Safe in their Hands? Non-Technical Skills and Competence Assessment

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NCSBN, Chicago, August 19th, 2015
Dr Harold Shipman family doctor convicted of murdering 215 of his patients

• Dame Janet Smith *Shipman Inquiry 5th Report* (2004)
• ‘consider the approaches taken by industry to maintain and assure professional standards of job performance to meet regulatory standards’
‘Safe in their Hands?’ competence assessment in high risk industries

• Three ‘high risk’ industries in UK selected
  – Civil aviation
  – Nuclear power generation
  – Offshore oil and gas production

• Report to Department of Health, England
    – Available on www.abdn.ac.uk/iprc
Method

• Semi-structured, face to face interviews
  – Regulators
    • CAA
    • HSE Nuclear Installations Inspectorate
    • HSE Offshore Safety Division
  – Industry
    • Two air operators
    • Two oil companies
    • One nuclear power company
Interview topics

- Identify target group
- Relevant legislation
- Role of the regulator
- Licence checks
- Standards of competence
- Competence assurance systems
- Other performance scrutiny mechanisms/safety monitoring systems
Civil aviation

- Well established, accepted system (ICAO 1944)
- Annual licence check by CAA approved examiner
- Six monthly Operational Proficiency Check
- Assesses technical and non-technical skills
- Type Rating Examiners have to be qualified as Type Rating Instructors and as TRIs for Crew Resource Management (non-tech skills)
- TREs are assessed and revalidated every 3 years by RETREs
Nuclear Power

- Sites are licensed
- Unit Desk Engineers (control room operators), CR Supervisors, Shift Charge Engineers
- ‘Duly Authorised Persons’
- Standards of competence
- Two yearly simulator assessment (tech and non-technical skills) plus interview
- Company appraisal system
Offshore Oil

- Safety case legislation for installations
- Companies’ competence assurance systems e.g. for offshore managers
- Defined standards
- Three year assessment of emergency response skills - qualified assessors
- Six monthly appraisal
- Monthly performance reviews/ targets
- Non-technical skills now being introduced
Transfer caveats: industry/ healthcare

High risk industries have:
• Specific organisational cultures
• Strong management hierarchies
• Risk consequences for workers
• Size of target population
  – Much larger in healthcare
• Standard operating procedures
General principles: higher risk industries

• Independent Regulators
• Regular, confirmatory proficiency checks
  – not a default to positive
• Standards of competence
• Trained, accredited assessors
• Non-technical skills
• Management of failure
• Use of simulators
• Physical health checks
• Link competence assurance to safety
Focus on non-technical skills

• Formally trained and assessed in aviation and nuclear industries
• Cognitive and social skills to reduce error/ enhance safety
  – e.g. decision making, situation awareness, team coordination, leadership
• Behaviour rating systems eg NOTECHS for pilots
• These have now been introduced for anaesthetists (ANTS), surgeons (NOTSS), emergency physicians, scrub nurses (SPLINTS)
Safe, Efficient Job Performance

Latent conditions

Safety Systems
Organisational/Professional Culture
Work Conditions

Individual actions

Worker Behaviour
Technical & Non-tech. Skills

Job Performance
Influential Accidents for CRM/NTS

Tenerife, 1977
Two Boeing 747s (Pan Am; KLM) crashed on the runway - 583 killed
Causes: conflict resolution, assertiveness, communication, situation awareness, stress
i.e. non-technical skills

Kegworth, England 1989
47 killed
The pilots mistakenly shut the working engine when the other was on fire. This was such a strong demonstration that human error and teamwork failures were contributing to fatal accidents, that the UK CAA took the view that CRM (non-technical skills) training had to be introduced.
Closing the NTS Loop

- Task Analysis/Accid. analys
- Identify NTS & conditions
- Behaviour/Safety Problem
Closing the NTS Loop (aviation)

- Monitor Evaluate
- Behaviour/ Safety Problem
- Task Analysis Accid. analy
- NTS/ CRM training
- Identify NTS & conditions

Task Analysis

Identify NTS & conditions

NTS/ CRM training

Behaviour/ Safety Problem

Monitor Evaluate

Closing the NTS Loop (aviation)
Closing the NTS Loop (healthcare)

- Monitor Evaluate
- Behaviour/ Safety Problem
- Identify NTS & conditions
- NTS/ CRM training
- Task Analysis Accid. analy
Identifying Pilots’ Non-Technical Skills

• Task analysis from 1979
  – Flight deck or simulator observations
  – Interviews with pilots
  – Surveys of pilots’ attitudes, experiences
  – Confidential safety reporting systems
  – Accident analysis, especially analysis of cockpit voice recorder
Air France AF447
Crash into Atlantic
2009

Autopilot disconnection warning sounds.

One of the plane’s externally-mounted sensors has iced over, which automatically turns off the auto-pilot.

BONIN:
I have the controls.

ROBERT:
Alright.

Bonin inexplicably pulls back on the stick, causing the plane to climb. The report issued Thursday by the Bureau d'Enquêtes et d'Analyses said Bonin’s attitude in the minutes leading up to the autopilot being disengaged added to their highly-charged emotional reactions. "Three seconds after the autopilot disconnection, surprise was a pilot’s natural reaction," the report read.

BONIN:
Ignition start.

SYNTHETIC VOICE
Stall. Stall.

ROBERT:
What is that?

BONIN:
We haven't got a good... We haven't got a good display of speed.

ROBERT:
We’ve lost the, the, the speeds so... engine thrust ATHR engine lever thrust. ... Alternate law protections (low)... Wait we're losing... wing anti-ice... Watch your speed.

BONIN:
...
A ‘Black Box’ for clinical units? What would be on your voice recorder?

“........”

“.......”
Voice recorder for your clinical area?

“My way is much quicker….”

“Did she say four..?”

“No-one follows that procedure…”

“I’ve done this hundreds of times..”

“We need to get this case done…”

“I knew that was going to happen…”
Pilots’ Non-Technical Skills

• Term non-technical skills first used in European civil aviation (1990s).

Non-technical skills are the cognitive and social skills that complement technical skills, and contribute to safe and efficient task performance.

Aka: Crew Resource Management (CRM) skills

Formally trained and assessed in aviation and nuclear industries.
Non-Technical/ CRM Skills

• Situation Awareness
• Decision Making
• Leadership
• Team Work

• Communication
• Managing stress and fatigue
Crew Resource Management (NTS)

- Based and updated on human factors research identifying behaviours (NTS) critical for safe performance
- 2-3 days basic training (lectures, videos, role-plays, etc.) plus annual recurrent training mandated by CAA (UK)
- Skills practised with feedback in simulator (LOFT)
- Regular formal assessment of non-technical skills for UK pilots mandated by CAA (2004)
- NTS Trainers/ examiners must be assessed as competent
Pilots’ Non-Technical Skills

NOTECHS system (1998)

Pan-European

Behaviour rating method to assess a pilot’s non-technical (CRM) skills.

Recommended by JAA/CAA

Adopted by some airlines, adapted by others.

Relevance for the operating theatre?

I am giving the safety briefing!
Relevance to OR?

Research has shown adverse events in surgery primarily caused by failures of teamwork, judgement:

- Sevdalis et al (2007) – interruptions in theatre
- Way et al (2003) – 97% of bile duct injuries had perception failures

Positive outcomes for the team and patient through good non-technical skills

- Edmondson (2003) – effective leadership

Non-technical skills for doctors in OR

“The cognitive, social and personal resource skills that complement technical skills and contribute to safe and efficient task performance”

- Communication
- Teamwork
- Leadership
- Situation awareness
- Decision making
- Managing stress and fatigue
Framework for Observing and Rating Anaesthetists’ Non-Technical Skills (ANTS) System Handbook v1.0

The Non-Technical Skills for Surgeons (NOTSS) System Handbook v1.2

Structuring observation, rating and feedback of surgeons' behaviours in the operating theatre
SPLINTS development method

Task analysis (2008-2009)
- Literature, survey, observations, interviews: nurses and surgeons
- List of skills emerged

Taxonomy design and development (2010)
- Skills sorted by panels of nurses
- Taxonomy and behavior markers written

Evaluation (2011)
- Reliability - using video scenarios (n= nurses)
- Usability testing in theatre

Implementation (2012 - )
- SPLINTS debriefing in theatre and theatre simulators
- Develop SPLINTS curriculum
Method – task analysis

- Review of literature n=13 papers
- Observations n=24;
- Interview: nurses n=25; 3 hospitals
  mean experience 15yr; SD 9.38; range 2-33yr
  consultant surgeons n=9; 4 hospitals

“You just know when something is going wrong, it’s either... you can physically see that something’s happened but sometimes you can’t see. You can just recognise the surgeon’s body language or see them clenching their jaw .. that things are not going well.”

“...when they [surgeons] ask for something and you give them what you think it is that they need and it’s not the thing they said but you know it is what they actually want.”

“The surgeon said “give me the buzzy thing.. ””
Surgeons’ interview data

• if I’m really concentrating hard on a task I’ll forget the names of instruments I use every day

• a lot of what you need arrives in your hand without you actually having got as far as asking for it, it’s almost telepathy, it’s smooth, it runs

• they [scrub nurses] need to have the ability to be quite focused on the procedure and not be distracted by what else is going on
How do you keep track of the status of an operation?

You know by the surgeon’s voice, by his actions. Just by what he asks for, you know if he’s come upon things he’s not expecting. You have a procedure you follow and there are certain things you expect to happen so you just go on and you go on and then when something isn’t right, you know it isn’t right because, if you can’t see, which often you can’t, he’ll ask for something you’re not expecting. At that point he usually says something to his assistant or to the anaesthetist so you just gauge it. Or perhaps it’s the anaesthetist who has recognised something on the monitor, and you can hear it sometimes, different to the way it should be. It depends on the experience of the surgeon too, because if you have an inexperienced surgeon when things like that change they’ll maybe get a bit hot under the collar and you’ve got to be the one to keep it calm. The junior surgeons do look to you, mostly although some of them can get a bit stroppy in his voice and in his manner, those who want to remain in charge and you think, right, things aren’t going to plan here. But most of them will say something like, “what do they normally use here?” or “what does Mr X use here?” so they look to you to tell them that. So, that’s when you know that it’s not going clockwork.

Cognitive skills e.g. situation awareness, decision making
Social/ Interpersonal skills e.g. communication, teamwork, leadership
Task Management skills e.g. planning and preparation, prioritising
Stress/Fatigue management skills
Emerging skill set....

Literature review

**communication, teamwork, situation awareness**

No leadership or decision making

Interviews (25 nurses, 9 consultant surgeons)

**communication, teamwork, situation awareness, task management, coping with stress**

Less: leadership, decision making, managing fatigue
Developing the SPLINTS framework

• Panels of experienced theatre nurses n=4; from 3 Scottish hospitals
• Reduced original list from 7 categories containing 27 elements to 3 categories with 9 elements
• Taxonomy guidelines followed;
  – observable behaviours
  – generic to all surgical specialities
  – simple structure; easy to use in theatre
• Provided labels/ examples of good and poor observable behaviours to describe those skills
The SPLINTS framework

- **Situation Awareness**
  - Gathering information
  - Recognising and understanding information
  - Anticipating

- **Communication & Teamwork**

- **Task Management**
  - Category
    - Element
      - Behaviour

+ve: Conducts frequent scan of the environment
-ve: Fails to listen to instructions
### SPLINTS taxonomy

<table>
<thead>
<tr>
<th>Category</th>
<th>Element</th>
</tr>
</thead>
</table>
| Situation Awareness | • Gathering information  
                    • Recognising and understanding  
                    • Anticipating                     |
| Teamwork and        | • Acting assertively  
                    • Exchanging information  
                    • Co-ordinating with others       |
| Communication       |                                                                         |
| Task Management     | • Planning and preparing  
                    • Providing and maintaining standards  
                    • Coping with pressure             |
# SPLINTS rating form v1.0

<table>
<thead>
<tr>
<th>Category</th>
<th>Element</th>
<th>Feedback on performance and debriefing notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Situation Awareness</strong></td>
<td>Gathering information</td>
<td></td>
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<tr>
<td></td>
<td>Recognising and understanding information</td>
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<td></td>
<td>Anticipating</td>
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<td><strong>Communication and Teamwork</strong></td>
<td>Acting assertively</td>
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<td></td>
<td>Coping with pressure</td>
<td></td>
</tr>
</tbody>
</table>

* 1 Poor; 2 Marginal; 3 Acceptable; 4 Good; N/A Not Applicable

1 Poor   Performance endangered or potentially endangered patient safety, serious remediation is required
2 Marginal Performance indicated cause for concern, considerable improvement is needed
3 Acceptable Performance was of a satisfactory standard but could be improved
4 Good   Performance was of a consistently high standard, enhancing patient safety; it could be used as a positive example for others
N/A      Not Applicable
Task analysis
Unstructured observations of scrub nurses on task

Semi-structured interviews with scrub nurses & surgeons
Analyses of interview data to extract non-technical skills for scrub nurses

Study 2 - Develop the non-technical skills taxonomy
Panels of expert theatre nurses discuss and refine skills taxonomy
Preliminary skill set produced with examples of poor and good observable behaviours for the identified skills

Study 3 – Reliability testing of rating system
Record simulated scenarios showing scrub nurse behaviours
Nurse experts rate nurse behaviours displayed in scenarios to test reliability and psychometric properties of rating system
Testing the SPLINTS scale

- Record simulated scenarios to test prototype SPLINTS rating system
SPLINTS reliability Study 3

Method

Full day sessions; n=7
Scottish teaching hospitals; n=5
Experienced scrub practitioners; n=34

Basic human factors training including introduction to non-technical skills

Detailed input on SPLINTS taxonomy including definitions and behavioural markers to guide ratings of good and poor performance
<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Mean</th>
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<tbody>
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<tr>
<td>Element 1</td>
<td>0.7</td>
<td>0.75</td>
<td>0.53</td>
<td>0.88</td>
<td>0.85</td>
<td>0.46</td>
<td>0.67</td>
<td>0.69</td>
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<tr>
<td>Element 2</td>
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<td>0.6</td>
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<td>0.58</td>
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<td>Element 3</td>
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<td>0.86</td>
<td>0.46</td>
<td>0.65</td>
<td>0.7</td>
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<tr>
<td><strong>3. TM</strong></td>
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<tr>
<td>Element 1</td>
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<tr>
<td>Scenario Mean</td>
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<td>0.9</td>
<td>0.86</td>
<td>0.5</td>
<td>0.64</td>
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</tr>
</tbody>
</table>
Test results

- Acceptable ratings
- Better agreement at the category than element level
- Scenario differences
  - Nurses generally positive about the system
  - Need training to use system
SPLINTS Papers

Non-technical skills of the operating theatre scrub nurse: literature review
Lucy Mitchell & Rhona Fin
Accepted for publication: 14 March 2008
Corespondence to: L. Mitchell, email: core-mitchell@blueyonder.co.uk
Lucy Mitchell MA, RN, MSc, PhD, Faculty of Health, University of Sunderland, Sunderland, UK
Rhona Fin, MSc, PHD, Faculty of Health, University of Sunderland, Sunderland, UK
Abstract
Title: Non-technical skills of the operating nurse. This paper is a report of a review of non-technical skills used by scrub nurses.
Background: Background comments on how the literature review is going to be set up and what the overall aim of the review is.

Evaluation of the Scrub Practitioners’ List of Intraoperative Skills (SPLINTS) system
*School of Nursing, University of Sunderland, Sunderland, UK
**School of Psychology, University of Sunderland, Sunderland, UK
Abstract
Background: The SPLINTS List (Surgical Pracitioner’s List of Intraoperative Non-technical Skills) is a list of non-technical skills required by surgical practitioners. The aim of this study was to evaluate the SPLINTS system.
Methods: A survey of surgical practitioners was conducted to assess their knowledge and confidence in performing non-technical skills.
Results: The results showed that surgical practitioners had varying levels of knowledge and confidence in performing non-technical skills.
Conclusion: The SPLINTS system is an effective tool for assessing and improving non-technical skills among surgical practitioners.

Thinking ahead of the surgeon. An interview study to identify scrub nurses’ non-technical skills
Lucy Mitchell, Rhona Fin, Steven Yule, Janet Mitchell, Kathy Coutts, George Youngson
School of Nursing, University of Sunderland, Sunderland, UK
School of Psychology, University of Sunderland, Sunderland, UK
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Abstract
Background: The aim of this study was to identify non-technical skills required by scrub nurses. The research was conducted through interviews with scrub nurses.
Methods: A qualitative research design was used, involving semi-structured interviews with scrub nurses.
Results: The results showed that scrub nurses had a range of non-technical skills that were important for their role.
Conclusion: The findings suggest that scrub nurses need to be trained in non-technical skills to ensure safe and effective surgery.

Keywords:
Non-technical skills; Surgical practitioners; Scrub nurses; Non-technical skills.

SPLINTS Papers
SPLINTS interest

www.abdn.ac.uk/iprc/splints

• Australia
• Canada
• China
• Denmark
• England
• Italy
• Japan
• Kenya

• Korea
• Majorca
• Norway
• Scotland
• Singapore
• Sweden
• Switzerland
• USA
Uses for SPLINTS

• Provides a common language/terminology for discussing non-technical skills/ issues
• Assist training and assessment of non-technical skills in junior scrub staff
• A structured framework to identify/ rectify ongoing training needs
ANTS-AP
for anaesthetic nurses/ ODPs

Rutherford, Flin, Irwin et al
(2012;2013) BJA
(2015) Anaesthesia; JPP
www.abdn.ac.uk/iprc/ants-ap
Non-technical skills for beginners

- Start to establish safe behaviours/ culture at the undergraduate level
  - by teaching about patient safety, human factors, non-technical skills
  - using simulation for demonstration, practice and reinforcement
Further reading on NTS

Flin, Youngson & Yule (Eds) (2015)
CRC Press

Flin & Mitchell (Eds) (2009)
Ashgate

Flin, O’Connor & Crichton (2008)
Ashgate
Professional issues

• Ab initio education of NTS concepts
  – *Cf Human Performance Limitations for Pilots*

• Training NTS
  – Qualification of NTS trainers
  – Single discipline before multi-discipline?

• Competence assessment
  – Qualification of NTS assessors
  – *Cf CRM instructors/ examiners in aviation*
Further information

• r.flin@abdn.ac.uk

• www.abdn.ac.uk/iprc
  lists of projects and papers and reports