Developing Clinical Decision Support:
Traversing the Institutional Landscape

Susan Abdel-Rahman, Pharm.D.
Chief, Section of Therapeutic Innovation
Professor of Pediatrics

Children's Mercy KANSAS CITY

Precision Medicine

Premise

not everybody given the same medicine at the same dose will have the same response

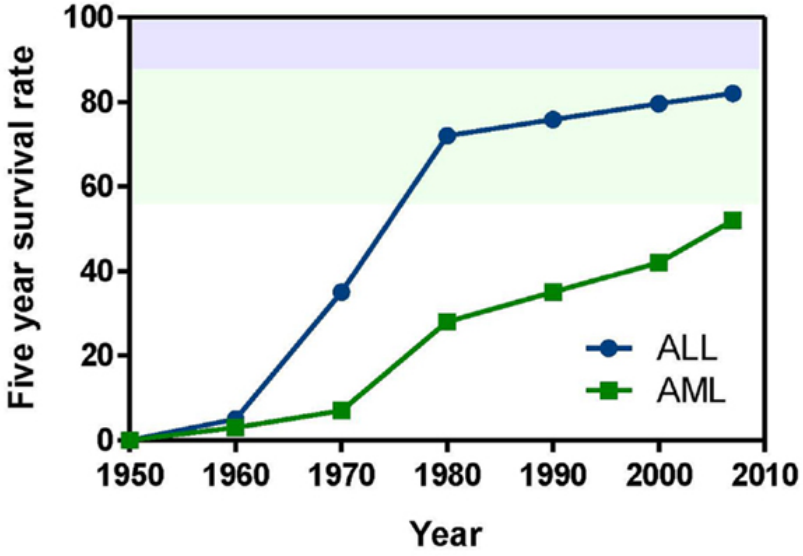
Promise

leverage individual information from genes, environment, lifestyle. etc…to accurately treat disease

Challenge

knowledge and skills to implement differ from clinician to clinician

Success with Optimal Utilization



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Busulfan in Bone Marrow Transplantation

- part of conditioning regimen
- large inter-individual variability
- narrow therapeutic index
- FDA product label addresses individualization

failure to engraft

severe liver toxicity

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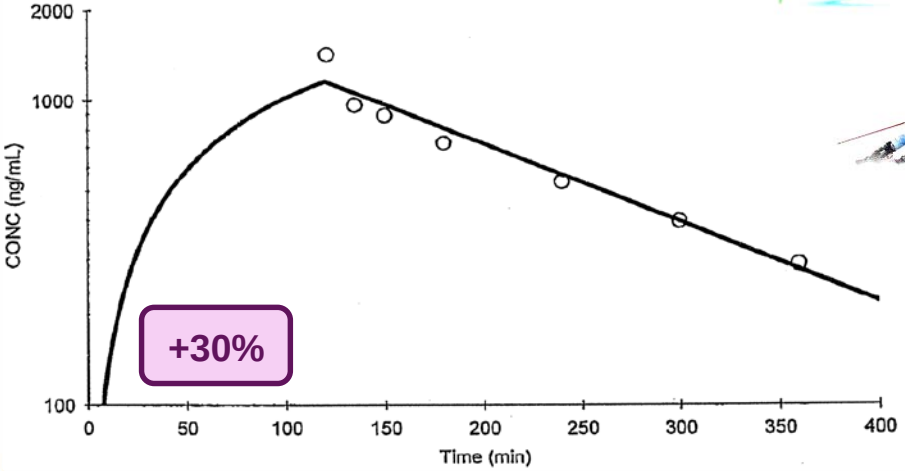
Busulfan Individualization:
Original Process

Aspect	Limitation
• Reference lab contacted >48 hr in advance	inconvenient
• Admission restricted Mon-Thur	
• Samples manually logged	inefficient
• Recommendation via call(s) coordinated b/w lab and team Mon-Fri 9-5 (PST)	
• Dose #7 modified	excessive
• Questionable PK modeling	inaccurate

Reference Lab #1



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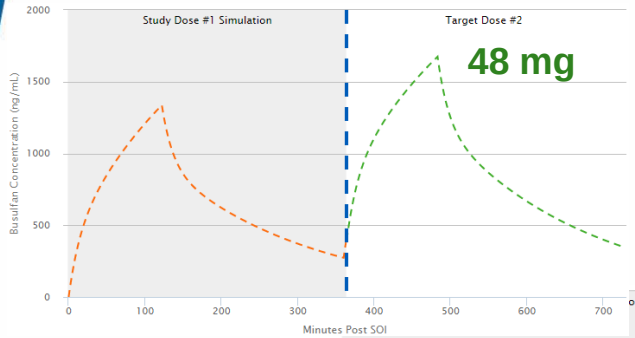
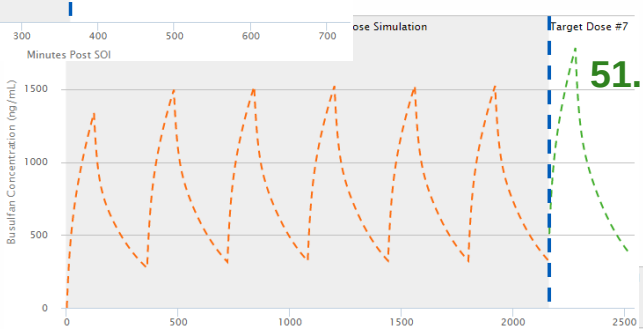
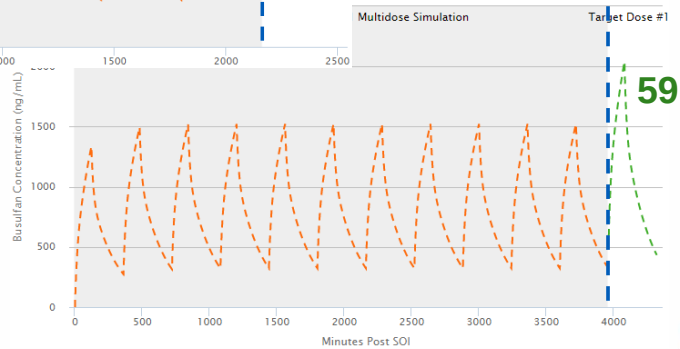
Reference Lab #2



$$\frac{Exp_{observed}}{Dose_{original}} = \frac{Exp_{desired}}{Dose_{new}}$$





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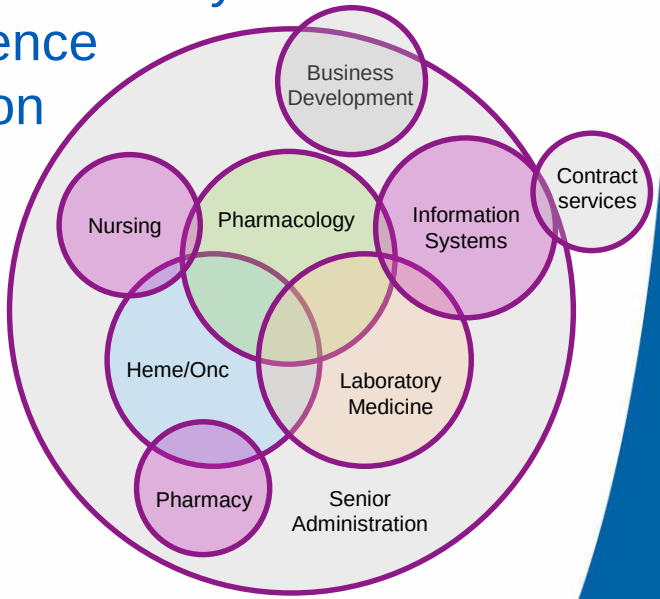
Solutions Considered for Children's Mercy

1. bring plasma assay online
2. perform modeling & simulation in house
   a. formal pharmacokinetic consult
   b. access to external PK software
      - rarely designed for physician user
      - can be unnecessarily complex
   c. clinician-driven decision support tool

} interrupt the flow of care

Successful DSTs…

1. developed with local users
2. available at time/location of decision making
3. integrate within the charting/order entry system
4. do not require additional data entry
5. justify decision with evidence
6. provide a recommendation



AHRQ Publication 12-E001-EF. April 2012

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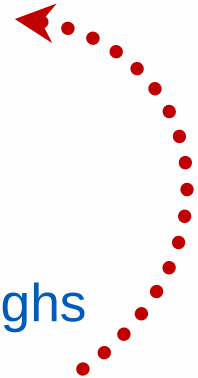
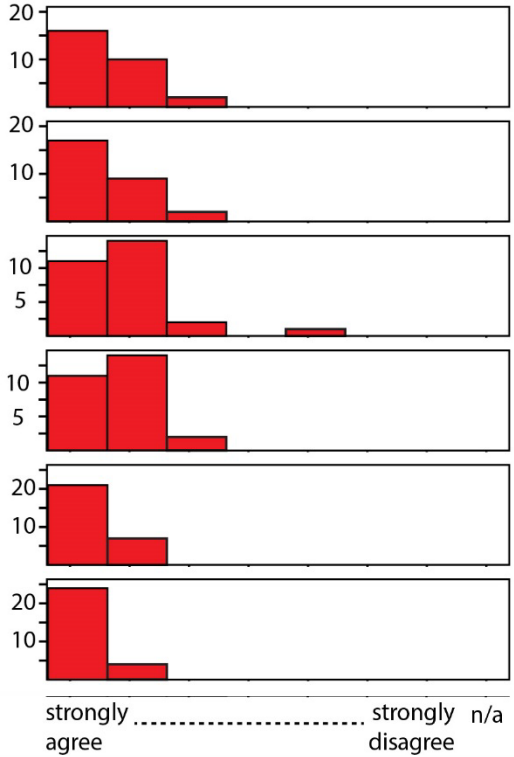
DST Development Activities

1. Requirements Analysis
2. Prototype and Design
3. Unit and Integration Testing
4. Functional Testing
   - Structured Cognitive Walkthroughs
   - Usability Testing



System Quality



Overall, I am satisfied with how easy it is to use this system.

It was simple to use this system.

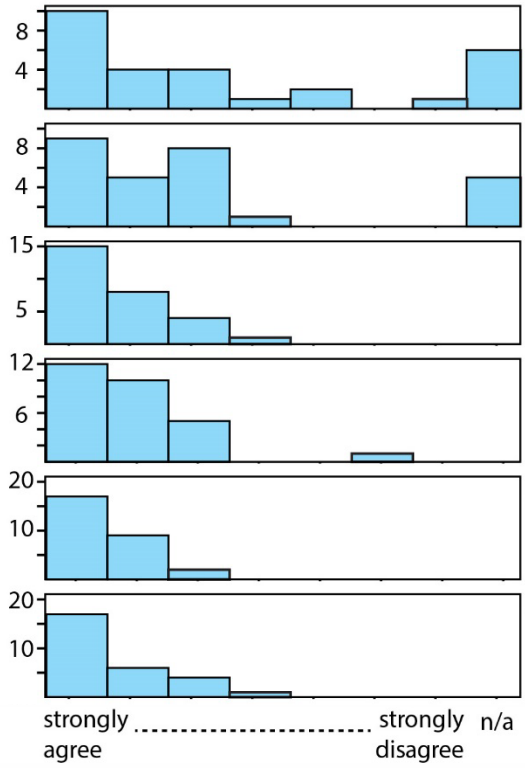
I was able to complete the tasks and scenarios quickly using this system.

I felt comfortable using this system.

It was easy to learn to use this system.

I believe I could become productive quickly using this system.

Information Quality



The system gave error messages that clearly told me how to fix the problems.

Whenever I made a mistake using the system, I could recover easily and quickly.

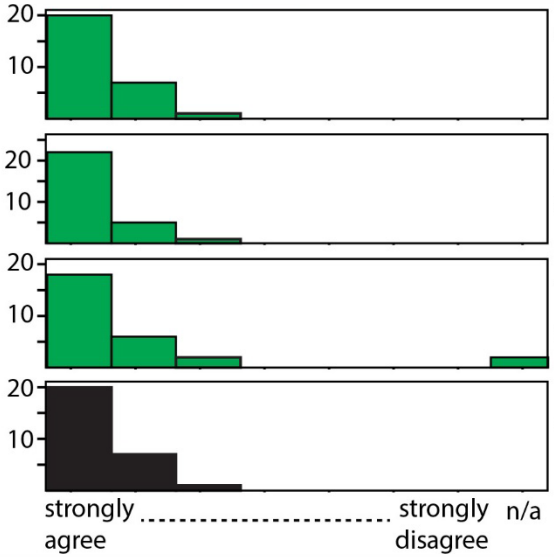
The information provided with this system was clear.

It was easy to find the information I needed.

The information was effective in helping me complete the tasks and scenarios.

The organization of information on the system screens was clear.

Interface Quality & Overall



The interface of this system was pleasant.

I liked using the interface of this system.

This system has all the functions and capabilities I expect it to have.

Overall, I am satisfied with this system.

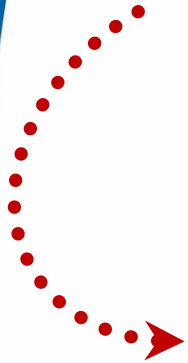
Busulfan Individualization:
Revised Process

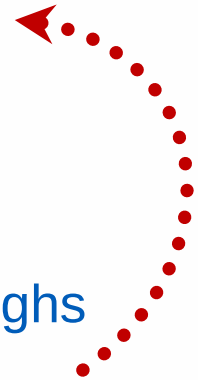
Original Limitation	Solution
• Reference lab contacted >48 hr in advance	• Reference lab contacted same day
• Admission restricted Mon-Thur	• Admission Sun-Sat
• Samples manually logged	• EHR PowerForm
• Recommendation via call(s) coordinated b/w lab and team Mon-Fri 9-5 (PST)	• Performed when convenient 24/7
• Dose #7 modified	• Dose #2-3 modified
• Questionable PK modeling	• Accurate PK modeling

DST Development Activities

1. Requirements Analysis
2. Prototype and Design
3. Unit and Integration Testing
4. Functional Testing
   - Structured Cognitive Walkthroughs
   - Usability Testing

   ****
5. Regression Testing (CQA)
6. Refactoring





Primary Challenge

IT Innovation Stream

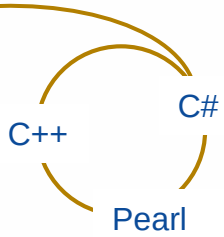
ideal
compliant
streamlined
predefined roadmap
dedicated personnel

Traditional IT

compliant
inefficient (dual hats)
iterative decision making
communication gaps
resource costs

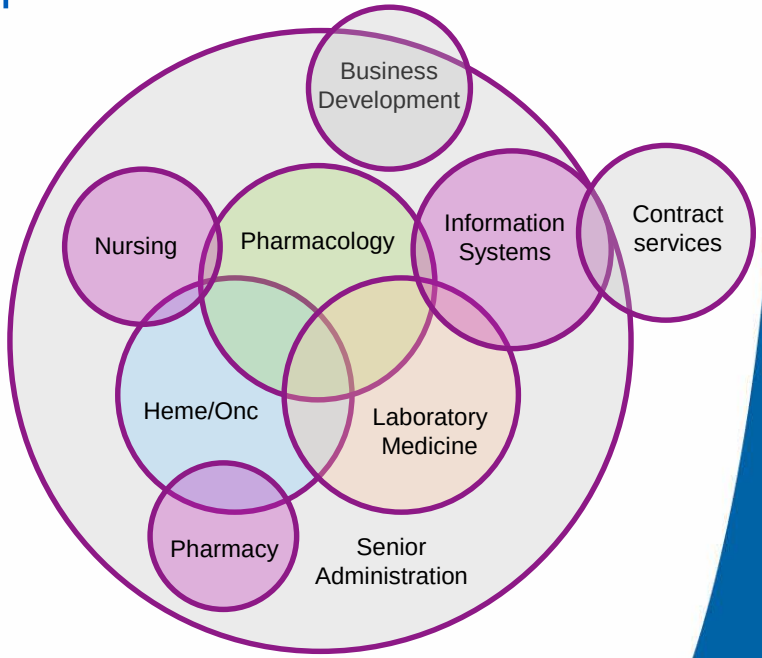
Shadow IT

efficient
impractical
non-compliant



Secondary Challenges

- long-term management
- business plan development
- accessibility
- sustainability
- regulatory clearance



frontiers in Pharmacology

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Design and Testing of an EHR-Integrated, Busulfan Pharmacokinetic Decision Support Tool for the Point-of-Care Clinician

Susan M. Abdel-Rahman[1,2], Matthew L. Breitkreutz[3], Charlie Bi[1], Brett J. Matzuka[1], Jignesh Dalal[4], K. Leigh Casey[5], Uttam Garg[2,6], Sara Winkle[3], J. Steven Leeder[1,2], JeanAnn Breedlove[3] and Brian Rivera[3]*