

Confirmation of the ability to ventilate by facemask before administration of neuromuscular blocker: a non-instrumental piece of information?

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Background. Our aim was to determine whether anaesthetists routinely confirm their ability to ventilate a patient's lungs by a facemask before the administration of a neuromuscular blocker and the rationale for this practice.

Methods. An online survey of trainee and non-trainee anaesthetists working in hospitals forming part of the Central London School of Anaesthesia collected 136 complete data sets over a 3 month period.

Results. Seventy-eight of 136 (57%) routinely checked they could ventilate by the facemask ('checkers'). The reasons given for this varied, though the most common was the ability to 'enable escape wake-up'. The practice was most commonly adopted by anaesthetists with less experience. In a hypothetical 'cannot ventilate' scenario, the use of succinylcholine was advocated by the majority of respondents, both 'checkers' and 'non-checkers'.

Conclusions. Despite the lack of firm evidence to support the practice of confirming the ability to ventilate the lungs before administering a neuromuscular blocking drug (NMB), we found strongly held views that supported the practice and equally strongly held views that opposed it. However, in a hypothetical emergency situation where ventilation by the facemask after induction of anaesthesia was impossible, the majority of respondents (including 'checkers') would administer a neuromuscular blocker. This apparent paradox can be explained by well-recognized psychological mechanisms. We suggest that in checking the ability to ventilate by the facemask, some anaesthetists are seeking information that may be relevant but not *instrumental* in deciding when to administer an NMB.

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Neuromuscular blocking drugs (NMBs) are usually administered before tracheal intubation in anaesthetic practice. When non-depolarizing NMBs are used, there is a latent onset period of varying duration before intubation can be performed. During this time, artificial ventilation using a reservoir bag, expiratory valve, and facemask (bag-valve-mask, BVM) is necessary. There are potential difficulties during this period if the patient's lungs cannot be adequately ventilated. There is a fear that the use of NMBs can cause severe hypoxia if the trachea cannot be intubated and the patient's lungs cannot be ventilated; this

has led some anaesthetists to routinely confirming their ability to carry out BVM before administering an NMB.¹ The efficacy and justification of this practice was questioned recently by Calder and Yentis² who pointed out that this dictum has been mentioned in one American textbook,³ but they could not find an evidence base for the practice. Indeed, they suggested that it conferred significant theoretical disadvantages including the potential risks of withholding an NMB in cases where one is clearly indicated, such as laryngospasm or opioid-induced muscle rigidity. A recent case report detailed a fatality in which

neuromuscular blocking agents were withheld.⁴ A recent work by Szabo and colleagues⁵ adds weight to the increasingly held view that administration of an NMB makes BVM ventilation easier.

The prevalence of this technique is currently unknown. Therefore, we conducted an online survey of anaesthetists practicing in North/Greater London to determine their current practice and rationale.

Methods and results

A web-page link was attached to an invitation on the Central School of Anaesthesia website visited regularly by trainee and consultant anaesthetists. All respondents were presented with two scenarios and were asked a series of questions. When there were multiple possible answers to a question, the order with which they were presented to the respondent was randomized to minimize bias. Respondents were also asked their grade, years of experience, and gender.

There were 136 respondents, of whom 59 were consultants and the remainder were trainees. Forty-four per cent of the respondents were female (Table 1).

Respondents were asked to consider the following scenario:

You are undertaking a solo list with you making the decisions. An endotracheal tube is mandatory for the procedure but the patient is adequately starved and there is no indication for rapid sequence induction. The patient is an adult ASA I; thorough airway examination is unremarkable.

They were asked whether or not they routinely would confirm their ability to BMV before administration of an NMB. Overall 78 respondents (57%) always or virtually always checked ('checkers'), whereas 32 respondents (24%) never or virtually never checked ('non-checkers') (Table 2). Nineteen per cent of respondents explained that their choice of practice varied in this given scenario according to additional clinical information. There was

Table 1 Respondents' details, presented as *n* (%)

Number of years in anaesthetic practice	Grade of respondent				Total of all grades
	Consultant	Core training	Intermediate	Higher training	
0-4		16	10		26
4-8	1	1	17	28	47
8-12	15			7	22
12-16	17				17
16-20	8				8
20-24	6				6
24-28	7				7
28-32	2				2
32-36	1				1
Total	57 (41)	17 (13)	27 (20)	35 (26)	136

Table 2 Responses to Scenario 1. Respondents are grouped by number of years in anaesthetic practice. The figures represent the number of respondents giving each answer. *Refers to the scenario detailed in the text

	Years in practice					Total
	0-4	4-8	8-12	12-16	>16	
I never confirm that I can ventilate by facemask before giving a neuromuscular blocker		2			5	7
I virtually never confirm that I can ventilate by facemask before giving a neuromuscular blocker		9	7	4	5	25
There are occasions when I would deem both techniques more appropriate (*within the scenario detailed)	2	12	1	6	5	26
I virtually always confirm that I can ventilate by facemask before giving a neuromuscular blocker	6	9	8	3	8	34
I always confirm that I can ventilate by facemask before giving a neuromuscular blocker	18	15	6	4	1	44
Total	26	47	22	17	24	136

Table 3 Reasons given to justify choices in Scenario 1, presented as *n* (%) of respondents giving each reason. Respondents were asked to select from a list and could select more than one option

	Checker (n=78)	'Varies' (n=26)	Non-checker (n=32)
Recommended by peer publication	4 (5)	9 (35)	12 (38)
Perceived 'best practice'	67 (86)	16 (62)	12 (38)
Can wake patient up and 'escape'	45 (57)	3 (12)	0
Departmental policy	10 (20)	3 (12)	7 (22)
Have always done it this way	49 (63)	6 (24)	3 (9)

considerable variation based on the experience of the anaesthetist. Those with <5 yr experience were almost all 'checkers', but the practice became less frequent with increasing seniority and only 38% of the most senior group (>16 yr in practice) were 'checkers'.

Respondents were asked to give their reasons for their answers from a list (Table 3). Both the 'checkers' and the 'non-checkers' thought that they were conforming to 'best practice'. The majority of 'checkers' identified ability to 'escape wake-up' (57%) and the fact that 'they had always done it that way' (62%) as additional reasons.

We asked if the respondents had changed their practice. Of the 'non-checkers', 22 (69%) had changed to this technique, 20 of these (90%) doing so within the preceding 2 yr. No respondent had changed from 'non-checker' to 'checker'.

Table 4 shows which technique the respondents would teach to a less experienced trainee. Eighty-nine of those asked (65%) answered 'checker'. This was 12 (16%) more

Table 4 Responses to the question 'Which policy would you teach to less experienced anaesthetists?', presented as numbers. *Refers to the scenario detailed in the text

	Practiced	Would teach	Change
Never confirm that you can ventilate by facemask before giving a neuromuscular blocker	7/136	4/136	-3%
Virtually never confirm that you can ventilate by facemask before giving a neuromuscular blocker	25/136	11/136	-10%
There are occasions when both techniques are more appropriate (*within the scenario detailed)	26/136	32/136	+4%
Virtually always confirm that you can ventilate by facemask before giving a neuromuscular blocker	34/136	27/136	+4%
Always confirm that I can ventilate by facemask before giving a neuromuscular blocker	44/136	62/136	+13%

Table 5 Responses to Scenario 2: emergency situation, (Respondents were asked to select from a list and could select more than one option), presented as *n* (%). Other answers were: deepen anaesthesia (17), nasopharyngeal airway (3), surgical airway (17), and summon assistance (10)

Succinylcholine	96/136 (71)
Non-depolarizing neuromuscular blocking agent	25/136 (18)
Laryngeal mask airway	116/136 (85)
Intubation without NMB	30/136 (22)
Other	17/136 (13)

than practiced this technique personally. Only 11% of respondents answered 'non-checker'.

Twenty of the 32 (63%) 'non-checkers' replied that they would not volunteer their practice in the FRCA examination. All the 'checkers' and 'varies' group would do so.

We asked if their current department had a policy on the timing of NMB and whether or not they thought such guidance should exist. Two per cent of departments had a policy, 19% of respondents thought one was needed.

Respondents were then asked to consider a second scenario:

You are called to an anaesthetic room to assist a colleague who has induced a patient that he didn't initially intend to intubate (so has not given a muscle relaxant). He cannot ventilate the patient by facemask and change in head position and Guedel airway insertion proved unhelpful.

They were then presented with a drop-down list of possible responses (and a free text box to input other options) (Table 5). The majority (85%) would attempt to place a laryngeal mask airway and 89% of respondents would administer a neuromuscular blocker if necessary; there were no differences between 'checkers' and 'non-checkers' in this regard.

Discussion

Routine confirmation of the ability of the anaesthetist to ventilate the patient's lungs by the facemask before administering an NMB is not ubiquitous practice. 'Checkers' and 'non-checkers' each believe that they are doing the correct and safest thing and opinions appear polarized.

The majority of 'checkers' (57%) in our survey cited the facility to wake the patient if required as a reason for their choice of NMB timing; this theoretical advantage is not easy to confirm. No 'difficult to BVM' patients were woken up in the study of Langeron and colleagues⁶ or Kheterpal and colleagues⁷ looking at the prediction of difficult mask ventilation. Maclean and colleagues⁸ anaesthetized a cohort of turtles and showed that the earliest time to first respiration was 5 min. It seems unlikely that anaesthetized patients who could not be ventilated at all could wake up quickly enough to restore spontaneous ventilation before significant hypoxic damage was sustained.

Using a small initial dose of an i.v. anaesthetic agent could permit escape wake-up, should BVM ventilation subsequently fail. Osaka and Koitabashi⁹ in their studies on humans showed good correlation with depth of anaesthesia (effect-site propofol concentration) and respiratory depression. However, there is a dilemma for the anaesthetist because a 'lightly' anaesthetized patient's airway is more difficult to manipulate, and there may be more false-positive presentations of difficult BVM ventilation because of inadequate depth of anaesthesia with this approach.²

Trainees are significantly more likely than consultants to be 'checkers' ($P=0.007$ χ^2 test), females are significantly more likely than males to be 'checkers' ($P=0.002$ χ^2 test). Consultants ($P=0.005$) and males ($P=0.013$) are also significantly more likely to be 'non-checkers' than trainees and females. This may be because senior anaesthetists are more confident in managing the airway.

Psychological research data show that males tend towards more risk-taking behaviour.^{10 11} This may explain our finding that checking is more common among female anaesthetists; non-checking is still seen by some as the more risky approach, and there are possible medicolegal ramifications of this. There were more male than female consultants in our sample cohort, so there is a potential for this finding to be skewed.

The widespread use of succinylcholine in the 'cannot ventilate' scenario seems illogical, particularly in the 'checker' group, and we find it difficult to give a rational explanation for this finding. It would suggest that rapid paralysis is perceived to be of benefit in this situation. The evidence suggests that the common response to impossible facemask ventilation is to give an NMB both in our collected cohort and in Kheterpal and colleagues' study published in 2009; a review of 50 000 anaesthetics found that of 77 patients whom were impossible to BVM ventilate, 73 were given a neuromuscular blocking agent and intubated.¹² So if paralysis assists ventilation and permits

airway instrumentation when a patient becomes problematic then why would an anaesthetist wait until the situation becomes difficult before administering the drug? There are of course situations when this does not apply, such as a patient with stigmata of difficult airway manipulation such as a gross fixed flexion deformity, when one may be extremely reluctant to even give an i.v. induction agent. But in the type of scenario given, when we are prepared to give propofol, should we not also be prepared to give an NMB?

A possible psychological basis for checking can be found in papers showing that people sometimes pursue demonstrably spurious information. In several studies, evidence has been found for a tendency to pursue *non-instrumental* information, that is, information that may appear relevant but, even by the reckoning of the decision-makers, ought not to alter the decision being contemplated.^{13 14} Bastardi and Shafir¹³ categorized the information sought by decision-makers as being *relevant* or *instrumental*. Instrumental information is of overwhelming importance. Relevant information can impinge on the decision in subtle ways. It can make one option appear more attractive and it makes the decision-maker feel happier. Relevant information has the potential to become *instrumental* only if it can alter the decision made. They devised pairs of scenarios where respondents were faced with a dilemma. In a *simple* version, for example, should students choose an interesting course usually taught by an excellent professor but, as he is on leave, will be taught by a less popular professor? In the other *uncertain* version of this scenario, a separate group of respondents faced the same dilemma but are told that it is uncertain if the regular professor will teach the course and they can wait a day to find out or decide now. In the *simple* version, 82% of respondents chose the course when certain the inferior professor would teach it (and would certainly do so when taught by the excellent professor), indicating that the issue of the professor did not affect the choice of the majority; nevertheless, in the *uncertain* scenario, a majority of respondents preferred to wait to find out which professor was teaching before deciding.

Similar effects have been observed in medical decisions made by clinical experts.¹⁵ Dialysis nurses were more willing to donate a kidney when they first decided to be tested for compatibility and were found suitable than when they knew they were suitable from the start. Practicing urologists contemplating surgery for a patient with prostate cancer and academic physicians considering emergency management for a patient with acute chest pain showed similar patterns in their decisions. These observations suggest that the rationale for decisions is somewhat inconsistent and is developed 'on the fly'; drawing attention to missing information that appears relevant (but is in fact *non-instrumental*) can render it more salient and consequently influential on choice.

The 'pursuit of non-instrumental' information has been described by psychologists in other contexts. Shafir and Tversky¹⁴ explored further examples of decision-makers pursuing information, even though the extra information was unlikely to alter the decision. A study of students considering a vacation to Hawaii found that the majority chose to postpone making a decision while awaiting the results of an examination they had been taking, even though they intended to go irrespective of the examination outcome. The pursuit of missing information leads decision-makers to focus on the particular fact more than they would have done if the information had been available initially, and to attach undue importance to it. This behaviour is sometimes exploited by salesmen who can set up deliberate uncertainties, only to resolve them with what appears to be excellent news that will entice the sale.

In this survey, clinicians seeking confirmation of their ability to ventilate by the facemask may parallel the pursuit of non-instrumental information: although this check may reveal information that appears relevant to their decision to give a neuromuscular blocker, the drug will be given regardless of the outcome of the test. A good clinician will gather lots of information to inform their actions, but in the absence of any clinical justification for this check, it would be worth encouraging anaesthetists to question the relevance of this action; indeed, there is a risk that the policy may lead to a neuromuscular blocking agent being inappropriately withheld. Although to advise against pursuing spurious information may appear trite, the evidence suggests that this tendency can emerge to the detriment of effective practice when clinicians face difficult decisions. The development of rapid neuromuscular block reversal agents such as SugammadexTM may alter our psychology, adding in additional choice.

In conclusion, the results of this survey suggest that some anaesthetists are seeking information that may make themselves feel more comfortable but which will not alter their subsequent actions. But how can this knowledge help us as clinicians, how can it lead to us giving safer anaesthetics? BVM ventilation is easier after administration of an NMB⁵ and enables successful tracheal intubation in the vast majority of cases where BVM ventilation is impossible.¹² The decision to delay administration of an NMB may prove to be an inbuilt, non-voluntary psychological programming, but can the potential disadvantages of delaying the administration of NMB override this urge?

This is a fundamental training issue. In our cohort, 90% of those who have become 'non-checkers' have done so in the last 2 yr, which coincides with recent publications.^{2 7 12} Current airway guidelines do not advise on the administration of NMBs when faced with difficult BVM ventilation and teaching at a hospital level seems inconsistent.

We suggest that the practice of routine 'checkers' has no evidence base and that a considered expert opinion is required urgently.

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