

Prediction of difficult airway management

- A cohort study of 182,050 patients registered in the Danish Anaesthesia Database

Nørskov AK^{1,2}, Rosenstock CV¹, Wetterslev J² & Lundstrøm LH¹

¹⁾ Department of Anesthesiology, Nordsjællands Hospital - Hillerød - a part of Copenhagen University Hospital ²⁾ Copenhagen Trial Unit, Rigshospitalet - a part of Copenhagen University Hospital

Background

Preoperative airway assessment, registered in the Danish Anaesthesia Database (DAD), is based on a non-specified clinical assessment. No objective evaluation of a non-specified preoperative clinical airway assessment exists in the literature.

The purpose of this study was to analyse the diagnostic value of a clinical assessment for prediction of difficult airway management (DAM), secondly to determine the proportion of unanticipated DAM.

Method

A cohort of 182,050 tracheal intubated patients from June 1st 2008 to June 1st 2011 was extracted from the DAD.

Data from the preoperative airway assessment were compared with the actual conditions of airway management, described by objective scores for intubation and mask ventilation, respectively.

Table 1
The diagnostic value of a clinical assessment for prediction of difficult intubation (DI)

Cohort 1		Dichotomized intubation score		DI	
		Yes	No		
Test	Anticipated DI	Yes	229	700	929
		No	3154	177967	181121
			3383	178667	182050

Sensitivity	=	0.07	(0.06-0.08)
Specificity	=	1.00	(1.00-1.00)
Positive predictive value	=	0.25	(0.22-0.28)
Negative predictive value	=	0.98	(0.98-0.98)
Positive likelihood ratio	=	17.28	(14.94-19.98)
Negative likelihood ratio	=	0.94	(0.93-0.94)
Odds ratio	=	18.46	(15.84-21.52)

The diagnostic value of a clinical assessment for prediction of difficult mask ventilation (DMV)

Cohort 2		DMV			
		Yes	No		
Test	Anticipated DMV	Yes	49	169	218
		No	808	128936	129744
			857	129105	129962

Sensitivity	=	0.06	(0.04-0.08)
Specificity	=	1.00	(1.00-1.00)
Positive predictive value	=	0.22	(0.17-0.29)
Negative predictive value	=	0.99	(0.99-0.99)
Positive likelihood ratio	=	43.68	(32.01-59.60)
Negative likelihood ratio	=	0.94	(0.93-0.96)
Odds ratio	=	46.27	(33.41-64.06)

Table 2
Proportions and their 95 % confidence interval

	Count	95 % Confidence intervals
Difficult intubation		
All intubated	182050 (100 %)	
Difficult intubation (DI)	3383 (1.86 %)	1.80 – 1.92 %
All intubated, alternative cohort (Including patients anticipated to be difficult, scheduled for and intubated by an advanced method as true difficult to intubate)		
Difficult intubation	4165 (2.28 %)	2.21 – 2.35 %
Difficult mask ventilation		
All mask ventilated	129962 (100 %)	
Difficult mask ventilation (DMV)	857 (0.66 %)	0.62 – 0.70 %
All difficult mask ventilated		
Also having DI	857 (100 %)	
Also having failed intubation	424 (49.47 %)	46.13 – 52.82 %
	32 (3.73 %)	2.46 – 5.00 %
Combined difficult intubation and difficult mask ventilation		
All intubated and mask ventilated		
DI and DMV	424 (0.33 %)	0.30 – 0.36 %
Failed intubation and DMV	32 (0.02 %)	0.02 – 0.03 %
Difficult intubation and difficult mask ventilation		
Anticipated one or both of DI or DMV	45 (10.61 %)	7.68 – 13.54 %
Anticipated both DI and DMV	16 (3.77 %)	1.96 – 5.59 %
Failed intubation and difficult mask ventilation		
Anticipated one or both of DI or DMV	6 (18.75 %)	5.23 – 32.27 %
Anticipated difficult airway management		
Anticipated difficult intubation		
Scheduled for intubation by an advanced method	835 (47.52 %)	45.19 – 49.86 %
Scheduled for intubation by direct laryngoscopy	850 (48.38 %)	46.04 – 50.71 %
Not scheduled for intubation, but subsequently intubated	72 (4.10 %)	3.17 – 5.02 %
Anticipated both difficult intubation and difficult mask ventilation		
Scheduled for intubation by an advanced method	200 (52.91 %)	47.88 – 57.94 %
Scheduled for intubation by direct laryngoscopy	162 (42.86 %)	37.87 – 47.85 %
Not scheduled for intubation, but subsequently intubated	25 (6.61 %)	46.04 – 50.71 %



Results

Difficult intubation:

The proportion of difficult intubations (DI) was 1.86 % (1.80-1.92 %). Of which 93 % (92-94 %) was unanticipated and only 7 % (6-8 %) of the DI was correctly predicted. DI occurred in 25 % (22-28 %) of the anticipated cases. Likelihood ratio for a positive test for DI was 17.28 (14.94-19.98). Despite anticipation of DI in 48 % (46-51%) of these cases intubation by direct laryngoscopy was first choice of attempt.

Difficult mask ventilation:

The proportion of difficult mask ventilation (DMV) was 0.66 % (0.62-0.70 %) and 94 % (92-96 %) was unanticipated. Thus, only 6 % (4-8 %) of DMV was correctly predicted. The predictive value of a positive anticipation of DMV was 22 % (17-29 %). Likelihood ratio for a positive test for DMV was 43.68 (32.01-59.60).

Conclusion

Anticipation of DAM increases the likelihood of a difficult airway, suggesting the relevance of a preoperative airway assessment. In a clinical context, however, the low positive predictive values and the high proportions of unanticipated DAM downplay its value.

Better prediction of DAM is needed. Randomized trials comparing a non-specified clinical assessment with objective predictive models, e.g. the Simplified Airway Risk Index, are warranted.

