Electronic Health Record in ICU

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Managing Patients in a Ever Changing ICU Environment

• ICU is a high risk environment
  – Sickest patients in the hospital
  – High work load
  – Time poor environment
  – Minor errors have major clinical impacts

• Human-Technology interaction increasingly complex and unchartered

• Rapid advances in medical technology leading increases cognitive and information overload
ICU Staff Burnout

• Prevalence of burnout in ICU professionals ranged from 6% to 47%.

• Prevalence increasing

• Multifactorial but work environment and workload are important contributors

• Technology both part of the problem and part of the solution for safer health care

_Burnout in the intensive care unit professionals- A systematic review and Meta-analysis- Chuang et al. Medicine (2016) 95:50_
Poorly integrated technology adds to problem

• Prevention hip fractures from falls - Non-height-adjustable low beds - Increased staff back and knee injuries - (Clin Orthop Relat Res. 2001;385:260–6)

• Barcoding medication administration to decrease medication errors
  – Increased medication errors – (J Am Med Inform Assoc. 2002;9:540–53)
  – Increased risk of infection (Hum Factors. 2006;48:15–22.)
Electronic Health Record

• **Electronic Health Record**
  – Documentation
  – Prescribing
  – Results

• **Clinical Decision Support**
  – Alerts
  – Reminders

• **Data Analytics**
Electronic Health Record - A two edged sword

<table>
<thead>
<tr>
<th>Promise of EHR</th>
<th>Pitfalls of EHR</th>
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<tr>
<td><strong>EHR</strong></td>
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<tr>
<td>– Improve efficiency</td>
<td>– New technology</td>
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<tr>
<td>– Decrease work load</td>
<td>– New staff skill mix</td>
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<tr>
<td>– Increase safety and situational awareness</td>
<td>– Changed workflows</td>
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<td>– <em>This will lead to</em></td>
<td>– Information overload</td>
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<tr>
<td>– Improved patient safety</td>
<td>– Decreased patient safety</td>
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<tr>
<td>– Improved staff satisfaction</td>
<td>– Decreased staff satisfaction</td>
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Current status- Transition

• Transition phase
  – Little evidence
  – Strong emotions
  – Extreme positions
EHR- Efficiency

• Poor evidence that overall EHR improves clinical efficiency
  – Efficiencies gained in one area offset by inefficiencies in other areas
    (Health Serv Res. 2015 Dec; 50(6): 1751–1771.)
    • Decreased time searching for information is offset by increased time to input data

• Reasonable evidence that EHR improves administrative efficiency

• Multiple confounders
  – Individual skill mix
  – Adequacy of training and support
  – Quality of software
  – Workload
EHR- Quality of Documentation

  – Significant increase with EHR
  – Copy forward and pull sets increase “chart bloat”

  – Consistently better with EHR
  – Multiple sources; Multiple platforms
  – Improved patient satisfaction- Patient held records
EHR- Quality of Documentation

- **Quality and accuracy of documentation**
  

  - Generally better with EHR
    
    • Improved legibility
    • Improved accuracy

  - New errors
    
    • Cut and paste errors
    • Voluminous information- Decreases ability to find specific information
EHR- Safety

- Decreased medication errors
  - Decreased prescribing errors (JAMA. 2001;286:2839-44)
    - Allergy check
    - Dose check
    - Drug-Drug interaction
  - Decreased transcription errors (J Am Med Inform Assoc. 1999;6:313-21)
    - Clarity of prescription
  - Improving surveillance (JAMA. 1986; 256:1007-11)
EHR- Safety

• **Clinical Decision Supports**

• **Reminders and Alerts**
  – Improved vaccination rates *(JAMA 2004;292: 2366-71)*

• **Decision making assists**
  – Antibiotic choice and decreased surgical wound infection *(Infect Control Hosp Epidemiol. 1989;10: 316-20)*
EHR- Safety

• **New Errors**
  • **Human-computer interface (33%)**
    – Unfamiliar technology
    – Poor font/ Tall-man font
    – Decimal errors
    – Over reliance on EHR

• **Workflow and communication (24%)**
  – Changed workflows- Orders no longer placed at the bedside
  – Free texting instructions in incorrect fields (35%)
  – Poorer communication

• **Clinical (23%)**
  – Wrong patient record- Context
  – Omission of dose/ Wrong dose/ Extra dose

• **Yet-to-be errors**

Pennsylvania Patient Safety Authority- 889 EHR medication errors between Jan. 1 and June 30, 2016
Decreasing risks - Improving Technology

• Characteristics of Technology
  – Reliability
  – Ergonomic design
  – Output display and input mechanisms
  – Interface
  – Compatibility with other technology

• Improving the fit-Adapting technology to work practices
Decreasing risks - Organisational Level

- Good leadership
- Adequate staff engagement and feedback
- Adequate training and support
  - Presence of hospital staff with previous experience of Health Information
- New Workflows- Use technology to improve workflows
- Standardisation of documentation and workflows
Decreasing risks - Clinician Level

• Engage early with the process
• Adequate training
• Being supportive of other team members
• Avoiding over-reliance on the system
• Alert fatigue
• Cautious use of “cut and paste” functionality
• Improving computer and typing skills
• Careful documentation- The computer never forgets
Future- EHR and Big Data

• Technology will allow us to collect large volumes of data will minimal cost
  – Improve our understanding of disease- ANZICS CORE

• "Big Data” will change our understanding of disease processes and impact research
  – Google and ICU big data
  – Answer more questions
Future- Workload reduction

• Mundane tasks taken over by technology
  – Documentation will become easier
  – Monitoring will become more automated

• Increased integration of bedside devices
  – EHR with mechanical ventilators, dialysis machines
  – Automatic blood sugar checks
Future- Increased Clinical Decision Supports

• Artificial Intelligence and machine learning
  – Filter data and prioritise important information

  – Monitoring patient data- Pattern recognition
    • Management of new sepsis- Joining the dots

  – Harnessing wider experience through big data
    • Problem solving
    • Decision making