Alerts and reminders: Is this all there is to clinical decision support?

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Overview

• Reminders and alerts
• Clinical decision making
• Iteration 1: information spaces
• Iteration 2: onscreen spaces
• Iteration 3: joint cognitive space
Alerts and reminders
Clinical decision making

Diagnosis    Prescription

Monitoring    Administration

Traditional ICU chart designs

1. Haemodynamic variables
   - Graphs and numerical table

2. Respiratory variables (patient and ventilator)
   - Numerical table

3. Continuous drug infusions
   - Numerical table

4. Comments
   - Free-form text

5. Biochemistry results
   - Numerical table

6. Haematology results
   - Numerical table

7. Regular drugs
   - Text and numerical table

8. As needed (prn) drugs
   - Text and numerical table

9. Once only (stat) drugs
   - Text and numerical table

10. Intravenous fluids
    - Text and numerical table

11. Haemofiltration
    - Text and numerical table

12. Fluid balance
    - Numerical table

13. Specialist reports
    - Free-form text
Information environment - design goals

1. Group information meaningfully

2. Make targets / goals visible

3. Make cause & effect dynamics visible

The goal/target clinicians want to achieve

pH is regulated by respiratory rate

KCL (replacement)

K- Potassium

Iteration 1: Information environment
Evaluation results

ICU Resident physicians:
• better able to agree about current state diagnosis
  (2 tailed t-test: t=0.67; p>0.05), but
• NS difference in ability to detect failed physiological systems

ICU Nurses:
• better able to detect changed parameters
  (2-tailed t-test for d’: t=2.39; p = 0.02; for β: t=2.86, p=0.01)
Iteration 2: Onscreen spaces

Computerized mockup
Evaluation results

ICU Resident physicians:
• Better able to agree about failed organs using Comp vs Charts ($t_6=3.14$, $p<0.01$). NS agreement about current state diagnosis.
• Agree about current state using Graphic vs Comp ($t_{10}=3.14$, $p<0.01$). Agree about failed systems better using Comp vs Graphic ($t_{10}=2.23$; $p<0.02$)

ICU Nurses:
• Better able to detect change using Comp vs Charts ($t_6=3.14$ $p<0.01$ for $d'$; $t_6$) 1.94, $p<0.05$ for $\beta$
• Comp vs Graphic $t_6=5.96$. $p<0.001$ for $d'$; NS for $\beta$

Miller, Scheinkestel & Steele (2009) Applied Ergonomics
Iteration 3: joint cognitive space

24-hour Sepsis bundle

Ecological approach
Joint cognitive space

Computational approach

- No significant differences on task times
- Sign diff, tasks completed \((\chi^2 = 6.426; p<0.04)\)
Conclusions

Alerts & reminders: is that all there is to Clinical Decision Support? No, but:

• Need a more sophisticated understanding clinical decision making
• Professional decision niches
• Dealing with complexity (information, constraints, computation)
Collaborators

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Funding:
• Australian and New Zealand College of Anaesthetists (ANZCA)
• NIH Challenge Grant#: 1RC1LM010310-01