The importance of applying human factors to nursing practice

**Abstract**

The aim of this series is to introduce the topic of human factors and to show how it can be used in nursing practice on the ward and in nursing management, to improve the safety of patient care. Human factors can be used to make many aspects of working life easier, and if it is easier to do it is less likely to go wrong. This article discusses the importance of human factors in nursing and provides some practical suggestions on how to apply the principles of human factors. Forthcoming articles will examine human factors tools, surgical safety and human reliability in more detail.

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Defining human factors

The term human factors (Box 1) is used in a number of ways in health care but, put simply, human factors means designing to fit people, or ‘making it easy to do the right thing’. It is a scientific discipline that developed from studying people working under physical and cognitive stress during the second world war. The premise is that the design of our workplace, equipment and working processes should be based on human abilities and characteristics – how we process information, communicate, make decisions and remember things – rather than expecting people to adapt to the poorly designed world around them. Contemporary human factors uses knowledge from biomechanics, psychology, social sciences and safety engineering to design systems that are effective, efficient and safe. In some industries, changes to a workplace cannot be approved without first going through a human factors evaluation; for example, the introduction of new equipment would be assessed for how it affects mental workload and error (Defence Procurement Agency 2006). In the NHS, where change seems to be a feature of daily life, it may be difficult to imagine how human factors could possibly have this sort of role. In this series of articles we hope to show that human factors can be used by everyone, from clinical nurses through to managers and executives, to make it easier for staff to do the right thing to ensure errors – even though these can never be eliminated in health care – can be minimised.

Thinking about people

A human factors approach to system design considers the characteristics and abilities of the people who have to work in that system, and how to optimise that system. This could include:

- Physical abilities – responses to fatigue, the effects of shift work, the effects of stress, manual or patient handling and so on.
- Perceptual abilities – how information on charts is read, reactions to alarms and the effect of lighting and noise.
- Cognitive abilities – mental models of how things are expected to work, how much information we can remember, what affects our decision making, response times, the types of errors made and what actions we prioritise from conversations.
- Social and interpersonal characteristics – how to work in teams, our response to rules and our willingness to take risks.

Thinking about systems

The definition of human factors shows that the focus is on people working in complex systems. Systems include the equipment, devices, medication and information systems being used; the jobs and tasks being carried out; the physical environments and workplaces in which they are carried out; and the teams, organisation and culture within which that happens.

For systems to work safely, consideration needs to be given to how each of these can be optimised to help staff work without error:

- Workplaces that are laid out to minimise travel distances.
- Alarms that are set so that they only go off when they require a response.
- Colour coding that makes connections easier.
- Devices that are intuitive to operate without needing to consult a complex instruction booklet.
- Workplaces that meet the needs of all the staff who use them (nurses, doctors, allied health professionals, administrators, porters).
- Environments that provide space to work without excessive noise or temperatures.
- Rotas that allow teams to get together to discuss how they are working.
- Organisations where staff are consulted and involved in changes to their working practices.
- A culture where staff are encouraged to speak up.

Human factors can be used to improve the design of physical things, such as device interfaces/ control panels, packaging, forms and charts, lighting levels and storage. Improvements are often immediately palpable and it can be easy to compare the before and after of design changes. However, human factors also considers issues that are less physically apparent such as work design. This means thinking about how tasks fit together to make up a working day: for example, how tasks are prioritised, what information is required and when, interdependencies with other departments or staff, and what happens in deteriorating or emergency conditions. It is probably rare for the totality of a job to be viewed in this way, particularly when changes are introduced. For example, is the effect of a new protocol or

**BOX 1**

**Definition of human factors**

Human factors ‘is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimise human wellbeing and overall system performance’.

(Human Factors and Ergonomics Society 2000)
guideline on a typical nursing shift assessed in terms of workflow, how tasks are prioritised, what gets left out and what corners are cut?

**Principles of human factors**

Human factors is a profession with recognised qualifications, international professional bodies and techniques, and tools that require extensive training and practice. Changes to complex systems require expert application of specialist techniques such as mental workload assessments, human reliability assessments, task analysis and prospective hazard analysis tools. While these will be outside the interest of many healthcare staff, human factors is underpinned by a number of principles which mean that the philosophy of human factors can be used by non-specialists.

**Anticipate what can go wrong**

Cognitive psychology and models of human error teach us that people will get things wrong regardless of expertise, training and motivation. We make errors even when we are well practised at a job – the errors will just be different to those we make when we are learning (Reason 1990).

Think about how many times you have forgotten to record something on a fluid chart, hand over an important piece of information before you went home, get a new stock of a patient’s medication that has run out, or check someone’s observations following surgery. Everyday repetitive tasks are prone to problems such as missing out steps or losing sight of detail.

Given what we know about human error, we need to anticipate what can go wrong and incorporate suitable defences. For example, we also know that people will take shortcuts; if there is an easier, quicker way of doing things then someone will do it. These shortcuts are often well intentioned and done in the name of efficiency. Often it is not a case of poor motivation, but rather the system that makes it difficult to do the right thing. We know that introducing new equipment that operates differently to existing or associated equipment is likely to cause confusion.

These are all errors or failures that we can anticipate. Formal, systematic assessments of how, where and why things can go wrong is the first step in safety or risk management. Prospective hazard analysis tools such as Failure Modes and Effect Analysis (DeRosier et al 2002) can help to anticipate this. Other techniques that prospectively anticipate what can go wrong have recently been adapted for health care (Clarkson et al 2009).

**Speak to the people who do the job**

A key principle of human factors and good usability is to involve users in the design process. Sometimes they can come up with the best design solutions as they are closest to the job (NHS Institute for Innovation and Improvement 2009). ‘Users’ are the people who best understand the environment, patients, equipment and processes involved. They are the people who know what works well and what does not; the shortcuts, errors and accommodations that are made every day to get the job done, which rarely surface unless something goes wrong. It is important to talk to all those who have a view of the job; not only the main job roles such as the nurses operating the infusion pumps, but also the people who clean, maintain, transport, store, buy the equipment and the patients receiving the medication. They all have different experiences and needs. This may sound arduous, but a simple, formal engagement process will help staff and patients feel empowered to speak up when decisions are being made.

**Consider the entire system**

Root cause analysis (National Patient Safety Agency 2006) is an incident investigation technique that looks beyond the immediate causes and looks for factors in the system that have contributed to what has gone wrong. This approach is a characteristic of a positive safety culture where fair blame is sought; where the influences of the organisation and the system on the way people work, and the decisions they make, are considered, as well as individual culpability. As well as looking back at what has gone wrong, this principle is also important during planning, and when introducing change. Context is important and assumptions are often made about the wider effects of change. When new ways of working or new equipment are being introduced, consideration should be given to how the change is going to affect immediate staff and processes, as well as to those who may not seem directly affected:

- Do all related departments know about changes in scheduling, ordering systems or accountability? How will it affect them?
- If information systems are being changed has everyone who needs to know been informed?
- If a new performance target is being made a priority, what happens to the other jobs – when will they be done?

**Manage safety proactively**

Safety is a continuum and the nature of risk means there is no guarantee of absolute safety. Similarly, the systems in which we work (and live)
are continually changing: changes in staff, patient demographics, training, technology, national policies and local governance all influence safety. It is not enough to assess the safety of a working system when it is introduced; the fast rate of change in health care means that safety needs to be reviewed and managed as part of regular governance activities. Staff should also be encouraged to monitor when they think safety is being compromised, even if everyone was satisfied when things were introduced, and to provide feedback.

**Standardise and simplify**

Standardisation is an accepted safety approach in many industries; where equipment and processes are standardised and operate in the same way they are easier to use, as there is less mental effort required to understand and process the way things work. There are circumstances when local adaption is necessary; one size does not always fit all as local conditions may dictate specific ways of working. For example, specialised units may require additional data categories on charts and forms. There can be extreme variation in healthcare practice, however, which is hugely difficult for locum staff and for staff moving between organisations. Pressure is put on resources for inductions and will often introduce risk, such as the variation in wristband colour coding conventions found in and across hospitals (Seydalis et al 2009).

One way to introduce standardisation and still allow local adaptation is to use generic design principles and to develop core requirements that are standardised in all settings. For example, when designing forms and charts:

- Use generic guidance around readability and layout, for example minimum font size, writing space, how to prioritise information, requirements for photocopying (Nielson and Mack 1994).
- Core datasets can be developed which ensure the same information will be included and presented in the same way in all settings.
- Specific guidance on known errors can be used, such as ensuring the same acronyms and abbreviations are used throughout an organisation.
- Ensure generic design conventions are always used in the same way, such as graphical trends on early warning charts or traffic light systems.
- Future modifications should be checked and recorded to ensure they do not diverge too far from original requirements. Ensuring standardisation throughout an organisation will reduce development time and cost and avoid replication of effort – how many forms are recreated every day in the NHS?

**Applying human factors to clinical practice**

These generic human factors and safety principles may sound difficult to apply to everyday nursing practice and management, but they can be made relevant to managing safety at work. The next four articles in this series will describe how to do this in more detail. This article now summarises how human factors can be incorporated into everyday activities.

**Get involved in safety**

- Do not leave it to others – make suggestions for improvements and if you are on the receiving end of these suggestions, ensure these are acted on.
- Get involved in the procurement of equipment and devices, and make sure that you give feedback about any problems you experience with the usability or reliability of equipment.
- If you have a procurement responsibility, make sure there is a process for staff to feedback their experiences of using equipment. Manufacturers also welcome feedback.
- Review the forms and charts that are in use. Are they up to date? Have they had to be adapted locally? Does all the information fit on?
- Think about the induction on your ward or department? Is it adequate? Is it up to date?
- Think about emergencies and contingencies. Is the department prepared?
- Does anything ever go missing?
- Review the posters and signs in your department? How many signs do you have to remind and warn staff, patients or visitors about risks? Do they work? Is there a better way of doing this?

**Adopt a systems view**

- Think about the system you are working in – not just the details of the job but how the organisation, teams, workplace, equipment and the environment affect how safely you can work.
- Share these findings with other staff, wards or departments. Do they have the same problems?
- How often do you have to take risks or shortcuts to get the job done? Have you had to adapt the recommended way of doing things to make it work? Think about why this is and provide feedback.
- Do you ever have to work on incomplete information or make assumptions?
Is there equipment that does not work well but you still have to work with it? Who can you tell?
Is there pressure on you to use equipment or undertake a task that you are not comfortable with?

Keep on top of safety
Make sure you get involved when you know changes are being implemented.
Is patient safety being compromised? How well are protocols adhered to? If they are not working, think about why not.

Encourage openness
Speak up when you are concerned about safety.
Reporting incidents is one of the main ways to learn about safety – talk to colleagues about a near miss you have experienced.
Challenge other staff if you feel they are compromising patient safety, or find a way of getting your concerns heard.
Can you introduce team working activities, briefings or debriefings in your department?
The next article in the series will examine a variety of tools and activities that can help you apply human factors in your work.

Conclusion
Patient safety is integral to nursing and must be part of everyday clinical practice. An understanding of clinical human factors will help nurses to understand how the design of the systems, processes, equipment and environment that they work in and with affects the ability to deliver safe patient care. An understanding of the concepts and models applied within human factors is essential if nurses are to make significant improvements in enhancing patient safety in clinical practice.

References


