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# Introducing the Intubation Credit Card

A go-anywhere checklist format to improve emergency tracheal intubation.

1930s, when even then it was realised that situational and technical complexity meant that there was ‘simply too much plane for one person to fly’ (Gawande 2007). This approach has been widely adopted in acute medicine only in the last decade. Whilst not using a formal checklist, Jaber et al. showed a planned approach to emergency tracheal intubation significantly reduced the incidence of serious complications such as life-threatening hypoxaemia and hypotension (Jaber et al. 2009).

Intensive care practice can be understood as falling into three domains: accurate diagnosis, finding effective therapies and optimal implementation of these at the bedside. Whilst great strides have been made to tackle the first two, the third has been relatively ignored by government, the academy, healthcare organisations and educators. However, after 20 years of exponential increases in the numbers and types of airway devices available to clinicians, it is now widely recognised amongst the airway community that the greatest single impact on airway related mortality and avoidable morbidity will not be technical, but will accrue from optimising human factors (Donati 2013). These include the non-technical skills of communication, planning, team working/coordination and maintaining situational awareness.

As part of the development of the UK’s first nationally endorsed airway guideline (approved by the Difficult Airway Society (DAS), Intensive Care Society (ICS), Faculty of ICM and the Royal College of Anaesthetists), a checklist specific to emergent intubation outside the Operating Room was developed (**Figure 1**) (Higgs

et al. 2018). Success, however, depends on implementation: the phenomenon of so-called ‘print and plunk’ must be avoided and the challenge is how to embed it into every day, every time practice.

The relatively slow uptake of checklists in acute medicine may be due to several factors. Not least is cultural resistance: their use may be seen as a substitute for clinical experience/confidence. However, the strength of cultural resistance may be fading and Low suggests that junior doctors in particular do not think checklists undermine their professional credibility and are willing to embed them into their everyday practice (Low et al. 2011). But what is also important because of the emergent nature of ICU intubation is a checklist not being universally and immediately accessible when required.

## Development of the Checklist Credit Card

In order to improve availability, an ICM trainee (SG) approached DAS wishing to share the concept of making the checklist universally and immediately accessible. This followed an incident when a vital drug was omitted during preparation for an intubation which led to a near-miss incident. The original prototype was simply a small checklist sticker enumerating a list of essential equipment, drugs and a prompt to consider calling senior help. The sticker was designed to go on the back of a doctor’s identity card holder.

Prior to distributing the checklist sticker, an anonymised survey was conducted amongst junior ICU doctors in two hospitals: all performed emergency intubations outside

## Introduction

Tracheal intubation outside the operating room is fraught with danger. According to the landmark NAP4 study, intubation in the ICU may be associated with 50 times greater risk of procedure-related death and brain injury compared to general anaesthetic practice (Cook et al. 2011). The primary risk factors included lack of planning, inconsistent immediate availability of equipment/drugs and poor team communication-coordination when managing extremely high acuity patients. Each of these deficiencies can be mitigated by consistent use of a well-developed pre-procedural checklist.

## Checklists

Checklists have been used to reduce error rates in the aviation industry since the

intensive care society  
care when it matters

**Intubation Checklist: critically ill adults - to be done with whole team present.**

The Faculty of  
Intensive Care Medicine

Prepare the patient	Prepare the equipment	Prepare the team	Prepare for difficulty
<ul style="list-style-type: none"> <li><input type="checkbox"/> Reliable IV/IO access</li> <li><input type="checkbox"/> Optimise position                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Sit-up</li> <li><input type="checkbox"/> Mattress hard</li> </ul> </li> <li><input type="checkbox"/> Airway assessment                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Identify cricothyroid membrane</li> <li><input type="checkbox"/> Awake intubation option?</li> </ul> </li> <li><input type="checkbox"/> Optimal preoxygenation                             <ul style="list-style-type: none"> <li><input type="checkbox"/> 3 mins or <math>ETO_2 &gt; 85\%</math></li> <li><input type="checkbox"/> Consider CPAP/NIV</li> <li><input type="checkbox"/> Nasal <math>O_2</math></li> </ul> </li> <li><input type="checkbox"/> Optimise patient state                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Fluid/pressor/inotrope</li> <li><input type="checkbox"/> Aspirate NG tube</li> <li><input type="checkbox"/> Delayed sequence induction</li> </ul> </li> <li><input type="checkbox"/> Allergies?                             <ul style="list-style-type: none"> <li><input type="checkbox"/> ↑ Potassium risk?                                     <ul style="list-style-type: none"> <li>- avoid suxamethonium</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Apply monitors                             <ul style="list-style-type: none"> <li><input type="checkbox"/> <math>SpO_2</math> / waveform <math>ETCO_2</math>/ECG / BP</li> </ul> </li> <li><input type="checkbox"/> Check equipment                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Tracheal tubes x 2 cuffs checked</li> <li><input type="checkbox"/> Direct laryngoscopes x 2</li> <li><input type="checkbox"/> Videolaryngoscope</li> <li><input type="checkbox"/> Bougie/stylet</li> <li><input type="checkbox"/> Working suction</li> <li><input type="checkbox"/> Supraglottic airways</li> <li><input type="checkbox"/> Guedel/nasal airways</li> <li><input type="checkbox"/> FONA set</li> </ul> </li> <li><input type="checkbox"/> Check drugs                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Consider ketamine</li> <li><input type="checkbox"/> Relaxant</li> <li><input type="checkbox"/> Pressor/inotrope</li> <li><input type="checkbox"/> Maintenance sedation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Allocate roles                             <ul style="list-style-type: none"> <li>One person may have more than one role.</li> </ul> </li> <li><input type="checkbox"/> Team Leader</li> <li><input type="checkbox"/> 1<sup>st</sup> Intubator</li> <li><input type="checkbox"/> 2<sup>nd</sup> Intubator</li> <li><input type="checkbox"/> Cricoid force</li> <li><input type="checkbox"/> Intubator's assistant</li> <li><input type="checkbox"/> Drugs</li> <li><input type="checkbox"/> Monitoring patient</li> <li><input type="checkbox"/> Runner</li> <li><input type="checkbox"/> MILS (if indicated)</li> <li><input type="checkbox"/> Who will perform FONA?</li> <li><input type="checkbox"/> Who do we call for help?</li> <li><input type="checkbox"/> Who is noting the time?</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Can we wake the patient if intubation fails?</li> <li><input type="checkbox"/> Verbalise Airway Plan is:                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Plan A: drug &amp; laryngoscopy</li> <li><input type="checkbox"/> Plan B/C:                                     <ul style="list-style-type: none"> <li>Supraglottic airway</li> <li>Face-mask</li> <li>Fibreoptic intubation via supraglottic airway</li> </ul> </li> <li><input type="checkbox"/> Plan D: FONA                                     <ul style="list-style-type: none"> <li>Scalpel-bougie-tube</li> </ul> </li> </ul> </li> <li><input type="checkbox"/> Does anyone have questions or concerns?</li> </ul>

**Figure 1.** DAS-ICS-FICM-RCOA intubation checklist for critically ill adults. The Executive of the Difficult Airway Society has granted permission to publish this checklist.

the ICU, but only 36% used a checklist and 38% could recall incidents when they personally had forgotten essential equipment or medication. SG acted as a *Clinical Champion* who achieved buy-in from the target audience. Feedback regarding the sticker was universally positive. A follow-up survey three months after the sticker was introduced demonstrated that half the doctors had used it, all felt confident they did not inadvertently omit essentials when they used the checklist and 90% felt the sticker format had advantages over a larger version (Goodhand et al. 2018).

After this positive feedback, the junior considered how to extend the concept more broadly. The obvious choice was to use the national guideline checklist (Figure 1) to ensure a gold-standard approach and the format was changed from a paper sticker to a plastic 'credit card' to improve durability and life-span of the mini-checklist (Figures 2 and 3). The doctor realised that the single item which was always at hand wherever and whenever emergent

## ▶▶ intubation in the ICU may be associated with 50 times greater risk of procedure-related death and brain injury compared to general anaesthetic practice ▶▶

intubation was performed in ICU, ED or the general wards was the duty airway operator's on-call electronic pager (bleep). The credit card has a means of attachment to the on-call pager (Figure 2), but can equally be carried in a personal wallet, mobile phone case or on the reverse of an identity holder (Figure 3). This process was done *suis generis*, but reflected recognised approaches for checklist implementation such as [ImplementingEmergencyChecklists.org](http://ImplementingEmergencyChecklists.org) very closely.

The DAS Executive was approached to secure support for this initiative and gave

the junior enthusiastic approval, financing a print-run of 250 mini-checklist cards for free-distribution at the DAS Annual Scientific Meeting in November 2018 (cost £99). The verbal feedback for the cards was overwhelmingly positive, with DAS receiving many enquiries regarding further availability/purchase. On that basis, DAS has decided to take the initiative further.

### Best Practice Checklists for Emergency Procedures: Does the Intubation Credit Card Measure Up?

Poor design means checklists are not used (Mosier et al. 1992). In order to be effective, there are several important facets which must be considered:

#### 1. Content

Marshall stated that content should be based on national guidance (Marshall 2013); a goal which is obviously met by the intubation credit card. Importantly the checklist covers all the areas which need



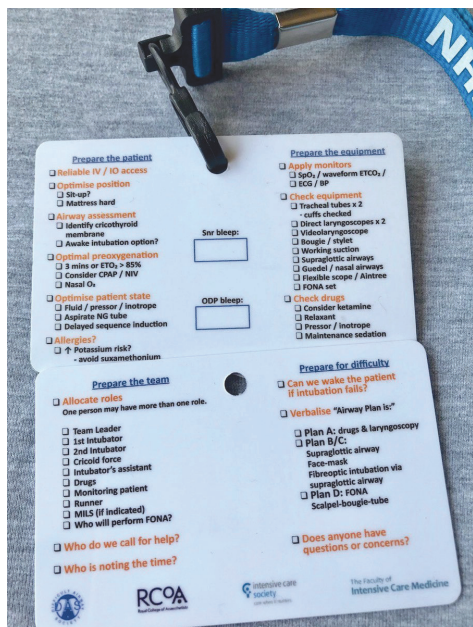


Figure 2: The intubation credit card mini-checklist



Figure 3: The intubation credit card mini-check list on the reverse of an identity holder

to be addressed prior to induction: namely, *preparation of the patient, preparation of all equipment/medications which might be required and preparation of the whole intubation team* rather than only the operator. Finally, the checklist guides the team in how to verbalise *preparation for difficult intubation*, if it arises, using the familiar Plan A, B, C, D approach (Henderson et al. 2004). The content should be familiar: again, using the national guideline template which was itself based on one of the most cited airway publications (NAP4) ensures this.

In training his department, the lead author plays to staff strengths such that senior nursing staff are encouraged to verbalise the first section (preparation of the patient) as this is criteria which must be addressed before intubation: nursing staff can be relied-upon to faithfully complete this task well. Much of equipment can be collected by nurses too. This facilitates early dialogue within the team when, importantly, staff should familiarise themselves with each other's names and roles. The Leader then takes over organising task allocation and individuals' responsibilities. It is worth noting that optimally trained teams using well-designed checklists don't delay the

process of intubation (Thomassen et al. 2010).

The final section prompts the Team Leader to verbalise the airway plans (A-D) and the triggers for transition between these. This is vital, as smooth team dynamics are not a given: for instance, many ICUs have over a hundred staff and the chances of all team members having performed intubation together before may be less than 1 in 100,000. Talking through the plans are vital in order that the 'mental model' is shared by all team members. This is important because if difficulty is encountered, the stressed operator very rapidly becomes cognitively over-loaded: *they look but they don't see, they listen but they don't hear and they think but don't comprehend; that is, they lose situational awareness*. If this happens when the mental model has been shared beforehand, other team members can prompt the operator to move forward through the sequence. This cognitive unloading broadens the mental band-width of the operator (Brindley et al. 2004).

Vitality, such an approach turns the 'me' of intubation by a sole operator into the 'we' of safe airway management accom-

plished by a team.

## 2. Card design and ease of implementation: 'your flexible airway friend'

The innovative aspect of the mini-checklist is its credit card-like design. To make significant inroads into airway-related mortality and morbidity, a checklist must actually be used. In turn, it must be available each time intubation is performed. The sticker approach is one option, but was abandoned because new/locum doctors may not have received one at induction, some are lost, the expected life-span is short and inadvertent defacement is common.

The credit card design, attached to the on-call pager, is handed from airway operator to airway operator at shift change, ensuring universal availability whenever it is required and its durability is excellent: it withstands physical deformation and soiling. It is also very easily kept in the doctor's wallet.

Many airway trolleys have laminated full-sized copies of the DAS checklist, but these get lost or soiled and are not replaced; additionally, not all ward areas where intubation is performed have formal airway trolleys.

A commonly discussed alternative is a downloadable app. However, not all juniors will acquire it, especially locums, Wi-Fi and batteries may fail. Furthermore, DAS has provided a downloadable app for several years but has found uptake disappointing. The low-tech nature of the credit card style means the failure rate is very low. It is also cheap and can be taken from hospital-to-hospital by rotational trainees.

To date, only one cognitive aid can be claimed to have undergone a systemic design process like the intubation credit card (Ziewacz et al. 2011). Poor design may lead to poorer outcomes (Carthy et al. 2009). Indeed, 'usability' may be the major factor in their success or otherwise (Burden et al. 2012; Degani et al. 1993). It has been suggested that once new information to be used in an intervention is agreed, this should be passed to a human factors design team and thence design, testing and improvement should follow a similar heuristic evaluation to that actually used in developing the mini-checklist credit card (Marshall 2013).

### 3. Training

For a checklist to be successful, the end-users must have practiced using it (ideally in real-time simulations). The mini-checklist is ideal for this.

### 4. Improved outcomes

Whether use of cognitive aids generally, and airway checklists specifically, improves outcomes has not been shown conclusively,

but many errors of omission and commission are definitely reduced which inevitably facilitates better process. Checklists such as the WHO Surgical Safety Checklist have been adopted globally following impressive results (Hayes et al. 2009). Other high-risk industries have incorporated their use wholesale. It is reasonable to expect that research enquiring into intubation checklist performance will show discernible benefit as they mitigate so many of the clear risk factors identified in the NAP4 study and others. Neale et al. suggest improved decision-making and team coordination using a local anaesthetic toxicity crisis checklist in simulations (Neale et al. 2012).

### Dissemination

The mini-checklist has now been distributed throughout ICUs and anaesthetic departments in the Wessex Training Programme Deanery (South West UK), via trainee representatives. It was clear that usage of the mini-checklist led to raised awareness of the DAS-ICS-FICM-RCOA guideline. On the basis of this and the successful scientific conference free-distribution trial, DAS has made available a further 2500 cards (£658) and will distribute these to each of the c300 intensive care units in the UK free-of-charge.

### Conclusion

It is intuitive that cognitive aids and checklists will improve outcomes in complex, multi-stage, multi-disciplinary interventions in acute medicine. To be successful,

a checklist must be based on a thoroughly well-planned approach, be well-designed and immediately available. Real-world users' organically-developed innovations, like the intubation credit card mini-checklist, meet these objectives and we hope it will gain wider traction as DAS and ICS roll-out this project.

### Acknowledgement

DAS is indebted to ICS for help in disseminating the cards to all the UK ICUs.

### Conflict of Interest

Andy Higgs is Treasurer of DAS and the lead author of the Difficult Airway Society-Intensive Care Society-Faculty of Intensive Care Medicine-Royal College of Anaesthetists' guideline for tracheal intubation in the critically ill adult. There are no other conflicts of interest. ■

### Key Points

- As part of the development of UK's first nationally endorsed airway guideline, a checklist specific to emergent intubation outside the Operating Room was developed.
- The relatively slow uptake of checklists in acute medicine may be due to several factors. Not least is cultural resistance: their use may be seen as a substitute for clinical experience/confidence.
- The checklist covers all the areas which need to be addressed prior to induction: namely preparation of the patient, preparation of all equipment/medications which might be required and preparation of the whole intubation team rather than only the operator.
- To be successful, a checklist must be based on a thoroughly well-planned approach, be well-designed and immediately available.

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