

PATIENT SAFETY

Meeting of the Parliamentary and Scientific Committee on Tuesday 13th October

HUMAN FACTORS AND PATIENT SAFETY



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In recent years, patient safety has become an increasingly important issue for hospitals, general practitioners and home healthcare. Considerations range from the safety of a particular device to support treatment for a long term condition such as cancer, kidney failure or diabetes, to understanding how we can ensure that operations are conducted as safely and effectively as possible. There is an increased interest and urgency in ensuring that our healthcare professionals, the technologies and equipment they use, the rooms or buildings in which they work and the organisations which employ them are designed in a way that enables them to work to the best of their ability and to provide the highest possible standard of care.

Ergonomics and Human Factors (the two terms can generally be used interchangeably) can be very basically described as the discipline that provides the underpinning scientific understanding that enables us to “fit the task to the person”. What

this means in practice is that ergonomists and human factors professionals develop skills and knowledge to inform the design of technologies and artefacts that are used by people in working contexts.

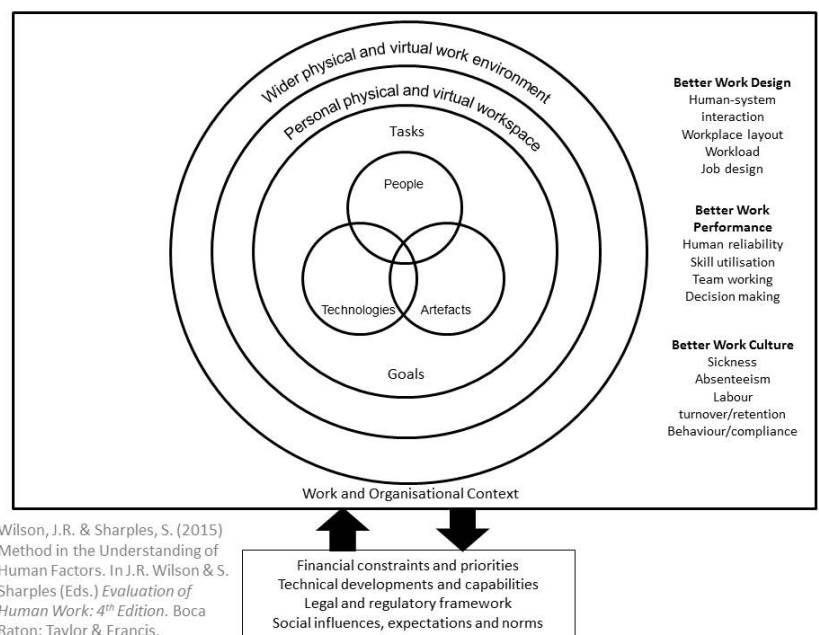
People in these contexts have tasks (for example, a ward nurse may have the task of taking a patient’s blood pressure) alongside goals (the same nurse may have the goal of ensuring that the patient feels cared for and attended to during their stay on the ward), and these tasks are completed in an immediate, or personal workspace, (the individual hospital bed) within a larger work environment (the ward or hospital). All of this happens within a wider organisational context, and is influenced by external financial constraints and priorities, technical developments and capabilities, the relevant legal and regulatory framework and social influences, expectations and norms.

In 2014 the Institute of Ergonomics and Human Factors was awarded the Royal Charter, and members are now entitled to apply for the status of ‘Chartered Ergonomist and

Human Factors Specialist’. A Chartered Ergonomist and Human Factors specialist is required to have a broad set of knowledge about all aspects of the physical, cognitive, social and

our current and future health care systems and technologies.

One area that has received much attention is the design of processes to support patient



Wilson, J.R. & Sharples, S. (2015) Method in the Understanding of Human Factors. In J.R. Wilson & S. Sharples (Eds.) *Evaluation of Human Work: 4th Edition*. Boca Raton: Taylor & Francis.

organisational aspects of work, and will take a ‘systems perspective’ to understand the different interactions that happen within this work context. The goal of ergonomics and human factors (E/HF) is to deliver better work design, better work performance and better work culture.

All aspects of E/HF are highly relevant to the challenges of patient safety. Recent years have seen a welcome increase in the focus on human factors within the clinical context, and have seen innovations in process and product design. But there is still much more opportunity to incorporate E/HF expertise in many aspects of healthcare, for

safety in the operating theatre, with a particular focus on communications between theatre team members. This work, in many cases prompted by tragic cases where communication failures have contributed to patient injury or death, informed the development of the surgical safety checklist, pioneered by Dr Atul Gawande (US clinician who also delivered the 2014 Reith Lectures). This approach asks clinical teams to work through a series of prompts to check details and plans of upcoming procedures, and also to facilitate discussion, reflection and communication within the operating team. While this is not

the only approach that can be used to build communication amongst teams, and is only successful if used diligently and with full commitment from all team members, it represents a valuable intervention that raises awareness of human factors in the operating theatre.

But the discipline of ergonomics and human factors covers matters far beyond the behaviour of humans. One of the areas in which E/HF can offer a significant contribution is around the design of medical devices and equipment. Examples where the role of design has been singled out as being an influential factor in a medical incident include the tragic death of Wayne Jowett, who received an injection of a drug that should only ever be delivered intravenously (ie into the bloodstream) into his spinal fluid. Design solutions now exist that should prevent such an error, such as 'lock and key' systems that prevent spinal drugs being attached to delivery devices for the bloodstream, and vice versa. However, these solutions have been noted to be difficult to implement in a complex healthcare system. In addition, some design solutions are not always suitable for all



Two different infusion devices delivering medication to one patient in hospital. These devices are programmed by nurses; they should be designed to maximise patient safety (minimising the likelihood of the user programming the wrong rate or volume of medication) – eg, by having consistent interfaces and intuitive user interaction.

©EPSRC funded CHI+MED project (www.chi-med.ac.uk).

infrastructure changes that would be needed to enable this change to be implemented mean that this has not yet happened. Our complex and distributed healthcare settings face the same challenge.

The Chi+Med project, led by University College London, has examined the design of infusion devices, used for drug delivery,

device might independently stand up to scrutiny when subject to usability testing, if a nurse is required to rapidly switch between two devices, one of which requires a single button to be pressed multiple times to achieve a certain setting for flow rate, but another of which requires a combination of several buttons to be pressed for the same setting, it is not surprising that even the most competent operator will occasionally make an error. There are of course systems in place to minimise the likelihood of this, such as requiring colleagues to check settings, but we know that in settings that are busy, safety-critical and stressful, such as hospitals, human performance is put under great strain, and workload can be consistently high.

Another value of taking an ergonomics/human factors perspective to design is that we naturally consider all actors within a system. A nice example of this has been shown by work led by Professor Sue Hignett of Loughborough Design School, who led a holistic design of a novel birthing pool, taking into account the comfort of the mother, the different positions a mother might take up during birth and while being examined,

comfort of both the mother and the medical professional was maintained.

The nature of healthcare is changing, and the discipline of medicine is advancing rapidly. Dansen (2011) has noted that by 2020 the doubling time of medical knowledge (eg the amount of information that exists related to the medical domain) will be just 73 days. Doctors are already developing ways to manage this safety critical knowledge, by designing tools to ensure that important information about dosing are close to hand, and by embracing mobile devices to support the capture of medical information and enable rapid checking of resources that can help diagnosis and treatment. Technologies are also changing the ways that patients manage and monitor their own health, from using 'apps' to monitor healthy behaviours, to providing peer support networks for patients with similar clinical conditions.

As well as technologies providing opportunities to help manage the volume of information, and to support patients in taking control of their own healthcare, technologies also provide an opportunity for

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patients (eg a design solution that prevents errors in administering medicines for adults may not always be transferable to the paediatric setting, due to the smaller volumes of drugs involved (see Newton et al, 2010, for further explanation). To take an analogy from a non-healthcare context, if we designed the nozzles for diesel to be a different shape to the nozzles for petrol, and it was then impossible to put the wrong type of fuel in a car, thousands of individual drivers would avoid costly repairs each year, but the massive-scale

mainly in hospital settings. Their work has highlighted a vast range of designs of infusion devices, as well as the need for specialist training of those using infusion devices, to minimise the likelihood of error. Their work also highlights the complexity of device design in the complex healthcare setting – it is often the case for example that procurement processes and financial constraints mean that several different devices designed by several different manufacturers are all sited in the same hospital setting, perhaps even on the same ward or for the same patient. While each



Ergonomic Birthing Pool

©Professor Sue Hignett

and the needs of the partner and the midwife. This holistic approach ensured that the

us as E/HF practitioners to further our understanding of how the work of clinical

professionals is impacting upon them. Physiological monitoring is now advancing to such an extent that it is becoming possible to monitor how busy different clinical staff are or how they are moving around a hospital. By combining different sets of data about clinical work we can start to support the design of clinical work more effectively, modelling patterns of tasks within different healthcare contexts, designing layouts of healthcare settings to be more supportive of the different types of tasks that take place, and helping managers to plan effective levels of staffing.

... support the design of clinical work ...

Ergonomics and Human Factors has much to offer to support the design of healthcare, and contributes to the improvement of patient

safety in all clinical settings. There are a number of things that will help this to happen:

1. To move beyond the emphasis on attribution of 'root cause' and 'human error' to understanding the good practice that contributes to a 'resilient system';

2. To ensure that when incidents occur, investigations are followed up with action, and resources are deployed to enable the lessons learned when, sadly, things do go wrong, to be transferred as widely as possible;

3. To harness the potential provided by the vast sets of data that are now being generated, about patient health state and clinical performance; and

4. To ensure that we always consider the whole system and its stakeholders.

Healthcare is complex – a hospital comprises not only the patients and clinical staff, but also porters, cleaners,

... Patient care involves many skilled people ...

procurement specialists, maintenance engineers, data analysts, and managers. Patient care involves many skilled people, and affects not only the patients but also their relatives, friends and carers. And clinical tasks involve multiple devices and artefacts. E/HF has a valuable role to play in supporting the design of the current and future healthcare environment, and is critical if we are to ensure that patient safety remains a priority for the future.

References

- 1 Newton et al. (2010) Making Existing technology safer in healthcare. *Qual Safe Health Care* 19: i19-i24.
- 2 Densen, P. (2011) Challenges and Opportunities facing medical education. *Trans Am Clinical and Climatological Association*, 122.

Other speakers at the meeting on 13th October were Jocelyn Cornwell, Chief Executive, The Point of Care Foundation, and Janet Anderson, Senior Lecturer in Adult Nursing, Kings College London. We hope to publish summaries of their talks in a future issue of Science in Parliament. Recordings of their presentations, together with the powerpoint files can be found at www.scienceinparliament.org.uk.

ROYAL SOCIETY PAIRING SCHEME

Alan Malcolm

Once again the Parliamentary and Scientific Committee supported the Royal Society in the launch of its Pairing Scheme on 23rd November.

Each autumn the Royal Society coaxes a few dozen MPs, (as well as some senior civil servants) to be paired with a scientist from their constituency.

The scientist spends four days in Westminster "shadowing" the MP to gain an insight into how Parliament works. The universal reaction from the scientists is to note how incredibly hard MPs



Jo Johnson MP, Minister of State for Universities and Science, Dr Julie Maxton, Executive Director, Royal Society, Nicola Blackwood MP, Chairman, House of Commons Science and Technology Select Committee