Human factors in critical situations
Disclosure slide

I have no actual or potential conflicts of interest in relation to this presentation
Error & error consequences

Accidents are not due to error but to context

Identical human failure (error)

Credit: BEA-É
Beyond humans as the fallible element

All these activities are **thought, conceived, organized, realized and supervised** by human beings. All successes should be credited to **human factors**.
“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 methods to design in order to optimize human well-being [including health and safety] and overall system performance.”

International ergonomics association, 2000
Human Factors - HF

**Domains**

- Cognitive Factors
  - Psychology
  - Cognitive science
  - Neuroergonomics

- Physical Factors
  - Physiology
  - Biomechanics
  - Anthropomometrics

- Organizational Factors
  - Human-Computer interaction
  - Communication science
  - Teamwork

- Participatory Design
  - Social sciences, Law
  - Management & political sciences

*International ergonomics association, 2000*
Human Factors | Ergonomics
Understanding Human System Interactions

Function: **to ensure the evacuation of military or other casualties to Role 2**

**TYPE OF INTERACTIONS**

A. **Human ↔ Machine**
   equipment, materials, interfaces...

B. **Human ↔ Humans**
   communication, coordination, teamwork...

C. **Human ↔ Rules/procedures**
   regulation, guidelines, protocols, checklist...

D. **Human ↔ Environment**
   physical, social, organisational, cultural...

Photo Credit: C. Derkenne
Human Factors
A growing interest in healthcare since the 2000s

IOM, 1999

Credit: WHO
Human Factors in critical situations
Development of guidelines for healthcare professionals and their organizations

Objective
To provide guidelines in the field of Human Factors for the management of critical situations by caregivers in healthcare [an idea box, a toolbox]

Critical situation in healthcare: any situation with life-threatening for patient(s) and cognition under pressure for caregivers (temporal pressure, complexity, uncertainty...)

Method
- A committee of 19 experts from SFAR and FHS group learned societies
- Systematic literature review and formulation of recommendations following the GRADE method (Grading of Recommendations Assessment, Development and Evaluation)
- 4 domains: Communication, Organization, Work Environment, Education & training
Human Factors in critical situations
Development of guidelines for healthcare professionals and their organizations

Results

21 recommendations mainly based on non-double-blind randomized studies (moderate and low quality of evidence) and on a strong agreement between experts

1. **COMMUNICATION**
   - Briefing
   - Secure communication (*Phraseology, closed-loop communication, speak-up*)
   - Team Debriefing

2. **WORK ORGANIZATION**
   - Organization of teamwork
   - Cognitive aids
   - Individual & team situation awareness
   - Safety culture

3. **WORK ENVIRONMENT**
   - Materials (*Logical layout, verification, training, usability*)
   - Fatigue & Workload management
   - Work environment (*noise, psychological*)
   - Task interruption

4. **EDUCATION & TRAINING**
   - Stress management
   - Human factors
HF in critical situations
Area #1 Communication

Before (anticipate): **Team Briefing**

**Recommendation.** In the context of a critical situation, the experts suggest conducting a briefing to improve team performance, improve the safety climate and decrease adverse event rates.

Design to prepare teams to cope with the situation: clear distribution of tasks, role and responsibilities; anticipation of scenarios that could disrupt the completion of the tasks; establish climate and goals.

Allow the pre-activation of knowledge and the ordering of “mental schemes”

Avoid the exposure to episodes of saturation or blockage of our cognition under stress.

Help to develop a shared situational awareness and a shared actions plan

Reduces uncertainty by making each team members' actions more predictable

Enhance teamwork, communication and synergy

Content and duration adapted to the predictability of the context.
**HF in critical situations**

**Area #1 Communication**

**Before (anticipate): Team Briefing**

*Recommendation.* In the context of a critical situation, the experts suggest conducting a briefing to improve team performance, improve the safety climate and decrease adverse event rates.

**Example: TeamSTEPPS® Briefing Checklist**

<table>
<thead>
<tr>
<th>Question</th>
<th>Complete?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who is on the team?</td>
<td>✔️</td>
</tr>
<tr>
<td>All members understand and agree upon goals?</td>
<td>✔️</td>
</tr>
<tr>
<td>Roles ans responsabilities are understood?</td>
<td>✔️</td>
</tr>
<tr>
<td>What is our plan of care?</td>
<td>✔️</td>
</tr>
<tr>
<td>Staff and provider’s availability throughout the shift?</td>
<td>✔️</td>
</tr>
<tr>
<td>Workload among team members?</td>
<td>✔️</td>
</tr>
<tr>
<td>Availability of resources</td>
<td>✔️</td>
</tr>
</tbody>
</table>
HF in critical situations: Area #1 Communication

During (cope with): **Secured & standardized communication**

*Recommendation.* The experts suggest that the healthcare team in crisis situations use **secured and standardized communication** to improve morbimortality and limit the incidence of adverse events.

**Standard phraseology**

- Enables us to **communicate effectively** despite differences in language.
- Reduces the opportunity for **ambiguities /misunderstanding.**
- Structure communications to facilitate recall.

**Closed loop communication for critical information**

**Speak-Up**

- Raising a safety issue
- Expressing oneself assertively (with confidence, without aggression and without fear)

*Credit: American Hospital Association*
**HF in critical situations**  
*Area #1 Communication*

**Recommendation.** The experts suggest that the healthcare team perform a **debriefing immediately after care** in critical situation to improve technical skills and some components of non-technical skills.

**Originating from the military and aeronautical sectors**

Mainly use in simulation settings (training) in healthcare

**Capitalization of experience (positive and negative)**

Experience as a learning **opportunity** (technical and non-technical skills improvement of team members, organizational learning)

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**Promoting Excellence and Reflective Learning in Simulation (PEARLS)**

**HF in critical situations**

**Area #2 Organization**

During (cope with): **Check-lists and cognitive aids**

*Recommendation.* The experts suggest that the healthcare team in a critical situation should use **check-lists and cognitive aids** to improve quality of care and patient safety.

- Help to organize tasks realization and reasoning
- Avoid the exposure to episodes of **saturation or blockage** of our cognition **under stress**
- Provide a safe and effective method (reflect the experience of the organization and previous teams)
- Protect against the limitation of Human operators (development of routines, allow errors detection and recovery before their consequences)
- Optimize effectiveness of teamwork (reduce variability between operators, enhance coordination)

**SAFE MARCHE RYAN Acronym**

French standardized method for care to war wounded

(Martinez, et al., 2012)
**HF in critical situations**  
Area #4 Education & Training

**Recommendation.** Experts suggest that health care teams facing critical situations benefit from **psychological preparation for stress management** to improve patient safety and performance.

⇒See. *Mental training for stressful situations* | Dr Fabien Ramon

**Recommendation.** Experts suggest that healthcare teams facing critical situations be **trained in human factors** to improve quality of care and patient safety.

Non-technical skills (NTS) are **not innate**

HF education & training improve NTS and patient safety

**Mandatory** in others high-risk industries

Typical cursus:

- Initial theoretical course
- **Crew Resource Management** (recurrent)
- **Simulation-based training** in HF (recurrent)

Credit: SSA/CESimMO
Acknowledgments
Link to guidelines
French version (English version coming soon)
Parachutes reduce the risk of injury after gravitational challenge, but their effectiveness has not been proved with randomised controlled trials.

What is already known about this topic
Parachutes are widely used to prevent death and major injury after gravitational challenge
Parachute use is associated with adverse effects due to failure of the intervention and iatrogenic injury
Studies of free fall do not show 100% mortality

What this study adds
No randomised controlled trials of parachute use have been undertaken
The basis for parachute use is purely observational, and its apparent efficacy could potentially be explained by a “healthy cohort” effect
Individuals who insist that all interventions need to be validated by a randomised controlled trial need to come down to earth with a bump