Win Big
With Hospital-Acquired Infection Rate Reduction

Nancy Dunton, PhD, FAAN
Catima Potter, MPH
Vincent Staggs, PhD

115: General Session

Thursday, January 26

ANA
AMERICAN NURSES ASSOCIATION

NDNQI®
NATIONAL DATABASE OF NURSING QUALITY INDICATORS

Improvement in Patient Safety

* National goal for more than a decade
  * High cost of care
  * Low quality
* Agency for Health Care Research & Quality finds
  * Little progress on quality of care
  * Declining patient safety

Story of Success on Hospital-Acquired Infections (HAI)

* Catheter-Associated Urinary Tract Infections (**CAUTI**)
* Central Line-Associated Blood Stream Infections (**CLABSI**)
* Ventilator-Associated Pneumonia (**VAP**)

HAI Significance

* There are about 1.7 million HAIs reported annually
* HAI are the 5th leading cause of death in U.S. hospitals
  * **~100,000 deaths/year**
* Treatment **costs $17- $20 billion** annually
  * Much of which is not reimbursed

VAP Deadly

* VAP is leading cause of death among patients who acquire HAI (IHI,)
* 46% of patients who acquire VAP die in the hospital
  * Compared with 32% of ventilated patients who do not acquire VAP

Prevention Saves Lives

* If best practices in infection control were applied to all U.S. hospitals, reduction in
  * CLABSI could save 5,520-20,239 lives annually
  * VAP could save 13,667-19,782 lives annually

CDC Breaking News

* *"Hospitals make impressive progress in driving down certain infections in critical care units through implementing CDC prevention strategies"* CDC Director Thomas Frieden, MD, MPH, 10/19/2011

* **33% reduction in CLABSI since 2008 &**
* **7% reduction in CAUTI**

CLABSI in critical care units.
CAUTI throughout hospital.

Why Have HAI Improved? Follow Donabedian's QI Model

Structural Factors

1. National policy influence
2. National dissemination of best practices
3. Patient populations
4. Nursing workforce characteristics

National Policy Initiatives

National Dissemination of EBP

Change in Patient Populations

Nursing Workforce Characteristics

Leadership of CDC's NHSN

* National Healthcare Safety Network (NHSN)
  * Established 2005—Integration of CDC surveillance activities
  * NHSN **standardized definitions** of hospital acquired infection and methods of **data collection**
  * Develop and disseminate **prevention bundles**
  * Encouraged mandated **public reporting**

CMS Value-Based Purchasing

* October 2008—Centers for Medicare & Medicaid Services (CMS) no longer reimbursed hospitals for certain preventable hospital-acquired conditions
  * Including HAI

Hospital Prevention Activities Related to CMS Non-Payment Rule

* Krein et al. (2011) found that the majority of non-federal hospitals reported moderate or large increases in the priority of prevention activities for HAI
  * 58% reported increase in preventing CLABSI
  * 54% reported increase in preventing VAP
  * 65% reported increase in preventing CAUTI

National Policy Initiatives

National Dissemination of EBP

Change in Patient Populations

Nursing Workforce Characteristics

Process Elements

* Most, but not all, HAI preventable with evidence-based practices (Umscheid, 2011)
  * 65%-70% of CLABSI preventable
  * 55% of VAP preventable

Nurses Have Critical Role in HAI Prevention

* Responsibility for performing procedures that can result in infection, e.g.
  * Insertion and removal of urinary catheters
  * Observation and maintenance of central lines
  * Observation and maintenance of ventilators

CAUTI Prevention

* Avoid unnecessary urinary catheters
* Insert catheters using aseptic technique
* Maintain catheters based on recommended guidelines
* Review catheter necessity daily against criteria

CLABSI Prevention

* Hand hygiene
* Maximal barrier precautions upon insertion
* Chlorhexidine skin antisepsis
* Optimal catheter site selection
  * Avoidance of femoral vein
* Daily review of line necessity with prompt removal of unnecessary lines

VAP Prevention

* Elevation of the head of the bed
* Daily “sedation vacations” and assessment of readiness to extubate
* Peptic ulcer disease prophylaxis
* Deep venous thrombosis prophylaxis
* Daily oral care with chlorhexidine

Dissemination & Adoption of Prevention Activities

* Recent upsurge in efforts to prevent HAIs (Flanagan, 2011)
* Education to increase awareness
  * Infection control professionals, CDC, IHI
* Systems redesign
* Hospitals reported:
  * Hand hygiene most frequent initiative
  * Most frequent challenge—sustaining behavioral change

Award Winning Hospitals Reduce or Eliminate HAIs

* Awards given by Department of Health & Human Services and Critical Care Societies Collaborative
* 2011 Awardees
  * **Mercy Hospital, Coon Rapids MI**
  * **Chidren's Hospital and Clinics of Minnesota, Minneapolis/St. Paul**
  * **St. Joseph Mercy Hospital, Ann Arbor, MI**
  * **Riverside Methodist Hospital, Columbus, OH**

What Did They Think Worked?

- **Attitude Change**
  - "We get angry when we're not at 0. It energizes us."
- **Multidisciplinary Teams**
  - Generally chaired by staff nurses
  - Unit-based Patient Champions
- **Regular Team Meetings**:
  - Sometimes daily
  - Huddle boards where staff ask "why did that infection occur and what can we do to prevent this in the future?"

What Were Their Obstacles?

* Long journey to **change culture**
  * One winner said nearly a decade
* Hard to **keep "eye on ball"**
* For VAP—culture change needed to adopt **light sedation**
  * High sedation patients have more PSTD than light sedation patients
* **Physicians** who don't buy into prevention bundles— "cookbook medicine"

What Is Their Advice?

* **Talk it up!**
* Find **champion** to promote change who is really **excited** about it
* **Post signs** in break rooms—how many days since the last HAI
* **Responsibility has to be with bedside nurse**

NDNQI Monographs
Stories of Sustained Improvement

* **Medical Center of the Rockies, Loveland, CO**
  * Saturated education strategy
* **Cook Children's Medical Center, Ft. Worth, TX**
  * Real-time feedback on infection-free days
  * Hired 2 RNs dedicated to line insertion and dressing changes

National Policy Initiatives
National Dissemination of EBP
Change in Patient Populations
Nursing Workforce Characteristics

Patient Populations

* Hospitalized patients now more acutely ill
* APACHE scores & nursing acuity scores not related to HAI in multivariate models (Cho et al., 2003))
* **Patient acuity is related to use of devices** that may lead to HAI

National Policy Initiatives
National Dissemination of EBP
Change in Patient Populations

Nursing Workforce Characteristics

Nursing Research Literature On Nursing Workforce & HAI

Factors Related to LOWER HAIs

* **Higher staffing,** lower CLABSI & VAP
  (Stone, 2007 & 2008; Cho, 2003)

* **Higher skill mix**, lower CAUTI & VAP
  (Needleman, et. al, 2002)

Nursing Research

Factors Related to HGHER HAIs

* More **overtime** related to higher CAUTI (Stone, 2007)
* More **agency staff**, higher HAI (Stone, 2008)
* Higher **float staff**, higher CLABSI (Stone, 2008)

Interpretation of Literature

* Sufficient **RN staffing** important
* Nurses not well oriented to critical care or the unit team (**float or agency**) may not provide high quality care
  * Or units that need float or agency may have quality problems that lead to turnover or absenteeism
* Under pressure of increased workload (**short staffing or overtime**), clinicians may not be complying with infection control measures

NEW
Analysis of HAIs Using NDNQI Data

HAI Rates Higher in Academic Medical Centers

	AMCs	Teaching	Non-Teaching
CAUTI	3.46	1.95	1.34
CLABSI	1.67	1.31	0.96
VAP	5.66	1.93	1.28

Similar HAI Rates for Magnets and Non-Magnets

	Magnet	Non-Magnet
CAUTI	1.98	1.91
CLABSI	1.30	1.19
VAP	1.65	2.47

Research Questions

1. **What characteristics of the nursing workforce related to CAUTI, CLABSI, and VAP rates?**

2. **What is the relationship between mandated public reporting and CLABSI?**

Value of NDNQI Data

* Large Sample
* National Coverage
* High data quality

Sample

* Adult critical care units that submitted HAI data to NDNQI for 2010 and participated in the RN Survey
* Compared with all NDNQI hospitals
  * More large hospitals
  * More academic medical centers (AMCs) & teaching facilities
  * More Magnet facilities

Sample Sizes

	CAUTI	CLABSI	VAP
Hospitals	354	420	409
Adult CC Units	619	750	730

Dependent Variables

* **CAUTI, CLABSI, VAP**
* Data collected using NHSN standardized definitions
  * Infection determined with laboratory test, X-rays, or clinical symptoms
  * Infection not present on admission
  * Infection occurred in patient with a device or within 48 hours of discontinuance of device

Independent Variables

* **Required State Reporting (CLABSI only)**
* **Hospital Characteristics**
  * Teaching status
  * Staffed bed size
  * Magnet status
* **Unit Staffing Characteristics**
  * RN HPPD
  * % RN hours from Agency staff
  * RN Certification

Analytic Design

* Hierarchical Poisson regression
* Random term included to account for clustering of units within hospitals
* Device Days used as exposure variable

NDNQI Analysis & Previous Research

* Confirmed beneficial effect of RN HPPD on CLABSI
* Did not find a beneficial effect of RN HPPD on VAP
* Confirmed deleterious effect of Agency RNs on VAP

New from NDNQI Analysis

* Demonstrates for first time the beneficial effect of specific RN certifications on HAI

Study Limitations

* Sample restricted to NDNQI hospitals participating in the RN Survey
* NDNQI hospitals are more likely to be AMCs, larger, Magnets, and not-for-profit than non-NDNQI hospitals
* Methodology measures association, not causation

What Have We Learned About Reductions in HAI?

National Policies and EBP Dissemination

* **Policy Effects**
  * Some evidence of the beneficial effect of mandated reporting
  * Effectiveness of CMS non-payment rule merits additional investigation
* **Widespread adoption of prevention practices**
  * Multiple organizations disseminating
  * Aided by on site infection control staff

Nurse Staffing

* **Higher RN HPPD** associated with lower CLASBI & CAUTI rates
* More **certified RNs** on CC units
* Detrimental effect of **% Agency on VAP**

Looking Forward: Can the HAI Lessons be Translated to Other Outcomes?

For HAI, the "Stars Were Aligned"

* National Policies to promote prevention
* Solid EBP guidelines
* Multiple organizations disseminating EBP
* On-site infection control personnel
* Critical care units more likely others to have higher RN HPPD and higher RN certification rates

Potential Reducing Hospital Acquired Pressure Ulcers

Have

* Solid EBP
* CMS non-payment for HAPU III & IV

May Lack

* Equivalent EBP dissemination campaign
* Sufficient RN HPPD
* Unit-based RNs w/relevant certifications
* Hospital counterpart to investigative infection control staff

ANA AMERICAN NURSES ASSOCIATION

NDNQI® NATIONAL DATABASE OF NURSING QUALITY INDICATORS

Potential Reducing Falls

Have

* CMS non-payment for serious injury falls

May Lack

* Solid EBP
* Multi-organization dissemination campaign
* Sufficient RN HPPD
* A relevant certification?

Closing Thoughts

* **Great** to see progress on HAI
* **Delighted** that there are so many drivers and supports for improvement in HAI
* HAI experience may be a guide as to "what it takes"
* **Thankful** that you in the audience collect the data used for looking at relationships between staffing characteristics and outcomes

Thank You
for Your Commitment to Safe Patient Care!

ANA
AMERICAN NURSES ASSOCIATION

NDNQI®
NATIONAL DATABASE OF NURSING QUALITY INDICATORS

References

- Centers for Disease Control and Prevention. Health care-associated Infections Declined in 2010. Available at http://www.cdc.gov/media/relsease/2011/p1019_healthcare_infections.html. Accessed October 31, 2011.
- Cho SH, Ketefian S, Barkauskas VH, et al. The effects of nurse staffing on adverse events, morbidity, mortality and medical costs. Nurse Res 2003;52(2): 71–9.
- Coffin SE. Klompas M, Classen D, et al. Strategies to prevent ventilator-associated pneumonia in acute care hospitals. Infect Control Hosp Epidemiol 2008; 29(Suppl 1):S31–40.
- Duncan, J., Montalvo, I., and Dunton, N. (2011). *NDNQI Case Studies in Nursing Quality Improvement.* Silver Spring, MD: American Nurses Association.
- Gould C, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA. Healthcare Infection Control Practices Advisory Committee. Guideline for prevention of catheter-associated urinary tract infections 2009. Infection control and hospital epidemiology. 2010-04;31:319-326.
- Flanagan M., Welsh CA, Kiess C, Hoke S, Doebbeling BN. A national collaborative for reducing health care–associated infections: current initiatives, challenges, and opportunities. American journal of infection control. 2011-10;39:685-9.
- 5 Million Lives Campaign. Getting Started Kit: Prevent Central Line Infections How-to Guide. Cambridge, MA: Institute for Healthcare Improvement; 2008. (Available at www.ihi.org)
- Klevens R, Edwards JR, Richards CL Jr, Horan TC, Gaynes RP, Pollock DA, Cardo DM. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. Public health reports (1974). 2007-03;122:160-166.
- Krein SL, Kowalski CP, Hofer TP, Saint S. Preventing Hospital-Acquired Infections: A National Survey of Practices Reported by U.S. Hospitals in 2005 and 2009. Journal of general internal medicine : JGIM. 2011-12-06
- Needleman J, Buerhaus P, Mattke S. Nurse-staffing levels and the quality of care in hospitals. The New England journal of medicine. 2002-05-30;346:1715-22.
- O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Lipsett PA, Masur H, Mermel LA, Pearson ML, Raad II, Randolph AG, Rupp ME, Saint S; Healthcare Infection Control Practices Advisory Committee. Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011. Am J Infect Control. 2011 May;39(4 Suppl 1):S1-34.
- Stone P, Pogorzelska M, Kunches L, Hirschhorn LR. Hospital staffing and health care-associated infections: a systematic review of the literature. Clinical infectious diseases. 2008-10-01;47:937-944.
- Stone PW, Mooney-Kane C, Larson EL, Horan T, Glance LG, Zwanziger J, Dick AW. Nurse Working Conditions and Patient Safety Outcomes. Med Care. 2007 Jun;45(6):571-578.
- Umscheid C, Mitchell MD, Doshi JA, Agarwal R, Williams K, Brennan PJ. Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. Infection control and hospital epidemiology. 2011-02;32:101-114.
- U.S Department of Health and Human Services. HHS Recognizes Progress Toward Eliminating Healthcare-Associated Infections. http://www.hhs.gov/ash/news/20110502a.html?source=govdelivery Accessed November 9, 2011.