Electronic Health Record in ICU

Santosh Verghese
Intensive Care Specialist
Flinders Medical Centre

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

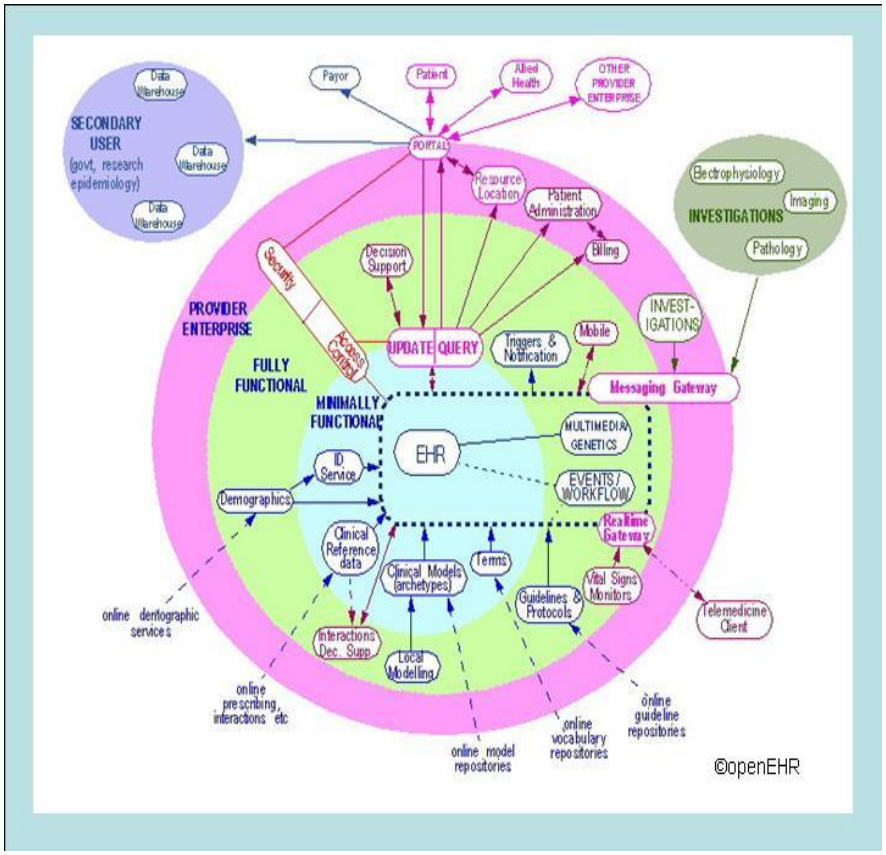
Poorly integrated technology adds to problem

- 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

Promise of EHR

- *EHR*
  - Improve efficiency
  - Decrease work load
  - Increase safety and situational awareness
- *This will lead to*
  - Improved patient safety
  - Improved staff satisfaction

Pitfalls of EHR

- *EHR*
  - New technology
  - New staff skill mix
  - Changed workflows
  - Information overload
- *This will lead to*
  - Decreased patient safety
  - Decreased staff satisfaction

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

- *Quantity of documentation* (Ann Intern Med. 2006 May 16;144(10):742-52. Epub 2006 Apr 11.)
  - Significant increase with EHR
  - Copy forward and pull sets increase " chart bloat"

- *Reliably retrieve documents* (J Biomed Inform. 2013 Oct;46(5):830-6.)
  - Consistently better with EHR
  - Multiple sources; Multiple platforms
  - Improved patient satisfaction- Patient held records

EHR- Quality of Documentation

- *Quality and accuracy of documentation*
  (BMJ. 1992 Jan 18;304(6820):159-62, J Am Med Inform Assoc. 2003 Sep-Oct; 10(5): 470–477)
  - 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)
  - *Decreased dispensing errors (*Br J Clin Pharmacol. 2009 Jun; 67(6): 681–686.)
    - 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)**
  - Improved documentation of Advanced Care Directives **(Ann Intern Med. 1998;128:102-10)**
  - Increased preventive care- DVT **(N Engl J Med. 2005;352: 969-77)**

- *Decision making assists*
  - Antibiotic choice and decreased surgical wound infection **(Infect Control Hosp Epidemiol. 1989;10: 316-20)**
  - Decreased CLABSI in surgical ICU **(Appl Clin Inform. 2015 Oct 7;6(4):611-8.)**

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