

Preventing Catheter-Associated Urinary Tract Infection: Translating Research into Practice

Sanjay Saint, MD, MPH

Professor of Medicine

Ann Arbor VA Medical Center

University of Michigan Medical School



Healthcare-Associated Infection (HAI)

- At least 20% of episodes are preventable; perhaps as much as 70%

(Harbath et al. J Hosp Infect 2003)

- Medicare no longer reimburses U.S. hospitals for the additional costs of certain infections
- Preventive practices are variably used
- Infection control is a good model for understanding translation – both successes and failures

Overview



- Catheter-Associated UTI
 - Background
 - Prevention
- Translating Research into Practice
- Conclusions

Urinary Catheter-Related Infection: Background

- Urinary tract infection (UTI) causes ~ 40% of hospital-acquired infections
- Most infections due to urinary catheters
- Up to 25% of inpatients are catheterized
- Leads to increased morbidity and costs

Clinical Manifestations of CAUTI

- Clinical manifestations vary greatly
- Asymptomatic bacteriuria \Rightarrow overwhelming sepsis
- Symptomatic UTI:
 - Lower abdominal, suprapubic, or flank pain
 - Systemic symptoms: nausea, vomiting, fever

Burden-of-illness

- Of patients who receive urethral catheters:
 - Bacteriuria rate is ~5% per day
- Among those with bacteriuria:
 - ~10% will develop symptoms of UTI
 - Up to 3% will develop bacteremia
- Direct medical costs:
 - Symptomatic UTI: ~\$600 per episode
 - Bacteremia: ~\$3000 per episode

(Tambyah et al. ICHE 2002; Saint AJIC 1999)

Centers for Medicare & Medicaid Services (CMS) Rule Changes: 1 October 2008

- CMS now holds U.S. hospitals accountable for not preventing certain hospital-acquired complications
- CMS required to choose at least 2 conditions that:
 - are high cost and/or high volume; and
 - could *reasonably* have been prevented through the application of evidence-based guidelines

CMS Chose More Than 2 Conditions

- Catheter-associated UTI
- Vascular catheter-associated infection
- Retained object during surgery
- Air embolism
- Blood incompatibility
- Pressure ulcers
- Surgical Site Infections after certain surgical procedures
- Falls and Trauma
- Manifestations of Poor Glycemic Control
- DVT or PE following certain orthopedic surgeries

Cost Implications of CMS Rule Change

University of Michigan patient with pneumonia:

- Without complication or comorbidity (CC): \$6899
- With CA-UTI (CC): \$8495 (~\$1600 more)

University of Colorado patient with acute MI:

- Without CC: \$5436
- With CA-UTI (CC): \$6721 (~\$1300 more)

(Wald and Kramer. JAMA 12/19/07)

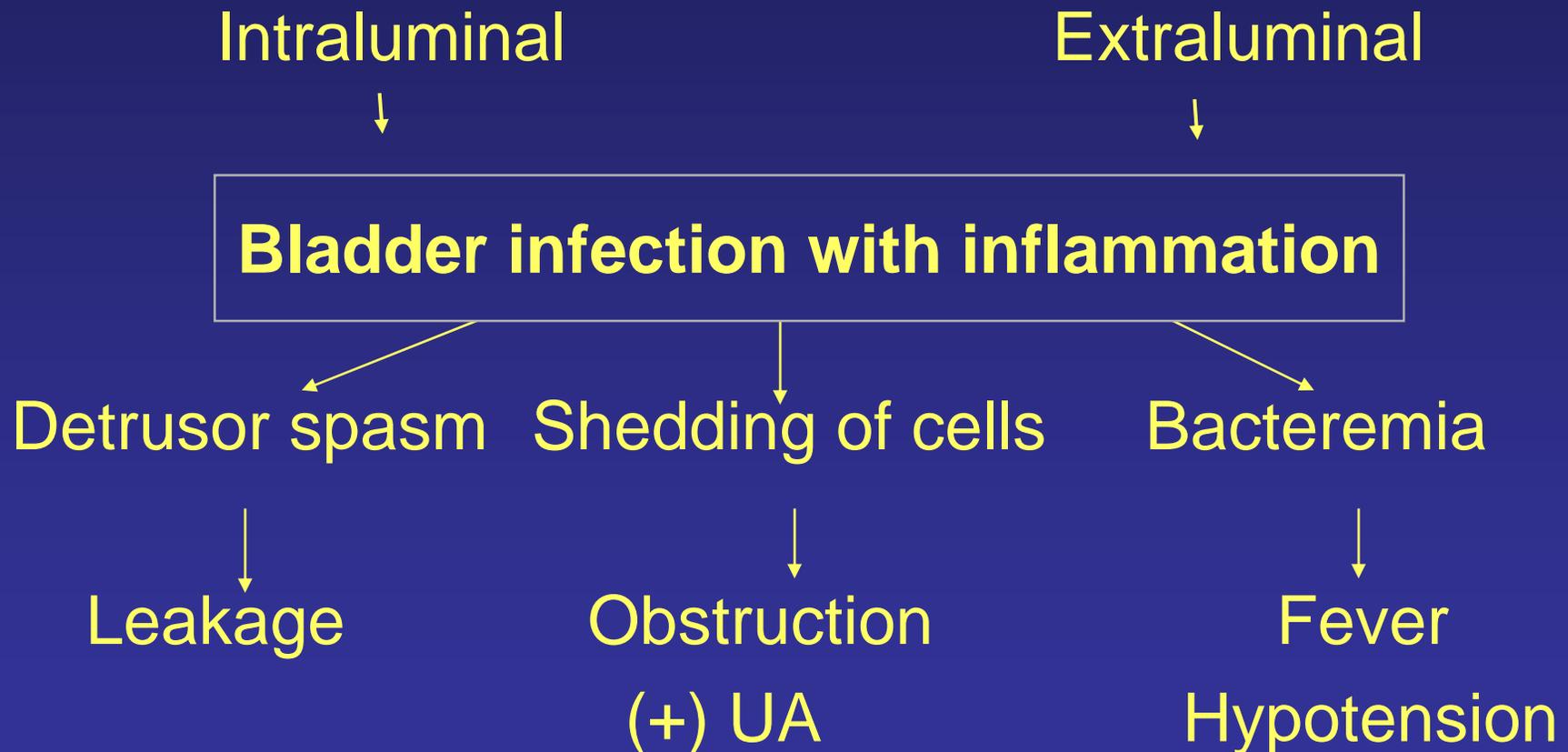
Urinary Catheter-Related Infection: Pathophysiology

Organisms enter the bladder by **3 ways**:

- 1) At time of catheter insertion
- 2) Through the catheter lumen (from a colonized drainage bag)
- 3) Along external surface of the catheter (migrate along the catheter-mucosal interface)

(Tambyah, Halvorson, Maki. Mayo Clin Proc 1999)

Urinary Catheter-related Infection: Pathophysiology



The Indwelling Urinary Catheter: A “1-Point” Restraint?

Satisfaction survey of 100 catheterized VA patients:

- 42% found the indwelling catheter to be uncomfortable
- 48% stated that it was painful
- 61% noted that it restricted their ADLs
- 2 patients provided unsolicited comments that their catheter “hurt like hell”

(Saint et al. JAGS 1999)

Catheter-Associated Urinary Tract Infection

- Background
- Prevention

Prevention of Catheter-Associated UTI

- Make sure the catheter is indicated
- Adhere to general infection control principles (eg, aseptic insertion, proper maintenance, hand hygiene, education, feedback)
- Remove the catheter as soon as possible
- Consider other methods of prevention

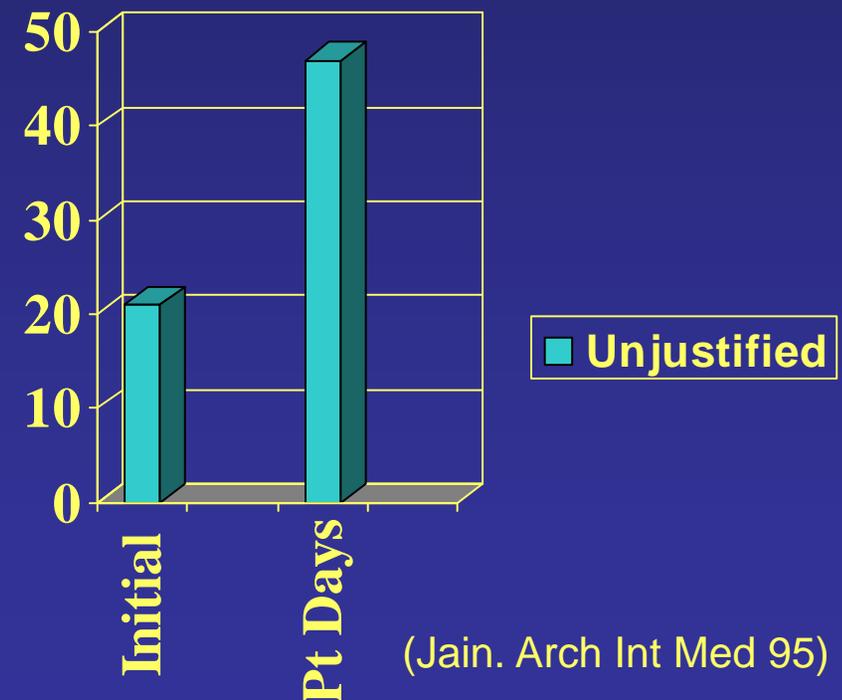
UTI Prevention Rule #1: Make Sure the Patient Really Needs the Catheter

Appropriate indications

- Bladder outlet obstruction
- Incontinence and sacral wound
- Urine output monitored
- Patient's request (end-of-life)
- During or just after surgery

(Wong and Hooton - CDC 1983)

Percent unjustified



(Jain. Arch Int Med 95)

One Reason Catheters Are Used Inappropriately

| Level | Proportion Unaware of the Catheter |
|-----------------------------|---|
| Medical students | 18% |
| House officers | 25% |
| Attending physicians | 38% |

(Saint S, Wiese J, Amory J, et al. Am J Med 2000)

Prevention of Catheter-Associated UTI

- Make sure the catheter is indicated
- Adhere to general infection control principles (eg, aseptic insertion, proper maintenance, hand hygiene, education, feedback)
- Remove the catheter as soon as possible
- Consider other methods of prevention

Use Proper Aseptic Technique for Catheter Insertion

- NEJM Videos in Clinical Medicine:



The NEW ENGLAND
JOURNAL of MEDICINE

- Male Urethral Catheterization
T. W. Thomsen and G. S. Setnik - 25 May, 2006
- Female Urethral Catheterization
R. Ortega, L. Ng, P. Sekhar, and M. Song - 3 Apr, 2008
- Goal is to avoid contamination of the sterile catheter during the insertion process
- Should not assume that the healthcare workers inserting urinary catheters know how to do so

Prevention of Catheter-Associated UTI

- Make sure the catheter is indicated
- Adhere to general infection control principles (eg, aseptic insertion, proper maintenance, hand hygiene, education, feedback)
- **Remove the catheter as soon as possible**
- Consider other methods of prevention

Early Removal of Indwelling Catheters: Summary of the Evidence

- 14 studies have evaluated urinary catheter reminders and stop-orders (written, computerized, nurse-initiated)
 - Significant reduction in catheter use
 - Significant reduction in infection
 - No evidence of harm (ie, re-insertion)

(Meddings J et al. Clin Infect Dis 2010)

Prevention of Catheter-Associated UTI

- Make sure the catheter is indicated
- Adhere to general infection control principles (eg, aseptic insertion, proper maintenance, hand hygiene, education, feedback)
- Remove the catheter as soon as possible
- Consider other methods of prevention

Prevention of CAUTI using Antimicrobial Catheters

Different antimicrobial urinary catheters have been evaluated in patients:

- ❑ Silver (either alloy or oxide)
- ❑ Nitrofurazone-releasing

Cochrane Review of Antimicrobial Catheters

(Schumm & Lam. *Cochrane Database* 2008)

- 23 trials involving 5236 hospitalized adults in 22 parallel group trials met inclusion criteria
- Conclusions: "...Silver alloy (antiseptic) coated or nitrofurazone-impregnated (antibiotic) urinary catheters might reduce infections in hospitalised adults ... but the evidence was weak."
- "Larger, more scientifically rigorous, trials are needed on whether catheters impregnated with antibiotics or antiseptics reduce infection."

Other Methods for Preventing CA-UTI

- Alternatives to the indwelling catheter
 - Bladder ultrasound
 - Intermittent catheterization
 - Condom catheter

Recent Guidelines on CAUTI Prevention

Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals

Evelyn Lo, MD; Lindsay Nicolle, MD; David Classen, MD, MS; Kathleen M. Arias, MS, CIC;
Kelly Podgorny, RN, MS, CPHQ; Deverick J. Anderson, MD, MPH; Helen Burstin, MD; David P. Calfee, MD, MS;
Susan E. Coffin, MD, MPH; Erik R. Dubberke, MD; Victoria Fraser, MD; Dale N. Gerding, MD;
Francis A. Griffin, RRT, MPA; Peter Gross, MD; Keith S. Kaye, MD; Michael Klompas, MD; Jonas Marshall, MD;
Leonard A. Mermel, DO, ScM; David A. Pegues, MD; Trish M. Perl, MD; Sanjay Saint, MD;
Cassandra D. Salgado, MD, MS; Robert A. Weinstein, MD; Robert Wise, MD; Deborah S. Yokoe, MD, MPH

PURPOSE

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections. The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals in implementing and prioritizing their catheter-associated urinary tract infection (CAUTI) prevention efforts. Refer to the Society for Healthcare Epidemiology of America/Infectious Diseases Society of America "Compendium of Strategies to Prevent Healthcare-Associated Infections" Executive Summary and Introduction and accompanying editorial for additional discussion.

SECTION 1: RATIONALE AND STATEMENTS OF CONCERN

1. Burden of CAUTIs

a. Urinary tract infection is the most common hospital-acquired infection; 80% of these infections are attributable to an indwelling urethral catheter.¹

b. Twelve to sixteen percent of hospital inpatients will have a urinary catheter at some time during their hospital stay.²

c. The daily risk of acquisition of urinary infection varies from 3% to 7% when an indwelling urethral catheter remains in situ.

2. Outcomes associated with CAUTI

a. Urinary tract infection is the most important adverse outcome of urinary catheter use. Bacteremia and sepsis may occur in a small proportion of infected patients.^{3,4}

b. Morbidity attributable to any single episode of catheterization is limited,⁵ but the high frequency of catheter use in hospitalized patients means that the cumulative burden of CAUTI is substantial.^{1,5,6}

c. Catheter use is also associated with negative outcomes other than infection, including nonbacterial urethral inflammation,⁷ urethral strictures,⁸ and mechanical trauma.

3. Risk factors for development of CAUTI

a. The duration of catheterization is the most important risk factor for development of infection.^{1,9-11} Limiting catheter use and, when a catheter is indicated, minimizing the duration the catheter remains in situ are primary strategies for CAUTI prevention.

b. Additional risk factors include female sex, older age, and not maintaining a closed drainage system.

From the University of Manitoba, Winnipeg, Canada (E.L., L.N.); the University of Utah, Salt Lake City (D.C.); the Association for Professionals in Infection Control and Epidemiology (K.M.A.) and the National Quality Forum (H.B.), Washington, D.C.; the Joint Commission, Oakbrook Terrace (K.P., R.W.), the Loyola University Chicago Stritch School of Medicine (D.N.G.) and the Stroger (Cook County) Hospital and Rush University Medical Center (R.A.W.), Chicago, and the Hines Veterans Affairs Medical Center, Hines (D.N.G.), Illinois; the Duke University Medical Center, Durham, North Carolina (D.J.A., K.S.K.); the Mount Sinai School of Medicine, New York, New York (D.P.C.); the Children's Hospital of Philadelphia and University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania (S.E.C.); the Washington University School of Medicine, St. Louis, Missouri (E.R.D., V.F., J.M.); the Institute for Healthcare Improvement, Cambridge (F.A.G.), and Brigham and Women's Hospital and Harvard Medical School, Boston (D.S.Y., M.K.), Massachusetts; the Hackensack University Medical Center, Hackensack (P.G.), and the University of Medicine and Dentistry—New Jersey Medical School, Newark (P.G.), New Jersey; the Warren Alpert Medical School of Brown University and Rhode Island Hospital, Providence, Rhode Island (L.A.M.); the David Geffen School of Medicine at the University of California, Los Angeles (D.A.P.); the Johns Hopkins Medical Institutions and University, Baltimore, Maryland (T.M.P.); the Ann Arbor Veterans Affairs Medical Center and the University of Michigan Medical School, Ann Arbor, Michigan (S.S.); the Medical University of South Carolina, Charleston (C.D.S.).

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An APIC Guide

2008

Guide to the Elimination of Catheter-Associated Urinary Tract Infections (CAUTIs)

Developing and Applying Facility-Based Prevention
Interventions in Acute and Long-Term Care Settings

Linda Greene, RN, MS, CIC
James Marx, RN, MS, CIC
Shannon Oriola, RN, CIC, COHN



About APIC

APIC's mission is to improve health and patient safety by reducing risks of infection and other adverse outcomes. The Association's more than 12,000 members have primary responsibility for infection prevention, control and hospital epidemiology in healthcare settings around the globe. APIC's members are nurses, epidemiologists, physicians, microbiologists, clinical pathologists, laboratory technologists and public health professionals. APIC advances its mission through education, research, consultation, collaboration, public policy, practice guidance and credentialing.

Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America

Thomas M. Hooton,¹ Suzanne F. Bradley,² Diana D. Cardenas,² Richard Colgan,⁴ Suzanne E. Geerlings,⁷ James C. Rice,^{5,6} Sanjay Saint,² Anthony J. Schaeffer,⁸ Paul A. Tambayh,⁹ Peter Tenke,¹ and Lindsay E. Nicolle^{10,11}

Departments of ¹Medicine and ²Rehabilitation Medicine, University of Miami, Miami, Florida; ³Department of Internal Medicine, Ann Arbor Veterans Affairs Medical Center and the University of Michigan, Ann Arbor, Michigan; ⁴Department of Family and Community Medicine, University of Maryland, Baltimore; ⁵Department of Medicine, University of Texas, Galveston; ⁶Department of Urology, Northwestern University, Chicago, Illinois; ⁷Department of Infectious Diseases, Tropical Medicine, and AIDS, University of Amsterdam, Amsterdam, The Netherlands; ⁸Department of Medicine, National University of Singapore, Singapore; ⁹Department of Urology, Jahn Ferenc Del-Pesti Korhaz, Budapest, Hungary; and Departments of ¹⁰Internal Medicine and ¹¹Medical Microbiology, University of Manitoba, Winnipeg, Canada

Guidelines for the diagnosis, prevention, and management of persons with catheter-associated urinary tract infection (CA-UTI), both symptomatic and asymptomatic, were prepared by an Expert Panel of the Infectious Diseases Society of America. The evidence-based guidelines encompass diagnostic criteria, strategies to reduce the risk of CA-UTIs, strategies that have not been found to reduce the incidence of urinary infections, and management strategies for patients with catheter-associated asymptomatic bacteriuria or symptomatic urinary tract infection. These guidelines are intended for use by physicians in all medical specialties who perform direct patient care, with an emphasis on the care of patients in hospitals and long-term care facilities.

EXECUTIVE SUMMARY

Catheter-associated (CA) bacteriuria is the most common health care-associated infection worldwide and is a result of the widespread use of urinary catheterization, much of which is inappropriate, in hospitals and long-term care facilities (LTCFs). Considerable personnel time and other costs are expended by health care institutions to reduce the rate of CA infections, especially those that occur in patients with symptoms or signs referable to the urinary tract (CA urinary tract infection [CA-UTI]). In these guidelines, we provide background

information on the epidemiology and pathogenesis of CA infections and evidence-based recommendations for their diagnosis, prevention and management. Unfortunately, the catheter literature generally reports on CA asymptomatic bacteriuria (CA-ASB) or CA bacteriuria (used when no distinction is made between CA-ASB and CA-UTI; such cases are predominantly CA-ASB), rather than on CA-UTI. As a result, most recommendations in these guidelines refer to CA-bacteriuria, because this is the only or predominant out-

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^{*} Present affiliation: Department of Molecular and Experimental Medicine, The Scripps Research Institute, La Jolla, California.

Reprints or correspondence: Dr Thomas M. Hooton, 1120 NW 14th St, Ste 1144, Clinical Research Bldg, University of Miami Miller School of Medicine, Miami, FL 33136 (thooton@med.miami.edu).

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These guidelines were developed by the Infectious Diseases Society of America in collaboration with the American Geriatrics Society, American Society of Nephrology, American Spinal Injury Association, American Urological Association, Association of Medical Microbiology and Infectious Diseases–Canada, European Association of Urology, European Society of Clinical Microbiology and Infectious Diseases, Society for Healthcare Epidemiology of America, Society of Hospital Medicine, and the Western Pacific Society of Chemotherapy.

It is important to realize that guidelines cannot always account for individual variation among patients. They are not intended to supplant physician judgment with respect to particular patients or special clinical situations. The IDSA considers adherence to these guidelines to be voluntary, with the ultimate determination regarding their application to be made by the physician in the light of each patient's individual circumstances.



GUIDELINE FOR PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS 2009

Carolyn V. Gould, MD, MSCR¹; Craig A. Umscheid, MD, MSCE²; Rajender K. Agarwal, MD, MPH²; Gretchen Kuntz, MSW, MSLIS²; David A. Pegues, MD³ and the Healthcare Infection Control Practices Advisory Committee (HICPAC)⁴

¹Division of Healthcare Quality Promotion
Centers for Disease Control and Prevention
Atlanta, GA

²Center for Evidence-based Practice
University of Pennsylvania Health System
Philadelphia, PA

³Division of Infectious Diseases
David Geffen School of Medicine at UCLA
Los Angeles, CA



CA-UTI Prevention: Concise Summary of Recommendations

- Adherence to infection control principles (eg, aseptic insertion, proper maintenance, education) is important
- Bladder ultrasound may avoid indwelling catheterization
- Condom or intermittent catheterization in appropriate pts
- Do not use the indwelling catheter unless you must !
- Early removal of the catheter using reminders or stop-orders appears warranted

(Saint et al. Jt Comm J Qual Saf 2009)

Overview

- Catheter-Associated UTI
 - Background
 - Prevention
- Translating Research into Practice
- Conclusions

What are Hospitals Using to Prevent CA-UTI?

- National survey of U.S. hospitals (focused on device-related infection)
- 719 hospitals surveyed (Spring 2005)
- Lead Infection Control Professional filled out the survey
- 72% response rate

(Saint et al. Clin Infect Dis 2008)

Urinary Catheter-Related Infection Prevention Practices

| <i>Practice</i> | <i>Regularly using</i> |
|------------------------------------|-------------------------------|
| Bladder ultrasound scanner | 30% |
| Antimicrobial catheters | 30% |
| Condom catheters in men | 14% |
| Urinary catheter reminder | 9% |
| Antimicrobials in the drainage bag | 3% |

(Saint et al. Clin Infect Dis 2008)

Translating Research Into Practice

- No common strategy used in hospitals to prevent UTI
- Less than 10% of U.S. hospitals using catheter reminders or stop-orders
- Next Step: Evaluate *why* interventions are used in some hospitals but not in others
- Theoretical underpinning: “Diffusion of Innovation”

“Diffusion of Innovation”: Background

- Based on the work of Everett Rogers, PhD
- Definitions:
 - Diffusion = spread
 - Innovation = a new practice
- Many innovations diffuse slowly

Consistently Using Evidence-Based Practices Remains a Challenge...

Hand Hygiene Compliance in Healthcare Workers

(Erasmus et al. Infect Control Hosp Epidemiol March 2010)

- Systematic review of 96 studies
- Overall median compliance of 40%
- Lower rates in physicians (32%) than nurses (48%)
- Lower rates “before” (21%) patient contact rather than “after” (47%)

Given this Gap Between What *Should* Be Done and What *Is* Done...

- Focus on “implementation science”
- “The scientific study of methods to promote the systematic uptake of research findings into routine practice”

(Eccles & Mittman. Implementation Science. Feb 2006)

- Synonyms:
 - “T3” translation
 - Knowledge utilization

Once discoveries are made, how
can we better implement
evidence-based practices in
infection prevention?

Why Are Some Hospitals Better than Others in Preventing Infection?

Quantitative phase

Qualitative phase

Part 1



Part 2



Part 3

- Surveyed infection control personnel at 719 U.S. hospitals

- Phone interviews with key informants at 14 hospitals

- Site visits at 6 hospitals

(Krein et al. Am J Infect Cont 2006)

Why Use Qualitative Methods?

- Quantitative methods help us answer the question of 'what' is happening
- Qualitative methods help us answer 'why'

(Forman et al. AJIC 2008)

Main UTI Qualitative Theme

Urinary catheter-related *infection* is a low priority, but timely removal of catheters considered important

(Saint et al. Infect Cont Hosp Epid 2008)

Urinary catheter-related *infection* is a low priority ...

- A hospital epidemiologist: “ I [nor] anyone else has really been able to get ourselves that excited about trying to prevent bladder colonization. But....I think that we probably should try to be more proactive about getting the catheters out.”

...but timely catheter removal considered important

- Hospitals using reminders highlighted non-infectious reasons for catheter removal: patient dignity & mobility, and length of stay
- Some pushback from nurses
- A nurse: “...convenience unfortunately is a high priority ...especially with urinary catheters...the workload will be increased if you have to take [patients] to the bathroom or you have to change their bed a little more often”

...but timely catheter removal considered important

- Nurse buy-in critical
- A physician administrator: “Because the nurses on the geriatrics unit wanted to have their patients regain mobility...they viewed ambulation and mobility as a very important goal...versus the other units where the nurses didn’t necessarily feel that was a real goal in the patient’s plan for that day.”
- Partnering with a nurse leader is key

Urinary Catheters Often Placed in the Emergency Department

- Avoiding insertion also important
- An Infection Control Nurse: “our other barrier is the Emergency Department and this is where most Foleys are placed. . . . Doctors forget to look under the sheets to say, ‘Oh yeah, there’s a Foley there’ and ... the nurses aren’t going to take the initiative. . . .”
- Initiatives to avoid insertion should include emergency department personnel (same for aseptic insertion)

(Fakih et al. Acad Emerg Med March 2010)

Qualitative UTI Themes

- 1) Urinary catheter-related *infection* is a low priority, but timely removal of catheters considered important
- 2) Identifying a committed “champion” facilitated prevention activities in several sites
- 3) Small hospital-specific pilot studies are important in deciding whether or not to use antimicrobial catheters

(Saint et al. Infect Cont Hosp Epid 2008)

Barriers and Facilitators

- Interested in *overarching* qualitative themes
- These themes spanned the hospital-acquired infections studied (UTI, CLABSI, VAP)
- Specifically interested in identifying barriers to and facilitators of the use of preventive practices

Findings: Key Barriers

- Active resisters: people who prefer doing things the way they have always done them
- Organizational constipators: passive-aggressives who undermine change without active resistance

(Saint et al. Joint Comm Journal Qual Safety 2009)

- Culture of Mediocrity (rather than Excellence)

What is a Culture of Excellence?

- Hospital wants to be superb
- Employees are rewarded for exemplary work
- Employees describe their hospital as “the best” and enjoy working there
- Clear goals that can be achieved

Culture of Mediocrity

- Happy to be “average”
- Constipators are prevalent
- Leadership is considered ineffective
- Over-performers are rewarded by
- Underperformers are not held accountable

Key Facilitators

The Importance of Effective Leadership

- Applies not only to the CEO...
- Getting the right people on the bus and in the right seats: identify and support “champions”
- Works well with other disciplines
- Examples: IPs, hospital epidemiologists, CMOs, patient safety officers

Key Behaviors of Effective Infection Prevention Leaders

- Cultivated a culture of clinical excellence
 - Developed a clear vision
 - Successfully conveyed that to staff
- Inspired staff
 - Motivated and energized followers
 - Some, not all, where charismatic

(Saint et al. Infect Cont Hosp Epid 2010)

Key Behaviors of Effective Infection Prevention Leaders

- Solution-oriented
 - Focused on overcoming barriers rather than complaining
 - Dealt directly with resistant staff
- Thought strategically while acting locally
 - Planned ahead leaving little to chance; politicked before crucial issues came up for a vote in committees
 - Kept their eye on the prize: improving patient care

(Saint et al. Infect Cont Hosp Epid 2010)

Another Key Facilitator: Collaboratives

- Collaboratives: align clinical silos and goals
- Examples: 100K Lives Campaign, Keystone



Key Facilitator: Collaboratives

- Tools used by collaboratives:
 - CEO buy-in
 - Spotlighting an issue
 - Identifying a champion within the organization
 - Using off-the-shelf solutions that have already been developed

Overview

- ✓ Catheter-Associated UTI
- ✓ Translating Research into Practice
- **Conclusions**

Conclusions

- CAUTI is a common and costly patient safety problem
- Several practices appear to decrease CAUTI
- Collaborative efforts underway in Michigan & elsewhere
- Understand the implementation process and tailor as appropriate: one size unlikely to fit all
- Leadership is important in preventing infection
- Preventing CAUTI is a team sport