World Health Organization | Patient Safety

A World Alliance for Safer Health Care

# Introduction to Patient Safety Research

Presentation 2 - Measuring harm: Direct observation mixed methods study

# 2: Introduction: Study Details

- **Full Reference**
  - **Donchin Y, Gopher D, Olin M, et al. A look into the nature and causes of human errors in the intensive care unit. Qual. Saf. Health Care 2003, 12; 143-147**

**Link to Abstract (HTML)**


**Objectives:** The purpose of this study was to investigate the nature and causes of human errors in the intensive care unit (ICU), adopting approaches proposed by human factors engineering. The basic assumption was that errors occur and follow a pattern that can be uncovered.
**Design:** Concurrent incident study.
**Setting:** Medical-surgical ICU of a university hospital.
**Measurements and main results:** Two types of data were collected: errors reported by physicians and nurses immediately after an error discovery; and activity profiles based on 24-h records taken by observers with human engineering experience on a sample of patients. During the 4 months of data collection, a total of 554 human errors were reported by the medical staff. Errors were rated for severity and classified according to the body system and type of medical activity involved. There was an average of 178 activities per patient per day and an estimated number of 1.7 errors per patient per day. For the ICU as a whole, a severe or potentially detrimental error occurred on average twice a day. Physicians and nurses were about equal contributors to the number of errors, although nurses had many more activities per day.
**Conclusions:** A significant number of dangerous human errors occur in the ICU. Many of these errors could be attributed to problems of communication between the physicians and nurses. Applying human factor engineering concepts to the study of the weak points of a specific ICU may help to reduce the number of errors. Errors should not be considered as an incurable disease, but rather as preventable phenomena.


**Link to Full Text (PDF)**

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CLASSIC PAPER

A look into the nature and causes of human errors in the intensive care unit*

Y Donchin, D Gopher, M Olin, Y Badihi, M Biesky, C L Sprung, R Pizov, S Cotev

Qual Saf Health Care 2003;12:143–149


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MATERIALS AND METHODS

# 3: Introduction: Patient Safety Research Team

- Lead researcher – Dr. Yoel Donchin, MD
  - Director of Patient Safety and Professor of Anaethesiology
  - Patient Safety Unit, Hadassah Hebrew University Medical Centre in Jerusalem, Israel
  - Field of expertise: anaesthesia human factors engineering
- Other team members
  - D. Gopher
  - M. Olin
  - Y. Badihi
  - M. Biesky
  - C. L. Sprung
  - R. Pizov
  - S. Cotev

# 4: Background: Opening Points

- Human factors engineering focuses on the study of the interface between humans and their working environment, with a particular emphasis on technology
  - Main goal is to improve the match between technology, task requirements and the ability of workers to cope with task demands
- Health industry has largely neglected this approach

# 5: Background: Study Rationale

- A previous review concluded that reducing the incidence of the preventable medical errors would require identifying causes and developing methods to prevent errors or reduce their effect
  - Almost no attention has been given to human factor consideration in the hospital setting
  - Further investigation was clearly needed

# 6: Background: Objectives

- **Objectives:**
  - To investigate the nature and causes of human errors in the intensive care unit (ICU), adopting approaches proposed by human factor engineering
  - (This study follows from the basic assumption that errors occur and follow a pattern that can be uncovered)

# 7: Methods: Study Design

- **Design: direct observation mixed methods study**
  - Error reports made by physicians and nurses immediately after an error discovery
  - Activity profiles  on a sample of patients created based on records taken by observers with human engineering experience
  - Errors were rated for severity and classified according to the body system and type of medical activity involved

# 8: Methods: Study Population and Setting

- Population: staff of the medical-surgical ICU of the Hadassah-Hebrew University Medical Center at Ein-Kerem, Jerusalem
- Setting: six-bed ICU unit with additional "overflow" beds
  - Yearly occupancy rate reaching 110%
  - Patient to nurse ratio of 2:1 for all shifts, regardless of the severity of number of patients

# 9: Methods: Data Collection

- Errors reported by physicians and nurses at time of discovery
  - Discovered errors rated independently by three senior medical personnel on a 5-point severity scale
- Developed error report form for the use of nurses and physicians to collect data on:
  - Time of discovery
  - Sectional identities of the person who committed the error and person who discovered it
  - Brief description of the error
  - Presumed cause

# 10: Methods: Data Collection (2)

- **Investigators recorded activity profiles based on 24 hour continuous bedside observations**
  - Conducted on randomly selected group of 46 patients representative of patient population in the unit
  - Observations provided a baseline profile of daily activity in ICU and reference point for the rate of errors performed
  - Investigators not medically trained but received training for the project from senior ICU nurse who also supervised their activity

# 11: Methods: Data Analysis and Interpretation

- **Analyses performed**
  - Frequency distributions, average activity, error rates, and percentages computed and cross-tabulated using statistical software
  - Comparisons between the average number of errors per hour at different times of the day conducted (t-tests in a planned comparison model)

# 12: Results: Key Findings

- During 4 months of data collection, a total of 554 human errors reported by the medical staff
  - Technician observers recorded a total of 8,178 activities during their 24 hour surveillances of 49 patients
  - All observed patients were included in the study
- Average of 178 activities per patient per day and an estimated number of 1.7 errors per patient per day (0.95% of activities)
  - For the ICU as a whole, a severe or potentially detrimental error occurred on average twice a day
  - Physicians and nurses were about equal contributors to the number of errors, although nurses had many more activities per day

# 13: Results: Key Findings (2)

- 29% of errors graded as severe of potentially detrimental to patients if not discovered in time
- Compared with nurses, physicians had much higher rate of error
  - 45% of errors committed by physicians and 55% by nurses BUT
  - Physicians carried out only 4.7% of daily activities, whereas nurses carried out 84%

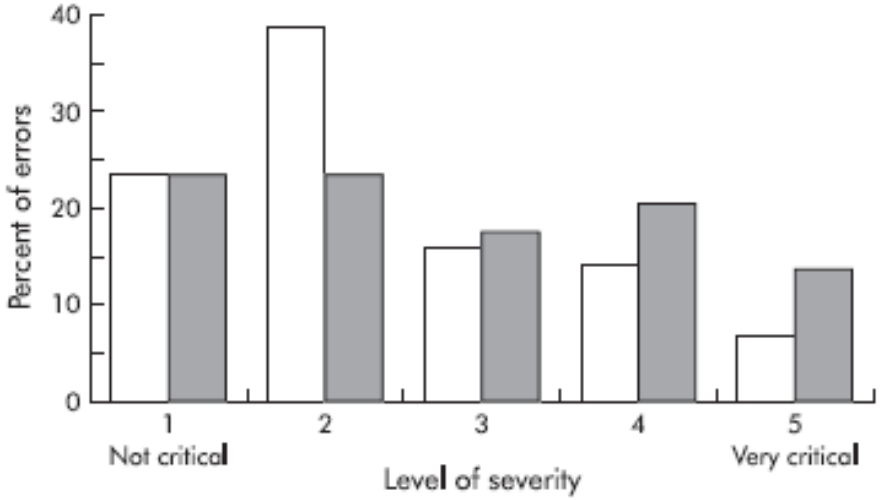


**Figure 2** Distribution of the severity of errors. The graph displays the joint distribution and the separate rating of errors performed by physicians (open bars) and nurses (shaded bars).

# 14: Conclusion: Main Points

- A significant number of dangerous human errors occur in the ICU
  - Many of these errors could be attributed to problems of communication between the physicians and nurses
  - Applying human factor engineering concepts to the study of the weak points of a specific ICU may help reduce the number of errors
- Errors should not be considered as an incurable disease, but rather as preventable phenomena

# 15: Conclusion: Discussion

- Possible reasons for higher error rate among physicians:
  - While nurses mainly involved with routine and repetitive activities, physicians perform more reactive and initiated interventions
  - Physicians must keep track of a larger number of patients and patient contact is much more intermittent
  - Due to the training role of the ICU as part of a university hospital, many physicians less experienced than the nurses
- These factors highlight the importance of good communication and transfer of information between nurses and physicians
  - Nurses have closer and more continuous contact with patients and thus should have a formal role in information exchange

# 16: Conclusion: Practical Considerations

- Study duration
  - Approximately 1 year
- Cost
  - About $1000 USD
- Competencies needed
  - Knowledge of research methods, human factors engineering, and cognitive psychology
- Ethical approval
  - Need for approval was waved as all that was done was observation

# 17: Author Reflections: Lessons and Advice

- If you could do one thing differently in this study what would it be?
  - *"Look at the unit after implementation of the recommendations."*
- Would this research be feasible and applicable in developing countries?
  - *"I cannot answer this. It is a matter of the ICU not of the country . But the methods are as good for developing countries."*

# 18: Author Reflections: Ideas for Future Research

- **What message do you have for future researchers from developing countries?**
  - ***"The message is universal: if you want safety you can get it in your own way, at your own working station. The problem is that there is a need to create safety culture, but that goes beyond this paper."***
- **What would be an important research project you recommend that they do?**
  - ***"Measure safety culture, and than start to improve according to findings the weak points."***

# 19: Additional Resources

- See survey attached to questionnaire, PowerPoint presentation