Non-technical skills of anaesthetic assistants in the perioperative period: a literature review

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Editor’s key points
- Non-technical skills (NTS) are required for safe and efficient performance at work.
- Anaesthetic assistants have an important role in the theatre team.
- The literature was reviewed to identify NTS for anaesthetic assistants.
- There is a need to develop an NTS structure for this group.

Summary. Non-technical skills (NTS), which include communication, teamwork, leadership, decision-making, and situation awareness, are important in the maintenance of patient safety. NTS frameworks have been developed for anaesthetists, surgeons, and scrub practitioners. Most studies of NTS in operating theatres to date have focused on anaesthetists and surgeons. We have attempted to identify the NTS used by anaesthetic assistants in the perioperative period. An electronic search of the NHS e-library, PubMed, BioMed Central, ScienceDirect, and Scopus databases was performed in December 2010. The abstracts of the papers identified were checked for relevance and the article examined. Out of 308 papers initially identified, there were only three papers describing the use of NTS by anaesthetic assistants. Communication and situation awareness were described in three papers, teamwork and decision-making in two, and leadership in one. This search did not reveal any comprehensive description of the NTS required by anaesthetic assistants. The benefits of developing an NTS taxonomy for anaesthetic assistants are discussed.

Keywords: anaesthesia; communication; decision-making; leadership; ODP; operating room technicians; safety

Anaesthesia in the UK is performed by anaesthetists with the assistance of a specifically trained nurse or operating department practitioner (ODP).1–3 In Ireland,4 Australia, and New Zealand,5 a similar function is performed by anaesthesia technicians and operating theatre practitioners, while in the USA and Canada, theatre nurses are trained to assist the anaesthetist and in many developing countries, specifically trained anaesthetic assistance may not routinely be available. For the purposes of this article, staff who assist the anaesthetist, regardless of their professional background, will be collectively referred to as ‘anaesthetic assistants’. The article focuses on the observable behaviours of the non-technical skills (NTS) used by anaesthetic assistants during the perioperative period. The area includes pre-operative checking, induction, maintenance, and reversal/recovery from anaesthesia, and also monitoring and positioning. We have taken that the priorities of the anaesthetic assistant, in co-operation with the anaesthetist, are to ensure patient safety and to utilize the theatre resources efficiently.

Box 1 The perspective of the anaesthetic author as an anaesthetic trainee.
I remember clearly the assistance I received as an inexperienced anaesthetist from one of my anaesthetic assistants. Shortly after being deemed capable of being ‘on-call’ for emergencies as night, I anaesthetized a patient for surgery requiring tracheal intubation. After the induction of anaesthesia, I looked into the mouth and thought ‘this looks difficult’. I was aware of a feeling of rising anxiety when I heard a reassuring voice say, ‘The patient looks fine and you are doing OK. Would this help?’ My anaesthetic assistant passed me a gum elastic bougie, which transformed the situation into a straightforward intubation. My assistant was aware of what I was doing, how I had been feeling though I had not said anything, was already prepared with the equipment required, and was confident that she could speak up. I was aware that I had been helped, but at the time lacked the vocabulary to discuss what had happened.
Aviation was the first high-risk industry to acknowledge that technical competence was not sufficient to guarantee safe performance. It is becoming more widely acknowledged that safe and efficient task performance requires a combination of technical expertise and NTS.6 NTS are the cognitive, social, and personal resource skills that complement technical skills and contribute to safe and efficient task performance.6 Between 1959 and 1989, more than 70% of commercial plane crashes were attributed to deficiencies in the flight crew’s NTS rather than solely mechanical failures.7 This led to the development of Crew (initially Cockpit) Resource Management (CRM) training6 and associated behavioural rating systems to assess the NTS of pilots. One such system was NOTECHS, which was developed by a multi-agency research group of psychologists from Europe and the UK, together with European pilots (NOTECHS).8 There is increasing evidence that failings in NTS such as communication10–11 or teamwork12–13 are a contributory factor to adverse events14 in the operating theatre. The awareness that human error is a factor in perioperative anaesthetic mortality was evident in the Lancet commission on the relative safety of the use of ether and chloroform in the 1890s, including descriptions of failure of situation awareness, decision-making, and teamwork.15–19 In 1982, Lunn and Mushin20 described the lack of skilled anaesthetic assistance as contributing to anaesthetic mortality. More recently, the 4th National Audit Project (of the Royal College of Anaesthetists and the Difficult Airway Society) reported on major complications of airway management in the UK. This identified contributory NTS factors including failure of communication, decision-making, and social failures which included leadership and support.21 Failure by staff who are lower in hierarchies to speak up is also associated with an increased risk of accidents, both in aviation22 and in healthcare.23

While there are generic NTS of communication, teamwork, leadership, situation awareness, and decision-making, which are applicable to a wide range of dynamic working environments, the emphasis and behavioural markers in a behavioural rating system will vary depending on the role under investigation. After a method of task analysis,24 to identify the most critical NTS for the role, behavioural rating systems have already been developed, by psychologists together with clinicians, for anaesthetists (ANTS),25 surgeons (NOTSS),26 and scrub nurses/practitioners (SPLINTS).27 Although operating theatre team rating tools (e.g. OTAS)28 have also been developed, which incorporate subteam (e.g. anaesthetist and anaesthetic assistant) performance ratings, these have predominantly been developed for research purposes rather than as tools to assist clinicians with training and formative assessment of staff in the operating theatre. Both ANTS and OTAS mention behaviours that address the anaesthetic assistant, but not as their primary focus, and in the case of ANTS, this relates to the anaesthetists’ behaviour with the assistant only.

The presence of anaesthetic assistance has been shown to ameliorate or contribute to adverse events in separate incidents29 so the development of a behavioural rating system specifically for the anaesthetic assistant would complement the ANTS system, for anaesthetists.25 This would provide the anaesthetic subteam with separate tools but a common terminology for discussing this important aspect of performance. The aim of the review was to search the extant literature on NTS used by anaesthetic assistants, with the objective of beginning to identify the essential NTS for safe and effective anaesthetic assistant performance in the perioperative period, as described in the literature.

This review followed the method used previously to identify NTS from the literature, for other members of the theatre team.30–31 The terms which formed the basis of the search comprised the list of generic NTS categories of communication, teamwork, leadership, situation awareness, and decision-making.6 The search method used the online sources of the Scottish NHS e-library, PubMed Medline, BioMed Central, ScienceDirect, and Scopus. The search was conducted in December 2010 with all papers up until this date considered.

There were three stages to the search.

**Stage 1: initial search**

*Electronic search: Scottish NHS e-library (with access to Ovid Medline, Embase, and CINAHL), PubMed Medline, Biomed Central, ScienceDirect, and Scopus.*

*Keywords* (an*sthetic nurse OR an*sthetic assistant OR operating room technician OR operating department practitioner OR operating department assistant) AND (communication OR discussion OR relationships OR trust OR leadership OR teamwork OR skill OR decision OR decision making OR situation awareness) AND an*sthetic.

*Limitations: Published in English.*

**Stage 2: screening of results**

*Filter 1: Title examined for relevance to anaesthetic assistants and anaesthesia and NTS (looking for topics related to communication, teamwork, leadership, situation awareness, and decision-making).*

*Filter 2: Abstract studied to assess relevance of the paper.*

**Stage 3: inclusion criteria**

*Inclusion criteria 1: Papers read to extract those with specific data collected from anaesthetic assistants relating to perioperative tasks.*

*Inclusion criteria 2. One or more behaviours of NTS had been examined:*

- Evidence of work or task-related communication whether verbal or non-verbal.
- Teamwork behaviours including supporting others in their tasks, co-ordination of work, or resolving conflicts.
- Leadership including examples of leading, asserting one’s opinion, directing others, allocating tasks, and organizing the team structure.
- Situation awareness examples such as gathering information, monitoring the patient or environment,
coming to a diagnosis of a problem, and use of such information to anticipate events.

- **Decision-making** as evidenced by option generation, appraisal, and selection.

A total of 308 papers were identified by the initial search. After checking the titles and abstracts, there were only three papers which met the criteria for detailed analysis. The papers identified in Stage 3 were independently coded by two of the authors (J.S.R. and L.M.) for behaviours demonstrating NTS used in the perioperative period (Table 1). The level of their agreement was calculated using Arcus Quickstat Biomedical Version 1.0 and had good inter-rater reliability; \( \kappa = 0.7 \).32

An anaesthetic nurse-led audit of ward-to-theatre communication based on 1295 patients coming to theatre examined the consistency of patient identification, consent forms, ward nurse handover, premedication, positioning on trolleys, patient dress, and results of investigations.33 While the paper was not specifically examining NTS, it referred to NTS behaviours on the arrival of the patient in theatre. For example, teamwork and communication were demonstrated in response to patients arriving in theatre with missing test results; the anaesthetic assistant had to find another nurse to stay with the patient, explain the delay to the theatre staff, and then phone around for the results. The presence of situation awareness was shown by the anaesthetic assistant checking patient identities before surgery and the correct side being identified in the consent, and patients being placed the right way round on tipping trolleys. The importance of communication was illustrated by the handover with ward nursing staff on the arrival of the patient in theatre and in response to missing investigations. Decision-making and leadership did not appear to be specifically addressed.

The experience of an anaesthetic nurse ‘speaking up’ and challenging a trainee anaesthetist who was new to the hospital when he was about to do something with which she was not comfortable is described.34 The anaesthetist was under pressure to proceed with an anaesthetic for appendicectomy from the surgeons without the fasting time being completed. His response was to insert a nasogastric tube and proceed. The nurse guided the anaesthetic assistant to discuss the situation with his consultant. She showed leadership, teamwork, decision-making, and communication in guiding a doctor to accept her concerns and phone the consultant. She showed situation awareness and an understanding of the pressure a new trainee might be suffering which would lead him to deviate from normal fasting guidelines, out of hours.

The Anaesthetic Incident Monitoring Study (AIMS), in Australia,35 had a database of 5837 reports. There were 187 reports where inadequate assistance contributed towards an incident, but 808 reports where skilled assistance had minimized the incident.29 However, not all these reports are necessarily about anaesthetic assistants, as they may also refer to the senior medical anaesthetic support of an anaesthetic trainee. There were 255 reports with ‘assistant’, ‘anaesthetic nurse’, or ‘technician’ in the narrative. One hundred and seventy-two of these reports were sufficiently detailed for analysis. In 148 of the incidents, it was suggested that the anaesthetic assistant contributed to or failed to help with the incident. In a further 24 cases, the anaesthetic assistant was said to have minimized the incident. The paper identifies failures of situation awareness (omitting to apply monitoring in a timely fashion, distraction) and the need for improved communication to reduce events. Behaviours relating to decision-making, teamwork, or leadership were not presented in the paper.

This review of the literature identified only three papers describing NTS in anaesthetic assistants and there appears to be no specific taxonomy relating to anaesthetic assistants’ NTS. This is not surprising, since this is a relatively new topic for medical staff36 and nursing.30 37 As noted, poor NTS on the part of anaesthetic assistants can be associated with poor outcomes for patients including arrhythmias, iatrogenic coagulopathy, anaesthetic awareness, and admission to intensive care, as identified retrospectively in the Anaesthetic Incident Monitoring Study (AIMS) database. Valuable as the AIMS database is, as with all incident reporting schemes, it is likely to be a significant underestimate of the frequency of critical events, which reduces the likelihood of identifying NTS. In addition, the database was not designed to report NTS so these had to be searched for using surrogate terms. The incidents in AIMS were mostly reported by anaesthetists and are therefore seen from their perspective. It is not to say that the anaesthetic assistants are not making decisions, but these may not be given prominence or recorded. Traditionally, medical staff have been viewed as being the top of the hierarchy in the operating theatre, and so decision-making by anaesthetic assistants is less likely to be overt in routine settings.

The search was deliberately directed specifically at the NTS of the anaesthetic assistant rather than looking at the function of the team as a whole as has been done with team rating tools such as OTAS28 38 or Revised NOTECHS.39

### Table 1 Anaesthetic assistants' NTS identified in the papers in search stage 3. Y, NTS present; —, NTS absent

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Communication</th>
<th>Teamwork</th>
<th>Situation awareness</th>
<th>Leadership</th>
<th>Decision-making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cormack33</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Dyke34</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Kluger and colleagues29</td>
<td>Y</td>
<td>—</td>
<td>Y</td>
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<td>Y</td>
</tr>
</tbody>
</table>

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The latter tool is used to make ratings of five generic NTS categories for the anaesthetic assistant and for the anaesthetist, surgeon, and nurse to provide an overall team rating score. However, although we agree that teams must function together to achieve a safe operation, the tasks required for each specialty are different, and therefore, the essential NTS may also be different between specialties. This is why we chose to examine the anaesthetic assistant role at the individual level.

Although NTS taxonomies such as Revised NOTECHS\(^3^9\) have been designed for one domain (e.g. NOTECHS for pilots’ NTS in aviation\(^4^0\)) and adapted for use in the operating theatre, we believe that it is important to identify the specific NTS for the role being studied. Rather than adapting existing tools such as ANTS, for the anaesthetist,\(^4^1\) which one might expect to have similar NTS to those required by anaesthetic assistants since they work closely together, we would suggest that it cannot be assumed, without evidence, that the NTS required by anaesthetists and anaesthetic assistants will be identical. The competencies required for training as an anaesthetic assistant are documented by NHS Education for Scotland (NES)\(^4^1\) and use NTS terminology such as communication.\(^4^2\)\(^4^3\) This interest is also evident in anaesthesia with pilots’ NTS in aviation\(^4^0\) and adapted for use in the operating theatre.\(^3^9\)\(^3^9\)\(^3^9\)\(^3^9\)

This literature review has not identified a comprehensive list of NTS for anaesthetic assistants, and therefore, the authors plan to interview anaesthetic assistants with a view to developing a specific NTS framework for this key member of the theatre team.

**Declaration of interest**

None declared.

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