Introduction of the i-gel supraglottic airway device for prehospital airway management in a UK ambulance service

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Received 7 November 2012
Revised 7 March 2013
Accepted 13 March 2012
Published Online First
10 April 2013

ABSTRACT

Aim To clinically review the use of basic and advanced airway management techniques within the North East Ambulance Service National Health Service Foundation Trust (NEAS) for cardiac arrests following the introduction of the i-gel.

Method Two retrospective clinical audits were carried out over a monthly period (May 2011 and January 2012) using electronic and paper NEAS patient records.

Results This audit confirmed that a range of basic and/or advanced airway management techniques are being successfully used to manage the airways of cardiac arrest patients. I-gel is emerging as a popular choice for maintaining and securing the airway during prehospital cardiopulmonary resuscitation. Success rates for i-gel insertion are higher (94%, 92%) than endotracheal (ET) tube insertion (90%, 86%). Documentation of the airway management method was poor in 11% of the records. The Quality Improvement Officers addressed this by providing individual feedback.

Conclusions I-gel shows a higher success rate in cardiac arrest patients compared to the ET tube. Staff who chose to use methods other than i-gel indicated this was a confidence issue when using new equipment. The re-audit indicated an upward trend in the popularity of i-gel; insertion is faster with a higher success rate, which allows the crew to progress with the other resuscitation measures more promptly. Airway soiling and aspiration beforehand have been reasons staff resort to ET intubation. It is anticipated by the authors that i-gel will emerge as the first choice of airway management device in prehospital cardiac arrests.

INTRODUCTION

Advanced prehospital airway management is a rapidly evolving and controversial area.[1] Tracheal intubation has been used in the prehospital environment in patients presenting with cardiac arrest since the 1970s and has been known as the gold standard of care. However, changes in the case mix over the past decade, the frequency of using this skill by paramedics and the emergence of a variety of supraglottic airway devices (SADs) called into question whether tracheal intubation is the best technique for prehospital airway management in cardiac arrest.

The Joint Royal College Ambulance Liaison Committee (JRCALC) Airway Working Group, in its publication in June 2008, recommended that the majority of those managing patient's airways in the prehospital setting should be trained to insert an SAD instead of a tracheal tube.[2] Subsequent publications[3–6] provided the evidence base to suggest that SADs were safe and easy to use. Training in the use of SADs had become mandatory for the UK paramedic registration at this time as well. With this backdrop, in 2010, the North East Ambulance Service NHS Foundation Trust (NEAS) Clinical Advisory Group decided to remove all tracheal tubes less than size 6 and stock all vehicles with a complete adult and paediatric set of i-gels.

The two clinical audits reported, following the introduction of i-gels, formally review the current use of endotracheal (ET) tube intubation and i-gel within the service for cardiac arrests. There were no changes in practice between the two study periods.

The aims were to:

- review the paramedics' choice of airway management technique following the introduction of i-gels on all emergency ambulances;
- calculate success rates for each airway management technique;
- report any clinical issues arising from the audit.

METHOD

Two retrospective audits were undertaken; one in May 2011 and the second in January 2012.

A 1 month sample of paper Patient Report Form (PRF) and electronic Patient Report Form (e-PRF) completed in May 2011 were manually audited by a Quality Improvement Officer, who is a qualified paramedic, filtering records only relating to adults in cardiac arrest where resuscitation had been attempted. All paper PRFs were manually filtered to identify cardiac arrest incidents and all e-PRFs were extracted from a web-based system using a 'cardiac arrest' filter.

The initial sample size was 76, but 6 of the PRFs did not indicate the airway management method used and one form indicated that the patient had vomited excessively. As the airway management technique was unclear from the documentation, these were excluded from the audit. The remaining 69 forms were clinically reviewed to establish the airway management strategies and processes in a stepwise fashion. All possible pathways were considered and logged to obtain a comprehensive overview (table 1).

We then looked at the success rates for each intervention (table 2). The success rates for each airway management technique were already determined and documented by the crew responsible, so the Quality Improvement Officer simply audited whether the technique had been described as 'successful' or 'unsuccessful'. The paramedics use standard clinical methods to establish the correct

To cite: Duckett J, Fell P, Han K, *et al*. *Emerg Med J* 2014;**31**:505–507.

Table 1 The choice of airway management technique

Airway management method	2012 n	2012 %	2011 N	2011 %
Airway adjuncts only	24	17.9	10	13.2
Endotracheal tube (ETT) only	4	3.0	4	5.3
I-gel only	20	14.9	2	2.6
Method not recorded	18	13.4	7	9.2
I-gel→ETT	1	0.7	0	0
Airway adjuncts→I-gel	31	23.1	28	36.8
Airway adjuncts→ETT	25	18.7	19	25.0
Airway adjuncts→I-gel→ETT	9	6.7	3	3.9
Airway adjuncts→ETT→I-gel	0	0	2	2.6
Airway adjuncts→ETT→Airway adjuncts	0	0	1	1.3
Airway adjuncts→I-gel→ETT→Airway adjuncts	1	0.7	0	0
Airway adjuncts→ETT→I-gel→Airway adjuncts	1	0.7	0	0

placement of the airway device. The Quality Improvement Officer also considered any documentation in the free text, which may indicate problems like regurgitation, aspiration, dental trauma relating to the airway management technique and comments from the receiving A&E department.

An identical analysis was made for the cohort of adult cardiac arrest patients (134) responded to by the NEAS in January 2012. The same Quality Improvement Officer assisted by a colleague audited the data and the Medical Director verified the audit results for both studies.

In 18 of the forms, it was not possible to identify the method used due to poor or limited documentation, so these were removed from the sample. The remaining 116 forms were clinically reviewed to identify the proportion of cases where an ET tube or i-gel was used. As the audit was undertaken manually, this reduced any possible data quality errors that may have arisen from an audit of electronic data.

The sample was significantly higher in the second audit; this was a true difference and not down to reporting differences.

Following the first audit, an article was placed in the Trust's newsletter to inform operational staff of the audit, recommend the i-gel, yet advise to use what they feel is best for the patient in the prehospital setting.

It should also be noted that following the initial audit in May 2011, the Quality Improvement Officer contacted those clinicians who used all three methods of airway management, chose to use the ET tube over i-gel or had poorly documented the PRFs, to understand their reasons for choice and any complications encountered. The clinician was informed that the questioning of the airway management method used was for quality improvement purposes only and was not indicating that an incorrect choice of airway management had been made. This feedback exercise was then repeated for the second audit. No changes to clinical practice guidelines were implemented between the two audit periods.

Table 2 Success rates for each of the airway management techniques

Success rates for each technique	2012 Success	2012 Fail	2012 Success rate (%)	2011 Success	2011 Fail	2011 Success rate (%)
Airway adjuncts	91	0	100	63	0	100
I-Gel	58	5	92	33	2	94
ETT	37	4	90	25	4	86

RESULTS

Table 1 and 2 illustrate the airway management methods used along with the success rates for each technique in the two cohorts of patients.

There were no reporting differences in the two study periods and the numbers reflect a true difference in cardiac arrest incidents responded to by the ambulance service.

Table 1 illustrates the stepwise process of airway management techniques for the entire cohort used by NEAS paramedics. It was decided that this was the best method to display the various choices to demonstrate the paramedics' first choice following airway adjuncts.

DISCUSSION

The i-gel is an innovative, second-generation supraglottic airway with a soft, gel-like, non-inflatable cuff designed to create a non-inflatable anatomical seal of the pharyngeal, laryngeal and perilaryngeal structures. It incorporates a gastric channel to provide an early warning of regurgitation, facilitate venting of gas from the stomach and allow the passing of a suction tube to empty the stomach contents. A bite block and epiglottic rest are also integrated into the device. The large diameter cylindrical airway tube is contained within a buccal cavity stabiliser, anatomically widened and concaved to eliminate the potential for rotation and provide vertical strength for insertion.[7 8]

Its extended use in resuscitation followed several studies reporting easy and rapid insertion, high seal pressures and minimal training period to enable safe use by non-anaesthetists. It also offers a mechanism of managing regurgitant fluid.

Several published reports between 2007 and 2009 indicated safe and successful use of the device.[9 10] Additional observations indicate that the patients' lungs can be asynchronously ventilated during chest compressions with no leak or clinical evidence of aspiration. Most recently, there has been reported successful use of i-gel as a conduit for blind prehospital intubation during resuscitation, although the indications for use states this should only be conducted with fiberoptic guidance.[11]

Our two audits demonstrate the change in clinical practice and reassurance that the introduction of i-gels has enhanced the choice of advanced airway management options for our paramedics with no reported compromise in patient safety, although this was not objectively measured. In cases where i-gel failed (due to airway complications), the crew used an alternative method. Although i-gel is recommended, staff has been advised following the circulation of a Patient Care Update, to use what they feel is best for the patient in the prehospital setting. It should be noted that neither audit highlighted any clinical issues raised by staff.

The demographics in table 3 highlighted no significant variation between the two studies, although the mean age for the female cohort of patients was higher in 2012 than 2011. The most likely cause of arrest in both studies was collapse with an unknown cause on first presentation.

The audit also indicated that:

- The training, which recommended staff to use the i-gel device to maintain the airway of a patient suffering from a cardiac arrest, was effective.
- A small minority of frontline emergency staff are not documenting important mandatory fields, that is, airway management on the PRF.

Table 3 Demographics and cause of arrest for both audit periods

	2012				2011			
Demographics								
Gender	Male		Female		Male		Female	
	n	%	n	%	n	%	n	%
	86	64.2	48	35.8	40	58.0	29	42.0
Age range	26–96 years				26–100 years			
Mean age	69 years		75 years		68 years		69 years	
Median age	73 years		78 years		74 years		74 years	
Cause of arrest								
Collapse—query cause	100	86.2	64	92.8				
Central chest pain	5	4.3	0	0				
Respiratory arrest	6	5.2	0	0				
Hanging	1	0.9	0	0				
Fitting	1	0.9	2	2.9				
Viagra	1	0.9	0	0				
Query pulmonary embolism	1	0.9	0	0				
Query Cerebrovascular accident (CVA)	1	0.9	0	0				
Overdose	0	0	2	2.9				
Road traffic collision (RTC)	0	0	1	1.4				

- A small minority of staff encountered difficulty while attempting to insert the i-gel, and therefore, had to resort to using either ET tube or bag-valve-mask (BVM) with airway adjuncts. The success rates for i-gel remain high and compare favourably with the 88.5% success rate with laryngeal mask in patients undergoing general anaesthesia[6] and 95.3% in Wang's series.[1]

The following limitations were identified:

- The Trust had not undertaken any previous airway management studies that this audit could compare with.
- Poor documentation of some patient records reduced the overall sample size.
- Time taken to achieve a successful airway was not documented and assessed.

Feedback illustrated that staff preferred to use the ET tube over i-gel as they felt that the airway remained more secure especially during the moving and handling of the patient and that it was the most appropriate method for the situation. The other reason for doing so was due to the patient aspirating prior to airway management and/or the commencement of cardiopulmonary resuscitation (CPR).

Confidence was also highlighted as an issue when using i-gel as this had recently been introduced, but since attempting to use i-gel, staff was happy to use this method again and feel confident enough to do so. This was evidenced by the increase in proportion of i-gel insertion as the first measure, see 'i-gel only' in table 1. In comparison to other series, our ET intubation success rates are better than Wang's study[5] but in line with most prehospital studies.[1] However, both i-gel and ET intubation are used infrequently and inadequate exposure leads to skill decay.[4]

The most recent and comprehensive data on i-gel use during cardiopulmonary resuscitation are hospital based.[12] The authors report on the 100 i-gel insertions and it has now become their "first line" device of choice during the initial phase of CPR while the resuscitation team is summoned. With such published reports on the merits and successful use of i-gel, we intend to update the staff on the evidence that is emerging to address the issues raised in the PRFs and the audit. Future training will include the high seal pressures and the mechanism of managing regurgitant fluid incorporated in the device. This will hopefully encourage more widespread use of the i-gel in the cohort of patients that have, or are in danger of, aspirating. We also hope to measure and monitor the time required to achieve a successful airway.

In conjunction with the above actions, we hope to look at the practice and behaviour of staff at regular intervals until we reach a steady state with optimal documentation in the PRFs.

Allowing for the limited numbers, we feel that the decision to add i-gels to the range of airway management equipment has enhanced the choice for our staff. We anticipate more widespread and safe use of i-gel by our paramedics in the years to come.

Acknowledgements The authors acknowledge Miss Rachel Murray and Miss Pippa Morley of the North East Ambulance Service NHS Foundation Trust for contributing to the data collection. Furthermore, we thank operational staff at the North East Ambulance Service for providing the relevant feedback.

Contributors JD was responsible for co-ordinating the audit among the relevant staff, analysis and interpretation of the data, writing the first draft of the paper, verifying the data quality and presenting the paper to the North East Ambulance Service Clinical Advisory Group. PF was responsible for the design of the audit and the final approval of the paper to be published. KH was responsible for conception of the audit, questioning the validity of the data, verifying the accuracy of the content of the paper, undertaking the literature review and encouraging submission of the paper. KH also revised the article critically for important intellectual content. CK and CT both undertook the clinical audit and equally contributed to the analysis and interpretation of the data, first draft of the paper and the quality improvement aspect involved. The two authors listed as guarantors are JD and KH.

Competing interests None.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The authors agree to share the data contained within the manuscript.

REFERENCES

1 Thomas MJC, Benger J. Pre-hospital intubation in cardiac arrest: the debate continues. *Resuscitation* 2011;82:367–8.
2 Deakin CD, Clarke T, Nolan J, *et al*. A critical reassessment of ambulance service airway management in pre-hospital care: Joint Royal Colleges Ambulance Liaison Committee Airway Working Group. *Emerg Med J* 2008;27:226–33.
3 Castle N, Owen R, Hann M, *et al*. Assessment of the speed and ease of insertion of three supraglottic airway devices by paramedics: a manikin study. *Emerg Med J* 2010;27:860–3.
4 Deakin CD, King P, Thompson F. Pre-hospital airway management by ambulance technicians and paramedics: is clinical practice sufficient to maintain skills? *Emerg Med J* 2009;26:888–91.
5 Wang HE. Out-of-hospital airway management in the United States. *Resuscitation* 2011;82:378–85.
6 Deakin CD, Peters R, Tomlinson P, *et al*. Securing the pre-hospital airway: a comparison of laryngeal mask insertion and endotracheal intubation by UK paramedics. *Emerg Med J* 2005;22:64–7.
7 Nolan JP, Soar J, Perkins GD. Cardiopulmonary resuscitation. *BMJ* 2012;345:34–40.
8 *I-gel User Guide*. 9989 issue 1, Wokingham, Berkshire, UK, Intersurgical Ltd, 2010.
9 Soar J. The i-gel supraglottic airway and resuscitation-some initial thoughts. *Resuscitation* 2007:74:197.
10 Piraccini E, Corso RM, Agnoletti V, *et al*. Use of the I-gel for tracheal intubation without the interruption of chest compressions. *J Emerg Med* 2012;43:e67–8.
11 Tiesmeier J, Emmerich M. Successful use of the i-gel supraglottic airway as a conduit for blind pre-hospital intubation during resuscitation. *Resuscitation* 2011;82:1358–9.
12 Larkin C, King B, D'Agapeyeff A, *et al*. I-gel supraglottic airway use during hospital cardiopulmonary resuscitation. *Resuscitation* 2012;83:e141.

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Emerg Med J 2014 31: 505-507 originally published online April 10, 2013
doi: 10.1136/emermed-2012-202126