

# Use of Human factors engineering in safe digitalisation

SIMPO Brno, 10.09.2025

Marc Lazarovici



## CoI und thanks

- No endorsement or recommendation (or bashing) of products
- Added usability testing to our simcentre portfolio
- Long-term connected to SESAM





WHY?



# Pressure





## Presence versus telemedicine









## Digital

- Workp
- Patien
- Tools
- ...





## Bright future







SAFENESS AND  
EQUIPMENT OF

FIREFIGHTERS AND  
EMERGENCY LINES

## WORK SAFETY

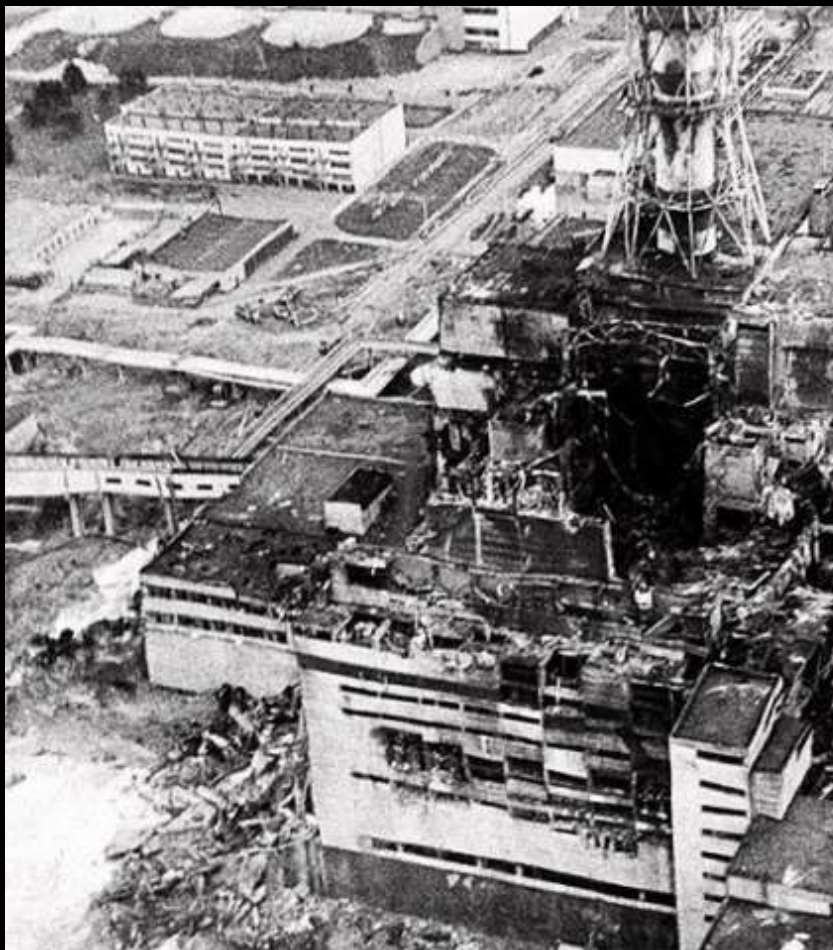


## PLACE





# Safety culture



*safety series*  
**safety series**  
**No.75-INSAG-1**

SAFETY SERIES No. 75-INSAG-1

## **SAFETY REPORTS** **safety series**

### **Safety Culture**

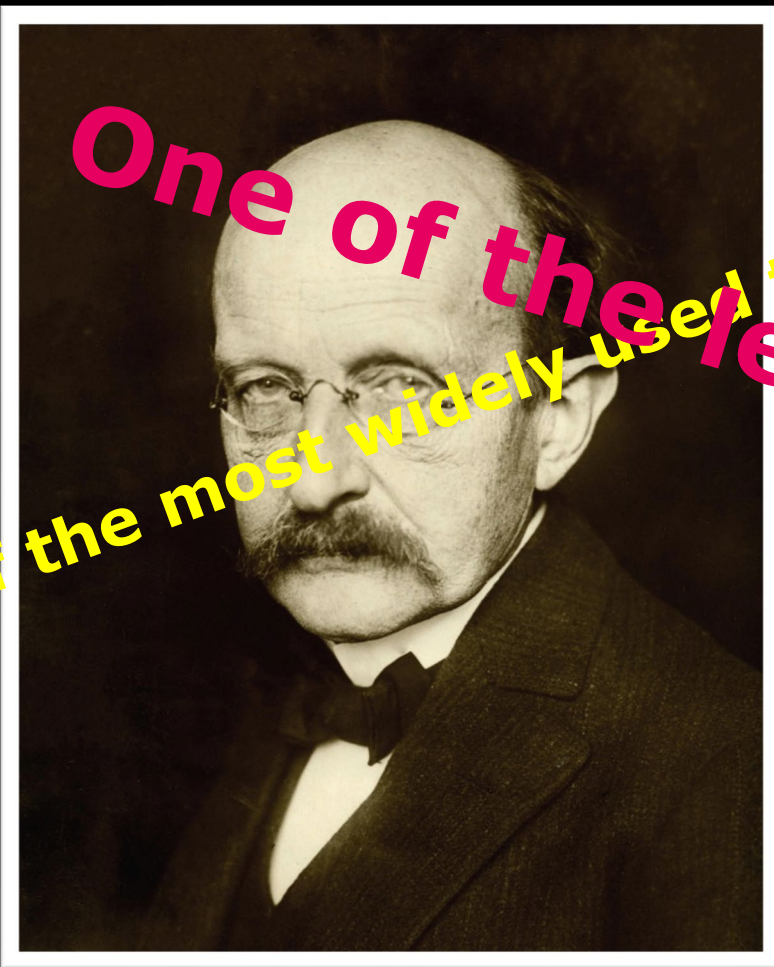
A REPORT BY THE  
INTERNATIONAL NUCLEAR SAFETY ADVISORY GROUP



INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, 1991



## Human factors



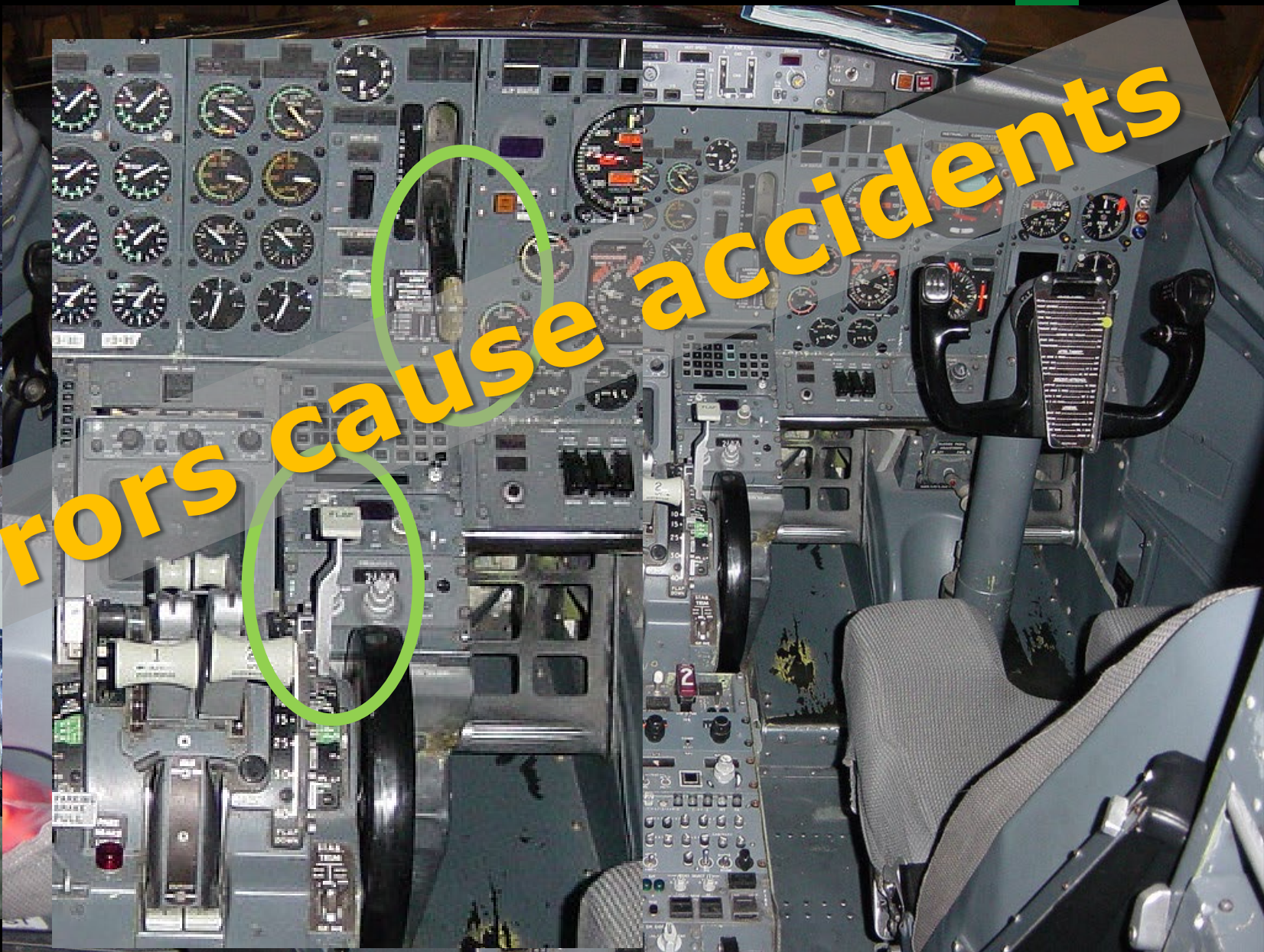
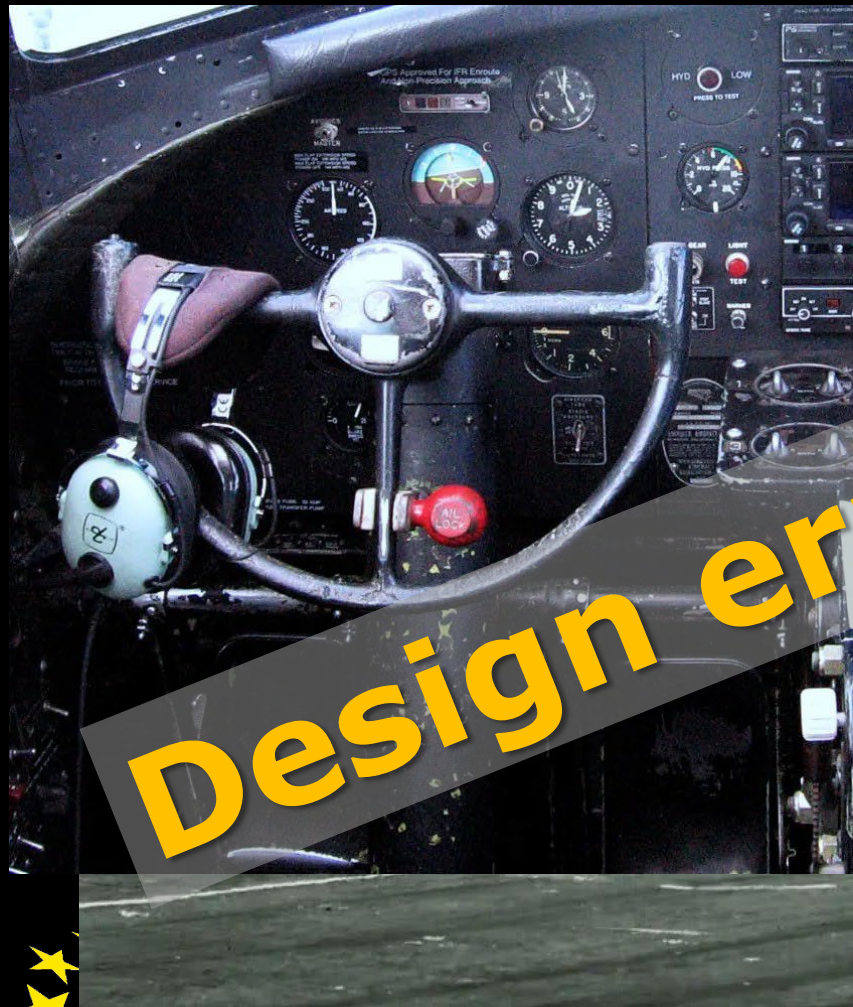
One of the most widely used terms around patient safety



One of the least understood terms!



## Human factors





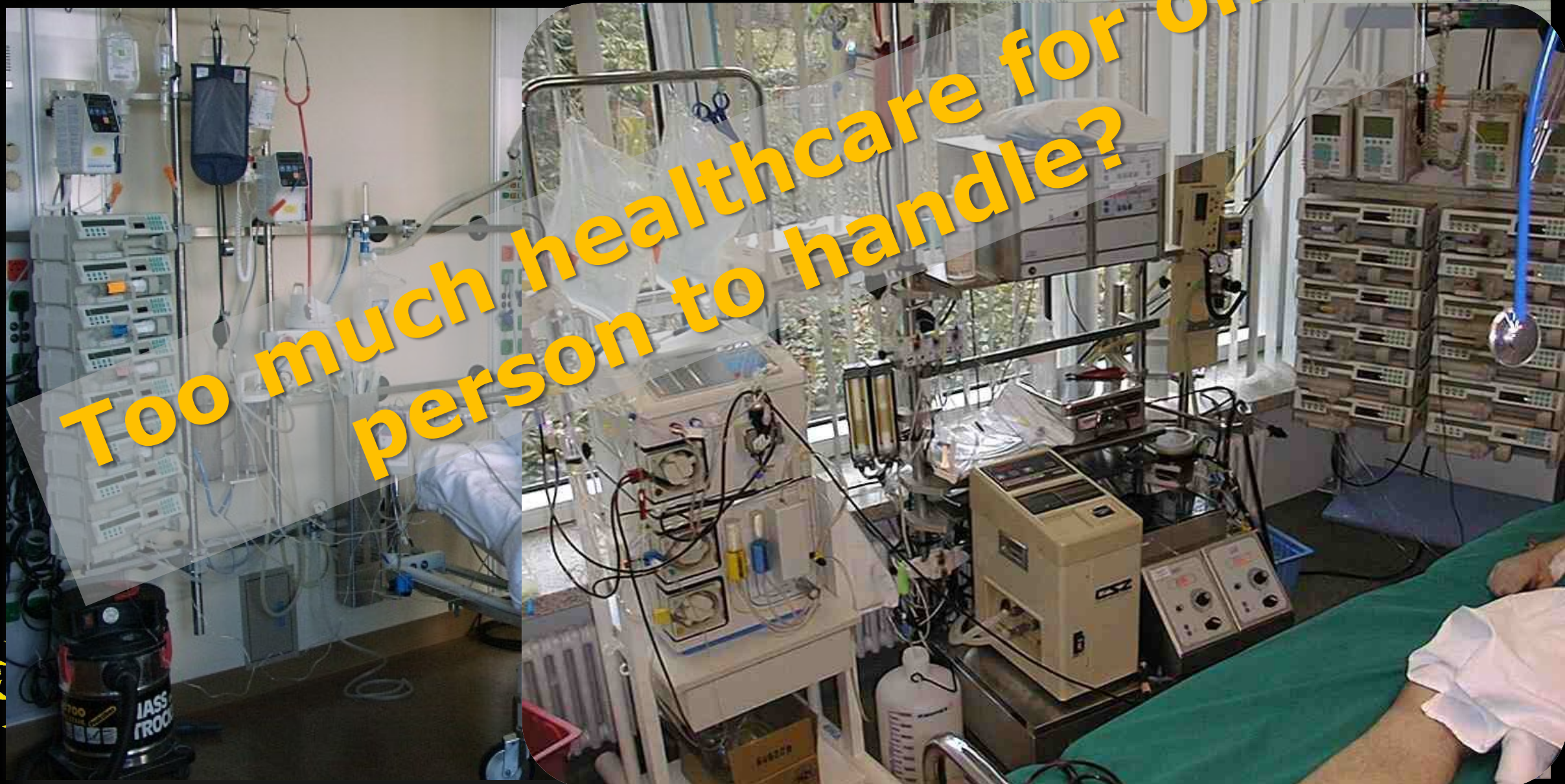
Too much plane for one man to fly





## System design

Too much healthcare for one person to handle?









# Design problems



## JUX Journal of User Experience

### Usability of Electronic Medical Records

by John B. Smelcer, Hal Miller-Jacobs, Lyle Kantrovich

#### Peer-reviewed Article

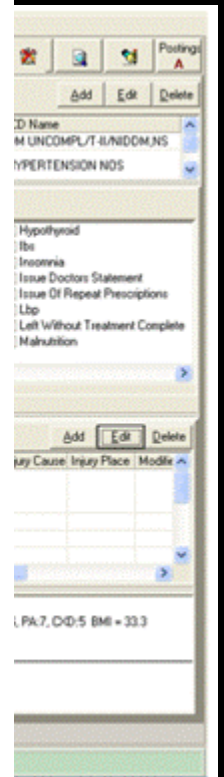
pp. 70-84

#### Abstract

Health care costs represent a significant percentage of a country's GDP. Implementing electronic medical records (EMR) systems are a popular solution to reducing costs, with the side benefit of providing better care. Unfortunately, 30% of EMR system implementations fail, often because physicians cannot use the EMRs efficiently. User experience problems, based on our experience at several clinics, are wide-spread among EMRs. These include loss of productivity and steep learning curves.

To help usability professionals contribute to the creation of more usable EMRs, we share our insights and experiences. Essential to understanding EMRs is the physician's task flow, which we explain in detail. It is also helpful to understand the different work styles of physicians, variations in the pace of work, the use of nurses, the mode and timing of data entry, and variations in needed functionality. These variances in task flow, work styles, and needed functionality lead us to propose solutions to improve the usability of EMRs focusing on: flexible navigation, personalization and customization, accessing multiple patients, delegation of responsibility among medical personnel, and enabling data variations and visualizations.

MU KLINIKUM



<https://uxpajournal.org/usability-of-electronic-medical-records/>



# Still a problem

## Quality and Safety Learning Corner

### Using Human Factors Science to Improve Quality and Safety of Healthcare

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**Keywords:** human factors, quality improvement, patient safety

#### LEARNING OBJECTIVES

1. Describe fundamental human factors (HF) concepts and approaches.
2. Outline key HF priorities that can be applied in diverse areas of healthcare.
3. Explain the multifunctional potential of the Systems Engineering Initiative for Patient Safety (SEIPS) framework for problem-solving, redesign, and improvement.

#### INTRODUCTION

Human factors (HF), also known as ergonomics, is the study of how humans interact with a system. In a healthcare setting, the study of HF seeks to optimize the quality and performance of healthcare systems while enhancing the well-being of both the individuals receiving care and the professionals providing it. Multiple agencies, including the World Health Organization and professional associations, have highlighted the urgent need to integrate HF-based science for improving the quality and safety of healthcare.<sup>[1,2]</sup>

There are clear synergies between and quality improvement (QI) and HF science, having different but potentially complementary system-based approaches. HF science explores a problem by placing humans as the central component of system, focusing on their interactions with each other and the wider work system, then redesigning tasks, interfaces, and work processes. QI science generally aims to

define care processes and implement changes by testing different approaches to achieve a desired outcome and make processes more reliable (which is not always analogous to making them safer). Exploring synergistic collaboration should be a priority to add value to both approaches.<sup>[3]</sup>

The aim of this article is to highlight the multifactorial importance of embedding HF concepts and methods across a diverse range of initiatives to improve the quality and safety of healthcare.

#### KEY PRIORITIES FOR HF SCIENCE IN HEALTHCARE

The HF-based systems approach provides a novel framework for integrating people, technology, physical and social environments, and work systems to safeguard patients and healthcare workers. Thus, the key priorities for an HF-based approach to QI include the design of healthcare facilities, usability of technology, opportunities for learning, and more.

#### Systems-Based Approach to Safety

A well-known HF framework for analyzing and redesigning healthcare safety systems is the Systems Engineering Initiative for Patient Safety (SEIPS) (Fig. 1). SEIPS can have significant potential in supporting care organizations and teams in taking a systems-based approach to collective learning from patient safety incidents and complaints as well as successes from routine healthcare. SEIPS can



Global Patient Safety Action Plan 2021–2030.  
World Health Organization.

Bowie P, Baharnah AA, Alkutbe R, et al. Using human factors science to improve quality and safety of healthcare.

Glob J Qual Saf Healthc. Nov 26, 2024; 8:93–96. DOI: 10.36401/JQSH-24-X8.

## PROCESS AND SYSTEMS The contribution of human factors and ergonomics to the design and delivery of safe future healthcare

Authors: Mark Sujan,<sup>A</sup> Laura Pickup,<sup>B</sup> Paul Bowie,<sup>C</sup> Sue Hignett,<sup>D</sup> Fran Ives,<sup>E</sup> Helen Vosper<sup>F</sup> and Noorzaman Rashid<sup>G</sup>

ABSTRACT

Human factors and ergonomics (HF/E) is concerned with the design of work and work systems. There is an increasing appreciation of the value that HF/E can bring to enhancing the quality and safety of care, but the professionalisation of HF/E in healthcare is still in its infancy. In this paper, we set out a vision for HF/E in healthcare based on the work of the Chartered Institute of Ergonomics and Human Factors (CIEHF), which is the professional body for HF/E in the UK. We consider the contribution of HF/E in design, in digital transformation, in organisational learning and during COVID-19.

**KEYWORDS:** ergonomics, human factors, patient safety

DOI: 10.7861/htj.2021-0112

#### Introduction

Future healthcare faces significant challenges, including complex care needs of an increasingly elderly population, staff shortages and burnout, and global crises (such as the COVID-19 pandemic). Responding to these challenges and providing safe care requires not only improvements in medicine, but also changes to how we work (ie how health and social care are designed and delivered). Healthcare providers need to communicate, coordinate and collaborate better across professional, departmental and organisational boundaries. Digital technologies (such as novel artificial intelligence (AI) applications) need to work well with people in order to harness their full potential. Health systems and organisations need to be agile and able to adapt to changing circumstances and demands. The design of work and work systems is the focus of

human factors and ergonomics (HF/E).

HF/E is a scientific discipline that takes a systems perspective, and aims to design interactions between people and other elements of the system to optimise human wellbeing and overall system performance.<sup>1</sup> Aspects of HF/E have been used to improve patient safety and the quality of care for over 20 years, but frequently with a narrow focus on teamwork and non-technical skills.<sup>2</sup> While such interventions can be valuable, they are best thought of as one element of the HF/E toolbox, which should be accompanied by consideration of how the wider work system can be designed. This includes, for example, the design of tools and equipment, task design, the development of work procedures, the design of physical spaces and the work environment, and processes to support organisational learning from experience.<sup>3</sup>

Across health systems, there is an increasing appreciation of the value of HF/E and, slowly, qualified HF/E professionals are employed to work as embedded practitioners alongside clinical teams, even if their number is far behind what is common practice in safety-critical industries (such as aviation, defence and nuclear).<sup>4</sup> The professionalisation of HF/E in healthcare is still in its infancy, and greater awareness and access to accredited education are required. Here, we present a vision for healthcare HF/E based on the work of the Chartered Institute of Ergonomics and Human Factors (CIEHF), which is the professional body for HF/E in the UK.

#### HF/E in design

The fundamental principles of HF/E are related to how the design of equipment, work and workplaces will influence the performance or outcomes of an organisation relative to safety, efficiency and wellbeing. A prospective risk analysis is an approach adopted within other safety-critical industries to understand the nature of the threats specific to a particular context or place of work. There is a regulatory mandate for many safety-critical industries (eg oil and gas, nuclear and rail) to adopt this approach. HF/E principles are embedded into this process, which enables an organisation to understand and evaluate how the current system design may influence the risk held by the organisation. This form of regulatory mandate does not exist in healthcare, where there are still few resources directed towards the employment of safety or HF/E expertise.<sup>5</sup>

A prospective risk analysis involves a systems perspective; this starts with an understanding of the key healthcare processes: what and who is involved, where is it completed and which

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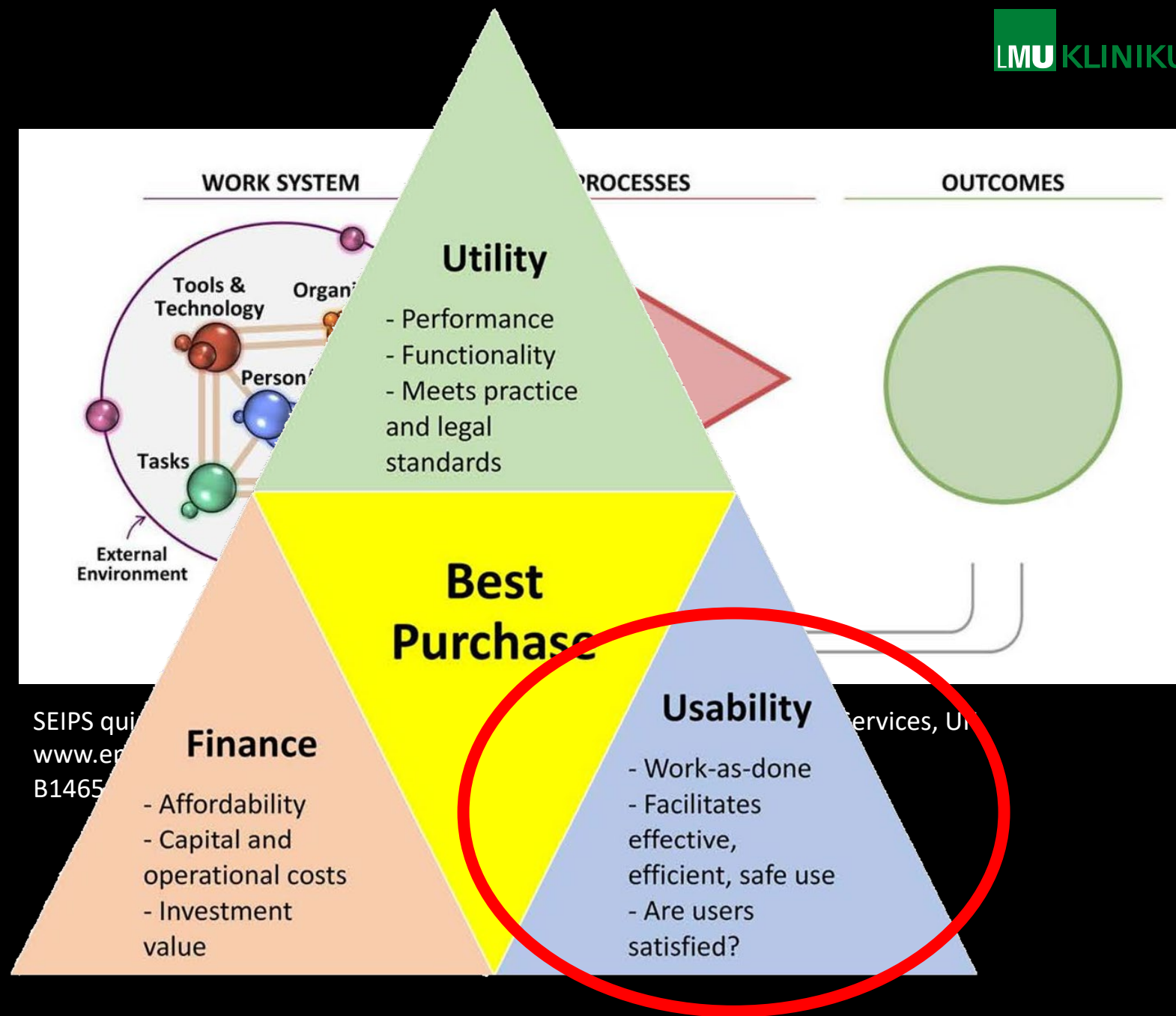
SujanM, Pickup L, Bowie P, et al. The contribution of human factors and ergonomics to the design and delivery of safe future healthcare. *Future Healthc J*. 2021;8:e574–e579.



## Solution ideas

Systems thinking  
(SEIPS framework)

Procurement





# Test

	Programm-start	Patienten-verwaltung	W/HO-Checkliste	Patienten-name	Video-management	Timer & Stoppuhr	Archivierung	Shutdown		
	ID8	ID2	ID10	ID6	ID3/1	ID7	ID5/4	ID9	Mittelwert	Gesamtdauer (min)
VP1	1	2	1	1	3	2	3	2	1,9	55
VP2	1	2	2	2	2	1	3	2	1,9	32
VP3	1	2	2	1	1	2	3	1	1,6	31
VP4	2	2	1	1	3	1	2	1	1,6	49
VP5	1	2	2	1	4	1	3	1	1,9	47
VP6	1	2	2	1	2	1	2	1	1,5	28
VP7	1	2	1	1	3	3	4	1	2	54
VP8	1	2	2	1	1	2	3	2	1,8	35
Mittelwert	1,1	2	1,6	1,1	2,4	1,6	2,9	1,4	1,8	41,4
Mittelwert (alt)*	1,5	2	2	1,9	2,3	1,5	2,5	1	1,9	34



**Video Management (ID3, ID1)**

Das Symbol wurde oft mit der Videoaufnahme-Funktion verwechselt

Beim Doppelklick wird die Markierung direkt wieder aufgehoben

Ausgewählte Quelle wurde durch den Strich an der Seite nicht eindeutig erkannt (möglicherweise Unklarung verstärken)

Bei helleren Desktopplan ist die Verbindungsline nicht sichtbar

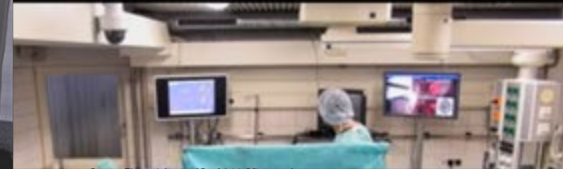
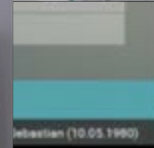
Videoaufnahme-Button wurde oftmals nicht erkannt (Vorschlag: Videokamera)

Roter Aufnahmepunkt wurde selten wahrgenommen

Farbliche Unterscheidung der systemen Ziele „Stream“ und „Monitor“ wurde gewünscht

1. Die Überschrift wird als Button wahrgenommen und oft vergeblich angeklickt, um eine Verbindung zu den Zielen herzustellen  
2. Es wird gewünscht, dass man Bildgebungen als Quelle integrieren

Veränderung des Layouts wurde oft erst nach längerer Suche gefunden (dann zunächst versuchen fast alle Probanden, die beiden Quellen in den Rekorder zu ziehen und es war für einige Personen irritierend, dass die Layout-Ansicht nicht permanent angezeigt wird)





# Train

Enlarge your team

Adapt curricula







**Spread the word!**



**DREAMS  
DON'T WORK  
UNLESS YOU DO**





# SAVE THE DATE!





