

**SINI 2016**  
26th Summer Institute in Nursing Informatics  
Informatics at the Crossroads of Care Coordination  
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University of Maryland School of Nursing, Baltimore, Maryland

**CIS: Show me the outcomes and the \$\$\$\$!!!**

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## Objectives

- Discuss the pressures to increase quality outcomes and decrease costs on healthcare organizations
- Describe how technology can support the uptake of evidence into nursing practice
- Review the history of alerts & reminders used to support reduction of CAUTI
- Discuss the implementation approach of alerts by a large health system to increase uptake of EBP for timely removal of urinary catheters
- Review before and after quality and financial metrics achieved

## Healthcare Environment



ARRA American Recovery and Reinvestment Act of 2009  
Clinician shortages  
HCAHPS Hospital Care Quality Information from the Consumer Perspective  
Hospital Acquired Conditions  
SRG Repeal  
The IHI Triple Aim  
Population Health  
Experience of Care  
Per Capita Cost  
THE HITECH ACT  
MEDICARE  
Abstracted Core Measures  
eQMs & MIPs

Medicare.gov/hospitalcompare/search.html

Andy Slavitt @ASlavitt  
In 2016, MU as it has existed-- with MACRA-- will now be effectively over and replaced with something better #IPAH10  
8:16 PM - 11 Jan 2016

## Background

- Reimbursement changes penalize organizations for hospital acquired infections (HAIs) (CMS, 2013)
- Urinary tract infections account for 35-40% HAIs (Blodgett, 2009; Lo et al., 2014)
- 70-80% are attributed to urinary catheters (Blodgett, 2009; Lo et al., 2014)
- Catheter associated urinary tract infections (CAUTIs) are the most common HAI (American Nurses Association, 2015)

## Background

- Healthcare Information Technology (HIT) is believed to support transformation through linkages between nursing care and patient outcomes
- Barriers to implement evidence based guidelines (EBG) include lack of time, access to articles, research and guidelines (Solomons & Spross, 2011; Melnyk, 2012)
- Electronic healthcare records can improve the quality of care by offering EBG to nurses
- Alerts and reminders can help fill the gap between current practice and EBG

## Problem

- Clinical decision support interventions should target EBG during decision making (Greenes, 2014)
- The use of alerts and reminders studied have been non-computerized (Cornia, Amory, Fraser, Saint, & Lipsky, 2003; Topal et al., 2005; Apisarntharak et al., 2007; Loeb et al., 2008; Blodgett, 2009; Bernard, Hunter, & Moore, 2012; Palmer, Lee, Dutta-Linn, Wroe, & Hartmann, 2013; Meddings et al., 2014; Lo et al., 2014)
- Relationship between catheter days and urinary tract infections is known (Gould, C. V., Umscheid, C. A., Agarwal, R. K., Kuntz, G., & Pegues, D. A., 2010)
- Informatics strategies need to be focused on cueing nurses (American Nurses Association [ANA], 2015)

## Significance

- Timely removal of catheter decreases CAUTI (Gould, C. V., Umscheid, C. A., Agarwal, R. K., Kuntz, G., & Pegues, D. A., 2010)
- Addressing the gap between EBG and removal of urinary catheter is key (Gould, et al., 2010)
- Incorporation of HIT solutions, such as clinical decision support, is important (American Nurses Association, 2015)
- Evaluation of effectiveness of alerts in the informatics literature is incomplete (Topal et al., 2005; Cornia, Amory, Fraser, Saint, & Lipsky, 2003; Loeb et al., 2008; Apisarntharak et al., 2007)

## Project Site specific example

- BSWH-NTX has implemented several tactics to eliminate CAUTI incidence;
  - Physician and Nursing leaders developed & approved an evidence based, nurse driven protocol (EBG) for timely removal of the urinary catheter
  - Integration and hardwiring into the physician & nursing workflow has been a challenge
    - Physician documentation indicating reason
    - Nursing assessment identifying catheter necessity
    - Inconsistent use of Catheter Management Protocol
  - Monitoring for utilization of the protocol and providing feedback loop has become labor intensive

## What does the Literature say?

### Incidence of CAUTI and association of urinary catheter days

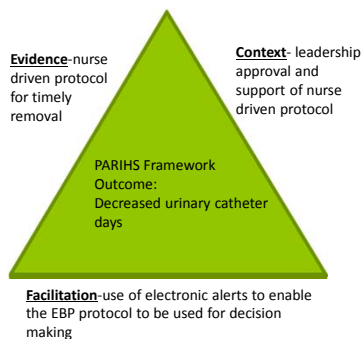
- 12-16% of adult acute care patients will have a urinary catheter during their hospitalization (Lo et al., 2014)
- Risk of CAUTI is directly linked to the length of time the urinary catheter is in place (Cornia et al., 2003; Topal et al., 2005; Apisarnthanarak et al., 2007)
- 20-50% of catheters do not meet appropriate indications for USE (Saint et al., 2000; Topal et al., 2005; Apisarnthanarak et al., 2007; Gould, Umscheid, Agarwal, Kuntz, & Pegues, 2010)
- 36% of physicians are unaware their patient has a urinary catheter (Saint et al., 2000)

## Literature Review

### Strategies to prompt removal of unnecessary urinary catheters

- Forming and initiating reminders to physicians is **common** (Cornia et al., 2003; Topal et al., 2005; Apisarnthanarak et al., 2007; Loeb et al., 2008; Blodgett, 2009; Palmer, Lee, Dutta-Linn, Wroe, & Hartmann, 2013; Meddings et al., 2014; and Lo et al., 2014)
- Implementation of reminders is effective in decreasing catheter days
  - Most reminders are face to face, paper based or electronic orders to physicians and require staff resources (Cornia et al., 2003; Huang et al., 2004; Crouzet et al., 2007; Apisarnthanarak et al., 2007; Loeb et al., 2008; Elpern et al., 2009; Fakhri et al., 2012; Weiden, 2013)
- Implementation of nurse driven protocol after physician documents catheter necessity criteria has been **successful** (Cornia et al., 2003; Topal, 2005; Apisarnthanarak et al., 2007; Fakhri, Rey, Pena, Szpunar, & Saravolatz, 2012; Roser et al., 2012; Adams, Bucior, Day, & Rimmer, 2012)

## Promoting Action on Research Implementation in Health Services (PARIHS)



(Kitson, Harvey, & McCormack, 1998; Rycroft-Malone et al., 2002; Rycroft-Malone et al., 2004)

## Project Site Metric

- By 2/1/15, implement content changes in the EHR to support Catheter Management Protocol and reduce overall urinary catheter days by 10%;
  - Include physician indication reason on urinary catheter order
  - Alert message to nurses based on catheter necessity documentation
  - Present EBG to support the nurses decision making about catheter removal
  - Compare pre and post alert implementation catheter days

## Project Site Metric

By 8/10/15, reduce overall NTX CAUTI incidence rate by 10%;

- Compare pre and post implementation CAUTI incidence rate

## Project Site Metrics

- By 8/1/15, calculate potential cost avoidance based on overall decrease of NTX CAUTI incidence rate by 10%;
  - Compare pre and post alert implementation CAUTI incidence rates
  - Calculate and compare the rate of change between two time periods
  - Calculate decreased rate and calculate cost avoidance based on \$2,160 per avoided CAUTI
  - Calculate the cost savings based on elimination of manual tracking

### Capture catheter indication

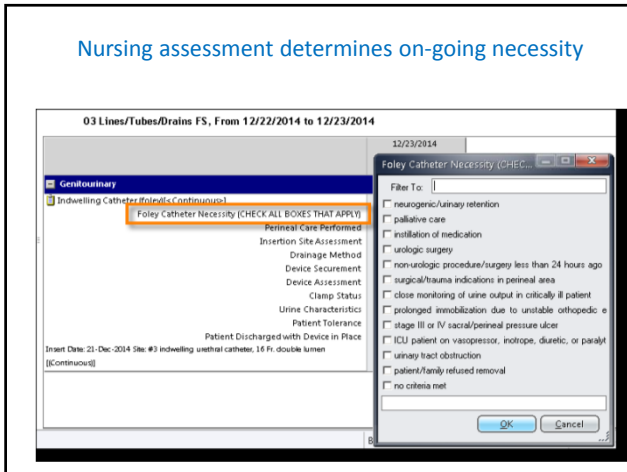
The screenshot shows a medical order form for a 'Foley Catheter'. Key fields include 'Requested By: LEMBOCKE, BRADLEY THOMAS', 'Start Date: 12/23/2014', and 'Foley Present on Admission: [ ]'. The 'Foley Necessity' section contains a list of checkboxes for various clinical indications such as 'Neurogenic/Urinary Retention', 'Urological Surgery', and 'Surgical/Trauma in Perineal Area'. A callout box points to the 'Foley Necessity' section with the text: 'Use same necessity reason on insert Tubes SN, but per your assessment thereafter'. Another callout box points to the 'Other Specify' field with the text: 'Be clear about how the provider wants to manage removal'. At the bottom, the 'Remove' field is set to 'Per Urethral Catheter Management Policy', and the 'Special Task' field is set to 'Remove Note: Post Op Day 1, Post Op Day 2, Prior to Removal: Call Physician When Patient No Longer Meets Criteria for Foley'. A third callout box points to the 'Remove' field with the text: 'Reason displays on last line'.

### Communicate clearly to care team

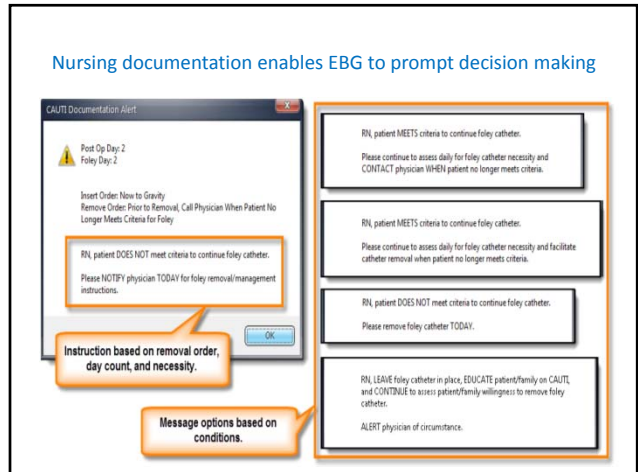
**Foley Catheter**; Insert/Maintains Now to Gravity; Remove: Per Urethral Catheter Management Policy  
Foley Necessity: Neurogenic/Urinary Retention

Include screen shot of columns or viewer?

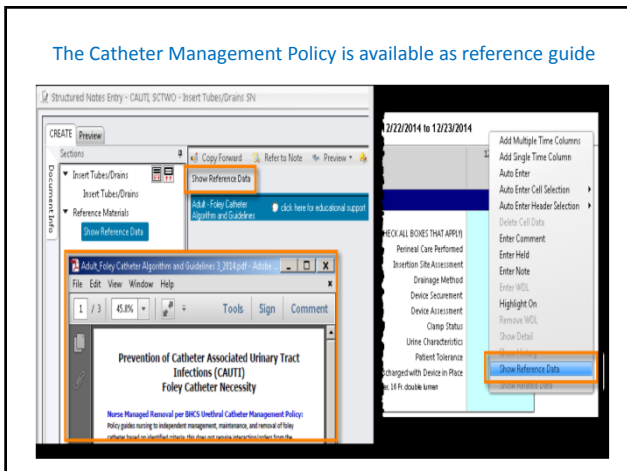
Nursing assessment determines on-going necessity



Nursing documentation enables EBG to prompt decision making



The Catheter Management Policy is available as reference guide



Retrospective Design

- Quantitative, non-experimental, before and after comparative design
- A retrospective data set from the electronic health record was used
- Large data set representing the total population
- Consecutive sample of all unique, EHR records with an urinary catheter order
- Electronic data query contained records 3 months before and 3 months after implementation of alerts

Nov	Dec	Jan	Feb	March	April	May
Before	Before	Before	Not used	After	After	After

## Evaluation approach

- Consecutive sample of the total population of discharge unique patient records
- Total sample population contain 13,774 unique patient records
- Before comparison group to contain 6,838 unique patient records
- After comparison group to contain 6,935 unique patient records
- Data set query meeting the inclusion and exclusion criteria was cleaned and scrubbed prior to data analysis

## Data Analysis Findings

Demographic Characteristic Statistics - Categorical Variables

Characteristic	Before group		After group		Whole group	
	n	%	n	%	n	%
<b>Gender</b>						
Male	2664	38.9	2593	37.4	5257	38.2
Female	4177	61.1	4345	62.6	8522	61.8
<b>Race</b>						
White	5523	80.7	5296	76.3	10,819	78.5
Non-white	1318	19.3	1642	23.7	2960	21.5
<b>Age</b>						
18-34	1153	16.9	1299	18.7	2452	17.8
35-120	5688	83.1	5639	81.3	11,327	82.2
<b>Type of Unit</b>						
Med-Surg	6020	88	5983	86.2	12,003	87.1
ICU	821	12	955	13.8	1776	12.9
Antibiotics	1571	23	1572	22.7	3138	22.8
No Antibiotic	5270	77	5366	77.3	10,636	77.2

## Data Analysis Findings

### Independent samples t-test

Catheter Days	Levene's Test for Equality of Variances	t	Sig. (2-tailed)	t-test for Equality of Means		95% Confidence Interval of the Difference	
				Mean Difference	Std. Error Difference	Lower	Upper
Equal variances not assumed	2.959	.003	.186	.063	.063	.310	

Test Statistics <sup>a</sup>	
<b>Mann-Whitney U</b>	Catheter Days 22840192.000
Wilcoxon W	46897708.000
Z	-3.868
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Alerts

## Mean Catheter Days

Descriptive Statistics

Catheter Days	N	Range	Minimum	Maximum	Mean	Std. Deviation
Before Group	6,838	39	0	39	3.06	3.790
After Group	6,936	39	0	39	2.87	3.597

### Mean Catheter Days by Unit of Care

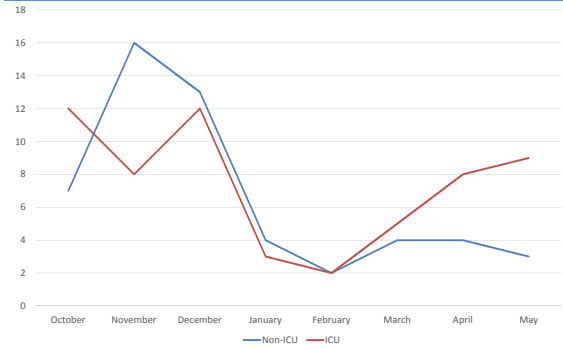
Before group			After group			Total group		
n	M/S	ICU	n	M/S	ICU	n	M/S	ICU
6838	3.01	3.55	6936	2.81	3.36	13744	2.89	3.45

Note. Confidence interval at 95%

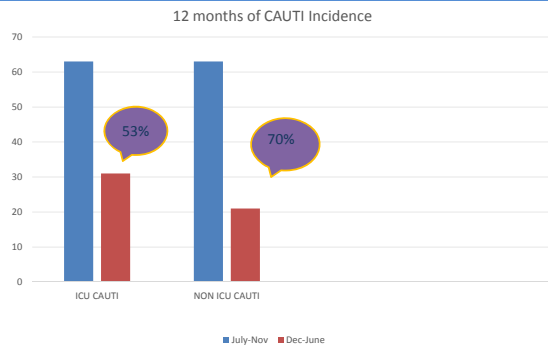
### Median Catheter Days

Variable	Before group		After group	
	n	Md	n	Md
Age				
18-34 years	1152	1.00	1299	1.00
35-120 years	5688	2.00	5639	2.00
Race				
White	5523	2.00	5296	2.00
Non-White	1318	2.00	1642	2.00
Gender				
Male	2664	2.00	2593	2.00
Female	4177	2.00	4345	2.00
Unit of Care				
Med-Surg	6020	2.00	5983	2.00
ICU	821	2.00	955	2.00
Antibiotics				
No	5270	2.00	5366	1.00
Yes	1571	4.00	1572	3.00

### CAUTI Incidence



### Potential Cost Avoidance



### Calculating Cost Avoidance

- 53% rate of change equates to 32 avoided CAUTI in ICU patients
- 70% rate of change equates to 42 avoided CAUTI in non-ICU patients
- Total of 74 avoided CAUTI at \$2,160 per case = cost avoidance of \$159,840
- Decrease in manual tracking of foley days in 181 units x 2.5 hrs. per week= 23,530 hrs. per year = \$941,200

**\$1,101,040**

## Importance to Nursing Informatics

- Introduction of electronic alerts was significant in decreasing catheter days
- Strong research links decrease in catheter days to decrease incidence of CAUTI (Cornia et al., 2003; Topal et al., 2005; Apisarnthanarak et al., 2007)
- Introduction of electronic alerts presented EBP at the time of decision making to cue nurses (American Nurses Association, 2015)
- The use of the PARIHS framework can organize and help evaluate implementation science projects
- Implementation of alerts and calculation by EHR decreases administrative burden
- Big data can be used to evaluate quality improvement projects

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**QUESTIONS?**

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