CRASH CART REDesign PROJECT
(INNOVATION IN PROBLEM SOLVING)

MICHIGAN PHARMACISTS ASSOCIATION MEETING 2017

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AND STAFF AT VA ANN ARBOR HEALTHCARE SYSTEM
CONFLICTS AND CREDITS

✓ The presenter has no conflicts of interest

✓ The presenter would like to thank:
  ✓ University of Michigan Industrial Engineering students
    ✓ Dar-Wei Chen, David Lloyd, Nathan Maziar, Vinay Ramanathan
  ✓ 2015 Pharmacy Valor Interns (Butterfield, VanWieren)
  ✓ 2016 Pharmacy Valor Interns (Cwikla, Yang)
  ✓ Systems Redesign staff – VA Ann Arbor (Valerie Miller)
  ✓ ICU nursing staff – VA Ann Arbor (Agulto et al)
  ✓ Pharmacist and technician staff – VA Ann Arbor (Preda, Davis, Hinton, Nolan, et al)
  ✓ Medication Safety Program Manager (Shah)
  ✓ Healthcare Logistics (Veteran Kyle Sharpe)
OBJECTIVE

*Of this pearl:*
To give the audience ideas about how to problem solve medication safety issues in ways not previously used.

*Of the project:*
Redesign trays to improve the usability of the system.

Genesis of the project – we had a “spice rack” idea from the food industry that needed “feasibility testing”

We had no extra staff and no project funding!!
CURRENT DESIGN
(PROBLEM? WHAT PROBLEM?)
PROBLEMS IDENTIFIED

A. Hidden vial labels reduce label reading and increase opportunity for drug selection mistake
B. Rigid medication slots difficult in drug shortage times
C. Similarity in tray sizes could result in stocking two trays with the same contents
D. Non-intuitive placement of medications
E. Inconsistent syringe placement
STEPS

✓ Secured help from IE Students at the University of Michigan
✓ Assembled a “problem solving team” at no cost to hospital
✓ Described the safety issue and students did literature review, staff surveys and videotaped usability testing of existing process (7/8 errors got through in current system)
✓ Described the improvement idea and had local vendor develop “prototype”.
✓ Did repeat testing with a prototype – verified the hypothesis but custom parts were expensive (only 1/8 errors got through and timing improved)
✓ Waited for something commercially viable (vendor secured 2 US patents from the project)
✓ Piloted new trays and then implemented house wide
✓ Re-tested usability after new trays were put into general use.
✓ Improved safety culture and dialog between various areas
Features of prototype design:

- Spice rack encourages nurses to read vial labels instead of less-reliable auxiliary labels
- Foam inserts in vial slots accommodate various vial shapes and sizes
- Asymmetrical trays feature control error-proofing by decreasing the chances of two non-complementary trays being inserted into drawer
- Medicines placed in descending order of usage from top to bottom and left to right; this placement reduces the time needed to find commonly-used medicines, according to human reading-like tendencies in search theory
- Dividers for the boxes provide redundancy gain in differentiating the boxes from each other through color and position
CODE CART MEDICATION TRAY
USABILITY TESTS

Original Tray

1st Prototype Design

Tested Prototype Design
TESTED PROTOTYPE REDUCED THE OCCURRENCE OF ERRONEOUS RETRIEVALS (94-96% FEWER) COMPARED TO THE ORIGINAL DESIGN

<table>
<thead>
<tr>
<th></th>
<th>Scenario 2</th>
<th>Scenario 4</th>
<th>Scenario 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>100%</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>1st Prototype</td>
<td>0%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Tested Prototype</td>
<td>4.5%</td>
<td>4.5%</td>
<td>9.1%</td>
</tr>
</tbody>
</table>

Comparison of Erroneous Retrievals in Current and Prototype Designs
CONCLUSIONS

The “prototype” tray design outperformed current tray design in terms of medicine retrieval time in a cardiac arrest procedure and also proved to dramatically increase the percentage of times that the actual product labels were read.

The post implementation measurements confirm this in actual use.

The project was an innovative use of students with different expertise to solve a difficult problem.

We also used MBA students to
✓ prepare for Vicodin filling when it went C2 (no more mail)
✓ study the management of drug shortages.

Where else can YOU use students, vendors or people from other industries to solve medication safety issues?

Can you learn from nuclear power, occupational safety, high volume fulfillment centers, auto industry engineers?
REFERENCE:

The Joint Commission Journal on Quality and Patient Safety

Field Notes

Using Human Factors Design Principles and Industrial Engineering Methods to Improve Accuracy and Speed of Drug Selection with Medication Trays

Field Notes provides a forum for brief reports on in-progress innovations in quality and patient safety. Readers are invited to send Field Notes proposals to Steven Berman at sberman@jcomsc.com.

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