An Electronic Dashboard to Improve Nursing Care

Alexandra Health Cluster, Singapore
- 570 bed tertiary care hospital – Newly built in 2009
- 428 bed community hospital (step-down care)
- Offsite ambulatory specialist centre

Dr Tan Yung Ming
Medical Informatics
contents

• Background
• The Clinical dashboard design
• Post pilot user satisfaction survey findings
• Conclusions
The Rise of CPOE

• Use of electronic medical records (EMR) and computerized physician order entry (CPOE) since 2009.

• Complaints by clinicians
  (1) CPOE Usability issues: Clinicians have to toggle multiple screens to gather patient info. Poorly designed UIs.
  (2) Information & cognitive overload
  (3) Loss of visual cues due to paperless workflows
  (4) Nurses are losing awareness of critical patients’ orders and tasks.
Project “Andon board” started in 2011

• “Andon board”
  a term derived from the Toyota Production System.

• A dashboard device which provides simplified visual management of a production line.

• Presents critical issues filtered from a complex web of data in daily operations.

• Our idea: Build a dashboard on top of our CPOE system.
PROJECT ANDON BOARD

A Heads-up Display for Nurses

Mounted at strategic positions in the wards
Broad Objectives the Andon System

• Improve nursing **situational awareness** of critical patients’ orders, results and tasks.

• **Make visible** all potential care issues eg. infection control alerts eg. MRSA, VRE

• Improve task **coordination** between departments – nursing, radiology, pharmacy, lab, doctors
### KTPH Ward A072

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<th>MEDICATION</th>
<th>NURSING ORDER</th>
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**Column Legend:**
1. Infection control alert
2. Lab order
3. Lab result
4. Radiology order
5. Radiology scheduling function
6. Medication order
7. Nursing tasks
Tracking Orders & Results

YAP Y
KTPH Ward B056-01

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<th>LABORATORY TEST</th>
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<td>Final Results</td>
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<tr>
<td>Liver Panel</td>
<td>Abnormal</td>
<td>Final Results</td>
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11:55:02

Nursing Order

Wednesday, 08-May-2013
Radiology Scheduling Function

KTPH Ward A072

Consent Status
- Consent Not Taken
- Consent Taken

Fasting / Last Meal
- Nil By Mouth
- Not Applicable

IV Cannulation
- Right Arm (IV Size: 22G)
- Not Applicable

Additional Information

CHRIS C
CT Abdomen
KTPH Ward B056-03

Today (21-Mar-2012)
Yesterday (20-Mar-2012)
## Radiology Scheduling Function

**KTPH Ward A072**

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Andon System went live between Jan-Feb 2012

POST PILOT STUDY ON MAR 2012

Objective of study
• Gather quick end-user feedback for improvements
• Evaluate factors that influence user satisfaction of the dashboard
Study Design

• Adapted a pretested questionnaire from an earlier CPOE user satisfaction study in Singapore*

• Survey tool consists of
  – 13 standardized questions attached to a five-point Likert scale.
  – 2 open ended questions for qualitative feedback.

• All nurses (170) in the 5 pilot wards were invited to participate in the survey

• 106 responded. All responses were anonymous.

## Demographics of Respondents

*(n = 106)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>(%   )</th>
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<td><strong>Age (years)</strong></td>
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<td>Senior assistant nurse</td>
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<td>Senior staff nurse</td>
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<td>16</td>
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<tr>
<td>Nursing manager, equivalents and above</td>
<td>2</td>
<td>1.9</td>
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</table>
System quality measures
- usability, reliability, performance

Q2: I can use the Andon Board on my own even if there was nobody around to show me how to use it.

- Disagree strongly: 3
- Disagree: 7
- Neither: 19
- Agree: 61
- Agree strongly: 16

Mean = 3.75  SD = 0.90

Q10. The Andon Board is easy to use.

- Disagree strongly: 0
- Disagree: 1
- Neither: 17
- Agree: 81
- Agree strongly: 7

Mean = 3.89  SD = 0.51
Impact on work efficiency

Q3. The Andon Board saves me time.

Mean = 3.47  SD = 0.79

Q4. The Andon Board enables me to accomplish tasks more quickly.

Mean = 3.44  SD = 0.81

Q5. The Andon Board enhances my efficiency in the job.

Mean = 3.51  SD = 0.74
Impact on care quality

Q6. The Andon Board helps me to improve patient safety.

Mean = 3.38  SD = 0.79

Q7. The Andon Board helps me to care better for patients.

Mean = 3.39  SD = 0.71
**Information quality**

**Q11. Information from the Andon Board is relevant.**

- Disagree strongly: 0
- Disagree: 0
- Neither: 15
- Agree: 83
- Agree strongly: 8

Mean = 3.93   SD = 0.47

**Q12. Information from the Andon Board is accurate.**

- Disagree strongly: 0
- Disagree: 2
- Neither: 22
- Agree: 76
- Agree strongly: 6

Mean = 3.81   SD = 0.56
Overall satisfaction level

Q13: Overall, I am satisfied with the Andon Board.

Mean score = 3.58 out of 5    SD = 0.72
Factors that influence user satisfaction.

Attributes of the system with the strongest correlations to user satisfaction. (p<0.01)

<table>
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<tr>
<th>Survey Statements</th>
<th>Correlation Coefficient*</th>
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<tr>
<td><strong>Attributes relating to impact on work efficiency</strong></td>
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<tr>
<td>Q3. The Andon Board saves me time.</td>
<td>0.70</td>
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<tr>
<td>Q4. The Andon Board enables me to accomplish tasks more quickly.</td>
<td>0.68</td>
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<td>Q5. The Andon Board enhances my efficiency in the job.</td>
<td>0.70</td>
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<tr>
<td><strong>Attributes relating to impact on care quality</strong></td>
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<tr>
<td>Q6. The Andon Board helps me to improve patient safety.</td>
<td>0.62</td>
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<tr>
<td>Q7. The Andon Board helps me to care better for patients.</td>
<td>0.63</td>
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</table>

*Spearman correlation coefficient
Qualitative feedback

Q14. What is one thing you like about the Andon?
   – 21% liked the ability to quickly view critical orders, results, tasks in one screen.
   – 20% said that the Andon is easy to use and understand.
   – 12% cited clearer communication with radiology dept. Lesser phone calls needed.

Q15. If there is one thing you could change about the Andon Board to make it better, what would it be?
   – Suggestions in the display format
   – Touch screens were too sensitive.
   – Suggestions for new locations to optimize visibility.
Discussion & Conclusions

• The project team was surprised by the generally positive responses, unlike previous clinical systems rollout!

• High satisfaction & adoption rates were due to the system’s perceived positive impact on work efficiency & care quality

• Tangible benefits cited by nurses
  – Faster access to relevant and accurate patient information
  – Improved coordination of radiology scans
  – Some nurses said that they could save 1-2 phone calls per scan (potential savings of 300-400 calls per month!).
Discussion & Conclusions

• Using touch screen computers as dashboards (unlike view-only ones) enabled us to develop interactive functions & monitor usage patterns. Usage patterns across features, locations are being monitored for interesting insights.

• A follow-up qualitative study may be done to assess if the Andon had mitigated the issues of information overload.
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Backup Slides
Dr orders test in CPOE

Phlebo takes & dispatches blood

Lab receives & processes blood

Blood result available in CPOE

**Problem:**
- Nurse totally out of the loop! (Disintermediated)
- Nurses are losing their key roles as patient advocates & care coordinators.
- NO more paper trail & visual cues.
- Lab orders and results no longer visible unless nurses stare at the CPOE all the time.
Principles of Jidoka – automation with human intelligence

1. A system should be designed so that errors can be surfaced easily.

2. Errors detected should not be allowed to propagate downstream. Stop & Fix asap!

3. Thinking humans and technology must go hand-in-hand!
System quality measures
- usability, reliability, performance

Q8. The Andon Board always does what it should.

Mean = 3.52  SD = 0.72

Q9. The Andon Board is very fast.

Mean = 3.38  SD = 0.75