The diversity of human factors: illustrating the relevance for nursing


Abstract
This article looks at a selection of human factors tools and activities that may be used in nursing practice to improve the safety of patient care. The Human Factors Walk-Around tool and the Foresight training programme are highlighted as means to raise awareness of systems factors that may compromise safety. Ideas are given on how to improve team skills, to consider risk proactively, and to influence the design of the healthcare system in which care is delivered.

Author
Beverley Norris
Correspondence to: beverley.norris@npsa.nhs.uk

Keywords
Human factors, patient safety, systems approach

Review
All articles are subject to external double-blind peer review and checked for plagiarism using automated software.

Online
Guidelines on writing for publication are available at www.nursing-standard.co.uk. For related articles visit the archive and search using the keywords above.

© NURSING STANDARD / RCN PUBLISHING

EARLIER IN THIS series, human factors was defined as an approach to improving safety focusing on how humans work in complex systems. Putting this generic approach into action in nursing may seem daunting. This article will look at what human factors can mean for nurses and provide some simple activities that can be used to help improve safety.

Understanding the system
An underlying principle of human factors is that the systems in which healthcare professionals work will influence the safety of healthcare delivery and the likelihood of human error (Reason 1995, Department of Health 2001). Systems should be designed to fit the people using them, for those systems and people to be effective, efficient and safe. Human factors and reliability science share similar principles: systematically identifying, preventing or mitigating failures and designing systems to compensate for the limits of human performance (Nolan et al. 2004). For example, electronic prescribing systems need to match the mental models of all users in terms of where and how to access key information, how menus work, and the use of symbols, icons and abbreviations. If these attributes are not taken into account, staff are more likely to enter data in the wrong sections, miss out steps and take longer to complete a task.

It is particularly important that these issues are understood when new work systems are being introduced. Even a new piece of equipment can introduce risk if it does not fit with the way people work or other equipment being used. A human factors systems analysis is one way of identifying where potential errors may arise during change. It is a formal approach that considers the influence of all
parts of the system on the safety of a job or task. Carayon et al (2006) used this approach to look at existing risks in outpatient surgery. Staff questionnaires, shadowing patients, and reviews of floor plans and job descriptions were employed to understand the work system, processes, outcomes and risks. Issues identified included the difficulties and timeliness of accessing patient information; unreliable information being sought at the last minute; poor quality of pre and post-operative communication with patients; noise and distractions; manual recording of vital signs and lack of privacy. Suggestions included form redesign and changes in policy and job design.

Carayon et al’s (2006) work shows that a human factors analysis can be a detailed and formal exercise, requiring specialist expertise. However, there are some short, quick activities that can be used by anyone to increase their systems awareness and to apply some human factors principles to ensure they are working safely, either as a spot check or when introducing change.

The Human Factors Walk-Around tool
The Human Factors Walk-Around tool is a short adaptation of a human factors systems assessment. It provides a structured way of examining a task or job and assessing what might be making it difficult to do the job safely. The tool involves a few simple steps including:

- Select a task that you are familiar with, for example taking observations, medication rounds or patient discharge. This could be something that is causing concern, a job that has not been reviewed for some time or something that is about to be changed.
- Define the start and end of the task. Consider where and how it fits into the overall delivery of care.
- Using Table 1, think about how each of these system factors influences how safely the job or task is carried out.
- Ask other users of the system (other staff groups, patients or visitors) for their perspective.
- Try to think how the job or task can be improved.

After the walk-around, findings should be shared and attempts made to come up with some solutions as a group, so that the team can have ownership of any changes. Findings can be discussed with those with influence, for example procurement, clinical engineering, facilities and clinical directors. It is a good idea to buddy up with another department or ward and share findings; it may be that there are similar issues across the organisation. Some suggestions for change are shown in Box 1 (page 38). Any changes must of course then be tested to ensure secondary risks are not introduced either here or elsewhere in the system. The Plan-Do-Study-Act (PDSA) cycle can be a way to trial interventions, starting with changes in one area and gradually spreading to other areas as feedback becomes available (Langley et al 2009).

Foresight
Foresight is a concept to help staff on the front line anticipate when things might go wrong; a kind of error vigilance. The aim is to help staff be aware when they may be working beyond their capacity or when working conditions may be conspiring to make an error more likely. The Foresight training programme is aimed specifically at nurses and midwives and uses Reason’s (2004) ‘three buckets’ model. In each bucket of ‘bad stuff’ are things in the system that may contribute to the chance of something going wrong. Sometimes the systems in which healthcare professionals work may seem so complex it can be difficult to see how things are stacking up in terms of risk. The three buckets – self, task and context – provide a simple way to visualise the system. The types of things that could go into each of the three buckets include:

- The self bucket – are you new to the ward/department? How are you managing your shifts at the moment?
- The task bucket – do you need to take more time for a new task? Do you ever leave jobs halfway through?
- The context bucket – have you had a chance to discuss today’s workload? Are you working in your usual place? Do you have to walk far to complete your tasks?

The training programme includes acute, community and mental health scenarios, such as patient discharge into the community, patient deterioration, nurse prescribing and handover, and includes video scenarios. Staff reflect on these and their own experiences, developing an increased systems and risk awareness that can then be used in their own practice.

The Foresight training programme is flexible to fit in with training opportunities when they arise, so it does not have to take a long time and could be fitted into a regular team meeting. The Foresight model can also be used when planning change or developing new ways of working to anticipate what might go wrong.

Working together for safety
Health care is rarely delivered by an individual working alone. Many people contribute to
the patient journey, at the point of care or before, either directly or indirectly. Healthcare professionals are perhaps some of the best team workers around, forming vital working relationships in short spaces of time, in pressured environments and sometimes even without meeting. Problems with team working or team skills can emerge quickly, however, and become entrenched, undermining many safety practices. Much has been written about the way people work together and how this influences patient safety (Leonard et al 2004, Catchpole et al 2010).

**TABLE 1**

**Considering the system using the Human Factors Walk-Around tool**

<table>
<thead>
<tr>
<th>System factors</th>
<th>Think about</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational and strategic factors</td>
<td>Are central systems such as information technology, procurement, ordering and maintenance easy to use and effective?</td>
</tr>
<tr>
<td></td>
<td>Do rosters or shift patterns cause problems?</td>
</tr>
<tr>
<td></td>
<td>How is change managed? Do all staff groups and grades get involved?</td>
</tr>
<tr>
<td></td>
<td>Do you have any problems with referrals and/or requests to other departments?</td>
</tr>
<tr>
<td>Working conditions</td>
<td>Are noise levels too high to work comfortably and hear conversations? What about alarms?</td>
</tr>
<tr>
<td></td>
<td>How is the signage? Does it work for patients, visitors and staff?</td>
</tr>
<tr>
<td></td>
<td>Are ward and/or department notices and posters up to date or still required? Is there any duplication?</td>
</tr>
<tr>
<td></td>
<td>Is the workspace used by more than one job role? Do they all have an input into how it is designed?</td>
</tr>
<tr>
<td>Task factors</td>
<td>How are new policies introduced? Are they reviewed after introduction to check how they have been adopted?</td>
</tr>
<tr>
<td></td>
<td>Are jobs (such as the medication round) ever interrupted?</td>
</tr>
<tr>
<td></td>
<td>Do you plan for emergencies, distractions or deviations from normal working such as during building work or bad weather?</td>
</tr>
<tr>
<td>Equipment and resources</td>
<td>Are user manuals and instructions easily accessible?</td>
</tr>
<tr>
<td></td>
<td>Is equipment labelling intact? Have additional labelling or notes been added to the equipment? Why are these needed?</td>
</tr>
<tr>
<td></td>
<td>Is colour coding used anywhere and does it work?</td>
</tr>
<tr>
<td></td>
<td>Are you still using old and/or legacy equipment that is no longer fit for purpose?</td>
</tr>
<tr>
<td>Medication</td>
<td>Do you have problems with look-alike and/or sound-alike medications?</td>
</tr>
<tr>
<td>Information systems</td>
<td>Is storage safe and effective?</td>
</tr>
<tr>
<td></td>
<td>Are there any potential errors caused by acronyms or abbreviations?</td>
</tr>
<tr>
<td></td>
<td>Does information (patient notes, letters and results) ever get lost?</td>
</tr>
<tr>
<td>Team and social factors</td>
<td>Do teams work well together? What about virtual or distributed teams that do not meet face to face?</td>
</tr>
<tr>
<td></td>
<td>Can decisions be challenged? Can junior staff speak up?</td>
</tr>
<tr>
<td></td>
<td>Do staff feel supported?</td>
</tr>
<tr>
<td>Education and training</td>
<td>Is staff training comprehensive, accessible and up to date?</td>
</tr>
<tr>
<td></td>
<td>What about refresher training?</td>
</tr>
<tr>
<td>Patient factors</td>
<td>Social and cultural factors – is communication satisfactory?</td>
</tr>
<tr>
<td></td>
<td>Is patient dignity maintained?</td>
</tr>
<tr>
<td></td>
<td>How does the ward and/or department look from a visitor's point of view?</td>
</tr>
</tbody>
</table>

(Adapted from Patient Safety First 2012)
**Team skills**
There are a number of features that influence how well a group of people may work together as a team including:

**BOX 1**

**Suggestions for change following use of the Human Factors Walk-Around tool**

- Have a ‘poster’ amnesty – are they all up to date? Are they all needed?
- Why do you need them? Can you redesign the job so people do not need reminding or warning?
- Rearrange workspaces – who uses them most? Does everyone know where things are kept? Whose jobs are most critical?
- Can you reduce the background noise in your area? Are equipment alarms effective?
- Think about storage of equipment manuals and instructions. Are they easy to find? Does everyone know where they are? Are they up to date? Can the equipment be used safely without them? Is all equipment training up to date?
- Carry out some team work assessments or a safety culture assessment in your area.

**BOX 2**

**Ideas on how to carry out briefings and debriefings**

**Briefings:**
- Why? Briefings ensure a shared understanding of the plan for the day, and can help anticipate and prepare for problems.
- When? Briefings should take place at the start of the day or shift, when all team members are available in the department.
- Who? Any member of staff can lead a briefing. It can be good practice to rotate the lead and particularly to encourage junior staff by stressing that everyone has a valid role and perspective, and by avoiding blame and criticism.
- The team. Members should introduce themselves and discuss who is doing what, where and when.
- Overview of the day. Review details of each patient and specify a clear plan and expectations.
- Questions and concerns. Ask for potential risks and hazards, and identify and discuss contingency and mitigation plans.
- Check. Ensure everyone feels comfortable about the day and remember that everybody has a valid role, perspective and opinion.

**Debriefings:**
- Why? Debriefings encourage team learning by capturing problems, trends and near misses. The aim is to improve, not blame.
- Who? As with briefings, consider rotating the lead and encourage junior staff and students.
- What went well and why? Did you work as well as you could have? If not, why? Did you speak up when you needed to? Did everyone work well as a team? Was everyone well prepared?
- What did not go well and why? Were there any surprises? Were there any errors, near misses or glitches? What were they linked to (an opportunity here to think about the work system)?
- How to debrief? Encourage openness and honesty and everyone to contribute. Reflect on your own work as well as others’ No direct criticism or blame should occur. End on a high or positive learning point.
- Feedback. Does anything require escalation? What can each person do? Who will take the recommendations forward? Record successes and learning points.

(Adapted from Patient Safety First 2010)

**Anticipating what can go wrong**

Research in the UK has shown that the majority of risk management activity in the NHS is reactive, focusing on learning from incidents (Clarkson et al 2009). By contrast, proactive hazard analysis focuses on the prediction of future hazards and errors. This is a standard approach in high-risk industries, and allows appropriate defences to be built once risks are identified. Health care is characterised by almost continuous change, therefore identifying future potential hazards and their consequences is needed more than ever. This can be done at every level, from senior
management through to ward level. There are a number of tools available to do this, such as failure modes and effects analysis (FMEA) (DeRosier et al 2002).

FMEA is becoming more widespread in healthcare following the requirement in the United States for healthcare organisations to carry out at least one FMEA per year (Spath 2003). Other tools include Hazard and Operability Studies and the Structured What-If Technique. Moves are in place to make these tools easier to use in healthcare, such as the Prospective Hazard Analysis toolkit developed for the NHS (Clarkson et al 2009). These may sound like complex tools, but all are predicated on the concept that formally and systematically anticipating and managing what can go wrong in the system, and including all staff in this process, is vital to managing safety.

**Structured approach**

While a full and formal prospective hazard analysis will be part of formal risk management, anticipating risks when introducing change can be done at more local levels. It is important to think ahead to what hazards could arise from all parts of the system. Questions used in the Human Factors Walk-Around tool or in the Foresight programme could help visualise workplace systems. The basic steps in a proactive hazard analysis include:

- Define the area to be considered and why.
- Describe the process (include all parts of the system).
- Identify hazards.
- Specify the consequences and likelihood of hazards.
- Assess acceptability of the risk and how it could be reduced.
- Communicate findings.

**Influencing design**

It might seem like the physical design of the healthcare world is the responsibility of others, such as architects, medical device companies, pharmaceutical companies, chief executives and beyond. While design decisions and standards are often driven at a national or international level, and are subject to financial pressures, everyone can have a role in design.

One of the first steps to good design is to understand user requirements. Put simply, this means having a good understanding of the people who will use a device or piece of equipment, and where it will be used, what for and how. To do this usually means designers observing people doing their jobs and involving them in the design process. This can be difficult to do in healthcare.

Ethical requirements, time pressures and logistics make it difficult for designers to access healthcare environments and staff. Also, there is often some distance between the people who use devices and those who buy them, since the time and resources available to test equipment is limited. However, there are ways that staff can help influence design.

**Help influence procurement**

Front line staff have the best view of whether a piece of equipment or a workplace meets the needs of the job. It is vital to include this perspective in the procurement or facilities design process. Good feedback mechanisms, such as the formal involvement of staff in evaluations, are needed and staff should make the most of opportunities to get involved. Box 3 shows some usability and design principles that can be used to help frame this feedback, so that those with responsibility for procurement, or those who wish to get their thoughts heard, can ensure assessments are complete and representative.

In addition, it is important to let others know when there are problems with a device; whether it is faulty or just difficult to use. This will be useful for others in the organisation and specialist networks. Faults need to be reported nationally, and manufacturers will welcome feedback on usability.

**Workplace organisation**

The space in which an individual works will affect the likelihood of making an error. Key environmental issues such as noise, lighting and temperature can cause distractions, make it difficult to concentrate and directly affect how effectively information is processed. There are guidelines for the design of the physical environment at work, but just being aware of what is making work difficult can go a long way.

---

**BOX 3**

**Choosing safer devices: usability and safety principles**

- Who will use it? Do you know all the potential users? What experience and skills do they have? Will they all use it in the same way? Are they used to using different designs and/or models? Will they have the same access to training?
- Where? Is the device suitable for all of the environments in which it will be used? Will it be moved? Where will it be stored? Will it go home with the patient?
- What for? What jobs will it be used for? Is it easy to clean and will it need to be reset? Is the manual needed to operate it? If so, is it available and easy to use? Is the colour coding appropriate? Are the connectors satisfactory? Are the symbols easy to understand? Are the alarms easy to set and adjust? Is the packaging clear? Can it be used in emergencies?
way to improving safety and working practices. For example, it is important to place equipment and computer displays so that there is no glare or reflections on the screens and to shut out background noise where possible.

The layout of the workplace is also important. Issues such as clutter, storage, writing surfaces and travel distances will all affect the chance of picking up the wrong drug, misplacing notes, forgetting things or cutting corners. Think about what equipment is needed most often, what is needed in an emergency and the things that are most likely to get mixed up when laying out the workspace. Many healthcare workspaces are shared, for example nurses, doctors, allied health professionals, porters, visitors and patients all use and work in the bedspace. It is important to think about the most frequent tasks, but also the most critical ones and whether everything that will be needed in an emergency is accessible. Everyone that uses the space should have the opportunity to contribute to decisions about where things are put. Signage, posters, floor surfaces, infection control measures, power points and provisions for cleaning, porter and catering services are all things to consider. There is a wealth of guidance and ideas available for individuals who wish to get involved in the design of their workplace (NHS Institute for Innovation and Improvement 2009, NPSA 2010).

Conclusion

Human factors is a discipline that promotes user-centred design and a systems approach to safety. While some human factors techniques and approaches may require specialist input, the basic principles are common sense and can be used at all levels, from the boardroom to the front line, to help improve safety. The Foresight training programme is a good place to start to teach systems thinking and to help staff reflect on when and how things may go wrong. Combining this with the Human Factors Walk-Around tool provides an opportunity for staff to review their work systems and acts as a conduit for all staff to feedback their views. Encouraging staff to think about their systems of work and to feed into workplace design, facilities design and procurement will aid inclusive design. Those working closely with patients often have a unique view of what can and does go wrong, and the insight to help find solutions NS

References


