Too soft to grasp? Application of non-technical skills to improve outcomes in anaesthesia

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Introduction

The Anaesthetists’ Non-Technical Skills (ANTS) taxonomy and behaviour rating tool [1] is the first non-technical skills framework to be specifically designed for anaesthetists. In this refresher course, I briefly present the background to the system and explain how it can be used for the training and competence assessment of anaesthetists in order to ‘grasp the soft skills’ which can elude clinical trainers. The need to develop a structured progression of training in non-technical skills for clinicians is considered. Two related tools under development; Obstetric-ANTS and A-ANTS (for anaesthetic assistants) will also be mentioned.

Non-Technical Skills

The term ‘soft skills’ is sometimes used by engineers and other technical professions to label the cognitive and social skills that complement their technical skills. This terminology seems to imply that these skills are easier or less essential than the associated ‘hard’ technical skills. An alternative term, ‘non-technical skills’, is employed by the European civil aviation regulator in relation to airline pilots’ behaviour on the flight deck. Non-technical skills can be defined as ‘the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance’ [2]. In essence, they enhance practitioners’ technical skills, and typically include situation awareness, decision making, teamwork, leadership and the management of stress and fatigue. Deficiencies in non-technical skills can increase the chance of error, which in turn can increase the chance of an adverse event. Good non-technical skills (e.g. vigilance, anticipation, clear communication, team coordination) can reduce the likelihood of error and consequently of accidents. To identify non-technical skills for a given job, various forms of task analysis can be used: Analysis of incidents, as well as studies of behaviour during routine tasks or emergencies, can reveal which workplace behaviours are associated with adverse outcomes or their avoidance. The resulting evidence base informs the content of non-technical skills taxonomies. In European aviation, pilots are trained and individually assessed on non-technical skills that are protective for flight safety [3]. Similarly, in other high risk work settings, e.g. nuclear power plants, assuring competence in non-technical skills is a key component of licensing and revalidation [4].

In contrast to the aviation industry, little attention had traditionally been paid to identifying the behavioural components of safe medical practice, until anaesthesiologists, such as Gaba and colleagues adapted the aviation Crew Resource Management (non-technical) skills approach for anaesthetic training and simulation [5]. Subsequently, anaesthetists in other countries began to recognise that for training and evaluation, they needed to have methods of measuring not only anaesthetists’ technical performance but also their non-technical skills, such as decision making or teamwork.

Development of the ANTS system

In 1999, Flin, a psychologist and Glavin an anaesthetist decided to develop a taxonomy of non-technical skills which could be rated from behavioural observations of individual anaesthetists working in an operating theatre. Their team of anaesthetists and psychologists designed an Anaesthetists’ Non-Technical Skills (ANTS) system using methods of task analysis similar to those used for the NOTECHS system for pilots [6]. The skill set for the ANTS content was derived from a series of task analyses based on a literature review, observations, interviews, surveys and incident analysis [7-9]. An associated rating tool was formulated to meet a set of design criteria, such as suitability for practical use in theatre or in a simulation setting. The website www.abdn.ac.uk/iprc/ants provides access to project reports, papers and a copy of the ANTS booklet.
The ANTS skills framework (Figure 1) has four categories: Situation awareness; Decision making; Task management; Teamworking, with component elements and examples of good and poor behaviour for each element. Managing stress and coping with fatigue are not explicit categories, as they can be difficult to detect unless extreme, moreover they influence other behaviours which can be observed and rated. Leadership is part of the Teamworking category, as there are times where the anaesthetist will lead the theatre team.

![Figure 1. The ANTS System – prototype](image)

In addition to the ANTS framework, a behaviour rating scale was designed. This has a set of 4 point scales for rating observed behaviours in relation to the elements and categories (see Figure 2). The point descriptors on the performance rating scale emphasise the relevance of these behaviours for patient safety. The ANTS ratings are made where anaesthesia is being delivered, normally in the theatre or anaesthetic room setting (or in simulator facilities). The tool is designed to be used by experienced anaesthetists to rate the non-technical skills of another anaesthetist who has achieved basic technical competence.

![Figure 2. Example of the ANTS system rating form for part of the Task Management Category rating form](image)

The first evaluation of the ANTS behaviour rating method was undertaken with 50 consultant anaesthetists who were given 4 hours training on the system and then were asked to rate the non-technical skills of consultant anaesthetists in videotaped scenarios. The levels of rater accuracy were acceptable and inter-rater reliability approached an acceptable level [10]. Given that these raters had no previous experience of behaviour rating and minimal training in the ANTS system, it was concluded that these findings were sufficient to begin usability trials. The first measures of usability and acceptability from consultants and trainees were promising [11], consequently the system was released in 2004 and made available free of charge to anaesthetists for non-commercial use.
The ANTS system can be used as a basis for anaesthetists’ non-technical skills training in both hospital departments and simulation centres, formative or formal competence assessment, and for incident analysis e.g. Morbidity and Mortality meetings or accident investigation [1]. It has also been used as a measurement instrument in a number of research studies, some of which are described below.

Training Anaesthetists in Non-Technical Skills

The informal process that introduced the ANTS system in the UK revealed the difficulties of bringing a novel assessment system to a profession which did not formally re-evaluate competence post-qualification at that time [1]. Not only was the notion of workplace assessment new (apart from trainees), it became apparent in the early training courses for ANTS raters that the basic psychological language (e.g. the term ‘situation awareness’) was unfamiliar to most anaesthetists, although there was good conceptual understanding of the need to maintain attention and vigilance. To draw a contrast with the aviation industry, pilots are taught and examined in the psychological and physiological factors influencing task performance from the start of their basic training (Human Performance Limitations courses and examination) [12]. Subsequently they undertake Crew Resource Management training, which focuses on pilots’ non-technical skills, on a regular basis. In some countries, e.g. the UK, they will have their non-technical skills regularly checked, along with their technical skills, as a requirement for licence revalidation [3].

This educational model from aviation suggests that there is a need for basic awareness training courses in non-technical skills in undergraduate medicine [13] to introduce the concept of non-technical skills and explain their importance for human performance, especially in relation to patient safety. Therefore, basic education in human factors concepts should occur pre-qualification for medical students. After that, training in non-technical skills for a particular clinical specialty, such as anaesthesia, can be effectively introduced at the postgraduate stage. A recent Parliamentary Report into Patient Safety in the UK stated: “Lack of non-technical skills can have lethal consequences for patients. However, the NHS lags unacceptably behind other safety-critical industries, such as aviation, in this respect. Human Factors training must be fully integrated into undergraduate and postgraduate education.” [14].

At the postgraduate level and beyond, there is a need for non-technical skills training for anaesthetists [15]. The first step as suggested above, is to provide training to give starting practitioners some familiarity with non-technical skills to use in their own practice. Those tasked with delivering this training need to have some knowledge of the skills and the psychological constructs underpinning them, as well as some knowledge of factors influencing human error in relation to patient safety [1]. This type of training could certainly be supported by web based delivery mechanisms or other forms of e-learning.

A basic postgraduate training programme can introduce the 4 key skills categories of the ANTS taxonomy, namely

- Situation Awareness
- Decision Making
- Team Working (Leadership would be covered here)
- Task Management

Depending on whether or not there has already been undergraduate training in Human Performance Limitations (HPL), then it may also be necessary to include the topics of Stress and Fatigue and the effects these can have on the cognitive and teamwork skills. A theoretical background to Human Error and its management is a useful introduction, if this has not been taught already on an earlier HPL course. The new Continuing Professional Development (CPD) Matrix of the Royal College of Anaesthetists has two core knowledge areas in this area: Team Leadership and Resource Management and Human Factors in Anaesthetic Practice (see www.rcoa.ac.uk).

Typically non-technical skills courses [1] include lecture and video presentations, as well as small group work exploring the skills using clinical cases. Role play scenarios involving management of anaesthetic cases (in a clinical simulator or using lower fidelity techniques) enable participants to put their non-technical skills into practice. Course participants can alternate taking part in scenarios with observing. Observers can use the ANTS taxonomy to identify their colleagues’ non-technical skills and provide feedback on the behavioural aspects of performance. Video replay is a powerful method of allowing scenario participants to reflect on their actions and facilitation also allows further exploration of the cognitive processes. The advantage of using a skills framework is that, by identifying specific behavioural examples during performances with illustration of the positive and negative impacts of these actions, course participants rapidly build
their understanding. Yee et al [16] have demonstrated an improvement in non-technical skills with repeated exposure to simulator based training and debriefing using the ANTS system.

A special type of training course is required for qualified anaesthetists who wish to become ANTS instructors or examiners. They should have completed an ANTS introductory course and need to become familiar with both the ANTS system and use of behavioural rating methods so that they can make reliable assessments in the workplace. They also need to have good debriefing skills. The UK Civil Aviation Authority standards for training and examining pilots’ non-technical skills provide a very useful framework for professional development and qualification at this level [17]. For anyone to be engaged in formal assessment, additional training would be required as these consultants would need to know how to deal with related professional issues, such as consequences of failure or provision for remedial training.

International perspectives on ANTS

There has been considerable interest in the use of ANTS by anaesthetists/anesthesiologists in other countries, and ANTs documentation has been translated into several languages including Danish, German and Hebrew. Rall and Gaba [18] in a review of behavioural assessment methods in ‘Miller’s Anaesthesia’ concluded, ‘On the whole, the ANTS system appears to be a useful tool to further enhance assessment of nontechnical skills in anaesthesia, and its careful derivation from a current system of nontechnical assessment in aviation (NOTECHS) may allow for some interdomain comparisons.’ They also discussed issues inherent in both technical and non-technical performance assessment, including criterion thresholds, rating fluctuating performance and inter-rater reliability. These concerns have been echoed in early trials, where the raters have been inexperienced in behavioural assessment and often have not had basic non-technical skills training.

The Australian and New Zealand College of Anaesthetists sponsored an evaluation study of ANTS training. Graham et al gave 26 anaesthetists a morning of training on ANTS and asked them in the afternoon to rate five videotapes showing behaviour of anaesthetists during operations. While their trainees were positive about the content validity, and the internal reliability (Cronbach’s alpha) scores of the categories were acceptable, they found low inter-rater reliability at the element level [19]. At the category level, which would be the more typical level for formal assessment, the inter-rater reliability scores were not reported. This level of reliability at the element level across 26 raters is hardly surprising, as none of the anaesthetists had any previous training in non-technical skills or in behavioural rating.

Previously, it has been acknowledged that a half day training session is not an adequate time period to teach the underlying psychology and anaesthetic consequences embracing four non-technical skills categories, the principles governing the use of behavioural rating scales and thereafter to explain and train the use of the ANTS system [1]. A minimum of two days’ instruction is recommended for raters who already understand non-technical skills concepts [19]. It is unlikely that anaesthetists would demonstrate very high inter-rater reliability if they were asked to use an unfamiliar system to rate observations of technical skills with only four hours’ training. Moreover, the training should be conducted in small groups to maximise time for class discussion and individual feedback from the trainers. Graham et al’s study is an important contribution to our understanding of the application of ANTS in practice. In this study they pointed out that anaesthetists, even from the same unit, do not always agree on what is safe anaesthetic practice. Variability in accepted practice can present a problem for professional assessment of technical, as well as non-technical, skills.

New Developments

Two new versions of the ANTS tool are being developed by consultant anaesthetists associated with our research group. Michelle Lamont has just completed a study which examined the suitability of ANTS for obstetric anaesthetists. Her preliminary findings suggest that while the taxonomy was generally applicable, a number of refinements would be required to emphasise the communication skills required for dealing with an awake patient and her partner, as well as the leadership skills needed in for emergencies such as major obstetric haemorrhage. John Rutherford is working on a new project to identify the non-technical skills required for anaesthetic assistants (i.e. the nurses, technicians or operating department practitioners who assist the anaesthetist) with the objective of developing an A-ANTS behavioural rating tool.
Conclusion

There has generally been an appreciation that the ANTS system, although it would benefit from further evaluation, has been useful, if only by introducing the concept of behavioural rating to anaesthetists. In a recent editorial, Abouleish comments: ‘These sets of behavioural markers are the real strength of ANTS. With these markers, the ANTS developers have provided clinical faculty with specific language to use when assessing a struggling resident, which gives the resident clear and succinct issues that can be targeted for improvement. Furthermore, one or two underlying behaviours can lead to multiple non-technical weaknesses……….but without ANTS, the evaluation would be vague and overwhelming. With ANTS and its markers, the issues can be broken down to small attainable goals. This focus is important for minimizing learned helplessness. It is also important for avoiding the bias associated with the Pygmalion phenomenon in the anesthesiology resident.’[20].

Key Learning Points

• Non-technical skills are ‘the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance’
• These skills can include: situation awareness, decision making, leadership, team working, managing stress and fatigue.
• The ANTS system is a taxonomy and behavioural rating method to observe and assess anaesthetists’ non-technical skills relating to Situation Awareness, Decision Making, Team Working and Task Management
• ANTS can be used to aid selection, training, competence assessment and incident investigation.
• Anaesthetists should receive training in human performance limitations and non-technical skills as part of their professional education.

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References