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Videolaryngoscopy utilisation: Facts and opinions

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ABSTRACT

Background: Videolaryngoscopy is used in routine and predicted difficult tracheal intubation. McGrath MAC videolaryngoscopes (VLs) are now widely available in our hospitals. We investigated current utilisation of VLs and opinions of anaesthetists regarding VL use.
Methods: A snapshot of airway management strategies was collected from theatres across all three adult sites in our region. A questionnaire was then distributed to anaesthetists working in these sites to explore their opinions regarding videolaryngoscopy.
Results: The McGrath MAC VL was used in 15.1% of intubations (range from 7.4 to 32.5% across the three sites). One hundred and eight anaesthetists returned the survey (47.8% response rate); 15.7% stated videolaryngoscopy should be a standard of care. The top reasons for VL use were failed direct laryngoscopy, previously documented difficult intubation, and reduced neck extension. Perceived barriers included risk of de-skilling in direct laryngoscopy, cost, and no perceived benefit from videolaryngoscopy.
Conclusion: We found less than expected VL use despite good evidence for its benefit. The barriers to use in this group are consistent with existing literature. These perceived barriers must be addressed through education and training to deliver the benefit of regular VL use.

1. Introduction

The benefits of videolaryngoscopy have been reported since its early development [1,2]. These findings have led to their incorporation into Airway Management Guidelines [3–6] and call for the introduction of videolaryngoscopy as a standard of care [7]. A Cochrane review demonstrated the clear benefits of videolaryngoscopy especially in the hands of experienced operators [8]. The acquisition of experience requires deliberate practice [9], meaning that videolaryngoscopes (VLs) must not only be available but also regularly used. Previous surveys have shown that despite increasing availability of VLs fewer than a third of anaesthetists report routine use [10,11]. In contrast, after implementation of freely available VLs Cook's group reported majority support for their routine use [12].

The McGrath MAC VL (Medtronic, Minneapolis, USA) consists of a traditional Macintosh-like blade with a screen mounted on the handle, allowing both a direct laryngoscopic view or a video assisted view of the larynx. In 2017, provision of the McGrath MAC VL had increased to one device per theatre in all hospitals within our group, allowing its accessibility for all intubations if required.

Recognising that the first step in effective intubation with a videolaryngoscope is the decision to use the device, we wished to investigate whether widespread availability was associated with widespread use. Cook and Kelly recorded that only 31% anaesthetists in the UK reported widespread routine use of videolaryngoscopy [11]. However, they conducted a survey of institutional use rather than a measure of actual use. We aimed to determine the frequency of McGrath MAC VL use across our three acute adult hospital sites. We also aimed to explore the opinions of anaesthetists on the benefits of and barriers to VL use.

2. Methods

Ethical approval is not required for surveys of practice within the UK. Quantitative and qualitative methods were used to explore VL utilisation and opinions at our three acute adult hospital sites. Quality improvement approval was sought and granted at each site. Data collection occurred between September and December 2018.

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2.1. Quantitative data

We conducted a snapshot survey of elective and emergency airway management practice over five continuous working weekdays on each site. All three sites are teaching hospitals which together provide a full range of specialties to a population of 850,000. Sites 1 and 2 both perform approximately 10,000 procedures primarily under general anaesthesia per annum, whilst site 3 performs approximately 14,000 such procedures. Approximately 7500 cases were non elective. Allowing for 50 weeks of anaesthetic operating per year the average number of elective cases per week should be approximately 530. Data was collected by anaesthetic assistants at each site. For all theatre cases the anaesthetic assistant recorded the type of anaesthetic, primary airway plan, laryngoscope of choice for intubation and, if necessary, the second laryngoscope requested and indication for use.

2.2. Qualitative data

An anonymous questionnaire was distributed to all anaesthetists at the three sites investigating individual opinions about VLs (Appendix 1). Anaesthetists were asked to provide the perceived frequency of VL use in their practice, details around any formal training they had received in videolaryngoscopy, indications for choosing videolaryngoscopy over direct laryngoscopy, and their reasons for not using a VL. A Likert scale was used to assess whether they considered themselves a VL enthusiast, and assessed confidence levels in using the McGrath MAC VL, including whether this laryngoscope would effectively facilitate tracheal intubation. Anaesthetists were asked whether VL should be made a "standard of care". Questionnaire return was voluntary to ensure anonymity, although local awareness campaigns took place to encourage return.

Results were collated and analysed using Microsoft Excel 2018.

3. Results

3.1. Quantitative intubation data

Six hundred and five cases were performed across the three hospital sites (48 theatres) during the data collection period. Nine cases were excluded due to missing data. Two hundred and seventy-nine (46.8%) of all cases required intubation, a supraglottic airway device (SAD) was used in 213 cases (35.7%) and a primary regional or local anaesthetic technique in 104 cases (17.4%). Using the assumptions in the method this represents data capture for procedures under general anaesthesia of 92.8% (95% CI 90.3–94.9%). Table 1 summarises the airway devices utilised, including laryngoscope used for intubations. A conventional Macintosh laryngoscope was used in 82.4% of all cases requiring intubation, the McGrath MAC VL in 15.1%, and flexible bronchoscopic techniques utilised in 2.5%.

In six cases intubation was unsuccessful using a conventional Macintosh laryngoscope and a second laryngoscope was requested. In four of these cases intubation was successfully achieved using the McGrath MAC VL. In the other two cases intubation was subsequently successful using an alternative (non-video) laryngoscope.

We performed a sub-analysis of theatres where visual inspection of results suggested higher VL utilisation. Utilisation in neurosurgery and obstetrics cases was 29.4% (5/14 cases) and 40% (2/5 general anaesthetic cases) respectively. No further analysis was performed given the low numbers.

3.2. Qualitative anaesthetists' questionnaire

Questionnaires were distributed to all anaesthetists working across the three sites (n = 226). One hundred and eight questionnaires were completed, a response rate of 47.8%. Of these, 76 (70.4%) were consultants who have over seven years of anaesthetic experience; 17 (15.7%) were specialty trainees with three to seven years anaesthetic experience; and 12 (11.1%) were core trainees with up to two years anaesthetic experience. Two respondents were Staff Grade doctors and one was a Physicians' Assistant (Anaesthesia), for whom the level of anaesthetic experience is unknown. The percentage response rate was similar in both the consultant and non-consultant groups (consultant response rate of 48.4%; non-consultant 46.4%).

Seventeen (15.7%) anaesthetists stated that videolaryngoscopy should be a standard of care. On a 10-point Likert scale asking whether they described themselves as VL enthusiasts (1 = not at all; 10 = very), the median response was 7 (range 1–10). The McGrath MAC VL was reported as the preferred overall laryngoscope by 17 (15.7%) anaesthetists, and 87 (80.6%) stated that the McGrath MAC VL would be their VL of choice should they require one.

Eighty (74.1%) respondents had received formal training on use of the McGrath MAC VL. The median response of confidence levels utilising the McGrath MAC VL was 8 (range 1–10; 1 being not confident at all and 10 being very confident); and the median response of confidence levels that the McGrath MAC VL could help facilitate intubation was 8 (range 1–10). The commonest reasons for using the McGrath MAC VL were inability to intubate with direct laryngoscopy (cited 86 times), previously documented difficult intubation (cited 75 times), and reduced neck extension (cited 65 times). The most frequent barriers to use were not wanting to lose skills in direct laryngoscopy (cited 58 times), cost (cited 19 times), and seeing no benefit in using it (cited 12 times). All reasons cited

Table 1
Anaesthetic technique across the three hospital sites including choice of laryngoscope in intubated patients.

	Endotracheal tube (ETT)			Supraglottic airway device (SAD) n	Local/regional anaesthesia n	Total number of cases n
	Conventional Macintosh laryngoscope n, (%)	McGrath MAC VL n, (%)	Flexible bronchoscopic technique n, (%)			
Site 1	53 (63.9)	27 (32.5)	3 (3.6)	77	8	168
Site 2	52 (86.7)	5 (8.3)	3 (5.0)	69	15	144
Site 3	125 (91.9)	10 (7.4)	1 (0.7)	67	81	284
Total	230 (82.4)	42 (15.1)	7 (2.5)	213	104	596

Number of cases at each site (as % of total number of intubations per site).
Total row gives number of cases (as % of total number of intubations across all three sites).

for or against use of the McGrath MAC VL are shown in Figs. 1 and 2.

There was no difference in the responses of consultants compared with non-consultants.

4. Discussion

We gathered a snapshot of current VL use in theatres in our hospitals. The frequency of intubation locally is greater than that reported nationally in NAP4 (46.7% vs 38.4%) [13], however VLs are used relatively infrequently (15.1%) with only 15.7% anaesthetists reporting routine use of the McGrath MAC VL, and the same proportion thinking it should be a standard of care. This is lower than the percentage identified in Cook's national survey and much lower than the use reported in Bath when videolaryngoscopy was proactively introduced [11,12]. There were no cases of failed intubation when the McGrath MAC VL was used as the first line laryngoscope and it was 100% effective as a rescue device in four cases. We did not record whether the McGrath MAC VL was used directly or indirectly.

We were surprised by the infrequency of use of VL in our hospitals, and used the questionnaire to investigate the perceived benefits of and barriers to VL use. 'Inability to intubate with direct laryngoscopy' was the most frequently cited reason for using a McGrath MAC VL by the majority of questionnaire respondents (79.6%). Other commonly cited reasons for VL use were associated with predicted difficulty in intubation, including 'a previously documented difficult intubation' and 'reduced neck extension', consistent with current literature [8]. Less than half (42.6%) cited a high Mallampati score as a reason for VL use even though the 2016 Cochrane review concluded there were significantly fewer failed intubations when a VL was used in an anticipated difficult intubation which, in most cases, was defined by a Mallampati score of three or four [8].

Despite its popularity in failed and difficult intubations there appears to be a lack of perceived benefit to use in more routine situations even though Norskov's data suggests 93% of difficult airways are unanticipated [14]. Anaesthetists may perceive the risk of difficult laryngoscopy low (estimated around 5.8% [15]) thereby minimising opportunity for benefit from videolaryngoscopy. However, in order to gain experience, anaesthetists must use VLs in patients with likely normal airways to become familiar with the subtle differences in technique required. Formal training may help to address the issue of familiarity. Only three quarters of respondents (and 65% of responding trainees) had received training. The Cochrane review defined at least 20 VL uses to be classed as experienced and achieve optimal results [8].

Technological advances appear to take 17 years to be fully adopted by the NHS [16]. Uptake of new equipment requires not just availability and an evidence base, but a perception of need and benefit. The benefits of the laryngeal mask (LMA) were quickly recognised and it had been used on two million patients within three years of its introduction [17]. A PubMed search (conducted 10.05.19) returned 889 citations for the string "videolaryngoscope" OR "videolaryngoscopy" including the Cochrane review, yet uptake on a clinical level appears slow. Early criticism of VLs claimed that despite easier laryngoscopy, endotracheal tube placement could be challenging [18] however this is likely to be a training issue. Unlike the LMA perhaps there is no perceived need for videolaryngoscopy, thus further reducing the impetus to adopt them in all cases.

We found few differences between consultant and non-consultant responses. Specifically considering trainees, we had speculated that a younger generation of anaesthetists would be more receptive to technological advances in equipment such as VLs. However, only 7% of trainees felt videolaryngoscopy should become a standard of care (compared with 20% of consultants who felt this should be the case). Similar initial findings were reported in Bath, when videolaryngoscopy was trialled, and later introduced, for all intubations in their anaesthetic department [12]. Prior to implementation, 84% of junior trainees felt universal videolaryngoscopy would negatively impact on their training. However, the six-month post-trial survey reported 84% of those same trainees felt the change had positively impacted their training, quoting improved coaching, increased time to perform intubation, and greater opportunity to attempt potentially difficult intubations as reasons. Ninety-five per cent of them then supported a change to universal videolaryngoscopy, which clearly has not been the case in our cohort. The Bath model involved complete replacement of conventional laryngoscopes with VLs perhaps making benefit reinforcement easier.

The main reason given for not using VL was not wanting to deskill in direct laryngoscopy. This may in part be due to trainees having to rotate around hospitals some of which may not have a complete VL capability, although this is contrary to the evidence from the Bath Group where trainees moving to hospitals without a universal VL capability were not disadvantaged [12,20]. Wolf et al. assessed the transfer of skills between videolaryngoscopy and direct laryngoscopy amongst novices [19], measuring success rates on cadavers after training in either DL or VL. In VL-trained group,

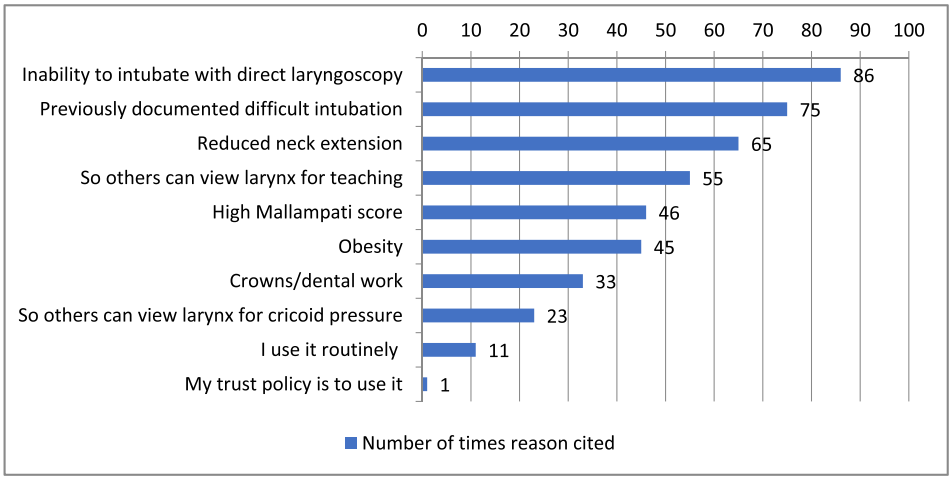

Fig. 1. Responses from survey, n = 108. Reasons for using a McGrath MAC VL.

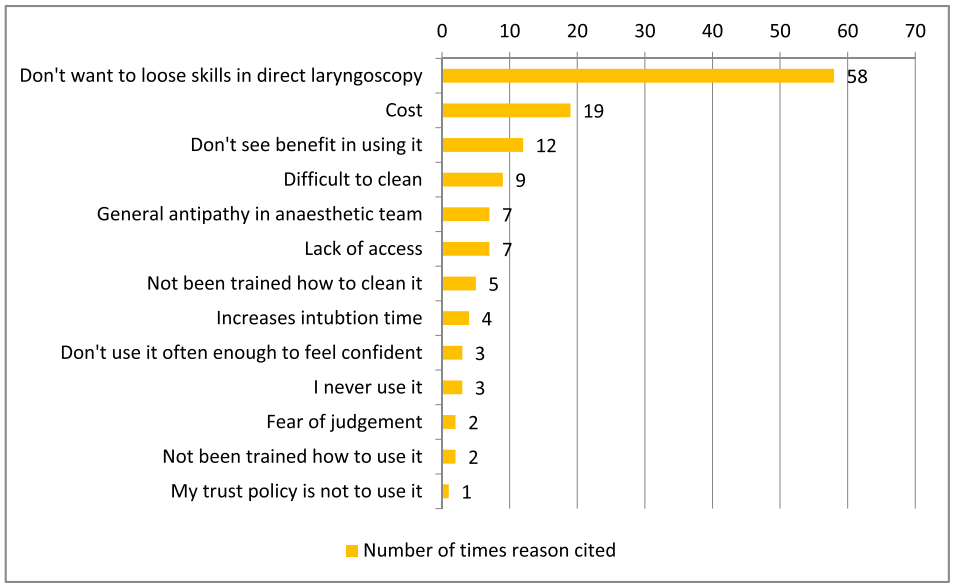

Fig. 2. Responses from survey, n = 108. Reasons for *not* using a McGrath MAC VL.

there was no significant difference in intubation success when they performed laryngoscopy using both methods. Conversely, the DL-trained group performed worse when they were asked to intubate using a VL.

Cost was also raised as a barrier to VL use. Zaouter stated that if VLs were available in every theatre and cost was not an issue "*there is no doubt that anaesthesiologists will use it*" [7]. We were surprised that this was the second most cited reason by individuals for not using the McGrath MAC VL, even though this has never been raised as an issue within our hospitals.

Continued support and definitive training are vital if new technology such as the McGrath MAC VL is to make the transition into routine practice. Although most respondents reported that they had received training in using the McGrath MAC VL, this was not further investigated. Cook's national survey indicated that almost half of respondents had no more than an informal introduction to VL use. This may also be true of our respondents.

We now intend to develop and deliver a high-quality education programme to anaesthetists in our hospitals, which will include the discussion points highlighted above. Future work will include performing a further snapshot intubation data collection in order to assess trends of VL use following implementation of education. We are also going to investigate in more detail trainees' opinions regarding VL use, as one might expect them to be more willing to adopt new technology into their practice.

5. Limitations

The snapshot results may be different if an alternative five-day period was chosen or the data collection period was longer, however we had to balance the benefits of a complete data set versus a larger (longer period) dataset that was incomplete. We did not include weekend working as the results could have been skewed by the individual practice of the relatively few anaesthetists providing an 'out-of-hours' service. We did not assess the frequency of VL use in other clinical areas such as Intensive Care and the Emergency Department, where a VL may be the first choice laryngoscope more often given the increased incidence of failed intubations [21,22]. Questionnaires can only reflect the opinions of those who chose to respond, and our questionnaire did not attempt to gather the opinions of anaesthetic assistants who may also influence practice. We recognise that our response rate is around 50%, however we felt that respondents were more likely to express honest opinions if anonymity was guaranteed. Our work did not explore the success of individual attempts at laryngoscopy, as this was not a primary aim, however we recognise that this would have been interesting. Further work in evaluating the success of the McGrath MAC VL is ongoing.

6. Conclusions

Evidence suggests that videolaryngoscopy reduces failed intubations, makes intubation easier, improves training, and reduces airway trauma [8,12]. However, videolaryngoscopy as a standard of care is not universally supported. Our work has demonstrated that despite widespread availability of the McGrath MAC VL locally it is utilised in fewer than a fifth of all intubations. Fear of losing skills in direct laryngoscopy was the main barrier to VL use reported despite evidence suggesting otherwise [19]. Our survey identified themes around barriers to VL use (deskilling, cost, training) which could be effectively explored in more detail at a national level however in the interim will be used to guide training on McGrath MAC VL use in our hospitals. The success of introducing the CMAC VL for all intubations in one hospital demonstrates that the transition from direct to videolaryngoscopy may offer several benefits and can be achieved [12]. VL enthusiasts must highlight these if their use is to become genuinely universal.

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None.

Conflict of interest

AMcN has participated in an advisory board (March 2018) and spoken at a symposium (June 2019) organised by Medtronic. He has received a wide variety of equipment for evaluation, teaching and research purposes, including from Aircraft Medical.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tacc.2019.09.001.

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