

Prediction that a patient might be a Difficult airway (D.A) has long been one of the major goals in the evaluation process of every patient that needs airway management. Assessing the likelihood a patient will likely be difficult to ventilate, intubate, be difficult for supraglottic airway placement or potentially a difficult surgical airway are actually the first steps recommended by the ASA DA Algorithm.[1] The word prediction is derived from the latin pre “before”, and dicere “to say” and as important as this might be, actually is one of the hardest tasks of the whole issue of airway management. The literature has plenty of references in which a set criteria and/or methods are used to attempt to establish if on clinical grounds or by other tests a patient might pose difficulties if airway instrumentation is needed.[2-19] In order to be of value these tests or methods have to be simple, objective, reproducible, and must have little or no inter-observer variation. Having said this, as it turns out none of the current available methods have the sufficient sensitivity and/or specificity, and unfortunately we sometimes still to this date rely on our experience, our instincts and sometimes luck, and the definition if the patient was easy or not can only be made after the airway instrumentation has taken place; (in the worst case scenario we find out if our “prediction”

was correct or not after failure to secure the airway or after difficulties are encountered). In order to continue this discussion, we need then to define the statistical definitions of our prediction methods in terms of sensitivity (probability of a positive test among patients with a D.A), specificity (probability of a negative test among patients without a D.A), positive predictive value (PPV) the probability of a D.A among patients with a positive test.

Some of the most commonly used methods are:

1-Mallampati score: Perhaps the most popular method used by anesthesiologists and ER physicians, was described originally in 1985 and subsequently modified in 1987 by Samsoon;[10, 20] it is a classification system used to predict the ease of larynx exposure on direct laryngoscopy (DL) based on the degree of visibility of oropharyngeal structures and the ratio of the size of the tongue to the oro-pharynx with the patient and examiner facing each other and not phonating;[21] the higher the score the lower the chances of having adequate laryngeal exposure, and therefore greater chance of difficulty with intubation. Originally as described, it had a very high sensitivity and greater than 90% PPV, however, in retrospect the original description may turned out to be considerable less accurate: the

addition of one more grade changed its value and more importantly since the Cormack-Lehane system (the scale to predict intubation difficulty according to the view obtained at laryngoscopy, to this date the most used method to classify the degree of difficulty at intubation) [22] was not used in his description, it turns out what he described as grade 3 or difficult, we now place it into a 2 category, and therefore this value is not associated with the high degree of difficulty originally described.[13]. In fact recent data show the PPV of this system when used as a predictor for DA is around 30-45%, therefore is no longer used as a single predictor but rather in association with other clinical and radiological signs.

2- The Wilson Risk Sum:[19] see criteria below in the table:

Risk factor	Level
Weight	0 < 90 kg
	1 90-110 kg
	2 > 110 kg
Head and neck movement	0 Above 90°
	1 About 90° (ie. ± 10°)
	2 Below 90°
Jaw movement	0 IG ≥ 5 cm* or SLux > 0
	1 IG < 5 cm and SLux = 0
	2 IG < 5 cm and SLux < 0
Receding mandible	0 Normal
	1 Moderate
	2 Severe
Buck teeth	0 Normal
	1 Moderate
	2 Severe

When originally released it showed a sensitivity of 75% when the score was = or > than 4, but more recent studies show that its sensitivity is no greater

than 50%.[12]

3- The Arne score [2] as originally described showed a sensitivity around 90 % if the score was equal or greater than 11. See criteria below.

Simplified Score Model Described by Arné et al. for Prediction of Difficult Intubation

Risk factor	Score
Previous knowledge of difficult intubation	
No	0
Yes	10
Diseases associated with difficult intubation	
No	0
Yes	5
Clinical symptoms of airway pathology	
No	0
Yes	3
IG and mandible subluxation	
IG ≥ 5 cm or SLux > 0	0
IG < 5.0-3.5 cm and SLux = 0	3
IG < 3.5 cm and SLux < 0	13
Thyromental distance	
≥ 6.5 cm	0
< 6.5 cm	4
Maximum range of head and neck movement	
More than 100°	0
About 90° (±10°)	2
Less than 80°	5
Mallampati score	
Class 1	0
Class 2	2
Class 3	6
Class 4	8
Total possible	48

IG = interincisor gap; SLux = subluxation (maximal forward protrusion of the lower incisors beyond the upper incisors).

As with most other criteria more recent data show that actually the sensitivity is around the low 50%.

4- Rose and Cohen described that if the patient had any of the following criteria: male gender, age > 40-59, small mouth opening, short thyromental distance (TMD), poor visualization of the hypopharynx, and limited neck extension there was a RR of 6% of D.A, if any of the above features was present (although

they did not state their cut off values). [23]

5- Tse et.al, [24] reported that a combination of high Mallampati score (3 or 4), TMD < or equal to 7 cm and head extension < 80 degrees had a sensitivity of only 5% but a specificity of 99%.

6-Merah et.al[11] described that a combination of a high Mallampati (3 or 4), TMD <6.5 cm and Inter incisor gap < 4 cm had a sensitivity of 84.6%, and that weight > 90Kg was an independent risk factor for difficult laryngoscopy, but this in West African population.

However, as the reader can appreciate there are underlying problems with any or all of these systems:

- a) Low sensitivity and PPV, and therefore some might argue that these systems are no better than a coin toss... (not that I recommend doing that).
- b) They are difficult to remember and the more variables and criteria they use, actually increases their complexity and no surprise most systems (a lot of them omitted in this review) are simply not widely known or used.
- c) Some use complex measurements and some require radiological criteria, which not only adds costs, and risks, but also takes away the practicality of a simple reproducible system.

d) The premise of all these systems is that in the presence or absence of some variables there is a chance of encountering a D.A and /or difficult with intubation (D.I); unfortunately the exact or uniform definition of a difficult airway does not exist, and current methods available are not precise and the terms D.A and D.I are used interchangeably, even though they are not the same.

e) Most -if not all- of these prediction systems described, were correlated with difficulty with BMV, D.L with conventional blades (Macintosh and Miller) and intubation, but newer modalities like supraglottic airways and the newer quantum leap devices the video laryngoscopes that have been recently released, (the majority of available literature is positive and they have been gaining popularity and have become widely accepted), but the number of studies available is limited, and none actually have looked at the use of the devices and compared the degree of success with long standing airway evaluation systems; only time will tell, it may turn out that these newer methods of airway management might allow us to handle the airway and intubate successfully, regardless if a patient meets the long standing criteria of difficulty like with previous generation methods and systems did.[25-34]

Another aspect worth discussing is that it is not clear what the next step should be if one encounters based on an evaluation some of the common criteria of “difficulty” and a “prediction” or - should I say suspicion- that a patient might be a D.A; opinions are as abundant as practitioners in charge of airway management because we deal with another of the great big difficulties when we talk about airway issues and that is variability in expertise and skill among practitioners.

So in conclusion it is important to state that not only have we stated some of the reasons why all of the current and older available evaluation systems for predicting the D.A miss the bullseye of their intended purpose, but more importantly the challenge remains and the lack of reliability means something that at one point or another got lost in the historical archives of airway management and is that management of the airway by whatever means (mask, LMA, VL, ETT etc..) is inherently difficult; the stakes are so high and the consequences of not doing it properly are devastating, and we have to continue to seek answers regarding proper patient preparation and selection of techniques, devices and pharmacologic approaches to handle the airway in a prospective manner, and not retrospectively, by a bad experience, since doing it this way, may mean that perhaps a bad outcome could

have been avoided.

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