



**Quality and Workflow:**

**How Novel Medication Reconciliation Software Transformed Communication & Enhanced Patient Safety**

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• Safety • Quality • Service






- Part of Tenet Healthcare Corporation (49 Hospitals)
- Academic Teaching Hospital
- Affiliated with Drexel University
- 496 Beds
- Urban Environment – Philadelphia, PA



**Level 1 Trauma Center**

- Ranked one of nation's Top 50 Hospitals for Cardiology & Heart Surgery – *U.S. News & World Report*, 2007, 2010, 2011
- Ranked fourth among 91 hospitals in Philadelphia metro area - *U.S. News & World Report*, 2012
- Ten specialties ranked "high performing" in Philadelphia metro area - *U.S. News & World Report*, 2012
- Ranked fifth among hospitals in Philadelphia area, nine specialties ranked "high performing" - *U.S. News & World Report*, 2011
- FACT Accreditation, Bone Marrow Transplantation, 2011
- Magnet Recognition Facility, ANCC (American Nurses Credentialing Center), 2009
- Best Places to Work, *Philadelphia Business Journal*, 2008, 2009, 2010, 2011
- Gold Plus Performance Achievement Award for Stroke, American Heart Association, 2010

<http://www.hahnnemannhospital.com/en-us/aboutus/pages/awards%20and%20designations.aspx>

## Conference Objective Met

Evaluate effectiveness in Integrating New Technologies that Support Quality Improvement

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## Learning Objectives

1. Employ workflow redesign utilizing technology to promote safety through enhancing communication among caregivers.
2. Examine evidence-based concepts of medication reconciliation & nursing informatics to promote quality resulting in reduced adverse drug reactions.

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## Background

- Medication reconciliation is required on admission to acute care facilities to ensure that orders for inpatient medications reflect thoughtful consideration of the patient's home medications, and that medications ordered on admission are adjusted accordingly (The Joint Commission, 2011b).
- Despite the regulatory requirement, many patients do not have an accurate list of medications collected and documented on admission, potentially leading to Adverse Drug Events (ADEs) (Clancy 2006; IHI, 2008; ISMP, 2005; Mansur, n.d; McGaw, Conner, Delate, Chester, & Barnes, 2007; Poole, Chainakul, Pearson, & Graham, 2006; Pronovost et al., 2003; Schnipper et al., 2009; & Stefan, 2010).

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## Joint Commission Regulations

The goal of medication reconciliation is to:

1. Obtain information on the medications the patient is currently taking when he or she is admitted to the hospital.
2. Compare the medication information the patient brought to the hospital with the medications ordered for the patient by the hospital in order to identify and resolve discrepancies



(The Joint Commission, 2011b)

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## Joint Commission Regulations

3. Provide the patient (or family as needed) with written information on the medications the patient should be taking when he or she is discharged from the hospital (name; dose; route; frequency; purpose).
4. Explain the importance of managing medication information to the patient when he or she is discharged from the hospital or at the end of an outpatient encounter.



(The Joint Commission, 2011b)

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## Meaningful Use & Medication Reconciliation

- Despite previous regulatory efforts, patient-centered, technology-enabled medication reconciliation is still not a consistent reality
- Menu-set option in MU1 in order to promote adoption of a technology-enabled process through financial incentives
- Becomes a Core Objective in MU2 with EP & EH needing to demonstrate compliance with 50% of all TOC

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MEANINGFUL USE 42 CFR 46.402(a) Stage 2 Objective		MEANINGFUL USE 42 CFR 46.402(a) Stage 2 Message		2014 Edition EHR CERTIFICATION CRITERIA 42 CFR 170.313		STANDARDS	
EP	EH						
CPOE	EP	Generate and transmit electronically medication orders, or all prescriptions, orders by the EP are entered for a drug formulary and transmitted electronically using CPOE.	Electronic prescribing. Enable a user to electronically create prescriptions and prescription-related information for electronic transmission in accordance with: <ol style="list-style-type: none"> <li>The specified standard in § 170.207(a)(2).</li> <li>As a minimum, the version of the standard specified in § 170.207(a)(2).</li> </ol>	§ 170.207(a)(2)	§ 170.207(a)(2)	§ 170.207(a)(2) - NCPDP SCRIPT version 2.0.6. § 170.207(a)(2) - RxNorm, August 8, 2012 Release	
	EH	The EP performs medication reconciliation for more than 90% of transitions of care to admit the patient to inpatient care in the unit of the EP.	Drug history display. EHR technology must automatically and electronically check whether a medication prescribed drug (DRUG) exists for a given patient and medication. <ol style="list-style-type: none"> <li>Enable a user to review and validate the accuracy of a final list of data and, upon a user's confirmation, automatically update the list.</li> </ol>	§ 170.204(a)(4)			
CPOE	EP	The EP, EP, or CMT who receives a patient from another setting or a provider of care in inpatient or emergency department (ED) performs medication reconciliation for more than 90% of transitions of care to admit the patient to inpatient or emergency department (IPD or ED).	Drug information reconciliation. Enable a user to electronically reconcile the data that represent a patient's active medications, problems, and medication allergy list in inpatient, for each visit type: <ol style="list-style-type: none"> <li>Electronically and simultaneously display (i.e., in a single view) the data from at least two sources to ensure that updates to one of the data and the others, which may include, at a minimum, the source and last medication date.</li> <li>Enable a user to review and validate the accuracy of a final list of data and, upon a user's confirmation, automatically update the list.</li> </ol>	§ 170.204(a)(4)			
	EH	Electronic laboratory test and values/results results are entered into CPOE as requested data.	Laboratory laboratory tests and values/results. <ol style="list-style-type: none"> <li>Receive results.</li> <li>Electronic display and integrate clinical laboratory tests and values/results in accordance with the standard specified in § 170.207(a)(2) and, at a minimum, the version of the standard specified in § 170.207(a)(2).</li> <li>Electronically display the tests and values/results received in human readable format.</li> <li>Integrate electronically. EHR technology must display laboratory tests and values/results in a structured format and electronically display both tests and values/results in human readable format.</li> <li>Electronically display of the information for a test report specified in 42 CFR 464.120(a)(4) through (7).</li> <li>Electronically archive, associate, or link a laboratory test and values/results with a laboratory order or request record.</li> </ol>	§ 170.207(a)(2)	§ 170.207(a)(2) - HL7 Version 2.5.1 Implementation Guide 2.0.0 Framework and Function Interface. § 170.207(a)(2) - LINC version 2.42, June 2012, a clinical data exchange for interlinking laboratory and clinical observations produced by the Regenstrief Institute, Inc.		

Retrieved from: [http://www.healthit.gov/sites/default/files/meaningfulusetablesseries2\\_110112.pdf](http://www.healthit.gov/sites/default/files/meaningfulusetablesseries2_110112.pdf)



## "Old" Process & Workflow - Admission

- RN captures "home" meds on paper Admission Database
  - Source: Typically the patient
- Provider captures "home" meds on H&P
  - Source: Old records, multiple sources
  - Neither discipline sees the other's list
  - Pharmacy never sees either list
- Provider orders inpatient meds via CPOE
  - Pharmacy verifies
  - RN administers meds
- No independent double-check or cross check

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## Reality of the hand-written chart

*Handwritten medical notes:*  
 LFTs v UDS v Ammonia  
 - to 40% ; Neuro (L)  
 d.  
 Will fix now.  
 ill.  
 well.  
 Discharge in ER 23 the rest the way  
 at night time 6:00 on Thursday 12/11/10.  
 She was like 6-8 hours before discharge  
 Prescriptions were like 100% of her  
 for 30 units 512 at night.  
 A. (Name)  
 (1) Consult: EP G. (Name)  
 Indicate Reason: Neuro  
 MIRA: (Name) (Name)

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## H&P Provider Home Med List

Medication	Dose	Route	Frequency
Propranolol	20	PO	daily
Lasix	30	PO	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily
Lasix	100mg	IV	daily

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## "Old" Process & Workflow - Discharge

- Provider writes out list of home medications on middle panel of paper discharge form
- RN re-writes med list on right panel of tri-fold form
  - The provider is to have manually reviewed the H&P & current active order in CPOE to create list
  - The RN is to have verified the provider list & compare to Admission Database, CPOE, & H&P
  - Second RN to verify process

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## Patient Discharge Med List- Provider

Allergies <input type="checkbox"/> No Known Allergies					
Discharge Medications	Dose	Times Daily	Scripts Written	Indications (What it treats)	Other Instructions
Do not write "Resume all medications" Write out the names of all medications.					
1. FETID	20mg	1	✓		
2. FLETOXINOL	120mg	1	✓		
3. OLANE	30mg	2	✓		
4. SEVA	150mg	1	✓		
5. SERENOL	30mg	1	✓		
6. LAMOTRIGINE	150mg	1	✓		
7. CARBAMAZEPINE	150mg	1	✓		
8. TRAMADOL	50mg	4-6x	✓		
9. LANTUS	30U	qHS	✓		
10. FEEDING ME			✓	10mg Sit, 2mg Sleep (Pump)	
11. VALPROATE	75mg	1	✓		
12.					
13.					
14.					
15.					

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## Mission . . . what about Vision?

- Meet the 2006 Joint Commission Medication Reconciliation requirement
- Utilize grant monies to purchase medication reconciliation software and implement
- Roll-out in 2007
- Pharmacy to manage

## Early Challenges

- No medication reconciliation software was available for purchase as a stand-alone or add-on solution for the existing CPOE
- Decision was made to create a novel system
- The Joint Commission mandate was delayed as many organizations struggled to meet the mandate

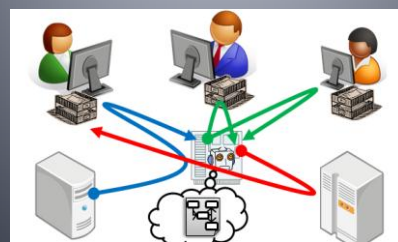
## Early Challenges

- Development took 18 months
- Initial product was released in late 2008, clinician validation found user interface cumbersome & redesign was needed
  - The Joint Commission extended the implementation date to January 2009
  - Programmers and pharmacy leaders did not include end-users in design
  - Goal was to meet regulation, *not usability*

## Implementation Challenges

- Due to the delay and initial lack of front-line staff input, a pilot was conducted
- Patient safety issues identified during pilot
- Three months spent fixing – pilot again
- Success!!! July of 2011 . . . Just in time?
  - Flaw – No edit feature

## Workflow Changes



## The New Admission Process

**Medication Reconciliation - Windows Internet Explorer**

Medication Reconciliation

Search: Patient Medications    Reconciliation History

Patient Medications

Current Home Medications

Notes

Special Instructions

Add from Previous Discharge list

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## Adding Meds – Pick List

**Medication Reconciliation - Windows Internet Explorer**

Medication Reconciliation

Search: Patient Medications    Reconciliation History

Patient Medications

Current Home Medications

Add Medication

Medication Name: FURAZEDONE\_LADOL  
 Class: FURAZEDONE\_LADOL  
 Route: TABLET (FURAZEDONE\_LADOL)  
 Preparation: FURAZEDONE\_LADOL (FURAZEDONE\_LADOL)  
 In: TABLET (FURAZEDONE\_LADOL)

Notes

Special Instructions

Add from Previous Discharge list

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## Visible "Face-up" Revision Tracking

**Medication Reconciliation - Windows Internet Explorer**

Medication Reconciliation

Search: Patient Medications    Reconciliation History

Patient Medications

Current Home Medications

Notes

Special Instructions

Add from Previous Discharge list

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## Attestation - Interdisciplinary

**Medication Reconciliation - Windows Internet Explorer**

Medication Reconciliation

Search: Patient Medications    Reconciliation History

Patient Medications

Current Home Medications

Notes

Special Instructions

Add from Previous Discharge list

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## Attestation Complete

**Medication Reconciliation - Windows Internet Explorer**

Medication Reconciliation

Search: Patient Medications    Reconciliation History

Patient Medications

Current Home Medications

Notes

Special Instructions

Add from Previous Discharge list

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## Discharge Reconciliation

**Medication Reconciliation - Windows Internet Explorer**

Medication Reconciliation

Search: Patient Medications    Reconciliation History

Patient Medications

Current Home Medications

Notes

Special Instructions

Add from Previous Discharge list

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## Final Medication List

The screenshot shows a web-based application titled 'MEDICATION RECONCILIATION'. It displays a table of medications with columns for medication name, strength, frequency, and other details. The interface includes a search bar and various navigation options.

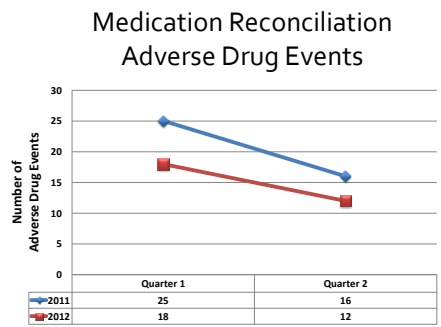
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## Patient-Centered Discharge Form

A simple graphic of a document icon with the text 'DOC' below it, representing a patient-centered discharge form.

## Outcomes

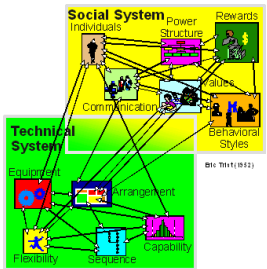
This slide is currently blank, serving as a placeholder for information related to the outcomes of the medication reconciliation process.



## Informatics & the Sociotechnical Process

Informaticians are prepared to influence, contribute to, and mold the realization of an organization's vision for knowledge management.

McLane & Turley, 2011



## Research – Key Findings

- Communication is essential. (AHRQ, 2011; ISMP, 2005; Pronovost; 2003; Poole et al., 2007; Schnipper et al., 2009)
- Interdisciplinary cross-checks, independent redundancy, independent double checks (AHRQ, n.d.; Poole, et al. (2006), McGaw et al. (2007), and Schnipper et al. (2009)
- Integrated electronic process is critical
- Focus has been on discharge process, not admission. Complete data on transitions is essential. (Greenwald et al, 2010; McGaw et al., 2007; Poole et al., 2007; Schnipper et al., 2009)
- Need more data about environment & process on admission (Poole, 2007; Schnipper et al., 2009)





## Cognitive Framework - Analysis

### G. Octo Barnett's 10 HIT Commandments

1. **Know what you want to do**
2. Thou shall construct modular systems - given chaotic nature of hospitals
3. Thou shall build a computer system that can evolve in a graceful fashion
4. Thou shall build a system that allows easy and rapid programming development and modification
5. Thou shall build a system that has consistently rapid response time and is easy for the non-computernik to use

(Silverstein, 2011)



## Cognitive Framework Analysis

6. Thou shall have duplicate hardware systems
7. **Thou shall build and implement your system in a joint effort with real users in a real situation with real problems**
8. Thou shall be concerned with realities of the cost and projected benefit of the computer system
9. **Innovation in computer technology is not enough; there must be a commitment to the potentials of radical change in other aspects of healthcare delivery, particularly those having to do with organization and manpower utilization**
10. Be optimistic about the future, supportive of good work that is being done, passionate in your commitment, but always guided by a fundamental skepticism.

(Silverstein, 2011)

## Conclusions

- Ensuring that usability through direct input from front-line clinical staff is a priority during design phase (ISMP, 2005; Levis, 2010; Silverstein, 2011)
- Change management with support of administration, clinical informatics, physicians and nurses, and IT are as important, if not more so, than the software or system itself (Greenwald et al., 2010; Koppel & Kreda, 2009; IOM, 2012; Silverstein, 2011; Weir 2009).
- Weir et al. (2009) confirm this view by stating:

"A sociotechnical perspective is essential. Technology and the institution must be viewed as an indivisible whole and change as an emergent property to properly answer the question of how to transform an institution into a 21<sup>st</sup>-century health care institution" (p. 391).



## Final Thought

- Computers are incredibly fast, accurate and stupid; humans are incredibly slow, inaccurate and brilliant; together they are powerful beyond imagination." - Author Unknown*

Source: <http://www.benshoemate.com/2008/11/30/einstein-never-said-that/>

## Questions?



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