

## An Anesthesia Checklist: A Survey of Compliance and Attitudes

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ARTICLE INFO	ABSTRACT
<p><b>Article type:</b> <i>Original Article</i></p> <hr/> <p><b>Article History:</b> Received: 27-May-2020 Accepted: 31-May-2020</p> <hr/> <p><b>Key words:</b> <i>Checklist, Crew resource management, Patient safety.</i></p>	<p><b>Introduction:</b> While anesthesia is regarded as one of the safest clinical specialties, continuing to ensure patient safety requires vigilance. The growing complexity of modern medicine makes it extremely dangerous to rely on the absence of human error. There is evidence to suggest that anesthesiologists are less inclined to use checklists than surgeons and nurses. Seniority has also been shown to dictate the acceptance of checklists.</p> <p><b>Materials and Methods:</b> We assessed compliance with, and attitudes to an anesthesia checklist, comparing by seniority.</p> <p>1. Analysed a representative sample (n=247, 95% CI, 5% ME) of general anesthesia cases performed in one year (n=747), calculating percentage compliance in each case. We compared groups by seniority with Mann-Whitney U testing using SPSS. 2. We assessed attitudes using a 20-item questionnaire, consisting of five themed subscales. Descriptive statistics were generated.</p> <p><b>Results:</b> Mean total compliance with the checklist was 91.6% (95% CI: 90.6-92.6%). Non-Consultant compliance was estimated at 94.4% (95% CI: 93.0-95.8%), compared to 91.6% (95% CI: 89.5-93.7%) in the Consultant group. Higher Non-Consultant compliance was significant, compared to the Consultant group (P=0.045).</p> <p><b>Conclusion:</b> The Non-Consultant group demonstrated greater compliance. Attitudes to the checklist were similar amongst the two groups with lack of time and lack of training cited as two major barriers to use. Both senior and junior anesthesiologists felt it had a positive impact on patient safety.</p>
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### Introduction

While Anesthesia is regarded as one of the safest clinical specialties, patient safety requires constant vigilance (1).

The complexity associated with continued technological advancement, coupled with the high standard of care both required and expected by patients, indicates that a clinical

practice completely reliant on the absence of human error is a dangerous practice indeed. Those high-risk industries where system failure can result in catastrophe have shown that checklists reduce human error. Those that succeed in avoiding catastrophes in these industries are known as High Reliability Organisations (HRO) (2).

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The aviation industry, an HRO, has shown that for both complex tasks and basic safety checks, checklists have ensured better outcomes (3). With the introduction of the WHO Safe Surgery Checklist in 2009(4), checklists have reached levels of ubiquity in the surgical setting (5).

Despite the overwhelming evidence base supporting their use, it has been shown that checklist compliance is not always as high as one would expect.

In particular, anesthesiologists have been shown to be less positively disposed to checklists when compared with surgeons and nursing colleagues with seniority also influencing how checklists are valued (6,7). To that end, department leadership at our institution developed an anesthesia specific checklist. An anesthesia specific checklist has been shown to improve parameters contributing to patient safety (8). A checklist can only be effective in its purpose if clinicians are willing to use it. It is imperative that thorough, continued audit of checklist compliance and satisfaction be carried out in order to inform change and improvement in checklist design. Thus, the objectives of this study were twofold: to determine compliance with an anesthesia specific checklist implemented in our department and compare compliance by seniority; and to assess and compare attitudes of the anesthesiologists working in the department to the anesthesia checklist by seniority.

## Materials and Methods

This study was conducted in two specific stages to reflect the objectives stated above. Initially, a retrospective chart review examined compliance with the anesthesia specific checklist used for general anesthesia cases in the day surgery unit (DSU) at our institution.

In the second component of the study, a cross-sectional quantitative survey of anesthesiologists was performed in our department using a Likert questionnaire to assess the attitudes toward the checklist. The questionnaire was originally developed and validated to assess the attitudes toward the WHO Safe Surgery Checklist (6). We adapted to assess attitudes towards our anesthesia specific checklist. The study protocol was approved by the Ethics

Committee of the University College Cork Teaching Hospitals, Cork, Ireland. No information regarding the patient or survey respondent was recorded during the study.

## Compliance with the checklist

A list of all general anesthesia cases (n=747) carried out in the DSU during 2016 was collated and randomized. A representative sample was generated at 95% level of confidence and 5% margin of error (n=247), and the medical records were randomly selected and requested from our institution's medical records service.

Compliance with a number of components was determined in each case:

- Date of surgery;
- Signature and grade of anesthesiologist;
- Compliance with individual components of the checklist.

While the majority of the checklist components were mandatory, others were only applicable in certain cases. This was taken into account when calculating the total compliance. Graphs and tables were generated using Microsoft Office Excel.

The data were analyzed in SPSS software (version 24) through descriptive statistics to analyze the distribution of data and perform comparative testing (9). Initial analysis of the data showed that distribution was negatively skewed (skewness=-0.968) requiring non-parametric testing. Therefore, the Mann Whitney U test was used to compare the two groups, namely Consultant and Non-Consultant Hospital Doctor (NCHD) anesthesiologists.

## Attitudes

The adapted 20-item questionnaire assessed attitudes under five sub-scale headings. Evaluation of hospital norms (n=2); personal views on the impact of checklist on patient safety (n=5); support available for appropriate completion of the checklist (n=3); personal performance completing checklist (n=2); and barriers to use the checklist (n=6). Responses to items were scored based on a five-point Likert scale. In addition, an open-ended response item was included to assess any other barriers to use. One demographic item was included to assess grade. Responses were anonymous. Descriptive statistics including mode and interquartile range were determined from

Likert responses using SPSS software (version 24). To further explore the departmental attitudes to the checklist, the study was presented in the post result stage at a departmental education meeting. The results were discussed in a structured environment with oral feedback sought from each member of the department. The outcomes from the meeting are outlined as part of the result section of this paper.

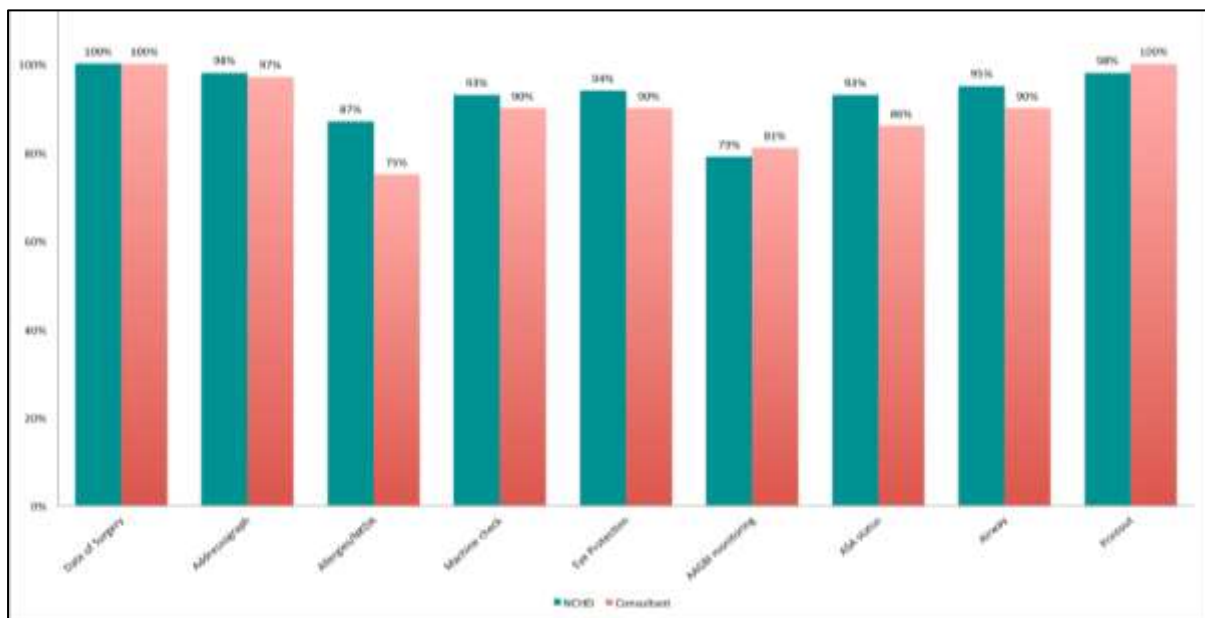
**Results**

*Compliance with the checklist*

Total mean compliance was 91.6% (95% CI: 90.6-92.6%). Figure 1 illustrates the mean compliance with the mandatory components of the checklist. Non-Consultants

consistently performed better in all but two components. The largest discrepancy existed in the recording of the presence or absence of any patient drug allergies, in which there was a difference in compliance of 12 percentage points.

During data collection, it was noted that an early version of the checklist contained a printing error, in which the prompt for signature and grade was omitted. The signature component was mandatory for obvious reasons, such as accountability. As a result, compliance with the signature component in the corrected version of the checklist (n=149) increased to 100% from 44% compliance in the early version (n=98) that did not feature a prompt.



**Figure 1:** Mean percentage compliance with mandatory components by grade

The printing error that omitted the prompts for signature and grade and resulting non-compliance reduced our comparative sample by approximately one-quarter. Analysis of those cases in which the grade

was indicated (n=186) showed that compliance was higher in the Non-Consultant group and significant at a 95% level of confidence (U=3558, P<0.05).

**Table 1:** Population characteristics and mean compliance by grade

	Population	Compliance	95% Confidence Interval
Mean (total)	n=247	91.6%	(90.6-92.6%)
Not Indicated	n=61	86.6%	(85.0-88.2%)
Non-Consultant	n=107	94.4%	(93.0-95.8%)
Consultant	n=79	91.6%	(89.5-93.7%)

Table 2 tabulates the responses to the questionnaire. The responses are described

as a function of seniority. The table shows the interquartile range and mode.

**Table 2:** Survey response. Descriptive statistics. ("Strongly Disagree=1", "Disagree=2", "Neutral=3", "Agree=4", and "Strongly Agree=5").

Sub-scales	Attitudinal items	Total (n=12)		Consultant (n=5)		NCHD (n=7)	
		Mode	IQR	Mode	IQR	Mode	IQR
Norms	I find that some sections of the checklist are not completed.	4	2.5	5	1	2	2
	I believe that the individual who signs the checklist should personally ensure that the relevant steps have been completed.	4	1	5	1	4	0
Impact on patient safety	I believe that failing to use the checklist is a poor professional practice.	4	1	4	2	4	1
	I believe using the checklist reduces the likelihood of human error.	4	0.75	4	0.5	4	1
	I believe using the checklist improves patient safety.	4	0	4	0.5	4	0
	I believe use of the checklist should be mandatory for every case.	4	1	4	1	5	1
	I believe certain components of the checklist are more important than others.	5	1	4	1	5	1
Support	In my experience, Senior Anaesthetists (Consultants) support the use of the checklist.	4	0	4	1	4	0
	In my experience, Junior Anaesthetists (NCHDs) support the use of the checklist.	4	1.75	3	1.5	4	2
	In my experience, hospital management supports the use of the checklist.	3	2	4	1	3	2
Personal performance	I have initiated the use of the checklist in the past.	4	0.75	4	1.5	4	0
	I intend to initiate the use of the checklist in the future.	4	0.75	4	1	4	0
Barriers to use	the requirement of signatures	2	1	2	2	2	1
	lack of assertiveness of staff	3	1.75	1	2	3	1
	lack of time	4	2	2	2.5	4	2
	lack of training	4	1.75	4	1.5	3	2
	I do not think the checklist makes a difference	2	0	2	1	2	1
	lack of an electronic version of the checklist that could be completed on the theatre computer system	2	1	2	2.5	4	2

**Departmental feedback**

The compliance data were presented and discussed at an education session in our

department, the content of which can be categorized under several themes (Table 3).

**Table 3:** Results of structured discussion of checklist

Theme	Feedback
Increased workload	The feedback indicated that there is often duplication, in some cases triplication of record keeping as a result of checklist introduction. This has an inevitable effect on morale and desire to comply with the checklist and places a question mark over its efficiency in the eyes of those filling it out.
Cognitive forcing tool or record-keeping exercise?	While checklists were accepted by the majority at the departmental meeting to be an effective cognitive forcing tool in complex and pressurized environments, which all were in the agreement included the practice of anesthesia, a genuine concern was expressed that the anesthesia checklist had become an exercise in record-keeping rather than the cognitive aid it was designed as.
Lower Consultant compliance	Upon presenting the results of the audit, explanations were sought for why compliance was lower in the Consultant cohort. One explanation proposed that as Consultants are often responsible for multiple theatres at once with the assistance of several trainee or junior anesthesiologists, at times there is uncertainty as to who was fully responsible for completing the checklist. Clarification on whom the lead anesthesiologist for each case may need to be addressed, or at least a protocol regarding responsibility for documentation.
Lack of evidence for checklist efficacy	While the concept of a surgical checklist has been adopted globally as the standard of care, it was felt by some within the department that there has been little quantitative evidence following the landmark 2009 WHO Safer Surgery paper (4) to show that the WHO surgical checklist had resulted in a genuine decrease in surgical mortality and morbidity.

## Conclusions

This study was undertaken to determine compliance with an anesthesia specific checklist designed and implemented by the anesthesia department in which it is used; and to evaluate the attitudes of the department staff. This study aimed to recognize if compliance with the checklist was less than complete and to examine the attitudes of those using it to discover why. This work was undertaken to inform review of the anesthesia checklist, to ensure its optimum use and performance improvement. In addition, we aimed to contribute to the evidence base underpinning checklist use and patient safety. We tested the hypothesis that seniority and experience play a role in checklist compliance and attitudes. To that end, we identified a number of findings.

### Compliance with the checklist

We found that total mean compliance with the checklist was impressive at over 90%. This was encouraging since the checklist had been designed in cooperation with departmental leadership rather than being

imposed unilaterally with the hope that this would encourage compliance. Non-Consultants performed better, significantly so on statistical analysis.

### Signatures

The printing error that omitted the prompt for signature and grade resulted in a reduction in compliance with that component of the checklist by more than half. This component is the only record of which anesthesiologist and of what grade was performing the procedure. The later version of the checklist boasted 100% compliance with the signature and grade component, compared to a mere 46% compliance in the early version with the printing error. Interestingly, this incidental finding showed that even an action that applies to the majority of a physician's written tasks was often foregone in the absence of a prompt. Particularly given this was not even duplication of work, which has been shown to be a major barrier to use of checklists (10).

It should be noted that compliance in the "Not Declared" group (n=61, Figure 4) was

disproportionately lower than the other two groups at 86.6%, which was 8% lower than the Non-Consultant group and 5.2% lower than the Consultant group. Practitioners may engage in poorer record-keeping under anonymous conditions.

### **Comparison of Consultant and Non-Consultant groups**

The higher total compliance seen in the Non-Consultant group held true for all individual mandatory components, except for AAGBI (compliance with Association of Anaesthetists of Great Britain and Ireland machine check) which required monitoring and attachment of the anesthetic machine printout (Figure 1). Both of these were a mere 2% difference; however, it is unlikely to be indicative of a specific shortfall. Nevertheless, the trend was in line with findings from the literature review that more experienced physicians and surgeons are less inclined towards checklists.

### **Attitudes**

#### *Key differences*

When comparing responses between the two groups, we viewed a Likert response with a difference of more than one to be a significant difference. These key differences existed only in two sub-scale groups: "Evaluation of Hospital Norms" and "Barriers to use of checklist".

The Consultant group was in strong agreement that parts of the checklist were not being completed, whereas the Non-Consultant group was unsupportive of this statement. The Non-Consultant group found "a lack of time" and the lack of an "electronic version of the checklist" to be barriers to use. However, the Consultant responses were in opposition to this. Meanwhile, the Consultant group strongly disagreed that there was a lack of assertiveness of staff in filling out the checklists, whereas the Non-Consultant group was non-committal.

Barriers to use Overall, the survey identified a lack of time and a lack of training as barriers to the use of the checklist. However, the respondents denied that the requirement of signatures, lack of an electronic version of the checklist, or a personal ambivalence to the efficacy of the

checklist were barriers. Only one respondent availed of the option of an open-ended response stating that it was at times difficult to obtain a checklist for use at the right time in the right place.

Our review of the literature demonstrated that reasons for deviation from checklist use can be categorized under three headings:

1. *Personal views of clinicians on the impact of checklist on patient safety*

The questionnaire reflected that both groups felt that the checklists had a positive impact on patient safety. Discussion at the departmental meeting uncovered a concern that since the original WHO Safe Surgery study in 2009, there was a lack of robust quantitative evidence that checklists had a real effect on improving patient outcomes after surgery.

In fact, a study carried out in Canada by Urbach et al.(11) showed that when the introduction of the WHO Safe Surgery checklist was replicated in tertiary hospitals in the state of Ontario, there was no significant decrease in operative mortality or complications. Further studies are recommended to confirm this evidence by conducting studies that show if and how patient safety is improved following the introduction of a checklist, such as post-operative mortality and surgical complications.

Our respondents express a concern that although this cognitive forcing tool is important and well-intentioned, there is a real danger that the checklist can become just another record-keeping exercise, more of which appear to arrive constantly into current clinical practice. In our respondents' view, this would merely represent an inefficient additional task discouraging compliance. There is evidence to support this in the literature (12).

The aviation industry has shown that brief and concise checklists that are practical and easy to use improve compliance and performance(13). In the review of our anesthesia specific checklist, this will doubtless be an element that will need to be improved upon.

### 1. Support of use from senior colleagues and the influence of peers

While compliance was lower in the more experienced cohort, our survey showed that the department both collectively and individually as senior and junior cohorts found that the use of the checklist was supported by senior colleagues. There was no evidence that members of the department found using the checklist to be a poor reflection on their ability, or that peers influenced their use of the checklist negatively.

This is encouraging as it has been found that endorsement from departmental leadership is an essential factor in checklist compliance as well as finding that the use of checklists can be seen by some users as a negative reflection on one's skill level (7).

### 2. Common barriers to use of the checklist

A lack of time and lack of training were the two barriers to use the checklist as indicated in the survey. The former, in particular, was cited as a barrier by the Non-Consultant cohort, who also found a lack of an electronic version of the checklist to be a barrier. The group response citing a lack of electronic version is mirrored by the individual open-ended response that stated it is often difficult to obtain a paper copy when one needs it. Training and education is a well-described tool in achieving increased implementation of a checklist. Sewell et al. showed an increase from less than 10% compliance to almost 100% upon implementation of an education program (14). Feedback from Consultant respondents indicated that their lower compliance stemmed from uncertainty on whether responsibility for completion of checklist fell to their junior colleague or themselves. While the review of the literature does not reveal this as an issue in other institutions and settings, it makes sense that the clear allocation of tasks would increase compliance.

### **Strengths and Limitations**

We accept some limitations, two of which deserve to be addressed. Firstly, this is a local study that details the success of and

attitude to the implementation of an internally designed anesthesia checklist. It is accepted that it is not internationally validated. However, it was found that our experience with its introduction and attitudes were reflected in the international evidence base, as well as highlighting the issue of poor compliance in anonymous conditions and the lack of compliance with essential items of a checklist without prompts.

Secondly, since our sample size for assessment of compliance with the checklist was robust, the number of staff was small preventing us from inferring meaningful statistical analysis, such as that described by O'Connor et al. (6).

We did however have a response rate of 100% which is worth noting. It is hoped that the findings of this study will not just aid our department but other leaders in the perioperative field. By both auditing compliance with our anesthesia specific checklist and assessing attitudes to it, we have created a holistic picture of what factors play a role in anesthesia checklist compliance. This will hopefully fill a void in the evidence which we established through literature review is not yet thoroughly researched.

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