Dr Harold Shipman family doctor
convicted of murdering 215 of his patients

- ‘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
  - Flin (2005) *Safe in their Hands?*
  - 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 co-ordination, leadership
- Behaviour rating systems eg NOTECHS for pilots
- These have now been introduced for anaesthetists (ANTS), surgeons (NOTSS), emergency physicians, scrub nurses (SPLINTS), anaesthetic nurses (ANTS-AP) etc.

Safe, Efficient Job Performance

- Latent conditions
- Individual actions
- Worker Behaviour
- Technical & Non-tech. Skills
- Job Performance

Safety Systems
Organisational/ Professional Culture
Work Conditions
Influential Accidents for CRM/NTS

Tenerife, 1977
Two Boeing 747s (Pan Am; KLM) crashed on the runway - 583 killed

Causes: conflict resolution, assertiveness, communical 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 introd

Closing the NTS Loop

Task Analysis/Accid. analys
Identify NTS & conditions
Behaviour/Safety Problem

Closing the NTS Loop (aviation)

Monitor Evaluate

NTS/ CRM training

Behaviour/Safety Problem

Task Analysis Accid. analy
Identify NTS & conditions
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

Task Analysis

Identify NTS & conditions
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?

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
Rhona Flin – Demonstrating Competence: Non-Technical Skills
Amsterdam, The Netherlands
June 25, 2015

Council on Licensure, Enforcement and Regulation

SPLINTS development method

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

Nurses’ interview data

“...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 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

Coding Interview Transcripts

How do you keep track of the status of an operation?

There are 3 main ways for the nurses to assess progress. The first is by what the surgeon says, you know, if he’s come upon things he hadn’t expected. You have a procedure you follow and there are certain things you expect to happen. There are some things 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, it’s for something technical happening. So you know how the surgical team react something to the 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 track something, 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 may 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 moody 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?” as they look to you to fill them in. Yes, 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 specialties
    - 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

Positive: Conducts frequent scan of the environment
Negative: Fails to listen to instructions
**SPLINTS taxonomy**

<table>
<thead>
<tr>
<th>Category</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation Awareness</td>
<td>• Gathering information</td>
</tr>
<tr>
<td></td>
<td>• Recognising and understanding</td>
</tr>
<tr>
<td></td>
<td>• Anticipating</td>
</tr>
<tr>
<td>Teamwork and Communication</td>
<td>• Acting assertively</td>
</tr>
<tr>
<td></td>
<td>• Exchanging information</td>
</tr>
<tr>
<td></td>
<td>• Co-ordinating with others</td>
</tr>
<tr>
<td>Task Management</td>
<td>• Planning and preparing</td>
</tr>
<tr>
<td></td>
<td>• Providing and maintaining standards</td>
</tr>
<tr>
<td></td>
<td>• Coping with pressure</td>
</tr>
</tbody>
</table>

**SPLINTS rating form v1.0**

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Surgeon Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td></td>
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**NON-TECHNICAL SKILLS FOR SURGONS**

**Situation Awareness:** Developing and maintaining a dynamic awareness of the situation in theatre based on assembling data from the environment (patient, team, time, displays, equipment). Understanding what they mean, and thinking ahead about what may happen next.

**Gathering information — seeking information in the operating theatre from the operative findings, theatre environment, equipment, and people.**

**Poor behaviour:**
- Jumps in theatre line or has to be repeatedly called
- Does not ask for results until the last minute or not at all
- Does not consider the scene of operating room staff
-未能根据情况做出最佳判断
- Fails to review information collected by team
- Acts on information for use from patient notes during procedure because has not been modified to reflect current state.

**Good behaviour:**
- Reviews all pre-operative checks of patient notes, including investigations and consent
- Seeks out all relevant investigations (e.g., imaging) before entering and are available
- Uses all available information regarding anaesthetic plan for patient
- Co-ordinates operating team for surgery
- Ensures operating theatre environment is ready
- Maintains ongoing blood loss
- Acts swiftly for update
Task analysis
Unstructured observations of scrub nurses at work

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
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 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
(2015) Anaesthesia;
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, O’Connor & Crichton (2008), Aldershot: Ashgate
- Flin & Mitchell (Eds) (2009), Farnham: 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