperative assessment form (Appendix 2). A common form to the experimental and control group was used to collect postoperative outcome data (Appendix 3).

For the purposes of this study, difficult mask ventilation (DMV) was defined as difficulty in maintaining a mask seal and obtaining satisfactory capnography (end-tidal CO_2 and tidal volume).[2] If mask ventilation was attempted and determined to be difficult, the severity was graded either mild (requiring oral/nasal airway), moderate (can ventilate with assistance), severe (cannot ventilate with a facemask), or extreme (cannot ventilate with the supraglottic device). However, the use of neuromuscular blocking agent, type, dosage, time of administration, and use as a rescue were not included as outcome.

Difficult supraglottic airway (DSGA) was defined as either inability to physically place a supraglottic device or inadequacy of ventilation, oxygenation, or airway protection after placement that required conversion to an alternative technique. If placement of a supraglottic device was attempted, level of difficulty, number of attempts, and type of device were documented. Difficult direct laryngoscopy (DDL) was defined as the difficulty in visualizing any portion of the vocal cords after conventional laryngoscopy requiring more than one attempt.[2] If direct laryngoscopy was attempted, the type of blade, number of attempts, Cormack–Lehane grade, and any difficulties encountered were documented. Difficult intubation (DI) was defined as proper insertion of the tracheal tube with conventional laryngoscopy requiring multiple attempts.[2] If intubation was attempted, the number of attempts and the presence of any difficulties were documented. Difficult surgical airway (DSA) was defined as a difficult cricothyrotomy or tracheostomy, open or percutaneous, performed electively or emergently, to manage a DA due to bleeding, poor orientation and difficult instrumentation, and defined by the surgeon as technically difficult. DA was defined as the occurrence of DMV, DSGA, DDL, DI, or DSA. If a surgical airway was attempted, it was classified as either emergent or elective and either difficult or easy, with the number of attempts recorded.

Statistical analysis

Our database includes 9117 postoperative encounters; a small subset of patients received multiple anaesthetics (n=155, 1.7%). Patients who received multiple anaesthetics were excluded from statistical analysis. All statistical analyses were conducted using SAS 9.2 (SAS Institute, Cary, NC, USA). Data on the completeness of documentation were analysed using a χ^2 test; accuracy of prediction was defined as the sum of correct assessments and significance determined using a χ^2 test, while the changes of prediction accuracy over time among groups were analysed by a logistic regression. A P-value of <0.05 was considered significant.

Results

A total of 8364 independent preoperative assessments were completed. Incomplete assessments (>4 risk factors not completed) were excluded, resulting in a total of 8075 assessments included in our analysis. Three thousand three hundred and thirty-two (41%) were performed by the experimental group and 4743 by the control group (59%) (Fig. 2). A total of 1560 (17%) of all postoperative assessments (n=9117) were reported as DA.

No difficult surgical or invasive airways were reported. The frequency of each particular event was similar between all groups (Fig. 2), and ranged from 7.17% to 8.79% for DMV, 5.59% to 5.64% for DDL, 4.09% to 4.98% for DI, and 1.38% to 1.43% for DSGA.

Completeness of airway examination documentation

Results are shown in Table 1 and demonstrate significant differences between the two groups. The experimental group had a higher rate of completion than the control group (94.3% *vs* 84.3%; $P<0.001$).

Overall recognition of the DA

The experimental group correctly predicted a DA in 2397 out of 3471 patients (69.1%). The control group predicted 3551 out of 4984 patients (71.2%) correctly, which was significantly higher (P=0.032) than the experimental group (Table 2).

Impact on resident education

Prediction accuracy for each day of the study was calculated and graphed as a 30 day moving average for the entire study period (Fig. 3). The multiple logistic regression model created

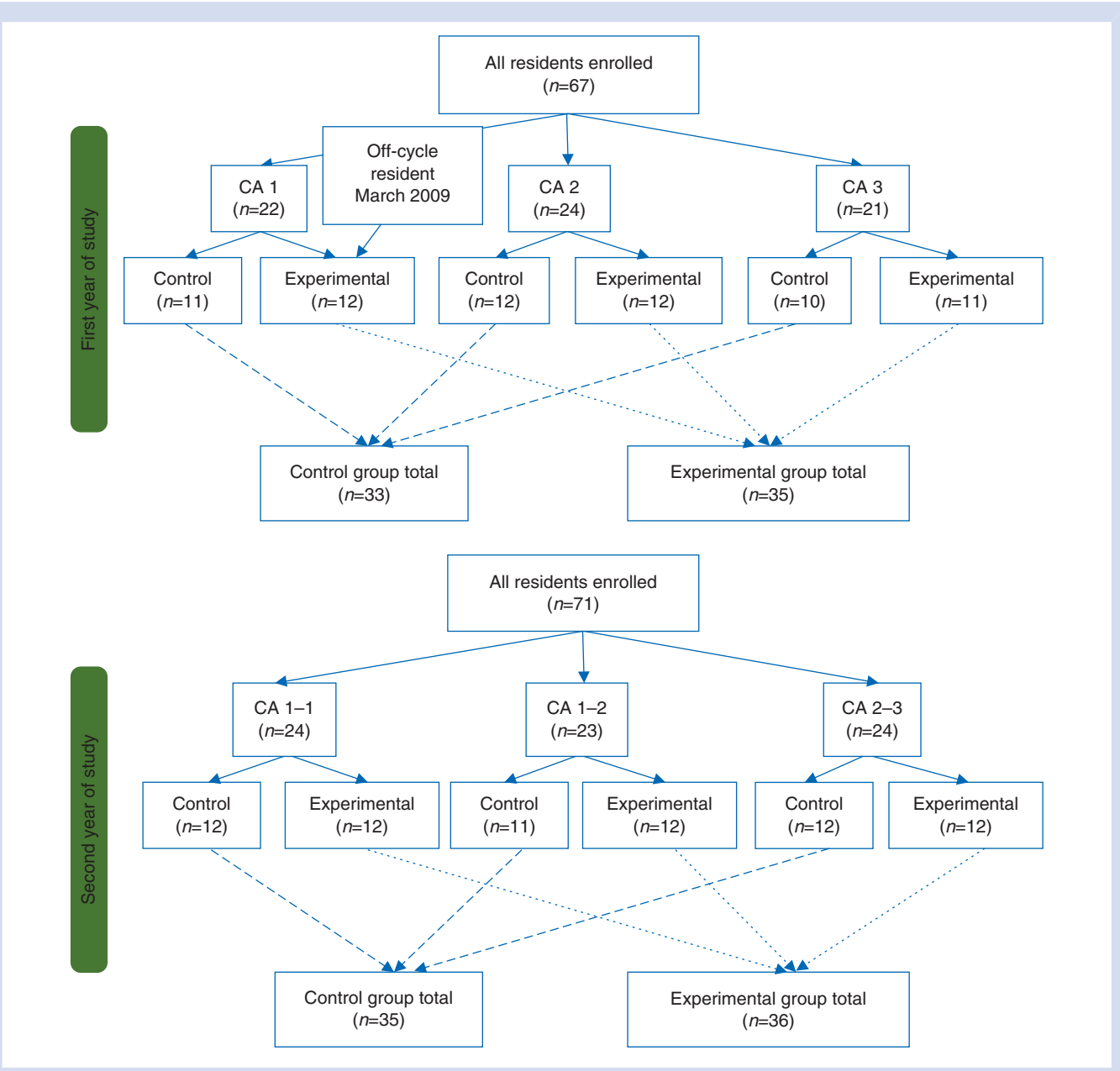
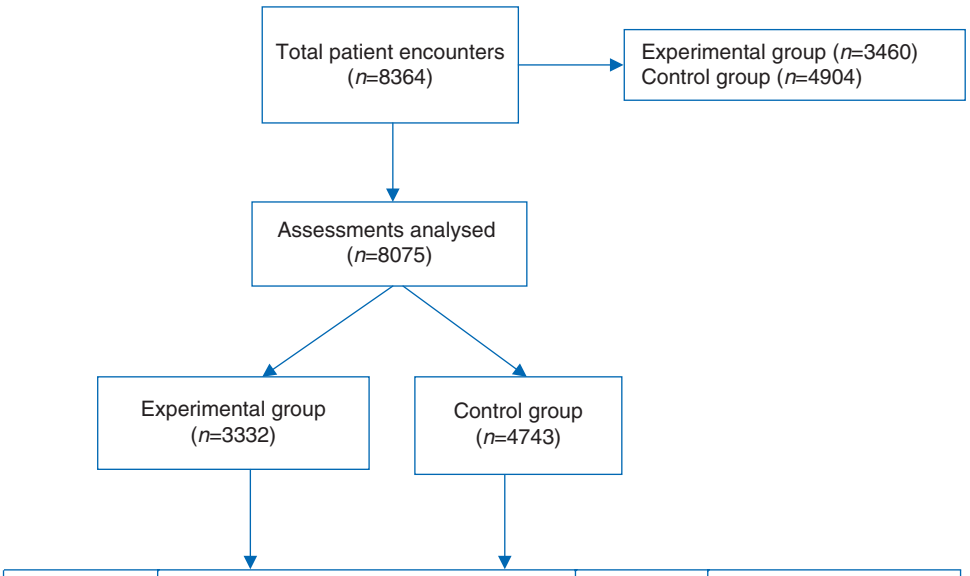


Fig 1 Resident randomization. CA 1, first-year residents during first year of study; CA 2, second-year residents during first year of study; CA 3, third-year residents during first year of study; CA 1–1, first-year residents during second year of study; CA 1–2, second-year residents during second year of study; CA 2–3, third-year residents during second year of study.

to analyse the differences in the rates of accuracy between resident groups showed significant relationships with both patient factors (age, weight, Mallampati, jaw protrusion, interincisor distance, thyromental distance, sternomental distance, and neck circumference) and resident factors (day of study and cohort). Inclusion in the CA 1–1 cohort was the largest negative predictor of correctness (likelihood estimate −0.62, $P=0.001$) followed by the CA 2–3 cohort (likelihood estimate −0.36, $P=0.0025$). Compared with the CA 3 cohort, the odds ratios for both the CA 1–1 (0.267, CI 0.130–0.549) and CA 2–3 (0.347, CI 0.171–0.705) cohorts were statistically significant. Inclusion in the CA 1–2 cohort was associated with a positive likelihood estimate (0.28, $P=0.018$), but compared with the CA 3 cohort, the odds ratio was not significant (0.660, CI 0.330–1.321). A significant positive likelihood estimate was also noted when the day of the study was used as a predictor (0.00068, $P=0.031$), indicating a small improvement in correct prediction during the study period.

Discussion

This study is one of few studies that focus on comprehensive airway assessment implemented on a large scale for training



Outcomes	Preoperative assessments				*P*-value	Postoperative events	
	Experimental		Control				
DA	693	20.79%	867	18.28%	0.061	1073	11.97%
DMV	293	8.79%	340	7.17%	0.0091	523	5.84%
DDL	188	5.64%	265	5.59%	0.55	393	4.39%
DI	166	4.98%	194	4.09%	0.16	315	3.51%
DSGA	46	1.38%	68	1.43%	0.13	77	0.86%

Fig 2 Assessment distribution. DMV, difficult mask ventilation; DDL, difficult direct laryngoscopy; DI, difficult intubation; DSGA, difficult supraglottic airway; DA, difficult airway.

Table 1 Completeness of airway exam documentation. MP, Mallampati. χ^2 test comparisons of completeness for each variable between control and experimental were all statistically significant ($P=0.005$)

	Control	%	Experimental	%	*P*-value
Total records	4882	100.00	3372	100.00	
MP complete	4581	93.83	3255	96.53	<0.00001
Neck mobility complete	4251	87.07	3265	96.83	<0.00001
Both complete	4114	84.27	3182	94.37	<0.00001
One complete	4718	96.64	3302	97.92	0.0038

purposes. This study demonstrates that a comprehensive airway assessment form using all 11 of the ASA's proposed airway risk predictors did improve documentation of airway assessment, but not the accuracy of such predictions.

The rates of DDL, intubation, and supraglottic device placement events reported in our study are similar to those that have already been reported in the literature.[2–16 31 32] Our overall rate of DMV (5.8%) is similar to the rates reported by Langeron and colleagues[7] (5%) and Yildiz and colleagues[33] (7.8%). However, it is significantly higher than the rate reported by Kheterpal and colleagues[5] (1.5%), Asai and colleagues[34] (1.4%), and Rose and Cohen[16] (0.9%), but differences in definitions, institutional practices, provider mix, and self-reporting may account for this difference.

For example, we did not include the contribution of neuromuscular blocking agents in our assessment of DMV and we did not control for oral airway placement, as it is routine practice to place an oral airway before any mask ventilation attempt and also to wait for proper ventilation before the administration of neuromuscular blocking agent. We left the opportunity to comment (open field) on the use of the neuromuscular blocking agent as rescue of a DMV, but no comments on such a specific topic were found in the database. We only included data from residents rather than a mix of

attending anaesthetists, CRNAs, and AAs, as is presented by Kheterpal and colleagues.[21]

Additionally, although other studies have reported a decrease in the number of surgical airways in conjunction with a comprehensive airway education programme,[26] no difficult surgical airway events occurred during the study period. Because such events are quite rare and because we excluded emergent cases, we probably lacked the appropriate sample size to address this issue. Despite these differences, the frequency of DA events in this study is comparable with other reported literature.

Completeness of airway examination documentation

The experimental form did significantly improve completeness of the airway assessment when compared with the standard anaesthetic record, although complete documentation was not necessarily equivalent. With respect to comparing the completeness of documentation, we only looked at two fields (Mallampati and neck mobility), as only these were present on both forms.

Overall recognition of the DA

The accuracy of predicting difficulty was greater for the control group than the experimental group (71% *vs* 69%, $P=0.032$). This difference, small and probably not of significant clinical impact, may have been related to the additional work required to complete the form—effort which may have distracted from the actual assessment; for example, the requirement to perform several measurements, some of which may have been normal, could actually have directed attention away from an obviously abnormal appearance. Alternatively, the form may have provided false reassurance and led to an incorrect prediction (i.e. false negative), underscoring the lack of sensitivity of the predictors (more is not necessarily better).

Table 2 Accuracy of difficult airway prediction in the experimental and control groups. Per χ^2 test, statistical significance between the groups is $P=0.032$

	Correct	%	Incorrect	%	Total
Control	3551	71.20	1433	28.80	4984
Experimental	2397	69.10	1074	30.90	3471
Total	5948		2507		8455

Impact on resident education

The logistic regression analysis demonstrated significant differences in prediction accuracy between cohorts of residents in the experimental group (Fig. 3); however, considering the low rate of overall correct prediction, it is questionable in its clinical value.

In particular, the low rate of correct prediction observed for the CA 2–3 residents compared with the CA 1–2, particularly at the start of the study, was unexpected. This may reflect difficulty by the CA 2–3 in adjusting an established work flow to complete the form, but did not affect the CA 1–2 because they had not established a routine yet. It may also reflect an intermediate level of expertise in the CA 2–3 where residents are more likely to make errors. The decrease in accuracy seen in the CA 1–2 cohort starting in January 2009 and reaching a zenith in July 2009 is also consistent with this effect. The consistently high rate of correct prediction seen in the CA 3 might also reflect a different aspect of this effect, where passage from an intermediate to a more senior phase of training leads to lower rates of error. Other possible explanations for observed patterns may reflect changes in educational emphasis during the study and the impact of external events on resident perform-

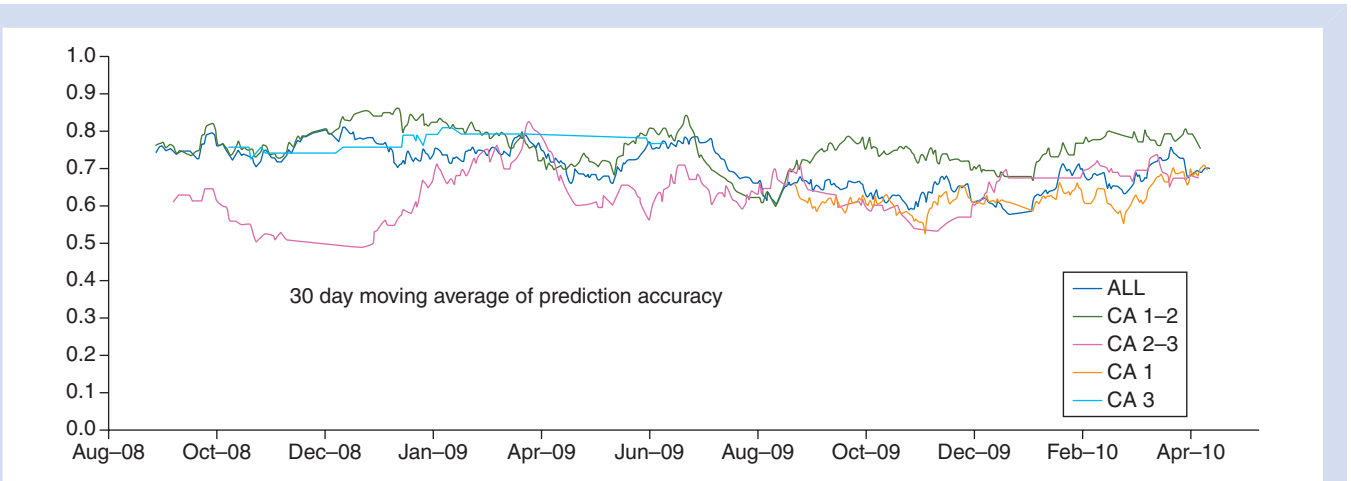


Fig 3 Thirty day moving average of prediction accuracy over duration of study. CA 1–2 are residents who enrolled as first-year residents when the study began and were second-year residents at the end of the study; CA 2–3 are residents who enrolled as second-year residents when the study began and were third-year residents at the end of the study; CA 1–1 are residents who enrolled as first-year residents the second year of the study; CA 3 are residents who enrolled as third-year residents the first year of the study.

ance. For example, the difference in initial frequency of correct prediction between the CA 1–2 class at the start of the study and the entrance of the CA 1–1 class in August 2009 may reflect the impact of a larger educational effort at the start of the study than at its mid-point. The decrease in the rate of correct prediction during the initial months of the study may be related to the increased demands placed on residents after hurricane Ike. Similarly, the decrease in the rate of correct prediction seen in July 2009 may reflect the annual turnover of residents. Simply being aware that this type of variability exists may be useful for planning educational efforts and managing operating theatre resources. However, we recognize our assertions remain speculative and require further confirmations.

Although it is encouraging that the considerable effort required by the residents to complete this study did result in improved prediction, we had expected to see a larger effect than was actually observed. It is possible that the educational effort applied at the beginning of the study resulted in an early improvement in prediction that lessened somewhat over time, resulting in a smaller improvement by the end of the study period.

Our form was intended to function as a cognitive aid analogous to those described by Hutchins[35] that supports pilots while landing an airplane. However, it is possible that the complexity of the information on our form did not adequately support clinician cognitive processes and could have actually contributed to poor performance.[36] We hypothesize that by fragmenting the provider's focus, the form may have distracted residents from the task of interpreting the data and performing an integrated assessment.

There are few limitations to this study. Although this study was large, it reflects only a single institutional experience. A multicentre trial is necessary to help limit this effect. Additionally, the interobserver variability between assessments presents a limitation, as does the variability of patients encountered between groups. The time from study design to study implementation was significant and the scope was limited by changes in technology and research findings that had occurred in the interim. It is possible that changes in work flow not directly related to airway assessment impacted resident performance. Although we anticipated this impact to be small, it is important to consider this factor to have potential impact on resident performance.

Conclusions

Based on our study, the use of an airway assessment that includes all 11 ASA's airway risk factors did not result in clinical improvement of resident prediction. Although completion of a specially designed airway assessment form led to significantly better documentation, it did not appear to have a clinically significant impact. Future studies pertaining to DA evaluation may benefit from a focus on the interpretation process rather than strictly data-driven prediction.

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Declaration of interest

C.A.H. was the recipient of the 2007 Foundation for Anesthesia Education and Research Grant. She is a consultant for Storz, Ambu A/S, Aircraft Medical, and serves on the speaker bureau for Covidien, LMA North America, and Ambu A/S. D.C. is a paid consultant for Smiths Medical and serves on the speaker bureau for Cadence. D.C. and C.A.H. equally contributed to the development of the Airway Assessment Form.

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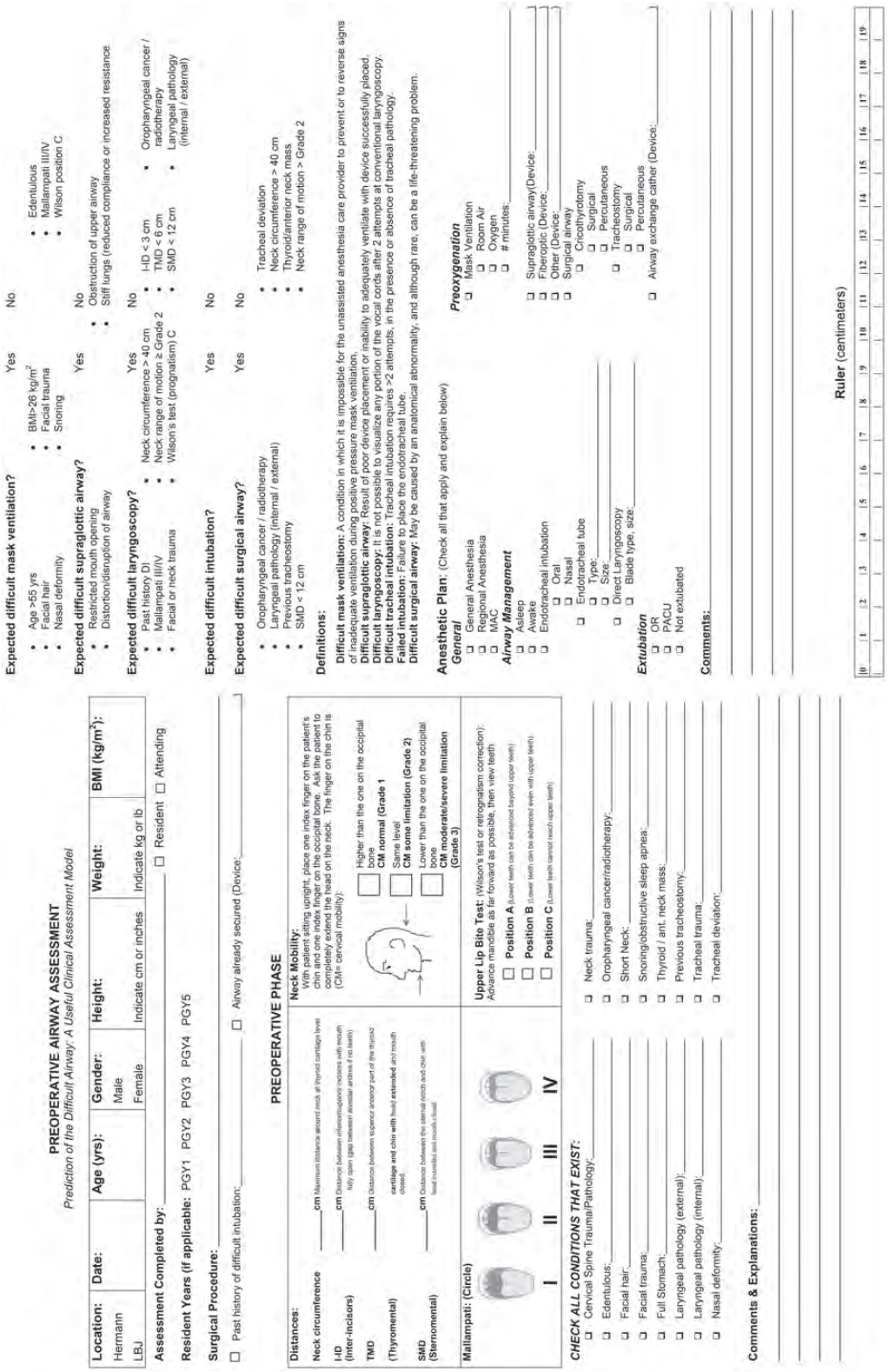
Appendix 1: Experimental group airway assessment form

This comprehensive airway assessment form was used by the experimental and research groups to assess patient airways before operation. The form contains descriptions of all 11 of the ASA's recommended DA predictors and requires a prediction as to the expected difficulty of the airway and the anaesthetic plan that will be used.



PREOPERATIVE AIRWAY ASSESSMENT

Prediction of the Difficult Airway: A Useful Clinical Assessment Model

Location:	Date:	Age (yrs):	Gender:	Height:	Weight:	BMI (kg/m²):
Hermann			Male			
LBJ			Female	Indicate cm or inches	Indicate kg or lb	

Assessment Completed by: _____ ☐ Resident ☐ Attending

Resident Years (if applicable: PGY1 PGY2 PGY3 PGY4 PGY5

Surgical Procedure: _____

☐ Past history of difficult intubation: _____ ☐ Airway already secured (Device: _____)

PREOPERATIVE PHASE

Distances:

Neck circumference _____cm Maximum distance around neck at thyroid cartilage level

I-ID (Inter-incisors) _____cm Distance between inferior/superior incisors with mouth fully open (gap between alveolar arches if no teeth)

TMD (Thyromental) _____cm Distance between superior anterior part of the thyroid cartilage and chin with head extended and mouth closed.

SMD (Sternomental) _____cm Distance between the sternal notch and chin with head extended and mouth closed

Mallampati: (Circle)

I II III IV

Neck Mobility:

With patient sitting upright, place one index finger on the patient's chin and one index finger on the occipital bone. Ask the patient to completely extend the head on the neck. The finger on the chin is (CM= cervical mobility):

☐ Higher than the one on the occipital bone
CM normal (Grade 1
☐ Same level
CM some limitation (Grade 2)
☐ Lower than the one on the occipital bone
CM moderate/severe limitation (Grade 3)

Upper Lip Bite Test: (Wilson's test or retrognatism correction): Advance mandible as far forward as possible, then view teeth:

☐ **Position A** (Lower teeth can be advanced beyond upper teeth)
☐ **Position B** (Lower teeth can be advanced even with upper teeth)
☐ **Position C** (Lower teeth cannot reach upper teeth)

CHECK ALL CONDITIONS THAT EXIST:

☐ Cervical Spine Trauma/Pathology: _____
☐ Edentulous: _____
☐ Facial hair: _____
☐ Facial trauma: _____
☐ Full Stomach: _____
☐ Laryngeal pathology (external): _____
☐ Laryngeal pathology (internal): _____
☐ Nasal deformity: _____
☐ Neck trauma: _____
☐ Oropharyngeal cancer/radiotherapy: _____
☐ Short Neck: _____
☐ Snoring/obstructive sleep apnea: _____
☐ Thyroid / ant. neck mass: _____
☐ Previous tracheostomy: _____
☐ Tracheal trauma: _____
☐ Tracheal deviation: _____

Comments & Explanations: _____

Expected difficult mask ventilation? Yes No

- Age >55 yrs
- Facial hair
- Nasal deformity
- BMI>26 kg/m²
- Facial trauma
- Snoring
- Edentulous
- Mallampati III/IV
- Wilson position C

Expected difficult supraglottic airway? Yes No

- Restricted mouth opening
- Distortion/disruption of airway
- Obstruction of upper airway
- Stiff lungs (reduced compliance or increased resistance

Expected difficult laryngoscopy? Yes No

- Past history DI
- Mallampati III/IV
- Facial or neck trauma
- Neck circumference > 40 cm
- Neck range of motion ≥ Grade 2
- Wilson's test (prognatism) C
- I-ID < 3 cm
- TMD < 6 cm
- SMD < 12 cm
- Oropharyngeal cancer / radiotherapy
- Laryngeal pathology (internal / external)

Expected difficult intubation? Yes No

Expected difficult surgical airway? Yes No

- Oropharyngeal cancer / radiotherapy
- Laryngeal pathology (internal / external)
- Previous tracheostomy
- SMD < 12 cm
- Tracheal deviation
- Neck circumference > 40 cm
- Thyroid/anterior neck mass
- Neck range of motion > Grade 2

Definitions:

Difficult mask ventilation: A condition in which it is impossible for the unassisted anesthesia care provider to prevent or to reverse signs of inadequate ventilation during positive pressure mask ventilation.
Difficult supraglottic airway: Result of poor device placement or inability to adequately ventilate with device successfully placed.
Difficult laryngoscopy: It is not possible to visualize any portion of the vocal cords after 2 attempts at conventional laryngoscopy.
Difficult tracheal intubation: Tracheal intubation requires >2 attempts, in the presence or absence of tracheal pathology.
Failed intubation: Failure to place the endotracheal tube.
Difficult surgical airway: May be caused by an anatomical abnormality, and although rare, can be a life-threatening problem.

Anesthetic Plan: (Check all that apply and explain below)

General
☐ General Anesthesia
☐ Regional Anesthesia
☐ MAC

Airway Management
☐ Asleep
☐ Awake
☐ Endotracheal intubation
☐ Oral
☐ Nasal
☐ Endotracheal tube
☐ Type: _____
☐ Size: _____
☐ Direct Laryngoscopy
☐ Blade type, size: _____

Extubation
☐ OR
☐ PACU
☐ Not extubated

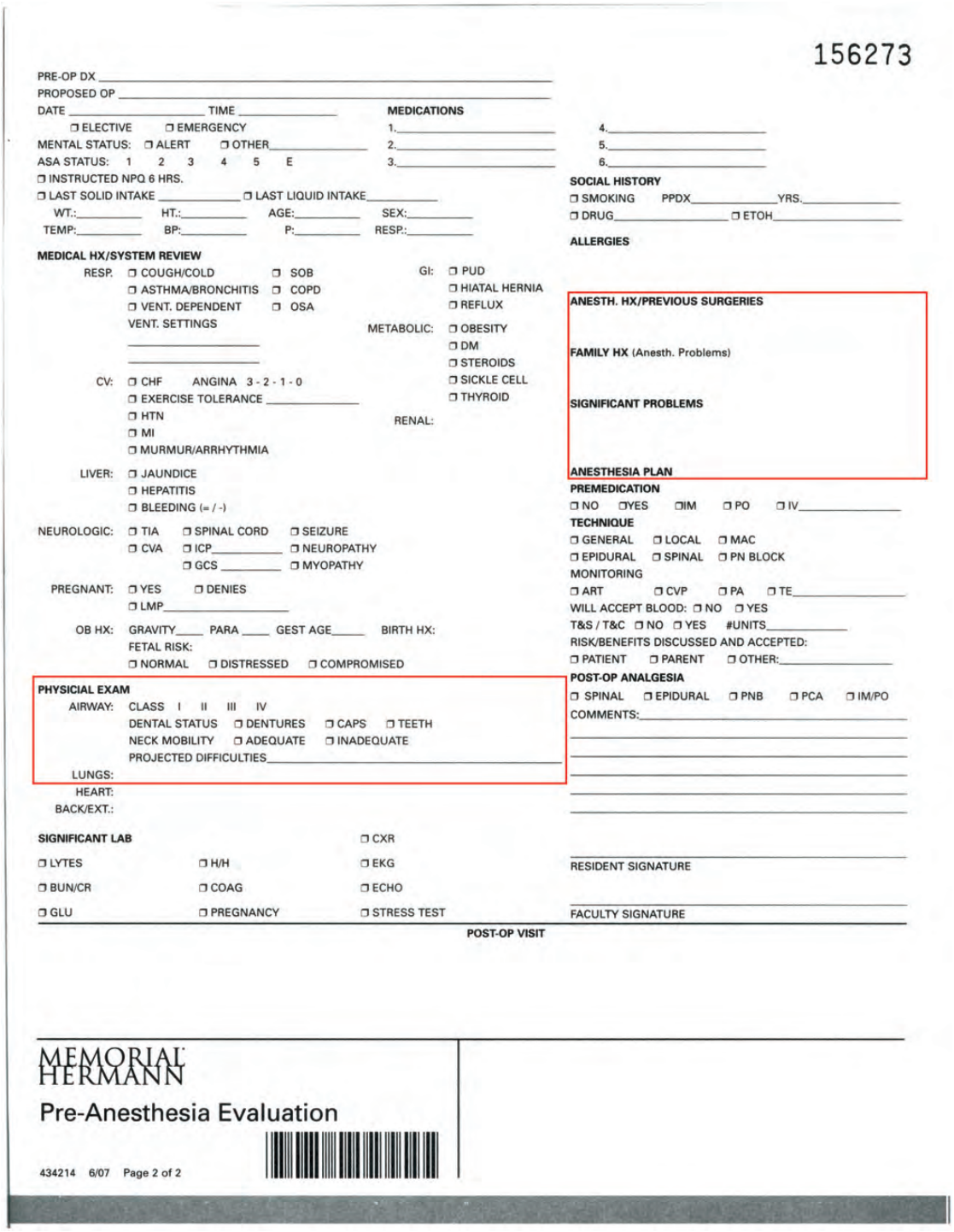
Preoxygenation
☐ Mask Ventilation
☐ Room Air
☐ Oxygen
☐ # minutes: _____
☐ Supraglottic airway(Device: _____)
☐ Fiberoptic (Device: _____)
☐ Other (Device: _____)
☐ Surgical airway
☐ Cricothyrotomy
☐ Surgical
☐ Percutaneous
☐ Tracheostomy
☐ Surgical
☐ Percutaneous
☐ Airway exchange catheter (Device: _____)

Comments: _____

Ruler (centimeters)

Appendix 2: Control group airway assessment form

This form was used by the control group to assess the expected difficulty of the patient airway before operation. The physical examination includes Mallampati score and neck mobility assessments.



156273

PRE-OP DX _____
PROPOSED OP _____
DATE _____ TIME _____
❒ ELECTIVE ❒ EMERGENCY
MENTAL STATUS: ❒ ALERT ❒ OTHER_____
ASA STATUS: 1 2 3 4 5 E
❒ INSTRUCTED NPO 6 HRS.
❒ LAST SOLID INTAKE _____ ❒ LAST LIQUID INTAKE_____
WT.:_____ HT.:_____ AGE:_____ SEX:_____
TEMP:_____ BP:_____ P:_____ RESP.:_____

MEDICATIONS
1._____ 4._____
2._____ 5._____
3._____ 6._____

SOCIAL HISTORY
❒ SMOKING PPDX_____YRS._____
❒ DRUG_____ ❒ ETOH_____

ALLERGIES

MEDICAL HX/SYSTEM REVIEW
RESP. ❒ COUGH/COLD ❒ SOB
❒ ASTHMA/BRONCHITIS ❒ COPD
❒ VENT. DEPENDENT ❒ OSA
VENT. SETTINGS
_____
_____
CV: ❒ CHF ANGINA 3 - 2 - 1 - 0
❒ EXERCISE TOLERANCE _____
❒ HTN
❒ MI
❒ MURMUR/ARRHYTHMIA
LIVER: ❒ JAUNDICE
❒ HEPATITIS
❒ BLEEDING (= / -)
NEUROLOGIC: ❒ TIA ❒ SPINAL CORD ❒ SEIZURE
❒ CVA ❒ ICP_____ ❒ NEUROPATHY
❒ GCS _____ ❒ MYOPATHY
PREGNANT: ❒ YES ❒ DENIES
❒ LMP_____
OB HX: GRAVITY____ PARA ____ GEST AGE_____ BIRTH HX:
FETAL RISK:
❒ NORMAL ❒ DISTRESSED ❒ COMPROMISED
GI: ❒ PUD
❒ HIATAL HERNIA
❒ REFLUX
METABOLIC: ❒ OBESITY
❒ DM
❒ STEROIDS
❒ SICKLE CELL
❒ THYROID
RENAL:

ANESTH. HX/PREVIOUS SURGERIES

FAMILY HX (Anesth. Problems)

SIGNIFICANT PROBLEMS

ANESTHESIA PLAN
PREMEDICATION
❒ NO ❒YES ❒IM ❒ PO ❒ IV_____
TECHNIQUE
❒ GENERAL ❒ LOCAL ❒ MAC
❒ EPIDURAL ❒ SPINAL ❒ PN BLOCK
MONITORING
❒ ART ❒ CVP ❒ PA ❒ TE_____
WILL ACCEPT BLOOD: ❒ NO ❒ YES
T&S / T&C ❒ NO ❒ YES #UNITS_____
RISK/BENEFITS DISCUSSED AND ACCEPTED:
❒ PATIENT ❒ PARENT ❒ OTHER:_____
POST-OP ANALGESIA
❒ SPINAL ❒ EPIDURAL ❒ PNB ❒ PCA ❒ IM/PO
COMMENTS:_____

PHYSICIAL EXAM
AIRWAY: CLASS I II III IV
DENTAL STATUS ❒ DENTURES ❒ CAPS ❒ TEETH
NECK MOBILITY ❒ ADEQUATE ❒ INADEQUATE
PROJECTED DIFFICULTIES_____
LUNGS:
HEART:
BACK/EXT.:

SIGNIFICANT LAB
❒ LYTES ❒ H/H ❒ CXR
❒ BUN/CR ❒ COAG ❒ EKG ❒ ECHO
❒ GLU ❒ PREGNANCY ❒ STRESS TEST

RESIDENT SIGNATURE
FACULTY SIGNATURE

POST-OP VISIT

MEMORIAL HERMANN
Pre-Anesthesia Evaluation
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Appendix 3: Postoperative outcome data form

This form was completed for all patients enrolled in the study and documented difficulties (if any) experienced with mask ventilation, supraglottic airway device, direct laryngoscopy, intubation, and surgical airway. Advanced airway techniques were documented if alternative devices were used. The number of attempts for all procedures was documented.

Appendix C - POSTOPERATIVE EVALUATION

Surgery Canceled: Yes No **Anesthesia related:** Yes No
Airway related: Yes No If yes, why? _____

MASK VENTILATION

SpO_2 Breathing room air: _____% SpO_2 Breathing 100% oxygen: _____%

Attempted? Yes No

Mild (require oral/nasal airway) Moderate (Can ventilate with assistance) Severe (Cannot ventilate with facemask) Extreme (Cannot ventilate with supraglottic device)

Difficult? Yes No

If yes, why? _____

Successful? Yes No

SUPRAGLOTTIC AIRWAY DEVICE

Attempted? Yes No Number of attempts? _____

Type: LMA / Fastrach / ProSeal / LT / LT-Suction / Cobra / Combitube / Soft Seal / Ambu AuraOnce / ILA / Other: _____

Difficult? Yes No

If yes, why? _____

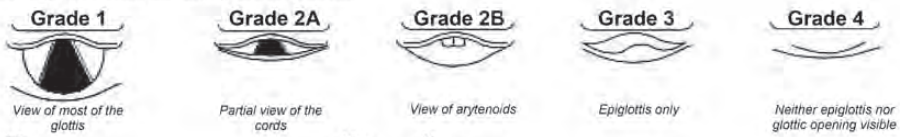
Successful? Yes No

DIRECT LARYNGOSCOPY

Attempted? Yes No Number of attempts? _____

Type of blade(s): _____

Circle best grade viewed with laryngeal manipulation:



Difficult? Yes No

If yes, why? _____

INTUBATION

Attempted? Yes No Number of attempts? _____

Difficult? Yes No

If yes, why? _____

Successful direct laryngoscopy? Yes No

Alternative methods: (Circle all that apply; include number of attempts for each; indicate if used for teaching purposes)

Nasal Fiberoptic _____ Oral Fiberoptic _____ Awake _____
Bougie _____ Frova/Aintree _____ Lightwand _____
Bonfils/Shikani _____ Bullard/Upsher/WuScope _____ McCoy _____
GlideScope _____ Video Macintosh _____ Retrograde _____
Other: _____

Successful? Yes No

SURGICAL AIRWAY

Attempted? Yes No Emergent / Elective

Difficult? Yes No Number of attempts? _____

If yes, why? _____

Successful? Yes No

EXTUBATION

Location: OR PACU Other: _____

Reintubation required? Yes No

Complications? _____

Registered difficult airway with Medic Alert? Yes No Not Applicable

Location: Hermann LBJ	**Date:**	**Evaluation Completed by:**