Assessing the impact of clinical information systems in hospitals

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How can health IT be used to improve care delivery and patient outcomes?

Generate high quality evidence of effects
Change from paper to electronic – Impact on safety

- Medication errors – single most preventable cause of patient harm
- 5.8 prescribing errors per admission
Do eMM systems reduce medication errors?

Controlled before/after study

2 Hospitals 2 Systems 6 wards

NHMRC Project Grant
Sample: 3200 patient records; >12,000 prescribing errors

Prescribing errors declined by >50% (p<0.0001)

44% (p=0.0002) reduction in serious prescribing error rate

25/100 admissions 14/100 admissions
(95%CI 21-29) (95%CI 10-18)

No significant change on the control wards (p=0.4)
- eMM – resulted in a reduction of $63-66 per admission (~$1528 TWD)

- Cardiology ward = ~$100,000 released p.a. due to a reduction ~ 80 ADEs p.a.

- Entire hospital with 39,000 annual admissions = releasing $2.5M each year ($57.9M TWD)
Percentage of Australian hospital beds with electronic medication management systems 2016

Source: B, Pedersen, 2017
The Checkley Group

<table>
<thead>
<tr>
<th>State</th>
<th>QLD</th>
<th>NSW</th>
<th>VIC</th>
<th>SA</th>
<th>WA</th>
<th>ACT</th>
<th>TAS</th>
<th>NT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed %</td>
<td>9</td>
<td>22</td>
<td>16</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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Is eMM the Solution?

Stepped wedge cluster randomized controlled trial
Aim – Assess the impact of eMM in paediatrics including harm & cost-effectiveness
Integrating systems into clinical work
Will I spend my life on a computer?

AIM: To measure changes in how nurses and doctors distributed their time across work tasks in a controlled pre and post eMMS studies

70 nurses observed for 276.9 hours
59 doctors observed for 356.3 hours
Work Observation
Method By Activity
Timing -

What task?

With whom?

With what?

Where?

Interruptions
## Task Time Distribution at Baseline

<table>
<thead>
<tr>
<th>Time with</th>
<th>Nurses</th>
<th>Doctors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>33%</td>
<td>18%</td>
</tr>
<tr>
<td>Nurses</td>
<td>50%</td>
<td>10%</td>
</tr>
<tr>
<td>Doctors</td>
<td>5%</td>
<td>63%</td>
</tr>
<tr>
<td>Relatives</td>
<td>4%</td>
<td>4%</td>
</tr>
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</table>
Results

- Nurses and Doctors with eMM experienced no significant changes in % of time spent on:
  - Medication Tasks;
  - Direct Care;
  - Professional Communication

Compared to control wards without eMM

Achieved significant reductions in errors

Research and applications

Impact of an electronic medication management system on hospital doctors’ and nurses’ work: a controlled pre–post, time and motion study

Johanna I Westbrook,¹ Ling Li,¹ Andrew Georgiou,¹ Richard Paoloni,² John Cullen³

J Am Med Inform Assoc 2013;
Guarding Against Selective Attention - Always be on the look out for Gorillas
“The Invisible Gorilla Strikes Again”

24 radiologists were asked to review ~ 200 CT scans of five patients for typical lung cancer screening.

Drew et al 2013 Psychological Science
Results

- 20 out of 24 radiologists missed the gorilla
- 25 non-trained reviewers all missed the gorilla

“It’s important to be willing to look for more than one thing, to set yourself up for success.”
Unexpected consequences of IT - New Errors facilitated by the eMM!

Of 1164 post eMMS prescribing errors

493 were facilitated by the eMM

Most frequent type

- Incorrect selection from drop-down menus = 43%
Human Factors

Understanding how to design systems that positively impact care and the work of clinicians
Computerised alerts

Trigger at the point of prescribing to warn prescribers of potential errors in orders, such as allergies, inappropriate doses etc.

![Image of Dicloxacillin Capsule alert]

*Dicloxacillin Capsule contains Dicloxacillin which is in the class Penicillins to which the patient is allergic.*

**Action**
- Override
- Remove
Evidence that targeted decision support can be highly effective

- Can change prescribing behaviours and improve patient outcomes, while reducing costs.

E.g. A US study estimated decision support in EMM could prevent 200,000 adverse drug events/year, saving $US1billion.


Impact of decision support on repeat laboratory test ordering rates
Repeat testing for 5073 children under 1 year in ICUs significantly (p<0.0001) declined following the introduction of electronic test ordering

But....... A large body of work demonstrates doctors override alerts up to 95% of alerts

Alert fatigue - mental state resulting from excessive numbers of alerts being triggered

Leads to:

- User frustration and annoyance
- Prescribers overwhelmed by alerts
- Learn to ignore all alerts
Context Matters
When and why decision support may be effective
What impact does eMMS decision support have during ward rounds?

- 58.5 hrs, 14 teams, 96 orders
- 48% of medication orders triggered alerts
- 17% read
- No orders changed

Research and applications

The influence of computerized decision support on prescribing during ward-rounds: are the decision-makers targeted?

Melissa T Baysari,1 Johanna L Westbrook,2 Katrina L Richardson,3 Richard O Day4,5
Junior doctors’ response to computerised alerts at night 16:30-22:30

- Observational study - 65 hours
- 78% of alerts were read
- 5% resulted in a change in prescribing
Conclusions

Digital systems have enormous potential to improve the quality, safety and efficiency of health care

Securing those benefits relies upon high quality evidence to inform the design and better integration and use of system

Need to subject IT interventions to evaluations using rigorous study designs and then translate those findings to improving systems

Open to both expected and unexpected findings – Beware of Gorillas!
Thank You

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