Non-technical Skills in Healthcare

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30.1 Introduction

Non-Technical Skills (NTS) can be defined as *a constellation of cognitive and social skills, exhibited by individuals and teams, needed to reduce error and improve human performance in complex systems*. NTS have been described as generic 'life-skills' that can be applied across all technical domains [1]; they are deemed to be 'non-technical', in that they have traditionally resided outside most formal technical education curricula. While the importance of human factors in the performance of technical tasks has been appreciated for over 80 years [2, 3], NTS as a formal training system is derived from aviation Crew Resource Management (originally called Cockpit Resource Management). CRM was first adopted by United Airlines in 1981 [4] after a series of high-profile air crashes in the late 1970s, in which human elements such as poor communication, teamwork and situation awareness were identified as key contributing factors [5–7]. CRM is now fully integrated into all commercial pilot training worldwide; in a constant state of evolution, it is currently in its sixth generation [8].

In healthcare, it was not until the 1990s that the significance of human factors in patient safety became more widely publicised [9], coinciding with the rise in medical simulation [10]. In 1999, an emergency medicine team training project, MedTeams, was launched [11]. The following year two landmark reports were published within weeks of each other: *To Err is Human* in the USA [12] and *An Organisation with a Memory* in the UK [13]. These inspired a burgeoning of research into applied human factors in healthcare. Flin pioneered a behavioural marker system known as Anaesthetists' Non-Technical Skills (ANTS: [14]), followed by Non-Technical Skills for Surgeons (NOTTS: [15]). The disciplines of anaesthesia, critical care and surgery remain at the forefront of NTS training in medicine. Several other multidisciplinary clinical NTS frameworks, including the Oxford NOTECHs system [16] and TeamSTEPPS™ [17], have also been implemented and studied in real and simulated clinical environments.

As NTS evaluation and/or training systems become increasingly incorporated within undergraduate and postgraduate technical curricula, and specific techniques are developed (especially

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in communication skills) supported by a growing body of research, a paradox arises: many non-technical skills no longer qualify as being 'non-technical'. Moreover the term 'non-technical' appears to subordinate these skills to their technical counterparts, when in reality the two skill sets are both essential and inseparable, especially during the management of medical crises. In time new terms may be required (e.g. 'paratechnical' skills, Clinical Resource Management) to define and describe this group of skills, and to consolidate their true place in the clinician's armamentarium.

30.1.1 Practical Overview of NTS Training Topics in Healthcare

The standard NTS training topics are summarised in Table 30.1 and detailed in the rest of this chapter. It is important to recognise that these skills are intertwined not only with the more traditional skills they support, but also with each other. Proficiency in one non-technical skill is, to no small extent, dependent on proficiency in the others. Newer generations of aviation CRM have introduced new topics, e.g. the acquisition of expertise and managing automation. It is foreseeable therefore that these topics will be incorporated into future clinical NTS training programmes.

30.2 Performance Shaping Factors

Most work environments operate on the assumption that adequate training, experience and motivation are enough to ensure successful performance. These prerequisites are necessary but not sufficient, especially in a complex adaptive system such as healthcare. There are many factors that can influence human performance—over long periods of time, from day to day, or in a given moment. *Performance Shaping Factors* (PSFs) can be classified according to a clinical adaptation of Reason's 'Three Buckets' model [18] where the traditional categories of 'task' (factors inherent to the nature of the task), 'self' (internal and personal factors) and 'context' (environmental factors) are each sub-divided into 'task/patient', 'individual/team' and 'workplace/organisation' factors, respectively (Fig. 30.1).

The ability to identify and evaluate PSFs in everyday practice may be a useful skill for front-line clinicians. The Three Buckets model can be applied both prospectively and retrospectively. In 2008, the UK National Patient Safety Agency launched a Foresight Training Resource Pack [19], based on a simplified version of the Three Buckets model, to help nurses and midwives better foresee clinical risks. This package is currently used in a number of NHS Trusts. As a retrospective incident analysis tool, Contributory Factors Analysis, also known as the 'London Protocol' [20], is based on a similar principle, as is the HEAPS incident analysis tool used in Queensland Health [21] and other health networks in Australia. A quick Three-Bucket summary can be used to highlight PSFs relevant to cases presented at, e.g. Grand Rounds or M&M meetings.

Table 30.1 Typical NTS training topics

• Performance shaping factors
• Planning, preparation and prioritisation
• Situation awareness and perception of risk
• Decision-making
• Communication
• Teamwork and leadership

30.3 Planning and Preparation Skills

Popular culture is full of references stressing the importance of planning and preparation before performing complex tasks: 'Be Prepared', 'Plan the Dive and Dive the Plan', 'Luck favours the prepared', 'P to the seventh power' ('Prior Preparation and Planning Prevents P—Poor Performance'), etc. In teaching hospital settings, medical and nursing trainees are often asked to perform tasks for which they are ill-prepared. In these efforts they are not only hampered by the opportunistic nature of teaching in

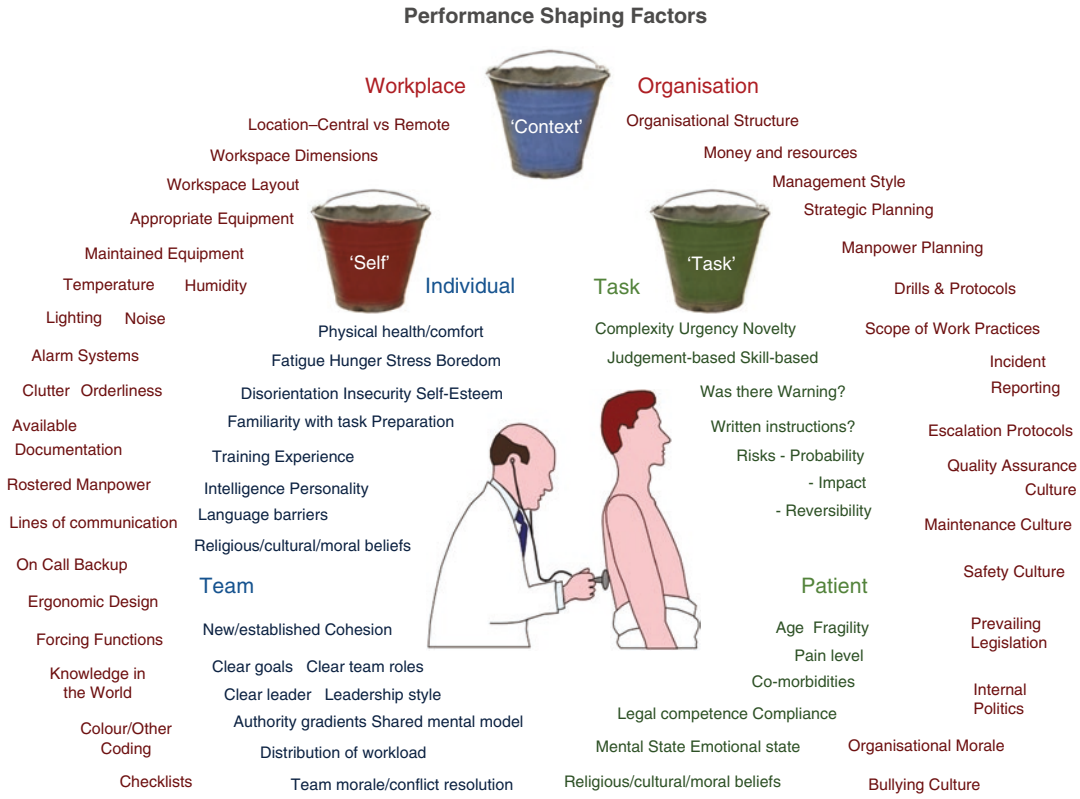

Fig. 30.1 Performance Shaping Factors. A clinical expansion of Reason's Three Buckets model

clinical settings, but also by the culture of 'see one, do one, teach one', a tradition that is counter-intuitive to human-factors thinking and seemingly peculiar (among high-risk endeavours) to medical and nursing education. 'SODOTO' training has both critics [22] and defenders [23]. Simulation Based Education (SBE) can be used to demonstrate the consequences of poor preparation and planning in a safe setting [24].

While there are a number of system tools that can help and guide staff (orientation days, checklists, pre-prepared procedural kits, etc.), the question arises as to whether there is a set of definable human competencies/aptitudes that optimise planning and preparing for tasks, and whether this can be taught. The answer to the first part of this question appears to be 'yes', in that evaluation of planning, preparation and prioritisation skills are key elements of the ANTS behavioural marker system. These help researchers identify 'good' and 'poor' task management behaviours in simulated settings, with the highest inter-rater reliability of the four main ANTS categories [25]. However, the ANTS system is not designed to address *how to train* practitioners to plan and prepare better.

30.4 Situation Awareness and Perception of Risk

Situation awareness (SA) is defined as 'the perception of elements in the environment, the comprehension of their meaning in terms of task goals, and the projection of their status in the near future' [26]. *Perception* is essentially being aware of and/or gathering available information relevant to a situation. In a clinical context this correlates with taking a clinical history, examining a patient, reviewing the results of investigations and tests, receiving a handover, conducting a

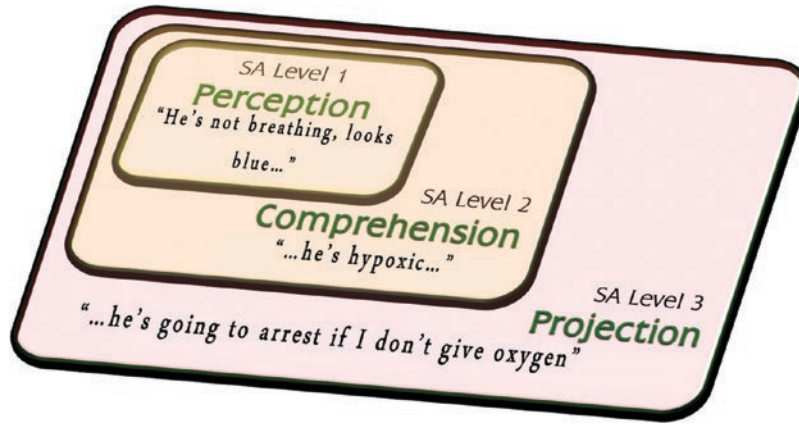

Fig. 30.2 Situation Awareness (SA) in a clinical context. (Courtesy of ErroMed, reproduced with permission)

briefing, etc. *Comprehension* is the ability to form a mental model that makes sense of the available information. In clinical practice, this would be similar to forming a diagnosis, or a differential of diagnoses. *Projection* is the ability to use an operating mental model of a situation to foresee potential future states, or as clinicians would say, to make a prognosis. A simple example is given in Fig. 30.2.

In traditional medical training, these levels of awareness are built upon each other. For example, trainees are (rightly) encouraged to take a history and examine a patient (Level I SA) before venturing a diagnosis (Level II SA). The SBAR/ISBAR communication tool (see below) is a way of serially organising information to facilitate situation awareness between individuals. In real life however, perception, comprehension and projection may not occur in that order. In many emergency situations it is possible, indeed potentially crucial, to prognose the need to resuscitate (Level III) before one has made a complete examination (Level I) or a definitive diagnosis (Level II). This concept of *parallel* rather than *serial* cognitive processing of SA is the hallmark of Naturalistic or Recognition-Primed Decision-Making, and a feature of expert cognition [27], described figuratively as 'seeing the past, present and future at the same time' [28].

In anaesthetic practice, [29] described a model of 'distributed situation awareness', emphasising that during an operation the patient's condition is constantly being modified by the interventions of the anaesthetist and the surgeon in real time. Thus, in this model, ideal SA is the result of a *dynamic* and *iterative* process of regularly scanning the environment, matching one's mental model with incoming information, modifying the anaesthetist's plan and actions accordingly, and cycling through this process repeatedly until the patient is safely in the recovery unit.

30.4.1 'Perception of Risk'

When thinking about potential adverse future states, a number of terms—*hazard*, *threat* and *risk*—are often used interchangeably, when they would perhaps be better used to connote overlapping but distinct concepts. A *hazard* is anything that could potentially go wrong or cause harm, without any qualification of its likelihood or severity. For example, when asked to list the possible complications of central venous catheter insertion, a medical student will often recite a list of early and late complications, subcategorised according to anatomical location, structure type, etc. The student has no direct experience of central line insertion and therefore limited ability to rank this list of *hazards* according to their likelihood of occurring in routine practice, or what the real impact of each complication would be.

A *threat* is the *subjective* perception of a hazard. It is important to recognise, independently of whatever data exists for a given situation, that a

number of factors influence the perception of danger, including gender [30], healthcare role and length of experience [31], primacy (the disproportionately 'formative' impact of early experiences or first impressions: [32]), recency (the disproportionate impact of most recent experiences: [33]), whether a person has volunteered to accept the hazard or had the hazard imposed upon them [34], whether the hazard is familiar or hitherto unknown [35], whether the effects are immediate or delayed [36], etc. If, for example, the medical student above, now a resident, were unlucky enough to cause a chylothorax with an early central line insertion, the complication would tend to figure prominently in that resident's future assessments for a considerable time afterwards, even though in objective terms such a complication is very rare.

Subjective factors influence threat assessments, which in turn can influence clinical decision-making. For example, a Canadian study of the prescribing practices of family physicians treating patients with atrial fibrillation showed that a substantial proportion stopped prescribing warfarin altogether after one of their patients suffered a haemorrhagic stroke, whereas physicians who did not routinely prescribe anticoagulants tended not to change their practice even when one or more of their patients suffered an thromboembolic stroke [37]. In this case, the negative consequences of electing to intervene (i.e. prescribing) had a greater impact on perception of risk than the negative consequences of electing not to intervene (i.e. not prescribing).

A *risk* is a calculated evaluation of the likelihood and impact of a hazard, based on objective assessments and measurements rather than subjective interpretation. For example, the same medical student, now a consultant intensivist, might be able to cite a personal log of their last 1000 central line insertions, quote literature reviews on the topic, and assert that the top three risks in their practice are, e.g. infection, pneumothorax and accidental arterial cannulation. This is what Klein [28] would call seeing the 'choke points'—another feature of expertise—the ability to identify quickly where the material dangers are in a situation, what actions are more likely to lead to failure, and what actions better ensure success ('leverage points').

In light of this, the term 'perception of risk' should be approached with a little caution. In the absence of hard data, most of what clinicians call 'risk assessments' in day-to-day practice would in large part actually be 'threat assessments'. Despite the subjective and potentially distorting nature of threat assessments, this is not necessarily a bad thing. Reliable data for a given risk situation often may not exist, let alone be to hand. Moreover, expert clinicians are often called upon to make decisions in urgent and complex situations, and their 'threat assessments' are usually better than a novice's 'risk assessments'. To understand why and when this might be true (and when it might not be) requires a deeper analysis.

30.5 Expert Decision-Making

Efficient and accurate decision-making is critical to patient safety—and it is important that the people responsible for making decisions that impact patient safety are as experienced and as expert as possible. Research on expert decision-making in complex, dynamic domains, often referred to as Naturalistic Decision Making (NDM: [27, 38]), has demonstrated that the most important step in making a decision in these domains is to accurately assess the situation—identify the problem, formulate a diagnosis, evaluate the risks. Mosier and Fischer [39] refer to this as the *front end* of the decision-making process. Once the situation is known, the retrieval of a workable course of action, the *back end* of the process, is facilitated.

Expertise impacts the decision process in several specific ways. First, expert decision makers exhibit high levels of competence and knowledge within the domain, and have experienced a wide variety of situations, instances, and cases they can draw upon (e.g. [40]). This means that a current case will often have features that match an event from the expert's repertoire, facilitating quick and accurate situation assessment. Second, experts see and process information differently than nov-

ices do. They can quickly identify critical cues—that is, the subset of information most critical to accurate situation assessment—and attend to or categorise them. This impacts their ability to develop situation awareness and to create an accurate mental model of the situation [41]. Experts are sensitive to changing values of information and can adapt their mental models to accommodate them [42]. They may use an iterative process, using feedback from the environment to adjust their actions and incorporate changes resulting from incremental decisions. In healthcare, for example, physicians often monitor results of a treatment to refine their diagnoses [43]. They also employ strategies to cope with dynamic situations—anticipating developments, prioritising tasks, and making contingency plans—and employ knowledge-based control to address conflicts or contradictions [39, 44]. The NDM framework relies heavily on expertise and on intuitive rather than analytical processing, and capitalises on decision makers' abilities to pattern match, to mentally simulate a course of action, and to use sense-making strategies to improve their understanding of a given situation.

30.5.1 Metacognition

Experts not only monitor the situation but also how they are thinking and whether it is appropriate for the situation at hand. They critique and correct their diagnosis until they arrive at a satisfactory mental model of the situation, or further processing is too costly [45, 46]. They are able to shift strategies when faced with high uncertainty or unmet expectancies, taking an incremental approach or engaging in more analytical processes [47, 48]. For example, expert surgeons perform many routine tasks automatically, but 'slow down' and engage in effortful processing in preparation for nonroutine events or in response to unexpected events [49].

30.5.2 Affect

Expertise also attunes the decision maker to affect that is in response to critical elements of the task context and that may have significance for their decisions. The affective reaction to a situation—particularly comfort or discomfort—may represent a knowledge-based informational cue for decision-making. For example, when a situation is not recognised as familiar, affective responses such as unease or discomfort ('something's not right') can motivate the expert to engage in more information gathering, or more substantive sense-making processes. Dominguez [50], for instance, reported that physicians frequently refer to their comfort level while deciding on whether or not to continue with laparoscopic surgery. This function of affect is similar to the role of 'hunches' in split-second decision-making.

30.5.3 Communication and Decision-Making

All individuals involved in ensuring a patient's safety must function collaboratively as a team. Because healthcare is a dynamic task environment, team members need to respond adaptively to changing conditions. Communication plays a pivotal role in this process [51], especially in healthcare as team members often perform sequentially and rely on information from the previous shift to guide their decisions and actions. Team members let others in on their reasoning and inform them about their intentions and expectations [52]. Critically, expert teams ensure common ground and shared mental models by providing feedback [53], and work to mitigate decision-making and other errors through team-centred communication [54, 55].

30.5.4 Stress and Decision-Making

Stress related to the working conditions is defined by the World Health Organization as the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities, and which challenge their ability to cope. It occurs in a wide range of circumstances and may have a profound impact on decision-making which, in the medical

context, could negatively affect clinical outcomes. Stress-related reductions in cognitive performance (e.g. accuracy, reaction time, attention, memory) resulted in poorer patient safety outcomes such as hospital acquired infections or medication errors [56].

It is therefore essential to address the causes of stress, which can be found both at the individual and at the organisational level. In the first case, it must be highlighted that medical practice has a solid rational basis made explicit through the clinical reasoning but, given the relationships doctors necessarily build with patients and other professionals, it also entails a strong emotional dimension that must be acknowledged [57]. Healthcare professionals experience emotions differently, quantitatively and qualitatively, and should be aware of their 'emotional intelligence' and trained on their ability to cope and react in case of stressful situations without stigmatisations [58, 59].

In the second case, from a system perspective, stressful conditions in the work environment must be identified and possibly mitigated—if not removed—in terms of both contents (working hours, monotony, participation and control) and contexts (job insecurity, teamwork, organisational culture, work-life balance). Doctors are requested to take charge of greater responsibilities and demands, but resources are often limited resulting in risks of overload and burnout. Adequate staffing levels, human-capital investments, respect of working times and cultural changes in the medical organisations with a radical shift from competitiveness to collaboration and teamwork are therefore needed to reduce stress and its consequences [60].

30.6 Communication

'Effective communication' is recognised as a core non-technical skill [17], a means to provide knowledge, institute relationships, establish predictable behaviour patterns, and as a vital component for leadership and team coordination [61, 62]. It is crucial for delivering high-quality healthcare and has been acknowledged together with effective teamwork as an essential component for patient safety [61, 63]. 'Communication failures' have long been recognised as a leading cause of unintentional patient harm [64]. More recently a report of 2587 sentinel medical adverse events, reviewed by the US Joint Commission over a 3-year period, cited 'communication' as a contributing factor in over 68% of cases [65].

However, 'communication' is a very broad term; pinning down a practical definition is difficult. In the wider academic literature, communication has been classified according to at least seven distinct philosophical approaches [66], of which at least two are relevant to non-technical skills training in healthcare: the information engineering ('cybernetic') approach and the social construction ('sociocultural') approach [67, 68]. The first defines communication as the linear transmission of 'signal packages' from a 'transmitter' to a 'receiver' through a medium. The latter emphasises how team communication can create the dynamic context in which people work, implying that communication, rather than a neutral mean, is the primary social process through which a meaningful shared world is built [67]. There is also the field of 'semiotics'—the study of signals and the nature of 'meaning' itself across different populations, demographics and cultures. These varied perspectives underscore the *sociotechnical* nature of all healthcare communication.

For the purposes of developing workable patient safety tools (and mindful of this very narrow context), communication can be defined as *the transfer of meaning from one person to another* [69]. In teams comprising health professionals with different backgrounds, roles, training and perspectives on care, the main purpose of communication is to facilitate among team members a *shared mental model* of a situation: the context, the goals, the tasks, the methods to be used, who will do what, etc. (i.e. 'team situation awareness'). Thus, it is important to recognise that 'meaning' is different to 'information' or 'knowledge', and effective communication therefore depends to some extent on the existing level of situation awareness of individual team members. For example, stating clearly that 'the

patient's blood pressure is 80/50' is not per se effective communication of its *meaning* if the person hearing it does not know that this finding usually represents critical hypotension in an adult.

While effective teamwork requires much more than communication (see below), specific failures in communication can hinder the process of building a shared understanding of the situation between team members, leading to poor performance and errors [70]. It follows that effective communication in healthcare teams can only be the result of dynamic iterative 'two-way' processes that lead to an 'equilibrium of understanding' among team members [69], and which can and must change with the input of new people and new information. Refining these processes can be seen as the basis for developing better 'communication skills'.

30.6.1 Specific/Directed/Acknowledged Communication

For ensuring effective team communication two aspects have been highlighted as fundamental [71]: the sharing of unique information held by team members in face-to-face environments and openness of information in virtual environments [72, 73]. To this one can add the implementation of closed-loop communication procedures that acknowledge the receipt of information and clarify any inconsistencies in information interpretation [74].

The concept of 'specific/directed/acknowledged' communication comes from simulation training [10]. 'Specific' refers to speaking clearly and the use of salient unambiguous descriptions, ideally using a 'controlled vocabulary' of terms with unique meanings as agreed by a discrete population of practitioners. An obvious example is the 'military speak' used in formal mission communications between soldiers, both in Hollywood movies and real life; however it should also be apparent that much of the diagnostic and therapeutic jargon used by clinicians, based mostly on Latin and Greek terminology, is already a form of controlled vocabulary. Specificity is also reflected in a number of other practical ways [69]:

- Using the word 'right' only to mean chirality (as in 'left' or 'right') and avoiding its use to mean 'Ok' or 'correct' (as in 'the left leg is the right leg for this operation, right?')
- Using numbers rather than vague terms where applicable ('the systolic is 200' rather than 'the blood pressure's high', 'I should be there in 10–20 min' versus 'I'll be down soon').
- Using the 'five rights' convention for prescribing and administering medications: checking the correct ***drug*** in the correct ***dose*** via the correct ***route*** at the correct time for the correct ***patient*** [75]; a convention routinely taught to nurses but not so consistently to doctors.
- Recognising and avoiding non-standard and ambiguous clinical abbreviations and acronyms [76].

'Directed' means that information or instructions are explicitly directed to a nominated person. For example, 'Fran, please pass me the Yankauer sucker' instead of 'Somebody give me something for the bleeding'. Of course, the ability to direct information requires team members to know others' names in the first place. One of the consistent elements of the WHO Surgical Safety Checklist is that team members introduce themselves by name and role [77]. A survey of OR teams showed that participants believed that knowing team member's name and rank was important not only to team bonding but also to patient safety [78]. While intuitively attractive, more studies are required to determine whether directed vs. undirected communication has a reproducible impact on clinical safety.

'Acknowledged' communication seeks to confirm that what was said was not only heard, but also that what was heard *matches* what was said. In *closed-loop communication*, also known as 'read-back' [79], the sender initiates communication, the receiver confirms that the communication has been heard and repeats the content, finally the sender verifies the accuracy of that content including an explicit accuracy check with

the recipient [62]. Closed communication loops improve the reliability of communication by having the receiver of communication restate what was said by the sender to confirm understanding. [67]. Organisations requiring this type of closed-loop communication can help smooth the communication process and ensure critical information is correctly conveyed and understood. This seems to be most useful, e.g. during surgery to confirm sponge count, during high-risk patient handovers to ensure comprehensive information exchange and during medication ordering [67].

30.6.2 Briefings and Handovers

Briefings are discrete meetings to provide members of a team with specific information and/or instructions. *Handovers* (also called *handoffs* in the USA) are briefings that occur at a changeover between personnel who share similar roles. Briefings set the scene for team interaction, ensuring that care providers have a shared mental model of what is going to happen during a process, and raising team situation awareness to identify any risk points and plan for contingencies. When done effectively, briefings can establish predictability, reduce interruptions prevent delays and build social relationships and capital for future interactions [80]. Briefings are designed to prepare teams to counter threats and minimise error potential. Formal and informal protocols, checklists, scenario planning, and open team discussion are commonly used [81].

Handover problems have been implicated in a number of adverse event studies [82, 83]. Perioperative briefings have been proven effective in improving surgical teams climate and their efficiency of their work [84]. Interprofessional checklist briefings have been shown to reduce the number of communication failures and to promote proactive and collaborative team communication [85]. Nevertheless, there remain definitional and methodological problems with using the existing literature to support any conclusions of what best practice should be [86]. This appears to be reflected in a recent retrospective study of over 300,000 adult patients undergoing major surgery, where the risk of complications, hospital readmissions and/or death was 44% in cases where there was a complete handover of anaesthetic care from one practitioner to another during the case, compared with 29% when no handover occurred [87]. There is clearly still a lot to learn about how to preserve continuity of care safely from one caregiver to another; meanwhile, specific techniques have earned substantial worldwide popularity.

30.6.3 SBAR

A structured communication technique called Situation, Background, Assessment, and Recommendation (SBAR) has been developed by the U.S. Navy nuclear submarine industry for high-risk situations and for its versatility has been adapted in healthcare setting [88]. The communication process involving SBAR is as follows: the Situation is conveyed by the initiating individual and establishes the topic of discussion; the Background involves any information needed to make an informed decision for the patient such as the list of current medication, or recent vital signs; in Assessment, the individual initiating the SBAR report the patient's situation and status; finally, the Recommendation is what the individual initiating the SBAR offers in terms of what they think should take place or be done [67].

A lower number of incident reports related to communication errors has been linked to SBAR tool in specific context such as effective in improving perception of communication between professionals and of the safety climate [89]. A recent review found moderate evidence for improved patient safety through SBAR implementation, especially when used to structure communication over the phone.

One study reported problems with the traditional SBAR tool during its implementation at a number of West Australian hospitals [90], most notably that (a) it was not intuitively obvious that personnel introduce themselves as part of the Situation phase, (b) sometimes certain members disputed the recommendations, and (c) some-

times not all parties clearly understood the recommendations. The researchers proposed 'iSoBAR' (where 'I' stands for Introductions, 'O' stands for Observations and replaces 'A' for Assessment, which in turn becomes Agreed Plan, and 'R' becomes Readback to confirm the agreed plan of action). At the time of publication, this variant was still in use in West Australia [91]. A simpler variant, ISBAR (where 'I' stands for 'Identify') has been adopted by healthcare authorities in other Australian States [92]; indeed in Australia implementation of some version of SBAR has been adopted as part of a national standard of clinical handover [93]. However, high-quality research on this widely used communication tool, in whichever variant, is still wanting [94].

30.6.4 Escalation of Concern: Graded Assertiveness

In most clinical situations, where there is a clear and agreed pathway for action and appropriate leadership, safety is best maintained by cooperating with the plan and deferring to one's superiors. However plans do not always proceed as expected; if errors or mishaps occur, or an imminent threat to safety arises, it is sometimes necessary for healthcare providers to assert themselves in a clear and timely fashion to support patient safety [67]. As there are many hierarchical structures in healthcare with many authority gradients between individuals, speaking up to senior colleagues does not come naturally to many people, especially junior personnel, even in the face of an overt safety issue. Organisations that employ clinicians with a duty of care to patients must therefore seek to empower staff by providing them with training in assertion techniques.

An example of assertive language is the two-challenge rule, where a concern is stated at least two times to better ensure it has been heard. The CUS tool (Concerned, Uncomfortable, Safety issue) also part of the TeamSTEPPS framework escalates communication from an expression of concern through a command to stop. The escalation of concern consists of, 'I'm concerned', 'I'm uncomfortable', 'this is unsafe', meaning 'This is a potential serious problem. Stop and listen to me'. [148]. Frankel and Leonard [95] suggest that the true 'test' of teams and leaders occurs when the 'line is stopped' after someone raises a concern, which then turns out to have been a false alarm.

Another tool, derived from the aviation-based PACE algorithm [96], is Graded Assertiveness. The tool comprises four levels of assertion—Observation, Suggestion, Challenge and Emergency—and has been adapted for use in clinical environments [69]. An example of the tool is given in Fig. 30.3.

30.7 Teamwork and Leadership Skills

A *team* can be defined as '*a distinguishable set of two or more individuals who interact dynamically, adaptively, and interdependently; who share common goals or purposes; and who have specific roles or functions to perform'* [97]. Successful teams are the product of time, effort and trust. As teams are also defined as *social* entities [98] that at times perform highly technical functions, there may be value in regarding healthcare teams as microcosms of a wider *sociotechnical* system, particularly in regard to improving patient safety [99].

Be it in a community health service or a large hospital, teams come in many forms: teams overlapping with other teams, teams nested within teams, teams dispersed in time and geographical space. It is therefore not surprising that there is a large variation among doctors in their conceptualisations of what and where teams are [100]. It may not be obvious to an individual practitioner where the team is, or even if one exists, for the task they are trying to perform. Moreover, there is a growing (albeit belated) recognition that patients and their families should be considered as part of the healthcare team [101].

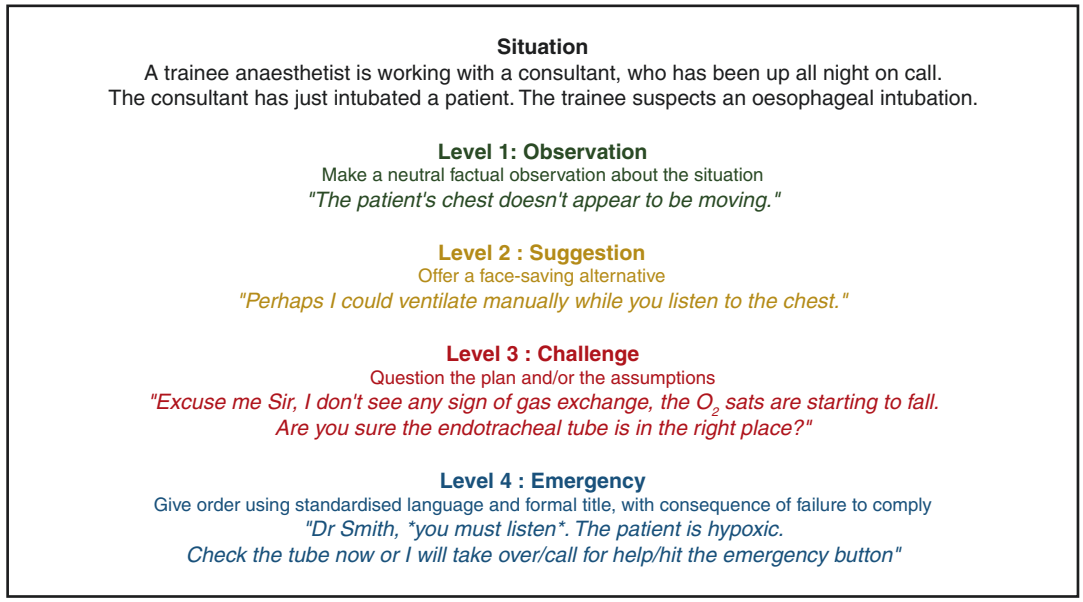

Fig. 30.3 Graded Assertiveness. (Courtesy of ErroMed Pty. Ltd. (Reproduced with permission))

30.7.1 The 'Anatomy' of Teams

While apparently 'leaderless' teams do exist, especially in nature, in the human world most successful teams have *leaders* and *followers*. The concept of leadership is complex, and is explored later in this chapter. In broad terms a leader is someone chosen (by the team itself or by others) to exercise authority and influence over the team. While good 'followership' requires a cooperative attitude, it too is not as straightforward a concept as it may seem. For example, followers need to know when and how to be assertive, even to their leader, when there is an overt threat to patient safety ([69]; see Sect. 30.6.4 above). Leaders and followers exhibit different characteristics in different types of teams.

30.7.2 Unidisciplinary Teams

A unidisciplinary team is one where most of the members, if not all, essentially share the same skill set—an army of soldiers, for example. Unidisciplinary teams tend to be hierarchical, with ranks according to seniority or experience, and leaders of unidisciplinary teams have usually risen through these ranks, and thus share a common training background with their team members. Ranks may be explicit ('sergeant', 'lieutenant', 'general') or implicit (the 'grand dame' of a department, the 'elder statesmen' of a college or the 'green' registrar).

Unidisciplinary teams are very common in healthcare, e.g. clinical departments within a hospital ('Neurology', 'Physiotherapy', 'Anaesthesia', etc.). Unidisciplinary team structures are task/service focused and therefore are great for training and producing results (e.g. provision of a service) of a reproducible standard. It is also more likely that one member of the team can be substituted for another. When members of a unidisciplinary team communicate, there is usually a pre-existing level of shared understanding; as a result, a lot of meaning in conversations, briefings and handovers can be conveyed *implicitly* (through assumptions, 'shorthand' jargon/acronyms and non-verbal communication) rather than *explicitly*.

Unfortunately, unidisciplinary teams tend to form 'silos'—isolated hierarchies of expertise that communicate poorly with each other—a problem well known to healthcare [102].

30.7.3 Multidisciplinary Teams

In multidisciplinary teams people with diverse backgrounds and skills are brought together for a particular purpose. Leaders of such teams will usually not share the same background or experience with many of their team members. Members tend to have discrete technical roles rather than hold rank.

An operating theatre team is an example of a multidisciplinary team (containing unidisciplinary sub-teams—anaesthesia, surgery, nursing, wardsmen, etc.—*as well as* the patient). In healthcare the output of these teams is tailored to individual patients, and heavily influenced by the input of all individuals in the team who each play a discrete role. Frequently it is difficult (if not impossible) to substitute one team member for another, or to do without a member who has a specific technical role. Unless such teams have worked closely together for a while, there is often little shared understanding between team members; consequently, implicit communication is unreliable, especially early in the life of the team.

Multidisciplinary teams counteract the negative effects of silos and have been shown to improve patient outcomes in a range of in-hospital settings [103]. However, cohesive multidisciplinary teams are much harder to establish and maintain [104]. Successful multidisciplinary team leaders tend to employ *situational leadership* and *transferable command and control* (see below).

30.7.4 Committees

A committee is a group of interested but diverse individuals ('stakeholders') assembled in a structured forum governed by agreed rules and motions through which collective decisions can be made. The group is presided over by a chairperson with limited nominal authority. A committee has the anatomical appearance of a team but its individual members are under no obligation per se to function like one, unless the committee has been convened to perform a specific function (e.g. a 'steering committee' or a 'task force'), and even that is no guarantee that it will function well. There is surprisingly little research on how healthcare committees function. 'The psychology of committees is a special case of the psychology of mobs' [105].

30.7.5 Improving Team Performance

Developing a behavioural marker system for team performance in high-risk clinical environments such as the operating theatre has been an ongoing global endeavour for at least three decades ([10, 14, 106, 107], [108]). The following is a summary of the more commonly used markers.

30.7.6 Calling for Help Early: Team Assembly

Declaring the need to form a team is a fundamental team competency. Calling for help early is the first step in the 'chain of survival' for improving outcomes from cardiac arrest ([109, 110]). Other examples of team assembly include a trainee knowing when to call their on-call superior, or a practitioner calling a colleague for advice, or to assist them if they are feeling unwell or overwhelmed.

30.7.7 Team Structure: Clear Leader, Roles and Goals

In traditional command-and-control systems, a clear team structure and process is important. Trauma and resuscitation teams are more effective where there is a clearly defined team leader (see below) with other team members assuming functional roles [111, 112]. Neonatal cardiothoracic teams that rehearsed a 'pit-crew' style handover process with designated roles resulted in a faster handover with fewer technical errors [113].

30.7.8 Team-Oriented Communication

Effective teams employ a number of team-oriented communication techniques such as briefings and handovers, specific/directed/acknowledged communication, tools for enquiry/advocacy/escalation of concern, etc. (see Sect. 30.6 above). It is important for the leader to create an atmosphere that fosters open exchange between team members [10] and encourages cooperative and assertive communication styles that are focused on the task at hand and 'what is right', rather than submissive and aggressive styles that are focused on power and 'who is right' [10, 69].

30.7.9 Decision-Making

Decisions in teams are usually made by the leader, either autocratically or in consultation with other team members, depending on the urgency and clarity of the situation, and skills and experience of the team involved (see Sect. 30.7.15 below).

The emergence of shared decision-making between clinicians and patients in a range of healthcare domains [114–116] is further validation of incorporating patients and their families as part of the wider clinical team. This is a variant of consultative leadership where the physician informs and guides the patient along a process of making decisions about their own care, which are then executed by the rest of the team.

30.7.10 Managing Workload and Time

A team approach allows distribution of physical and cognitive workload across the human resources at hand [10]. For example, trauma teams work faster when members perform pre-allocated roles [117], and the time to complete the primary survey has a direct bearing on patient outcomes [118, 119].

30.7.11 Team Situation Awareness

Getting all members of a team to share a mental model of what needs to be done by whom and how is fundamental to effective team function. In using the term '*shared mental model*' one can reinterpret Endsley's SA model of *shared* perceptions, *shared* comprehension and *shared* projection to infer the need for a '*team situation awareness*' that evolves with time and new information just as individual SA does [120]. Creating a shared mental model has been shown to improve overall team performance in simulated settings, both in aviation [121] and in medical trauma [122]. Establishing and maintaining a dynamic and appropriate team SA may be considered an important communication role of the team leader (see below).

30.7.12 Team Familiarity, Group Climate and Interpersonal Conflict

People who work together regularly perform better together. Teams where members are already familiar with each other tend to use their (shared) cognitive resources more effectively, which in turn improves their performance [123]. Cumulative team experience and team familiarity significantly reduce surgical operative time [124]. Moreover, teams that are made up of friends usually perform better than teams of ad hoc acquaintances, especially in larger groups and with high-output/high-turnover tasks [125].

In a complex dynamic workplace, differences of opinion and indeed conflict are inevitable. With appropriate resolution practices in place, conflict can be marshalled as a positive way to sharpen clinical decision-making [126]. More usually however, conflict that involves intimidation, bullying or verbal abuse over time has been cited as a cause of occupational stress, which in turn increases absenteeism and staff turnover [127, 131]. This effect appears to be more likely among female workers who have children [127], a dominant demographic of healthcare workers, especially in nursing and allied health. It seems

intuitive that interpersonal conflict within healthcare teams would be a threat to patient safety; indeed surveys and structured interviews confirm that healthcare workers strongly hold this perception [128, 129]. Interpersonal conflict is a key feature of whistle-blower cases of serious and serial patient harm [130]; however the conspicuous conflict in these cases is mostly a *consequence* of poor individual or team performance (and conflict over reporting this) rather than a *cause*. While there are some relevant case reports [132], there is to date surprisingly little systematic research linking team conflict to adverse patient outcomes; this would suggest an avenue for future study.

30.7.13 Debriefing

Debriefings are concise exchanges that occur after tasks or events, allowing team members to review what happened [67]. Debriefings may be *psychological* (especially after traumatic events), where team members are allowed a safe space to express their feelings about what occurred and to receive consolation and support; they may be *technical* (e.g. after a mission or procedure), where events and team/individual actions are systematically reviewed to improve future performance; or they may contain elements of both. Persons debriefing teams after a difficult clinical procedure, particularly where there was a negative patient outcome, should be prepared to conduct both a psychological and a technical debrief, or to defer one in favour of the other, as circumstances may demand. Debriefing may also be used to brainstorm new solutions to problems encountered during a procedure, or to consult experts from other clinical domains by the experts to enrich the collective wisdom of a care team. In this respect a well-run morbidity and mortality meeting can be viewed as a form of educational debriefing.

The benefit of providing single-session Critical Incident Stress Debriefing [133] or other variations of formalised psychological debriefing, which is standard procedure in many healthcare institutions to personnel after traumatic adverse events, has been brought into question in a number of studies [134–136]. For a healthcare manager faced with personnel exposed to a traumatic event, the most practical advice can be summarised as follows [135]:

- The exposed person(s) should, in a timely and empathic manner, be offered information about the possible reactions they may experience, what they can do to help themselves if these occur, and where to get help if they want or need it.
- Early support should be made ready and available, but instigating interventions, if at all, should be based on an accurate assessment of need. Different people cope with stress in different ways.
- Interventions should be customised to the culture, personality and developmental level of the person.
- A rapid recovery, or even freedom from distress, may not be desired outcomes. This will depend on the goals and motivations of the individual person.
- Evaluate any interventions early and be prepared to abandon something that isn't helping, and design a new intervention as needed.

Thus, with certain staff, and in the hands of an experienced, vigilant and compassionate facilitator, there may be greater therapeutic value in an informal but personalised debriefing process over time.

In any case it has been argued that putting the information gained from debriefing into an improvement process is more important than the debriefing itself [95]. A timely debriefing at the end of a session facilitates appropriate feedback [137] Teams should document items that did not go well and make suggestions for improvement. By documenting problems, teams can move towards fixing them and prevent issues later on [67].

30.7.14 Leadership, Command and Control

These are three distinct but overlapping concepts.

- ***Leadership*** can be defined simply as *the art of influencing others* to achieve common objectives in specific situations. Dixon [138] observed that people who are chosen to be leaders tend to be 'task specialists' or 'social specialists' or, rarely, both. These two leader types correlate with more modern descriptors of 'transactional' (task-oriented) vs. 'transformational' (team/relationship-oriented) healthcare leaders [139]. Ideal leadership combines proficiency in technical *command* (see below) with at least two additional social roles—that of a 'role model' (someone who 'shows the way' by taking initiative and inspiring junior members of the team to follow a shared vision) and that of a 'shepherd' (someone who cares for and protects the team, and encourages an environment in which the team can be most productive).
- It follows that just being a good technician/tactician without social skills, or an affable 'people person' without technical skills, does not per se make for a good clinical leader. [140] proposed a research-based framework for global evaluation of ED leadership behaviours that covers evaluation and planning behaviours (mission analysis, specifying goals, formulating strategy and reflection), action behaviours (patient and systems monitoring, providing guidance, error identification and coordination) and interpersonal skills (conflict resolution, affect management, motivation and communication).
- ***Command*** is the *exercise of authority* in the course of a task or a mission. Exercising authority usually involves assessing a situation, making decisions, giving orders and evaluating performance. Thus, command entails more than the mere wielding of resources (the definition of *control*—see below). For example, a consultant anaesthetist who is supervising a resident intubating a patient is *in command*, while the resident holding the laryngoscope is *in control*. A lone anaesthetist intubating a patient has both *command* and *control*.
- Command in complex emergencies can be divided into strategic ('why are we doing this'), tactical ('how are we doing this') and operational ('we're doing this'). This command structure is known as 'Gold-Silver-Bronze' in the UK and its application has extended from police responses to civil unrest [141] to the NHS management of large-scale medical incidents [142]. These principles apply equally to smaller scale command challenges, such as the running of a clinical department or a busy outpatients clinic.
- ***Control*** is the actual *wielding of resources* in the course of performing a task or series of tasks. For example, the person holding the laryngoscope *has control* of an intubation (whether or not they were directed by others to do it) but may *command* others to perform supporting manoeuvres (e.g. cricoid pressure), to get equipment or administer drugs.
- Understanding how these concepts interact influences leadership practice. For example, it is often difficult to maintain strategic and tactical oversight of a complex task if one is burdened with being technically 'hands-on'. Cardiac arrest teams whose leaders took an active part in resuscitating were often less well structured, less dynamic and performed resuscitation less effectively, leading to the concept of team leaders standing back and guiding the team remotely, or 'lighthouse leadership' [143]; this is now a standard part of advanced resuscitation team training.

30.7.15 Leadership Styles and Situational Leadership

Leadership styles can also be classified by the steepness of the *authority gradient* between the team leader and team members. In an *autocratic* style, the authority gradient is steep, i.e. the leader expects orders to be followed without question, and team members have little or no opportunity to query, challenge, or offer input to the leader. In a *consultative* style, the authority gradient is more shallow: the leader more actively solicits views and input from the team, and it is easier for team members to question or advocate suggestions, although the leader makes the final decision ('everyone gets their say but not everyone gets their way').

Which style is better? In one theoretical model, the answer depends on the situation. For example, in a complex ill-defined scenario involving an experienced multidisciplinary team, a consultative approach would seem more constructive; on the other hand, in a well-defined time-critical emergency with a novice team, invoking an autocratic drill would be more efficient. This is the concept of *situational leadership*—that good leaders adapt their style according to the available human resources and the needs of the situation [144].

Correlations have been found between Myers-Briggs personality types and leadership styles [145]. This suggests that clinicians in charge may gravitate naturally to one or other leadership style—autocratic or consultative, 'task-specialist' or 'social-specialist'—according to their personality. It is important therefore for clinicians to recognise their own natural tendencies, and (e.g. through simulation) to seek out training in being *the opposite*; naturally deferential types could practice being more assertive; naturally autocratic types could practice active listening. In this way the leader is better prepared to apply whatever appropriate style a situation may demand.

30.7.16 Transferable Command and Control

In helicopter medical retrievals, the pilot is in overall *tactical* command and can modify or abort the mission at any time. However, as the rescue moves through different phases, different team members hold *operational* command, directing other team members (even the pilot) during the performance of key tasks. The pilot is in charge of getting the team to the site; the winchman oversees getting the medical crew to ground; the medical officer assesses the patient and is in charge of initial resuscitation; the paramedic ensures the patient is safely secured on the stretcher; then it's the winchman again, in charge of getting the patient and crew back into the helicopter; then back to the pilot, getting the chopper to the receiving hospital; and finally the medical officer is in charge of handing the patient over to the receiving emergency team. This concept of 'taking the con' is a form of *transferable leadership* [146] or *transferable command and control*, and can be applied to many multidisciplinary situations in healthcare, e.g. running an operating theatre, a busy diabetes outpatient clinic, or a community mental health service. It requires multidisciplinary team leaders to know and trust the different skill sets of their team members, and to balance autocratic and consultative leadership styles (see Sect. 30.7.15—see above).

30.8 Teaching Non-technical Skills

Training to ensure effective decision-making for patient safety should contain components of deliberate practice and feedback [147]. It is essential to expand the number and range of scenarios that decision makers have in their repertoires, and to develop the sense of what is important. High- and low-fidelity simulations are increasingly being used for research and training in dynamic domains such as healthcare (e.g. operating rooms; [148]). Low-fidelity approaches such as the ShadowBox™ method are effective ways to expose decision makers to a range of possible decision scenarios with coaching from experts on cues to monitor, issues to worry about, and interpretations of ambiguous situations [149, 150]. Higher-fidelity training may include contextual features, such as the hospital or operating environment, and incorporate communication and teamwork in realistic simulations.

Over the last decade there has been increasing interest in the interprofessional team training—doctors, nurses and allied staff training together as opposed to training within their craft groups—to overcome the challenges of cultivating effective multidisciplinary teams and patient-centred care, particularly in crisis management scenarios [151, 152].

30.9 Summary

Supported by a large base of theoretical literature on human factors in both medical and non-medical domains, non-technical skills are fast becoming an established and indispensable build-

ing block of patient safety, and increasingly incorporated into many undergraduate and postgraduate healthcare curricula. A growing body of research suggests that good NTS training improves healthcare processes and outcomes, mostly in simulated environments, but also in real-world environments, especially in critical care fields such as anaesthesia, surgery and emergency medicine. While there remain substantial challenges in developing methodologies to better define and refine the role of NTS in improving healthcare outcomes, this domain is a rich seam for future study.

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