

## A survey of paramedic advanced airway practice in the UK

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### Abstract

**Introduction** – Although there are published studies examining UK paramedic airway management in the out-of-hospital setting, there has been no sizeable survey of practicing UK paramedics that examines their advanced airway management practice, training and confidence. Therefore, the Airway Management Group of the College of Paramedics commissioned a survey to gain an up to date snapshot of advanced airway management practice across the UK among paramedics.

**Methods** – An online questionnaire was created, and a convenience sample of Health and Care Professions Council (HCPC) registered paramedics was invited to participate in the survey. Invitations were made using the College of Paramedics e-mail mailing list, the College website, as well as social media services such as Twitter and Facebook. The survey ran online for 28 days from 21 October to 18 November 2014 to allow as many paramedics to participate as possible. The survey questions considered a range of topics including which supraglottic airway devices are most commonly available in practice and whether or not tracheal intubation also formed a part of individual skillsets. In relation to intubation, respondents were asked a range of questions including which education programmes had been used for original skill acquisition, how skills were maintained, what techniques and equipment were available for intubation attempts, individual practitioner confidence in intubation and how intubation attempts were documented.

**Results** – A total of 1658 responses to the survey were received. Following data cleansing, 152 respondents were removed from the survey, leaving a total of 1506. This represented 7.3% of paramedics registered with the HCPC (20,565) at the time the survey was conducted. The majority of respondents were employed within NHS ambulance services.

**Summary** – This is the largest survey of UK paramedics conducted to date, in relation to advanced airway management. It provides an overview of advanced airway management, with a particular focus on intubation, being conducted by UK paramedics.

### Keywords

airway management; supraglottic airway device; tracheal intubation

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## Introduction

Although there are published studies examining UK paramedic airway management in the out-of-hospital setting, using clinical audit (Deakin, King, & Thompson, 2009; Duckett, Fell, Han, Kimber, & Taylor, 2014) and surveys of NHS Ambulance Trusts (Gregory, Kilner, & Arnold-Jones, 2015; Ridgway, Hodzovic, Woollard, & Latto, 2004), there has been no sizeable survey of practicing UK paramedics that examines their airway management practice, training and confidence. Therefore, the Airway Management Group of the College of Paramedics commissioned a survey to gain an up-to-date snapshot of airway management practice across the UK among paramedics. Given the limitations of the available literature at the time in providing a UK wide view, an online survey was created to allow ease of participation for respondents across the UK.

The main aim of the survey was to gain a greater understanding of advanced airway management currently being undertaken by paramedics, in order to inform future college position statements. The survey was open to all UK registered paramedics in order to gain a representative sample of the profession as a whole.

## Methods

An online questionnaire was created and hosted using Survey Monkey. A convenience sample of Health and Care Professions Council (HCPC) registered paramedics was invited to participate in the survey. Invitations were sent to all paramedics signed up to the College of Paramedics e-mail mailing list, and the survey was advertised on the College website and via social media services such as Twitter and Facebook. The survey ran online for 28 days from 21 October to 18 November 2014 to allow as many paramedics to participate as possible. Regular reminders were sent out during the recruitment period via e-mail and social media.

Once the recruitment period was completed, the survey data were cleansed of respondents who did not meet the participant criteria and a narrative analysis of the data was conducted. Respondents were removed from the dataset if they were not HCPC-registered paramedics, such as nurses, doctors and community first responders. In addition, paramedics who were practicing abroad and who were not resident in the UK were also removed from the dataset.

As the aim of the survey was to gain a snapshot of advanced airway management, no hypothesis was proposed for testing. It was therefore not required to calculate an a priori statistical sample size for the survey. Analysis of the data would be narrative.

## Results

During the recruitment period, a total of 1658 responses to the survey were received. During data cleansing, 152

respondents were removed from the survey, leaving a total of 1506. This represented 7.3% of paramedics registered with the HCPC (20,565) at the time the survey was conducted.

## Demographic information

The following (optional) demographic information was requested from survey respondents:

- Current clinical role;
- Type of organisation that is their main place of work;
- Level of education.

### Current clinical role

All survey respondents provided their current clinical role, results of which are summarised in Table 1.

### Employing organisation type

Of the survey respondents, 1497 (99.4%) identified their employing organisation (Table 2).

### Paramedic education

Respondents were asked to choose which of the following best described their paramedic qualification:

- Bachelor of Science degree (with or without honours, BSc);
- Conversion course from IHCD Ambulance Technician to Foundation degree or Diploma (conversion);
- Foundation degree or Diploma (FdSc/DipHE);
- Institute of Health and Care Development (IHCD);
- Other.

**Table 1.** Summary of survey respondents' current clinical role.

Role	Total	%
Consultant paramedic	13	0.9
Other	29	1.9
Paramedic	1203	79.9
Specialist/advanced paramedic – critical care	103	6.8
Specialist/advanced paramedic – urgent and emergency care	158	10.5
Total	1506	100.0

Note: The 'Other' category consisted of a range of responses. The largest group (17 respondents) identified themselves as being involved in education (either at a university or ambulance service training school). Seven respondents did not provide any further details.

Of the survey respondents, 1279 (84.9%) indicated the qualification which best summarised their paramedic qualification (Table 3 and Figure 1).

supraglottic airway devices (SADs) were available for them to use.

### Airway management

The survey questions focused on intubation, with the exception of the first question in the airway management techniques section which asked survey respondents which

### Supraglottic airway devices

Of the respondents, 1415 (94%) indicated that they had one or more SADs available for them to use. The remainder either did not have SADs for use or did not answer the question (Table 4 and Figure 2).

**Table 2.** Summary of employing organisation, stratified by clinical role.

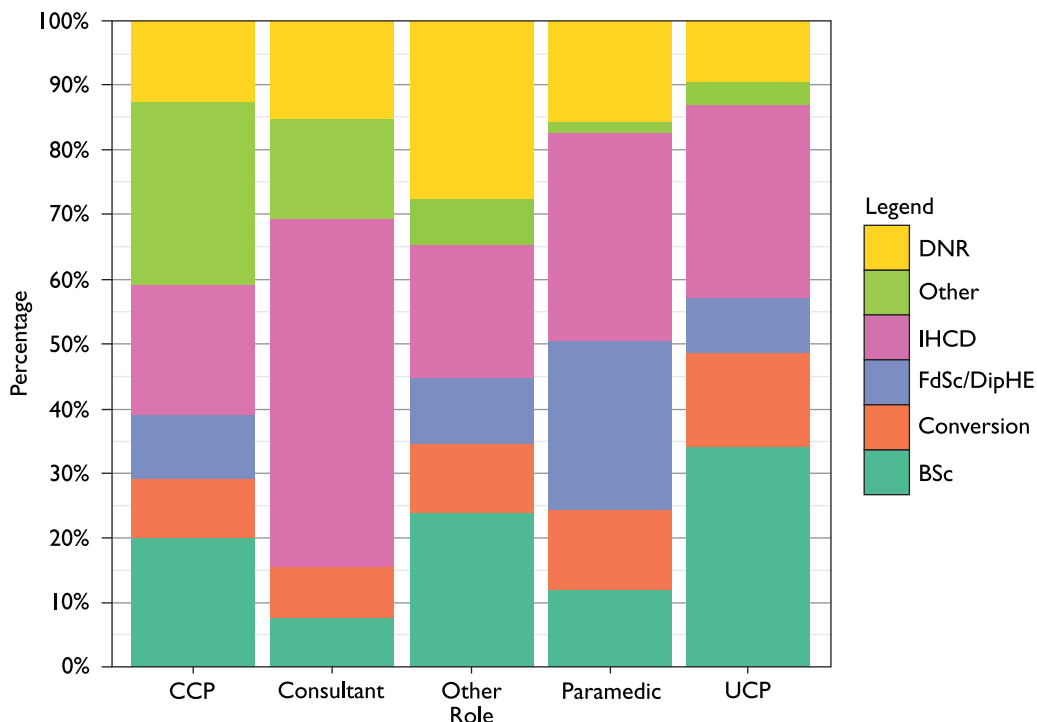
Role	NHS	HEMS	HART	Vol.	Military	Indep.	Other	DNR	n
CCP	58	36	2	0	0	1	4	2	103
Consultant	10	0	0	0	0	2	1	0	13
Other	13	0	0	1	0	1	13	1	29
Paramedic	1083	13	25	5	17	35	19	6	1203
UCP	136	0	6	0	1	7	8	0	158
Total	1300	49	33	6	18	46	45	9	1506

CCP: specialist/advanced paramedic – critical care; UCP: specialist/advanced paramedic – urgent and emergency care; HEMS: helicopter emergency medical service (NHS and independent, including search and rescue, SAR); HART: hazardous area response team; Vol: voluntary services; Indep: independent sector; DNR: did not respond; n: number of respondents.

**Table 3.** Summary of paramedic qualification of survey respondents, by clinical role.

Role	BSc	Conversion	FdSc/DipHE	IHCD	Other	DNR	n
CCP	21	9	10	21	29	13	103
Consultant	1	1	0	7	2	2	13
Other	7	3	3	6	2	8	29
Paramedic	146	146	315	386	21	189	1203
UCP	54	23	13	48	5	15	158
Total	229	182	341	468	59	227	1506

Note: A number of respondents who selected ‘Other’ interpreted this question as a request to indicate their highest academic qualification relating to paramedic practice. This included three respondents who stated they had (or were working towards) a PhD and 38 respondents who had (or were working towards) an MSc.



**Figure 1.** Summary of paramedic qualification stratified by clinical role.

## Intubation

Survey questions relating to intubation were divided into three broad areas:

- Ability to intubate and in which age ranges;
- Initial skill acquisition and maintenance;
- Intubation in practice, including aspects such as end-tidal carbon dioxide (ETCO<sub>2</sub>) monitoring, rescue techniques for a failed intubation and documentation of an intubation attempt.

### Ability to intubate

Of the respondents, 1418 (94.2%) indicated whether they could intubate, and if so, what age range. A summary of the results is shown in Table 5 and organised by current clinical role. As Figure 3 clearly shows, the majority of respondents were able to intubate all ages of patients.

### Initial skill acquisition and maintenance

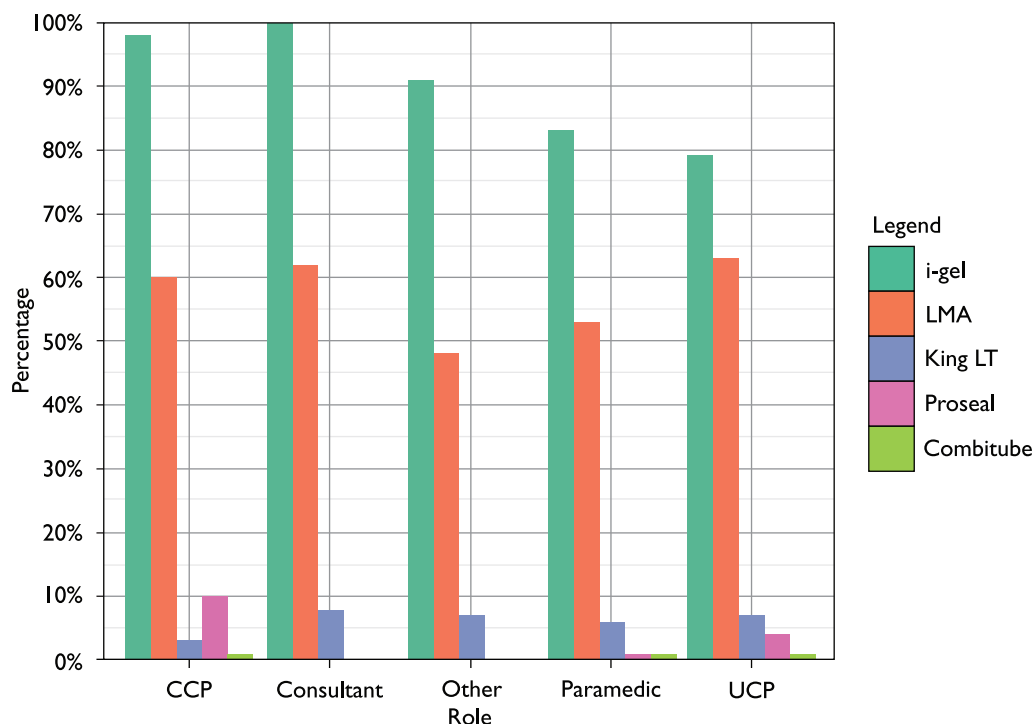
Respondents were asked how often they had attempted intubation in the last 12 months, as well as whether they had received update training or a skill assessment relating to intubation, and if so, how often. Of the respondents, 1223 (81.2%) provided the number of intubations they had attempted in the last 12 months (Table 6); 1178 (78.2%) provided an indication of the regularity of updates and/or assessment of intubation (Table 7). No definition was given for what constituted regular updates as part of the survey. Figure 4 provides a visual comparison of the results from Tables 6 and 7.

### Confidence in intubation

Survey participants were asked if they were confident in intubation (Table 8). During analysis of the data the confidence questions appeared to show suggested correlation

**Table 4.** Summary of supraglottic airway devices available for respondents' use, stratified by clinical role.

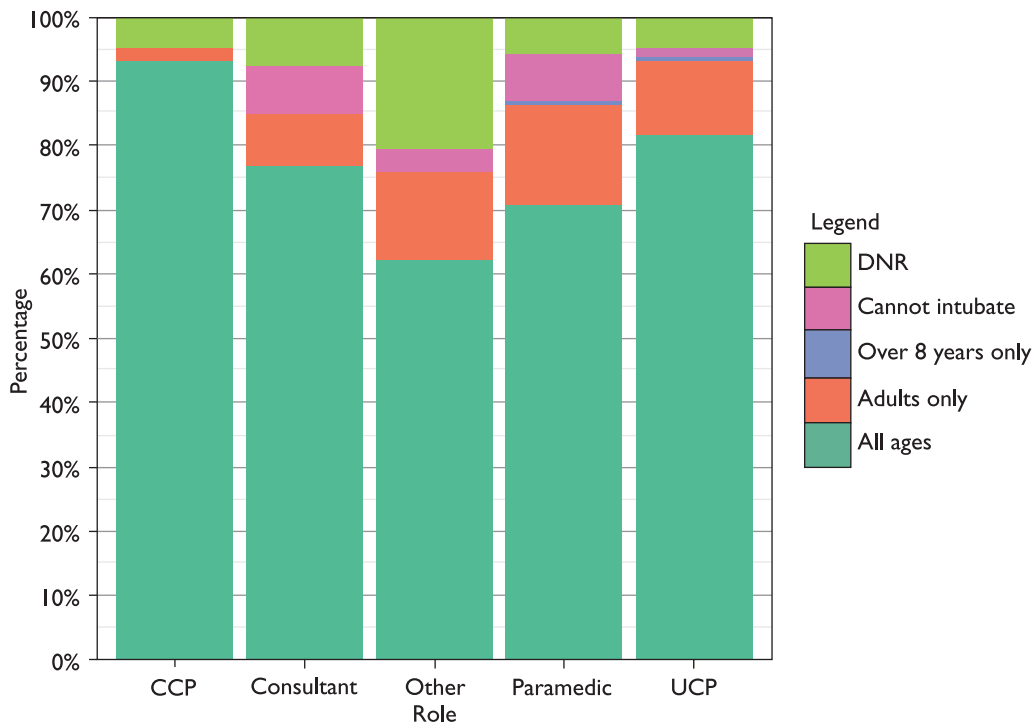
Role	i-gel	LMA	King LT	Proseal	Combitube	n
CCP	95	62	3	10	1	97
Consultant	12	8	1	0	0	12
Other	20	14	2	0	0	22
Paramedic	946	637	67	15	9	1133
UCP	119	100	11	6	1	151
Total	1192	821	84	31	11	1415



**Figure 2.** SAD availability stratified by clinical role.

**Table 5.** Summary of respondents' ability to intubate, stratified by clinical role and age of patient.

Role	All ages	Adults only	Over 8 years only	Cannot intubate	DNR	n
CCP	96	2	0	0	5	103
Consultant	10	1	0	1	1	13
Other	18	4	0	1	6	29
Paramedic	853	188	4	90	68	1203
UCP	129	18	1	2	8	158
Total	1106	213	5	94	88	1506



**Figure 3.** Ability to intubate by role and age group of patient.

with other parts of the survey. It was therefore decided to use regression analysis to explore the presence of any correlation between confidence and the following:

- Whether the participant had a practice placement supervised by an anaesthetist;
- How many intubations they had performed in the last 12 months;

- How many years since their initial intubation training;
- Whether they received regular update training or assessment;
- How many years since their last update training or assessment.

The results of the regression analysis are shown in Table 9.

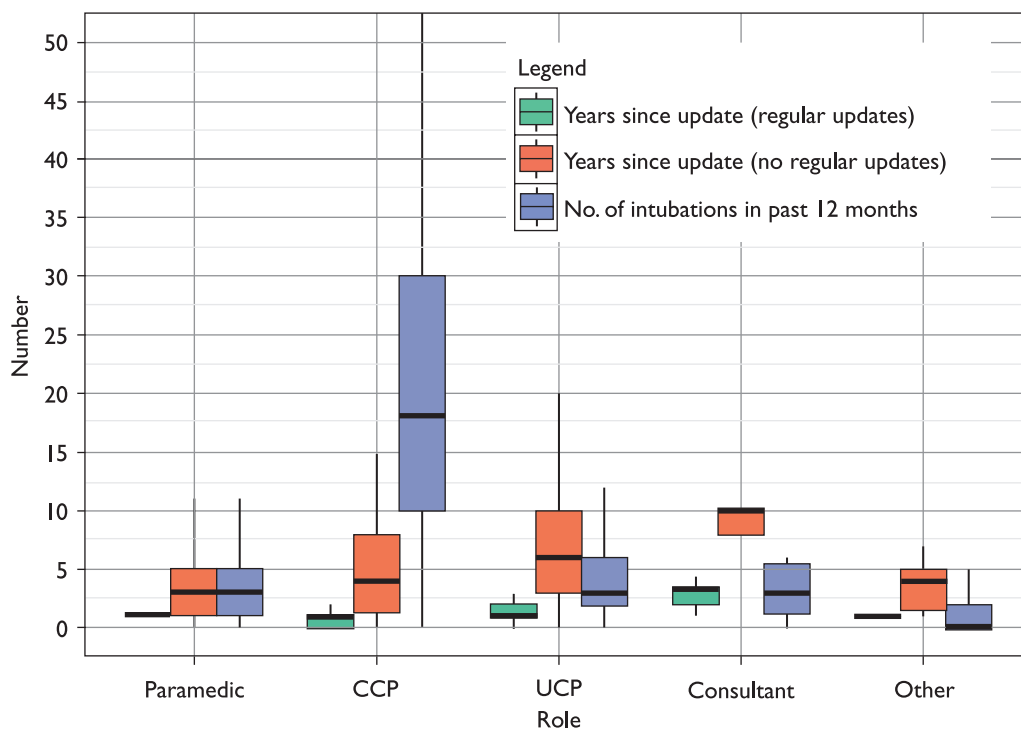
**Table 6.** Summary of number of intubations performed by respondents in the last 12 months, stratified by clinical role.

Role	Lower quartile	Median	Upper quartile	n
CCP	10	18.5	30	88
Consultant	1	3.0	6	10
Other	0	0.0	2	21
Paramedic	1	3.0	5	963
UCP	2	3.0	6	141

**Table 7.** Summary in years of the frequency of updates and assessment of airway management, stratified by survey respondents who perceived that they received regular updates (or not), and clinical role.

Role	Regular updates			No regular updates			n(freq)	n(reg)	n(no reg)
	LQTR	Median	UQTR	LQTR	Median	UQTR			
CCP	0	1	1.0	1	4	8	90	61	30
Consultant	2	3	3.5	8	10	10	8	5	5
Other	1	1	1.0	1	4	5	21	14	6
Paramedic	1	1	1.5	1	3	5	922	300	680
UCP	1	1	2.0	3	6	10	137	62	78

n(freq): number of respondents who indicated how many years had elapsed since their last update training or assessment of competency in intubation; n(reg): number of respondents who indicated that they had received regular updates or assessment of their competency in intubation; n(no reg): number of respondents who indicated that they had not received regular updates or assessment of their competency in intubation.



**Figure 4.** Time in years since last update training or assessment, and number of intubations performed in the last 12 months, stratified by role.

**Table 8.** Summary of confidence in intubation among survey respondents, stratified by role.

Role	Confident	Not confident	DNR	Total
CCP	87	4	12	103
Consultant	8	2	3	13
Other	19	2	8	29
Paramedic	801	182	220	1203
UCP	125	18	15	158
Total	1040	208	258	1506

**Table 9.** Odds ratios and confidence intervals of variables that may affect survey respondents' confidence in intubation.

Variable	Odds ratio	95% confidence interval
Placement with an anaesthetist	3.72	1.66–8.58
No. of intubations performed in past year	1.51	1.38–1.67
Years since taught intubation	1.05	1.01–1.09
Regular updates	6.28	3.39–12.49
Years since last update	0.99	0.93–1.05

*Intubation in practice*

**Mandatory equipment for intubation attempts**

Respondents were asked which of the following were mandatory when performing intubation:

- Use of a bougie regardless of the Cormack-Lehane grade of view;
- Use of a bougie for Cormack-Lehane grade II or greater views;

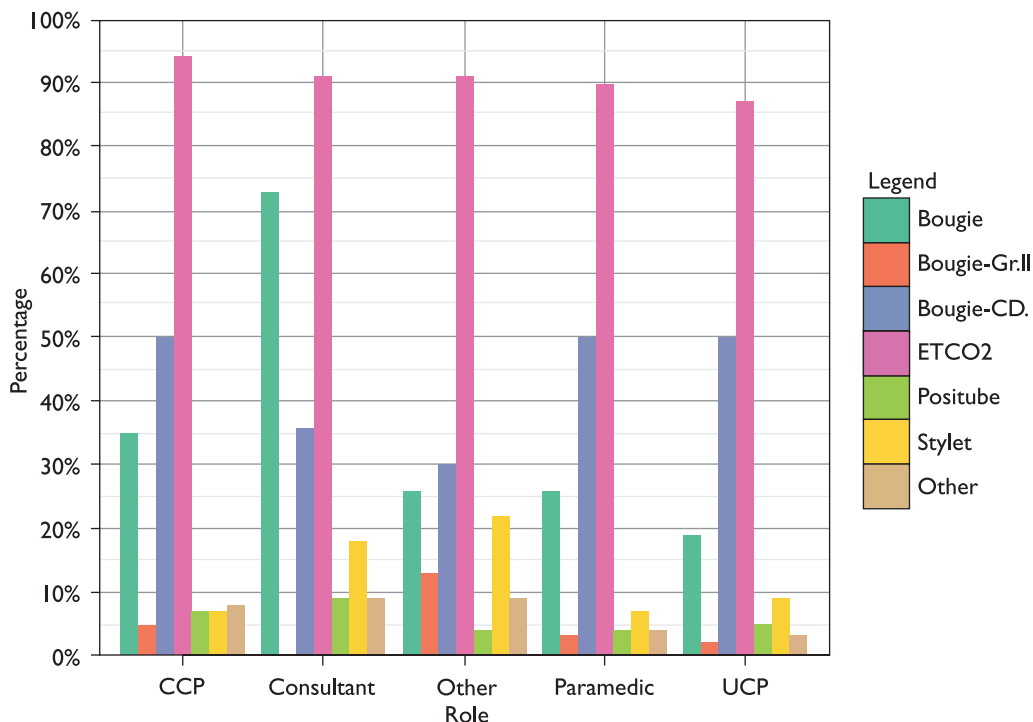
- Use of a bougie at the clinician's discretion;
- Use of ETCO<sub>2</sub>;
- Use of a Positube to confirm placement;
- Use of a malleable stylet;
- Other.

Of the respondents, 1359 (90.2%) indicated mandatory interventions when intubating (Table 10 and Figure 5).

**Table 10.** Mandatory equipment required for intubation attempts.

Role	Bougie	Bougie-GrII	Bougie-CD	ETCO <sub>2</sub>	Positube	Stylet	Other	Total	n
CCP	34	5	48	90	7	7	8	199	96
Consultant	8	0	4	10	1	2	1	26	11
Other	6	3	7	21	1	5	2	45	23
Paramedic	281	32	539	974	42	76	46	1990	1083
UCP	28	3	73	127	8	13	4	256	146
Total	357	43	671	1222	59	103	61	2516	1359

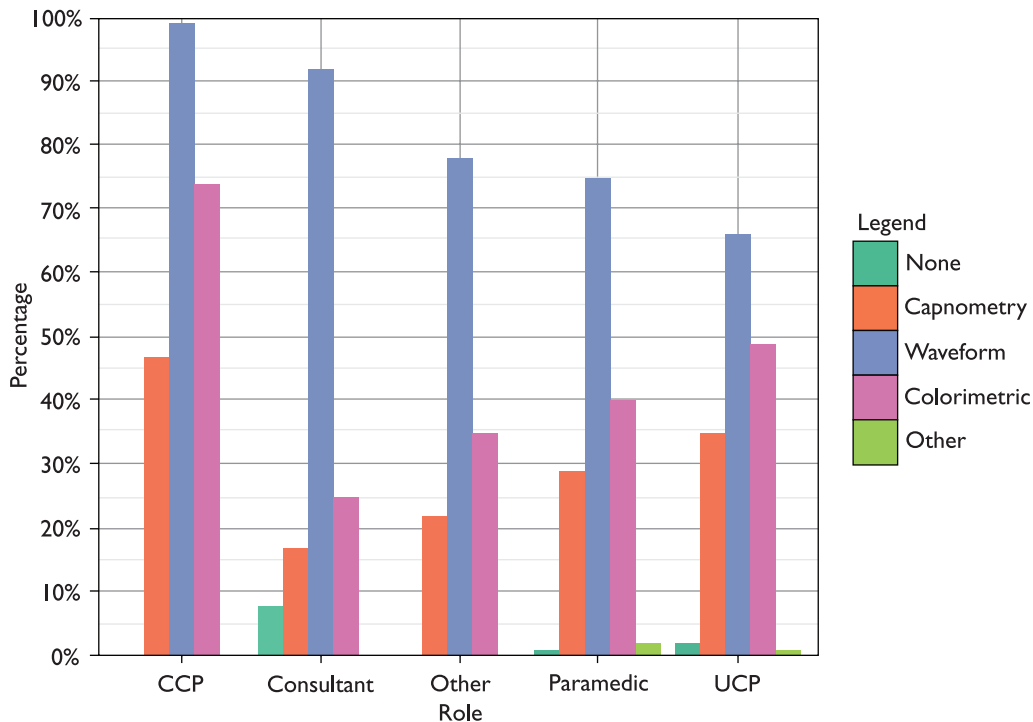
Bougie-GrII: bougie required for grade II views and higher; Bougie-CD: bougie use at the clinician's discretion.



**Figure 5.** Mandatory equipment required for intubation attempts by role.

**Table 11.** End-tidal carbon dioxide monitoring available for survey respondents when intubating, by role.

Role	None	Digital capnometry	Waveform capnography	Colorimetric	Other	Total	n
CCP	0	46	97	73	0	216	98
Consultant	1	2	11	3	0	17	12
Other	0	5	18	8	0	31	23
Paramedic	14	328	839	449	27	1657	1124
UCP	3	52	99	74	2	230	150
Total	18	433	1064	607	29	2151	1407

**Figure 6.** End-tidal carbon dioxide monitoring available to survey respondents when intubating by role.

### End-tidal carbon dioxide monitoring

Survey respondents were asked which of the following ETCO<sub>2</sub> monitoring devices they had available when intubating:

- None;
- Digital capnometers (e.g. EMMA);
- Waveform capnography;
- Colorimetric devices (e.g. EasyCap);
- Other.

Of the respondents, 1407 (93.4%) provided information about ETCO<sub>2</sub> devices they used to confirm intubation success (Table 11 and Figure 6).

### Techniques used during intubation

Survey respondents were asked if they adopted either of the following techniques:

- Cricoid pressure;
- Back, up, right, pressure (BURP).

**Table 12.** Use of cricoid pressure and BURP during intubation, stratified by role.

Role	Cricoid pressure	BURP	Total	n
CCP	77	84	161	95
Consultant	8	8	16	11
Other	19	14	33	23
Paramedic	928	523	1451	1021
UCP	136	76	212	142
Total	1168	705	1873	1292

Of the respondents, 1292 (85.8%) indicated whether they used cricoid pressure and/or the BURP manoeuvre (Table 12 and Figure 7).

### Rescue techniques for failed intubation

Survey respondents were asked what rescue techniques were available to them in the event that the patient could not be intubated. The options were:



- Failed intubation protocol;
- Needle cricothyroidotomy;
- Surgical cricothyroidotomy;
- None of the above.

Of the respondents, 1403 (93.2%) indicated the rescue techniques (or none) that were available to them (Table 13 and Figure 8).

### Securing the tracheal tube

Survey respondents were asked how they secured the tracheal tube in place following intubation. Of the respondents, 1368 (90.8%) answered this question (Table 14 and Figure 9).

### Documenting an intubation

Survey respondents were asked which of the following they documented following an intubation:

- Number of attempts;
- Cormack-Lehane grade of view;
- Length of tube at teeth;
- ETCO2 waveform/value;
- Presence of bilateral chest sounds;
- Other.

Of the respondents, 1326 (88%) provided information relating to documentation requirements for intubation (Table 15 and Figure 10).

### Skills log

Survey respondents were asked if they kept a skills log of intubations and other advanced airway techniques that they performed. The possible responses were:

- No log;
- Voluntary log;
- Compulsory log (e.g. as a condition of employment or insurance).

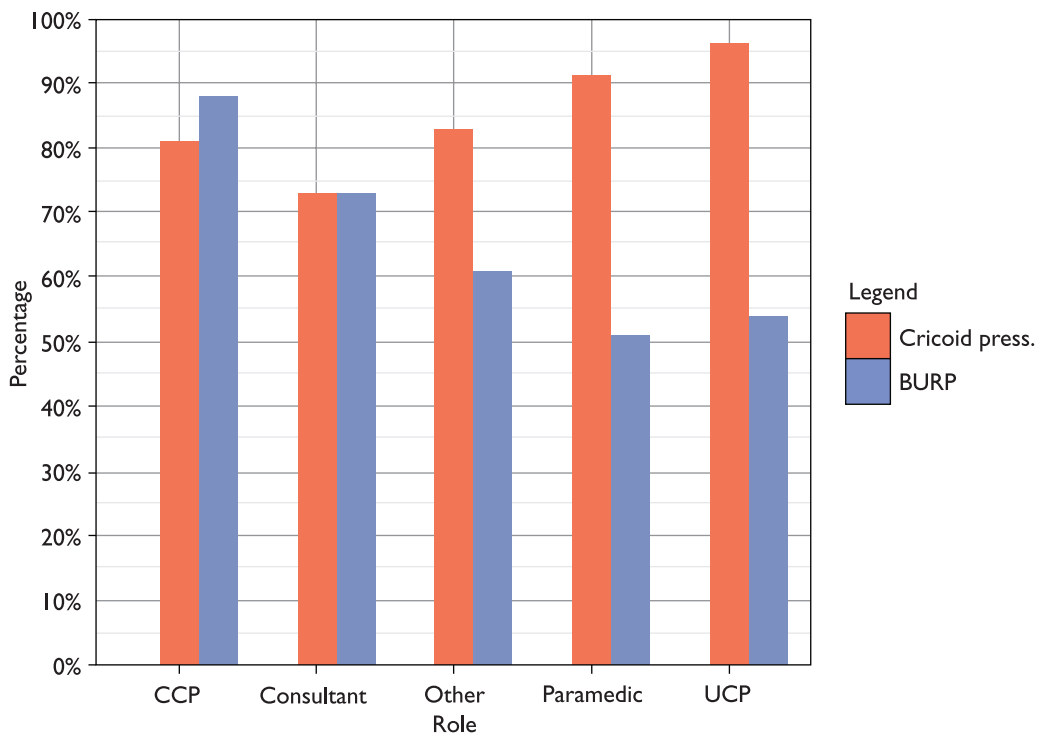


Figure 7. Use of cricoid pressure and the BURP manoeuvre by role.

Table 13. Rescue techniques for failed intubation by role.

Role	Surgical airway	Needle cricothyroidotomy	Failed intubation protocol	None	Total	n
CCP	61	79	82	1	223	98
Consultant	7	9	8	0	24	11
Other	1	19	11	1	32	23
Paramedic	71	977	326	81	1455	1121
UCP	34	136	65	4	239	150
Total	174	1220	492	87	1973	1403

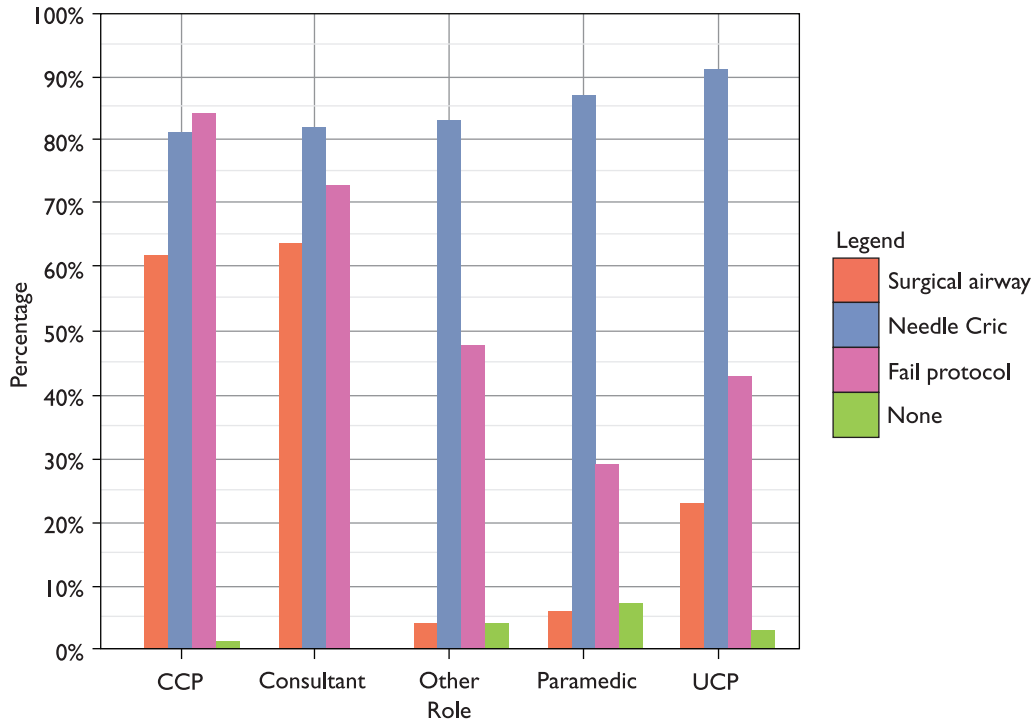


Figure 8. Rescue techniques for failed intubation, stratified by role.

Table 14. Techniques used to secure a tracheal tube in place, by role.

Role	Thomas tube holder	Other commercial device	Tape	Ties	Cervical collar	Total	n
CCP	81	1	37	54	16	189	98
Consultant	10	0	4	2	1	17	11
Other	18	0	4	9	2	33	23
Paramedic	853	19	334	400	199	1805	1086
UCP	119	4	49	63	33	268	150
Total	1081	24	428	528	251	2312	1368

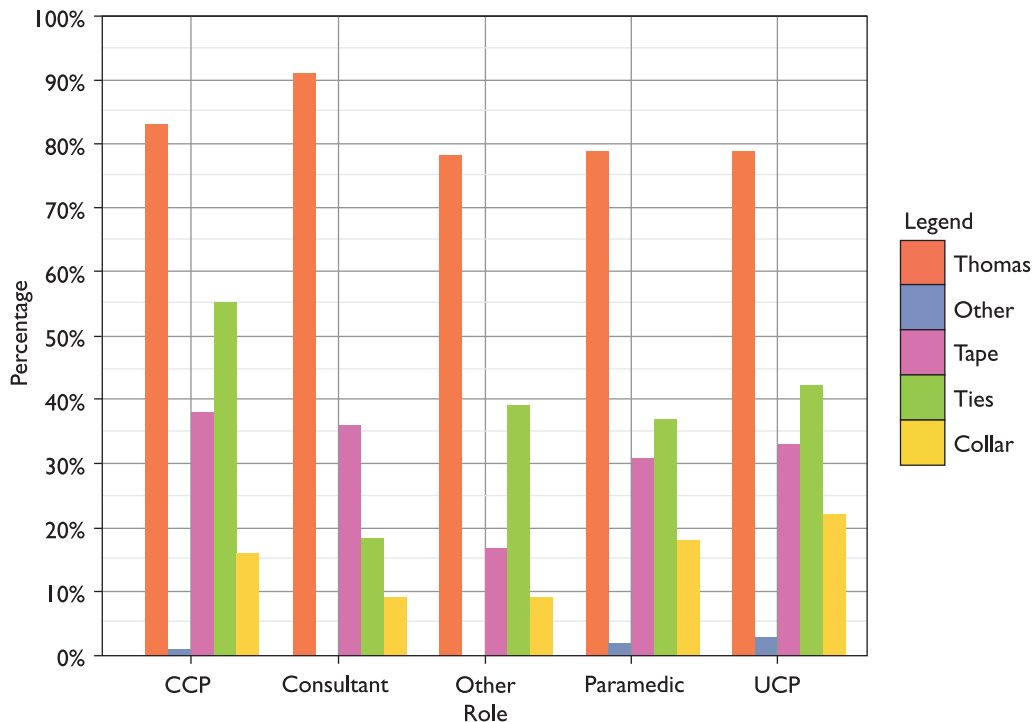
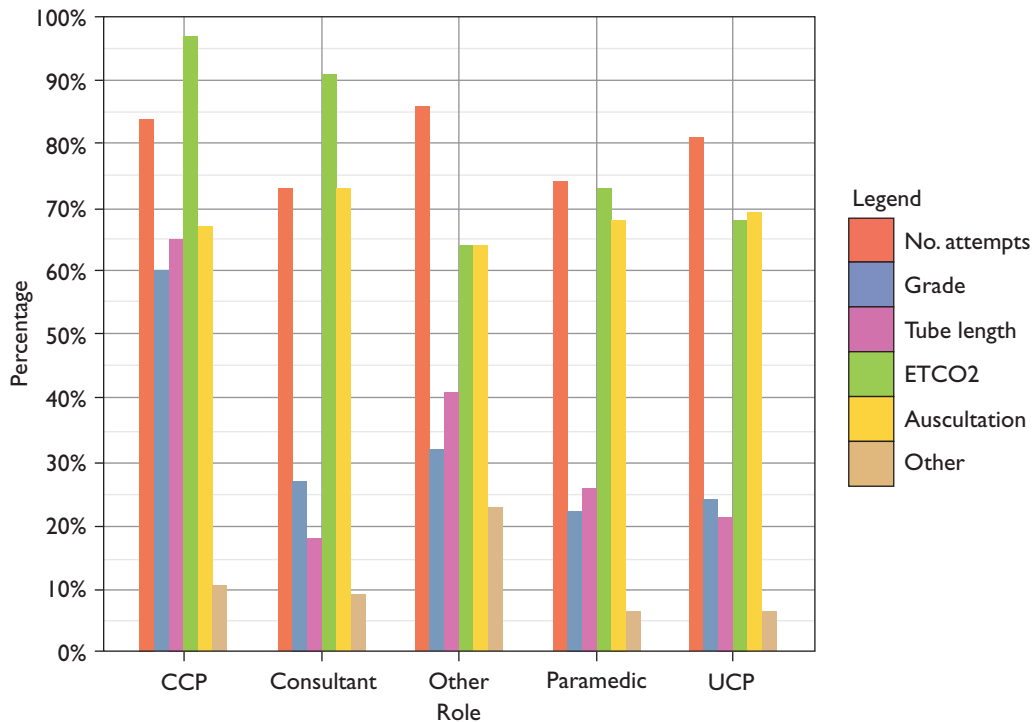


Figure 9. Techniques used to secure a tracheal tube in place, by role.

**Table 15.** Documented features of an intubation attempt, stratified by role.

Role	No. of attempts	Grade of view	Tube length at teeth	ETCO2	Breath sounds	Other	Total	n
CCP	81	58	62	93	64	10	368	96
Consultant	8	3	2	10	8	1	32	11
Other	19	7	9	14	14	5	68	22
Paramedic	781	229	279	767	718	68	2842	1054
UCP	116	34	30	97	98	9	384	143
Total	1005	331	382	981	902	93	3694	1326



**Figure 10.** Documented features of an intubation attempt, by role.

**Table 16.** Table summarising log keeping by survey respondents, stratified by role.

Role	No log	Voluntary log	Compulsory log	DNR	n
CCP	26	54	11	12	103
Consultant	1	7	2	3	13
Other	8	9	3	9	29
Paramedic	463	452	76	212	1203
UCP	70	66	7	15	158
Total	568	588	99	251	1506

Of the respondents, 1255 (83.3%) indicated whether they kept a skills log (Table 16 and Figure 11).

## Discussion

### Survey respondents

The vast majority of respondents to this survey were paramedics employed by an NHS Trust. Furthermore, the main employer for respondents, irrespective of clinical

role was also the NHS. In terms of paramedic education, the traditional IHCD training qualification had the highest representation, followed by FdSc/DipHE. Graduates with a BSc were more commonly found in advanced practice roles and the ‘other’ category (which, given that nearly 60% of respondents in this category were educators, is not surprising), with the exception of paramedic consultants, who had the highest proportion of IHCD qualifications of all roles. This could be an indication of the length of service of these paramedics.

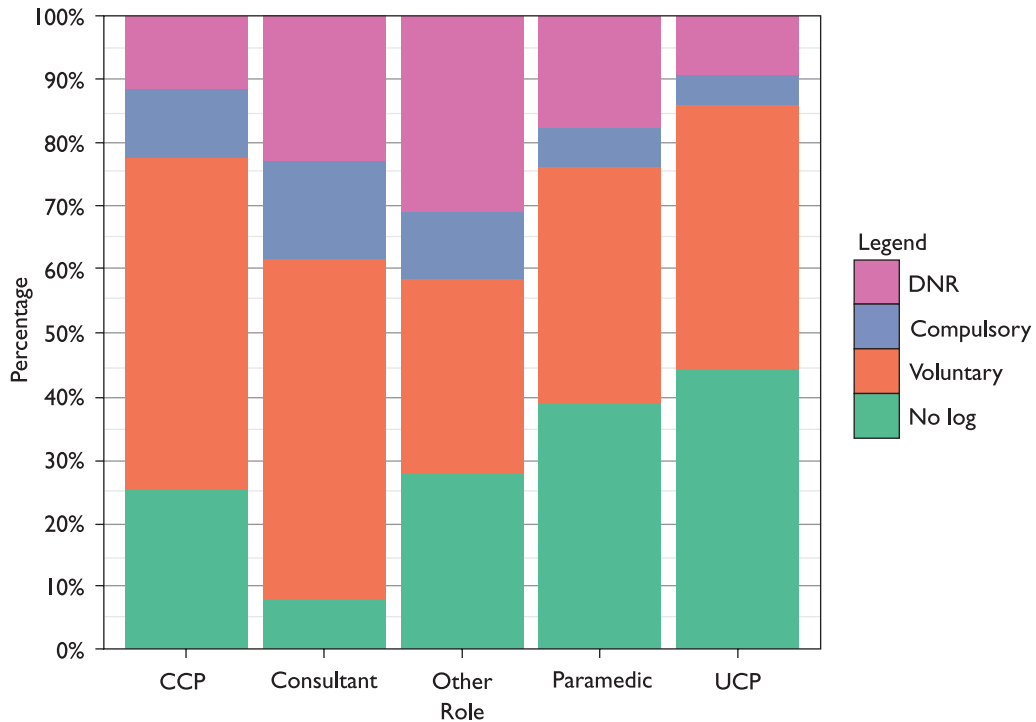


Figure 11. Log keeping by survey respondents, by role.

### Supraglottic airway devices

The most ubiquitous SAD available for survey respondents was the i-gel, a second generation SAD which unlike most SADs does not have an inflatable cuff, relying instead on a thermoplastic elastomer gel to provide a seal around the laryngeal inlet. However, the laryngeal mask airway (LMA) was also commonly available for survey respondents' use.

### Intubation

The vast majority of respondents were able to intubate patients irrespective of age (73.4%). However, there were a minority of respondents who could not intubate at all. Based on the free text comments (results of which will be published following qualitative analysis), a number of survey respondents highlighted their service's policy of not allowing new employees to intubate. This group represented only 94/1506 (6.2%) of all respondents and 90/1203 (7.5%) of paramedics.

### Initial skill and acquisition

Paramedics, consultants and UCPs in this survey all reported a median of three intubation attempts in the past 12 months (IQR: 1–5 for paramedics), which is higher than reported elsewhere (Deakin et al., 2009), although the survey results are self-reported as opposed to audit data. This is pertinent given that one of the key arguments against paramedic intubation is the infrequency with which the

intervention is performed (Joint Royal Colleges Ambulance Liaison Committee, 2008). Only CCPs reported a significantly higher number (median 18.5, IQR 10–30) of attempts. In addition, almost 70% of paramedics reported that they did not receive regular updates or assessments of their competency in intubation.

### Confidence in intubation

The vast majority of respondents were confident in intubation (1040/1248, 83.3%). The role with the highest proportion of respondents who were not confident was paramedic (182/983, 18.5%), and the lowest was CCP, with only 4/91 (4.4%) of respondents stating they were not confident in intubation.

Regression analysis suggested that confidence was most highly correlated with a practice placement with an anaesthetist as part of respondents' intubation education, and receiving regular updates or assessment of intubation competency.

### Equipment utilised during intubation attempts

ETCO<sub>2</sub> monitoring was the most frequent mandatory equipment item among survey respondents (1222/1359, 90.0%) and waveform capnography the most commonly available method of measuring ETCO<sub>2</sub> (1064/1407, 75.6%). Bougies were commonly identified as a mandatory item, although in the majority of cases respondents identified their bougie use as being at their discretion, so

arguably not mandatory. When securing the tube, most survey respondents reported having a Thomas tube holder available (1081/1368, 79.0%), with tape and ties also in wide use.

### **Techniques utilised during intubation attempts**

Cricoid pressure and the BURP manoeuvre were techniques commonly used by survey respondents, although the BURP manoeuvre was used least in the paramedic group (523/1021, 51.2%).

With respect to rescue techniques for failed intubation, only 492/1403 (35.1%) of respondents reported having a failed intubation protocol to follow. Needle cricothyroidotomy was the most commonly available technique (1220/1403, 87.0%) with surgical cricothyroidotomy much less common, although unsurprisingly a higher proportion of CCPs were able to perform this technique (61/98, 62.2% vs. 174/1403, 12.4% for all respondents). Arguably of greatest concern were the minority of respondents who reported that they had no rescue techniques available for a failed intubation (87/1403, 6.2%).

### **Documenting intubation attempts**

All clinical roles commonly documented the number of attempts, the ETCO<sub>2</sub> readings and the presence of breath sounds. However, only the CCP group had a significant proportion of respondents who recorded the Cormack-Lehane grade of the view and the tube length at the teeth.

Over half of respondents reported keeping an airway log, although this was voluntarily maintained by most respondents. However, that still left a significant number (568/1255, 45.2%) who kept no record of the number of intubations they had performed. An exception to this were the CCPs and consultants, who kept a log in 65/91 (71.4%) and 9/10 (90.0%) of cases, respectively.

### **Ongoing airway research**

There is currently a large randomised controlled trial underway (Benger, 2014) comparing the i-gel versus tracheal intubation in out-of-hospital cardiac arrest. This study is not due to publish until January 2019 and is anticipated to add to the knowledge in this area of practice.

### **Limitations**

As this is a self-reported survey, it has not been possible to verify the results against audit data to check for accuracy. This may lead to reported figures being over or under reported. Therefore, no solid conclusions can be drawn from the reported data without verification. Nor can the data be used to reflect the competence of the respondents based on their answers.

Although the authors have attempted to create the survey questions using commonly used terms, some terms may have been known as something else in some areas, which may in turn have influenced responses to some questions.

As this survey was conducted online, paramedics who do not have internet access or are not computer literate may not have responded.

### **Summary**

This is the largest survey of UK paramedics conducted to date, relating to advanced airway management. A total of 1506 paramedics responded to the survey, representing 7.3% of registrants at the time of the survey. The survey provides an overview of advanced airway management, with a particular focus on intubation, being conducted by UK paramedics. This information will be used by the College in the future to create an airway management position statement.

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### **Author contributions**

PY: Wrote and revised article, planned and set up the survey, cleaned and analysed the data.  
 RP: Wrote and revised article, analysed the dataset.  
 KL: Commented on article drafts, planned and set up the survey.

### **Conflict of interest**

Paul Younger (PY) is a Vice Chair of the College of Paramedics, Kris Lethbridge (KL) is a member of the College Board and Richard Pilbery (RP) is the Editor of the *British Paramedic Journal*. PY and RP are both members of the editorial board of the *British Paramedic Journal*.

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