Physiological monitoring workers: Maximizing worker efficiency and maintaining patient safety

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Introduction

• 24-hour real-time physiological monitoring
• Multiple noncritical care patients
• Remote display station
  – Cardiac rhythms, pulse oximetry, blood pressure, and other physiological data
  – 15-40 in-hospital patients at a single station
Introduction

• Benefits:
  – Early recognition patient deterioration
  – On-site workload reduction per patient

• Future plans for operation expansion

• Must determine factors influencing effective monitoring system
  – Major factor: Monitoring operator’s workload
Methods

• One-week data collection period on site
  – Three different work shifts: 6 AM, 2 PM, and 10 PM

• Ethnographic methods used:
  – Structured interviews
  – Observations with questioning
  – Think-aloud verbal protocols
  – Critical incident technique

Example Questions:

Tell me a little about your experience of the pros and cons of the monitoring system?

Based on your experience with a monitoring system, what elements do you think are absolutely necessary for an effective system?
Methods

• 37 Mayo Clinic employees:
  – remote monitoring operators, nurses, and other clinical personnel

• All information digitally recorded and/or written in field notes
What we know so far…

• There are three distinct Remote Monitoring Paradigms (RMPs):
  – make-up of the healthcare team, i.e., console operator, runner, and nurse staff
  – performed tasks
  – physical location
  – quality of communication
<table>
<thead>
<tr>
<th>Healthcare team</th>
<th>RMP 2</th>
<th>RMP 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console operator, runner, nurse staff</td>
<td>Console operator, nurse staff</td>
<td>No</td>
</tr>
<tr>
<td>Collocated</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tech components of communication</td>
<td>A/V display, telephone</td>
<td>Telephone</td>
</tr>
</tbody>
</table>

![Image of a console operator and nurse staff in a healthcare setting]
How do they compare?

• Perceived quality:
  – Paradigm 1 > Paradigm 2 > Paradigm 3

• Most influential characteristics:
  – Healthcare team spatial proximity
  – A/V technical capabilities available to console operators
Is nurse required? 

Contact nurse 

Collocated 

Call nurse’s station via phone 

Issue instruction 

NOT collocated 

Identify patient room number on screen 

Scan “log sheet” for nurse assigned to room 

Call nurse’s phone 

Issue instruction
Conclusion

• Initial steps in continued analysis of the remote monitoring system

• Currently in the works:
  – Validating task analysis
  – Narrowing in on key workload drivers

• Potential next step: simulation of monitoring workstation to manipulate workload drivers
Any Questions?

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