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1. Nurse-directed interventions to reduce catheter-associated urinary tract infections

August 2012

Kathleen S. Oman | Mary Beth Flynn Makic | Regina Fink | Nicolle Schraeder | Teresa Hulett | Tarah Keech | Heidi Wald

BackgroundCatheter-associated urinary tract infections (CAUTIs) are common, morbid, and costly. Nearly 25% of hospitalized patients are catheterized yearly, and 10% develop urinary tract infections. Evidence-based guidelines exist for indwelling urinary catheter management but are not consistently followed.MethodsA pre/post intervention design was used in this quality improvement project to test the impact of nurse-driven interventions based on current evidence to reduce CAUTIs in hospitalized patients on 2 medical/surgical units. Interventions consisted of hospital-wide strategies including policy and product improvements and unit-specific strategies that focused on a review of current evidence to guide practice.ResultsThe number of catheter days decreased from 3.01 to 2.2 (P = .018) on the surgery unit and from 3.53 to 2.7 (P = .076) on the medical unit. CAUTI rates were too low to achieve significant reduction. Product cost savings were estimated at $52,000/year.ConclusionGuidelines derived from research and other sources of evidence can successfully improve patient outcomes. Nurse-driven interventions, combined with system-wide product changes, and patient and family involvement may be effective strategies that reduce CAUTI.

Share Article

2. Comparative efficacy of hand hygiene agents in the reduction of bacteria and viruses

March 2005

Emily E. Sickbert-Bennett | David J. Weber | Maria F. Gergen-Teague | Mark D. Sobsey | Gregory P. Samsa | William A. Rutala

BackgroundHealth care-associated infections most commonly result from person-to-person transmission via the hands of health care workers.MethodsWe studied the efficacy of hand hygiene agents (n=14) following 10-second applications to reduce the level of challenge organisms (Serratia marcescens and MS2 bacteriophage) from the hands of healthy volunteers using the ASTM-E-1174-94 test method.ResultsThe highest log10 reductions of S marcescens were achieved with agents containing chlorhexidine gluconate (CHG), triclosan, benzethonium chloride, and the controls, tap water alone and nonantimicrobial soap and water (episode 1 of hand hygiene, 1.60-2.01; episode 10, 1.60-3.63). Handwipes but not alcohol-based handrubs were significantly inferior from these agents after a single episode of hand hygiene, but both groups were significantly inferior after 10 episodes. After a single episode of hand hygiene, alcohol/silver iodide, CHG, triclosan, and benzethonium chloride were similar to the controls in reduction of MS2, but, in general, handwipes and alcohol-based handrubs showed significantly lower efficacy. After 10 episodes, only benzethonium chloride (1.33) performed as well as the controls (1.59-1.89) in the reduction of MS2.ConclusionsAntimicrobial handwashing agents were the most efficacious in bacterial removal, whereas waterless agents showed variable efficacy. Alcohol-based handrubs compared with other products demonstrated better efficacy after a single episode of hand hygiene than after 10 episodes. Effective hand hygiene for high levels of viral contamination with a nonenveloped virus was best achieved by physical removal with a nonantimicrobial soap or tap water alone.

Share Article

3. Guideline for Prevention of Surgical Site Infection, 1999

April 1999

Alicia J. Mangram | Teresa C. Horan | Michele L. Pearson | Leah Christine Silver | William R. Jarvis

Abstract: EXECUTIVE SUMMARYThe “Guideline for Prevention of Surgical Site Infection, 1999” presents the Centers for Disease Control and Prevention (CDC)’s recommendations for the prevention of surgical site infections (SSIs), formerly called surgical wound infections. This two-part guideline updates and replaces previous guidelines.1,2 Part I, “Surgical Site Infection: An Overview,” describes the epidemiology, definitions, microbiology, pathogenesis, and surveillance of SSIs. Included is a detailed discussion of the pre-, intra-, and postoperative issues relevant to SSI genesis. Part II, “Recommendations for Prevention of Surgical Site Infection,” represents the consensus of the Hospital Infection Control Practices Advisory Committee (HICPAC) regarding strategies for the prevention of SSIs.3 Whenever possible, the recommendations in Part II are based on data from well-designed scientific studies. However, there are a limited number of studies that clearly validate risk factors and prevention measures for SSI. By necessity, available studies have often been conducted in narrowly defined patient populations or for specific kinds of operations, making generalization of their findings to all specialties and types of operations potentially problematic. This is especially true regarding the implementation of SSI prevention measures. Finally, some of the infection control practices routinely used by surgical teams cannot be rigorously studied for ethical or logistical reasons (e.g., wearing vs not wearing gloves). Thus, some of the recommendations in Part II are based on a strong theoretical rationale and suggestive evidence in the absence of confirmatory scientific knowledge. It has been estimated that approximately 75% of all operations in the United States will be performed in “ambulatory,” “same-day,” or “outpatient” operating rooms by the turn of the century.4 In recommending various SSI prevention methods, this document makes no distinction between surgical care delivered in such settings and that provided in conventional inpatient operating rooms. This document is primarily intended for use by surgeons, operating room nurses, postoperative inpatient and clinic nurses, infection control professionals, anesthesiologists, healthcare epidemiologists, and other personnel directly responsible for the prevention of nosocomial infections. This document does not:•Specifically address issues unique to burns, trauma, transplant procedures, or transmission of bloodborne pathogens from healthcare worker to patient, nor does it specifically address details of SSI prevention in pediatric surgical practice. It has been recently shown in a multicenter study of pediatric surgical patients that characteristics related to the operations are more important than those related to the physiologic status of the patients.5 In general, all SSI prevention measures effective in adult surgical care are indicated in pediatric surgical care.•Specifically address procedures performed outside of the operating room (e.g., endoscopic procedures), nor does it provide guidance for infection prevention for invasive procedures such as cardiac catheterization or interventional radiology. Nonetheless, it is likely that many SSI prevention strategies also could be applied or adapted to reduce infectious complications associated with these procedures.•Specifically recommend SSI prevention methods unique to minimally invasive operations (i.e., laparoscopic surgery). Available SSI surveillance data indicate that laparoscopic operations generally have a lower or comparable SSI risk when contrasted to open operations.6-11 SSI prevention measures applicable in open operations (e.g., open cholecystectomy) are indicated for their laparoscopic counterparts (e.g., laparoscopic cholecystectomy).•Recommend specific antiseptic agents for patient preoperative skin preparations or for healthcare worker hand/forearm antisepsis. Hospitals should choose from products recommended for these activities in the latest Food and Drug Administration (FDA) monograph. 12

4. Nurse staffing, burnout, and health care–associated infection

August 2012

Jeannie P. Cimiotti | Linda H. Aiken | Douglas M. Sloane | Evan S. Wu

BackgroundEach year, nearly 7 million hospitalized patients acquire infections while being treated for other conditions. Nurse staffing has been implicated in the spread of infection within hospitals, yet little evidence is available to explain this association.MethodsWe linked nurse survey data to the Pennsylvania Health Care Cost Containment Council report on hospital infections and the American Hospital Association Annual Survey. We examined urinary tract and surgical site infection, the most prevalent infections reported and those likely to be acquired on any unit within a hospital. Linear regression was used to estimate the effect of nurse and hospital characteristics on health care–associated infections.ResultsThere was a significant association between patient-to-nurse ratio and urinary tract infection (0.86; P = .02) and surgical site infection (0.93; P = .04). In a multivariate model controlling for patient severity and nurse and hospital characteristics, only nurse burnout remained significantly associated with urinary tract infection (0.82; P = .03) and surgical site infection (1.56; P < .01) infection. Hospitals in which burnout was reduced by 30% had

a total of 6,239 fewer infections, for an annual cost saving of up to $68 million.ConclusionsWe provide a plausible explanation for the association between nurse staffing and health care–associated infections. Reducing burnout in registered nurses is a promising strategy to help control infections in acute care facilities.

5. Indwelling urinary catheter management and catheter-associated urinary tract infection prevention practices in Nurses Improving Care for Healthsystem Elders hospitals

October 2012

Regina Fink | Heather Gilmartin | Angela Richard | Elizabeth Capezuti | Marie Boltz | Heidi Wald

BackgroundIndwelling urinary catheters (IUCs) are commonly used in hospitalized patients, especially elders. Catheter-associated urinary tract infections (CAUTIs) account for 34% of all health care associated infections in the United States, associated with excess morbidity and health care costs. Adherence to CAUTI prevention practices has not been well described.MethodsThis study used an electronic survey to examine IUC care practices for CAUTI prevention in 3 areas—(1) equipment and alternatives and insertion and maintenance techniques; (2) personnel, policies, training, and education; and (3) documentation, surveillance, and removal reminders—at 75 acute care hospitals in the Nurses Improving the Care of Healthsystem Elders (NICHE) system.ResultsCAUTI prevention practices commonly followed included wearing gloves (97%), handwashing (89%), maintaining a sterile barrier (81%), and using a no-touch insertion technique (73%). Silver-coated catheters were used to varying degrees in 59% of the hospitals; 4% reported never using a catheter-securing device. Urethral meatal care was provided daily by 43% of hospitals and more frequently that that by 41% of hospitals. Nurses were the most frequently reported IUC inserters. Training in aseptic technique and CAUTI prevention at the time of initial nursing hire was provided by 64% of hospitals; however, only 47% annually validated competency in IUC insertion. Systems for IUC removal were implemented in 56% of hospitals. IUC documentation and routine CAUTI surveillance practices varied widely.ConclusionsAlthough many CAUTI prevention practices at NICHE hospitals are in alignment with evidence-based guidelines, there is room for improvement. Further research is needed to identify the effect of enhanced compliance with CAUTI prevention practices on the prevalence of CAUTI in NICHE hospitals.

6. Patient-centered hand hygiene: The next step in infection prevention

May 2012

Timothy Landers | Said Abusalem | Mary-Beth Coty | James Bingham

Hand hygiene has been recognized as the most important means of preventing the transmission of infection, and great emphasis has been placed on ways to improve hand hygiene compliance by health care workers (HCWs). Despite increasing evidence that patients' flora and the hospital environment are the primary source of many infections, little effort has been directed toward involving patients in their own hand hygiene. Most previous work involving patients has included patients as monitors or auditors of hand hygiene practices by their HCWs. This article reviews the evidence on the benefits of including patients more directly in hand hygiene initiatives, and uses the framework of patient-centered safety initiatives to provide recommendations for the timing and implementation of patient hand hygiene protocols. It also addresses key areas for further research, practice guideline development, and implications for training of HCWs.

7. Guidelines for the prevention of intravascular catheter-related infections

May 2011

Naomi P. O'Grady | Mary Alexander | Lillian A. Burns | E. Patchen Dellinger | Jeffrey Garland | Stephen O. Heard | Pamela A. Lipsett | Henry Masur | Leonard A. Mermel | Michele L. Pearson | Issam I. Raad | Adrienne G. Randolph | Mark E. Rupp | Sanjay Saint

8. CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting

June 2008

Teresa C. Horan | Mary Andrus | Margaret A. Dudeck

9. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: Norovirus, Clostridium difficile, and Acinetobacter species

June 2010

David J. Weber | William A. Rutala | Melissa B. Miller | Kirk Huslage | Emily Sickbert-Bennett

Health care-associated infections (HAI) remain a major cause of patient morbidity and mortality. Although the main source of nosocomial pathogens is likely the patient's endogenous flora, an estimated 20% to 40% of HAI have been attributed to cross infection via the hands of health care personnel, who have become contaminated from direct contact with the patient or indirectly by touching contaminated environmental surfaces. Multiple studies strongly suggest that environmental contamination plays an important role in the transmission of methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococcus spp. More recently, evidence suggests that environmental contamination also plays a role in the nosocomial transmission of norovirus, Clostridium difficile, and Acinetobacter spp. All 3 pathogens survive for prolonged periods of time in the environment, and infections have been associated with frequent surface contamination in hospital rooms and health care worker hands. In some cases, the extent of patient-to-patient transmission has been found to be directly proportional to the level of environmental contamination. Improved cleaning/disinfection of environmental surfaces and hand hygiene have been shown to reduce the spread of all of these pathogens. Importantly, norovirus and C difficile are relatively resistant to the most common surface disinfectants and waterless alcohol-based antiseptics. Current hand hygiene guidelines and recommendations for surface cleaning/disinfection should be followed in managing outbreaks because of these emerging pathogens.

10. Preventing catheter-associated urinary tract infection in the zero-tolerance era

December 2011

Alexandre R. Marra | Thiago Zinsly Sampaio Camargo | Priscila Gonçalves | Ana Maria Cristina B. Sogayar | Denis Faria Moura Jr. | Luciana Reis Guastelli | Carla Andrea C. Alves Rosa | Elivane da Silva Victor | Oscar Fernando Pavão dos Santos | Michael B. Edmond

BackgroundCatheter-associated urinary tract infection (CAUTI) is one of the most common health care–associated infections in the critical care setting.MethodsA quasi-experimental study involving multiple interventions to reduce the incidence of CAUTI was conducted in a medical-surgical intensive care unit (ICU) and in 2 step-down units (SDUs). Between June 2005 and December 2007 (phase 1), we implemented some Centers for Disease Control and Prevention–recommended evidence-based practices. Between January 2008 and July 2010 (phase 2), we intervened to improve compliance with these practices at the same time that performance monitoring was being done at the bedside, and we implemented the Institute for Healthcare Improvement's bladder bundle for all ICU and SDU patients requiring urinary catheters.ResultsThere was a statistically significant reduction in the rate of CAUTI in the ICU, from 7.6 per 1,000 catheter-days (95% confidence interval [CI], 6.6-8.6) before the intervention to 5.0 per 1,000 catheter-days (95% CI, 4.2-5.8; P < .001) after the intervention. There also was a statistically significant reduction in the rate of CAUTI in the SDUs, from 15.3 per 1,000 catheter-days (95% CI, 13.9-16.6) before the intervention to 12.9 per 1,000 catheter-days (95% CI, 11.6-14.2) after the intervention (P = .014).ConclusionOur findings suggest that reducing CAUTI rates in the ICU setting is a complex process that involves multiple performance measures and interventions that can be applied to SDU settings as well.

11. Promoting and sustaining a hospital-wide, multifaceted hand hygiene program resulted in significant reduction in health care-associated infections

June 2013

Jaffar A. Al-Tawfiq | Mahmoud S. Abed | Nashma Al-Yami | Richard B. Birrer

BackgroundHand hygiene is the single most important intervention to combat infections in any health care setting. However, adherence to hand hygiene practice remains low among health care workers.ObjectivesOur objective was to assess compliance with hand hygiene over time utilizing a multifaceted approach to hand hygiene. In addition, we assessed the rate of device-associated infections.MethodsThis is a descriptive time series study with a multitude of interventions from October 2006 to December 2011 set in a 350-bed community hospital in Saudi Arabia. We utilized a multimodal program to promote hand hygiene activities. We also calculated device-associated infection rates as outcome measures.ResultsOver the study, the overall hand hygiene compliance rate increased from a baseline of 38% in second quarter 2006 to 65% in 2010 and then to 85% in 2011 ($P < .001$). The compliance rates increased among all professions and different hospital units. The compliance rates were 87% for physicians, 89% for nursing staff, and 93% for nutritionist. The rate of health care-associated methicillin-resistant Staphylococcus aureus per 1,000 patient-days decreased from 0.42 in 2006 to 0.08 in 2011. Ventilator-associated infection rates decreased from 6.12 to 0.78, central line-associated bloodstream infections rates decreased from 8.23 to 4.8, and catheter-associated urinary tract infection rates decreased from 7.08 to 3.5.ConclusionThis intervention used a multitude of interventions and resulted in an institution-wide increase and sustained improvement in compliance rates.

12. Effect of central line bundle on central line-associated bloodstream infections in intensive care units

August 2013

Ihn Sook Jeong | Soon Mi Park | Jeon Ma Lee | Ju Yeon Song | Su Jin Lee

BackgroundThis study was conducted in 4 intensive care units (ICUs) to investigate the effect of the central line (CL) bundle on central line-associated bloodstream infection (CLABSI).MethodsDuring phase 1 (baseline, from April 2009 to March 2010), active surveillance and training on hand hygiene only were conducted. During phase 2 (intervention, from April 2010 to December 2011), systemic training on the CL bundle and active surveillance and feedback with an electronic CL insertion checklist were performed.ResultsAdherence to the CL bundle significantly increased from 0.0% in phase 1 to 37.1% in phase 2 ($P < .001$), but the change of CLABSI rate was insignificant for adults in ICUs. However, adherence to the CL bundle significantly increased from 0.8% in phase 1 to 20.1% in phase 2 ($P < .001$), and the CLABSI rate significantly decreased from 3.7 to 0.0 per 1,000 catheter-days ($P = .014$) for children in ICUs.ConclusionThe higher adherence to the CL bundle was not positively correlated to a reduction in the CLABSI rate in adults, but it was related to a zero CLABSI for 18 monts among children in the ICUs.

13. Successful reduction in catheter-associated urinary tract infections: Focus on nurse-directed catheter removal

Available online 13 June 2013

Michael F. Parry | Brenda Grant | Merima Sestovic

BackgroundDespite using sterile technique for catheter insertion, closed drainage systems, and structured daily care plans, catheter-associated urinary tract infections (CAUTIs) regularly occur in acute care hospitals. We believe that meaningful reduction in CAUTI rates can only be achieved by reducing urinary catheter use.MethodsWe used an interventional study of a hospital-wide, multidisciplinary program to reduce urinary catheter use and CAUTIs on all patient care units in a 300-bed, community teaching hospital in Connecticut.

Our primary focus was the implementation of a nurse-directed urinary catheter removal protocol. This protocol was linked to the physician's catheter insertion order. Three additional elements included physician documentation of catheter insertion criteria, a device-specific charting module added to physician electronic progress notes, and biweekly unit-specific feedback on catheter use rates and CAUTI rates in a multidisciplinary forum.ResultsWe achieved a 50% hospital-wide reduction in catheter use and a 70% reduction in CAUTIs over a 36-month period, although there was wide variation from unit to unit in catheter reduction efforts, ranging from 4% (maternity) to 74% (telemetry).ConclusionUrinary catheter use, and ultimately CAUTI rates, can be effectively reduced by the diligent application of relatively few evidence-based interventions. Aggressive implementation of the nurse-directed catheter removal protocol was associated with lower catheter use rates and reduced infection rates.

14. Reduction in central line-associated bloodstream infections by implementation of a postinsertion care bundle

August 2010

Karen Guerin | Julia Wagner | Keith Rains | Mary Bessesen

BackgroundCentral line-associated bloodstream infections (CLABSIs) cause substantial morbidity and incur excess costs. The use of a central line insertion bundle has been shown to reduce the incidence of CLABSI. Postinsertion care has been included in some studies of CLABSI, but this has not been studied independently of other interventions.MethodsSurveillance for CLABSI was conducted by trained infection preventionists using National Health Safety Network case definitions and device-day measurement methods. During the intervention period, nursing staff used a postinsertion care bundle consisting of daily inspection of the insertion site; site care if the dressing was wet, soiled, or had not been changed for 7 days; documentation of ongoing need for the catheter; proper application of a chlorohexidine gluconate-impregnated sponge at the insertion site; performance of hand hygiene before handling the intravenous system; and application of an alcohol scrub to the infusion hub for 15 seconds before each entry.ResultsDuring the preintervention period, there were 4415 documented catheter-days and 25 CLABSIs, for an incidence density of 5.7 CLABSIs per 1000 catheter-days. After implementation of the interventions, there were 2825 catheter-days and 3 CLABSIs, for an incidence density of 1.1 per 1000 catheter-days. The relative risk for a CLABSI occurring during the postintervention period compared with the preintervention period was 0.19 (95% confidence interval, 0.06-0.63; P = .004).ConclusionThis study demonstrates that implementation of a central venous catheter postinsertion care bundle was associated with a significant reduction in CLABSI in a setting where compliance with the central line insertion bundle was already high.

15. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings

December 2007

Jane D. Siegel | Emily Rhinehart | Marguerite Jackson | Linda Chiarello

16. Preoperative chlorhexidine shower or bath for prevention of surgical site infection: A meta-analysis

February 2013

Maciej Piotr Chlebicki | Nasia Safdar | John Charles O'Horo | Dennis G. Maki

BackgroundChlorhexidine showering is frequently recommended as an important preoperative measure to prevent surgical site infection (SSI). However, the efficacy of this approach is uncertain.MethodsA search of electronic databases was undertaken to identify prospective controlled trials evaluating whole-body preoperative bathing with chlorhexidine versus placebo or no bath for prevention of SSI. Summary risk ratios

were calculated using a DerSimonian-Laird random effects model and a Mantel-Haenzel dichotomous effects model.ResultsSixteen trials met inclusion criteria with a total of 17,932 patients: 7,952 patients received a chlorhexidine bath, and 9,980 patients were allocated to various comparator groups. Overall, 6.8% of patients developed SSI in the chlorhexidine group compared with 7.2% of patients in the comparator groups. Chlorhexidine bathing did not significantly reduce overall incidence of SSI when compared with soap, placebo, or no shower or bath (relative risk, 0.90; 95% confidence interval: 0.77-1.05, P = .19).ConclusionsMeta-analysis of available clinical trials suggests no appreciable benefit of preoperative whole-body chlorhexidine bathing for prevention of SSI. However, most studies omitted details of chlorhexidine application. Better designed trials with a specified duration and frequency of exposure to chlorhexidine are needed to determine whether preoperative whole-body chlorhexidine bathing reduces SSI.

17. Alcohol handrubbing and chlorhexidine handwashing protocols for routine hospital practice: A randomized clinical trial of protocol efficacy and time effectiveness

November 2012

Angela Chow | Onyebuchi A. Arah | Siew-Pang Chan | Bee-Fong Poh | Prabha Krishnan | Woei-Kian Ng | Saugata Choudhury | Joey Chan | Brenda Ang

BackgroundThe World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) recommend the use of alcohol handrubs to prevent health care-associated infections. However, the efficacy and time effectiveness of different alcohol handrubbing protocols have yet to be evaluated.MethodsWe conducted a randomized controlled trial in the general wards of a 1,300-bed, acute, tertiary care hospital to compare the effectiveness of 3 hand hygiene protocols during routine inpatient care: (1) handrubbing with alcohol covering all hand surfaces, (2) handrubbing with alcohol using the standard 7-step technique, and (3) handwashing with chlorhexidine using the standard 7-step technique. Hand samples were obtained from 60 medical and 60 nursing staff, before and after hand hygiene. Quantitative and qualitative bacterial evaluations were carried out by microbiologists blinded to the protocol.ResultsAll 3 protocols were effective in reducing hand bacterial load (P < .01). During routine patient care, alcohol handrubbing covering all hand surfaces required less time (median, 26.0 seconds) than alcohol handrubbing using the 7-step technique (median 38.5 seconds; P = .04) and chlorhexidine handwashing (median, 75.5 seconds; P < .001).ConclusionAlcohol handrubbing protocols are as efficacious as chlorhexidine handwashing. Alcohol handrubbing covering all hand surfaces is the most time-effective protocol for routine patient care activities in busy general wards.

18. The effectiveness of hand hygiene procedures in reducing the risks of infections in home and community settings including handwashing and alcohol-based hand sanitizers

December 2007

Sally F. Bloomfield | Allison E. Aiello | Barry Cookson | Carol O'Boyle | Elaine L. Larson

Infectious diseases (ID) circulating in the home and community remain a significant concern. Several demographic, environmental, and health care trends, as reviewed in this report, are combining to make it likely that the threat of ID will increase in coming years. Two factors are largely responsible for this trend: first, the constantly changing nature and range of pathogens to which we are exposed and, secondly, the demographic changes occurring in the community, which affect our resistance to infection. This report reviews the evidence base related to the impact of hand hygiene in reducing transmission of ID in the home and community. The report focuses on developed countries, most particularly North America and Europe. It also evaluates the use of alcohol-based hygiene procedures as an alternative to, or in conjunction with, handwashing. The report compiles data from intervention studies and considers it alongside risk modeling approaches (both qualitative and quantitative) based on microbiologic data. The main conclusions are as follows: (1) Hand hygiene is a key component of good hygiene practice in the home and community and can produce significant benefits in terms of reducing the incidence of infection, most particularly gastrointestinal infections but also respiratory tract and skin infections. (2) Decontamination of hands can be carried out

either by handwashing with soap or by use of waterless hand sanitizers, which reduce contamination on hands by removal or by killing the organisms in situ. The health impact of hand hygiene within a given community can be increased by using products and procedures, either alone or in sequence, that maximize the log reduction of both bacteria and viruses on hands. (3) The impact of hand hygiene in reducing ID risks could be increased by convincing people to apply hand hygiene procedures correctly (eg, wash their hands correctly) and at the correct time. (4) To optimize health benefits, promotion of hand hygiene should be accompanied by hygiene education and should also involve promotion of other aspects of hygiene.

19. Continuous passive disinfection of catheter hubs prevents contamination and bloodstream infection

January 2013

Marc-Oliver Wright | Jackie Tropp | Donna M. Schora | Mary Dillon-Grant | Kari Peterson | Sue Boehm | Ari Robicsek | Lance R. Peterson

BackgroundCatheter hub decontamination requires a thorough scrub and compliance varies. This study evaluates the effectiveness of a disinfection cap with 70% alcohol in preventing contamination/infection.MethodsA 3-phased, multifacility, quasi-experimental study of adult patients with central lines divided into P1 (baseline), when the standard scrub was used; P2, when the cap was used on all central lines; and P3, when standard disinfection was reinstituted. House-wide central-line associated bloodstream infection (CLABSI) rates are reported with catheter-associated urinary tract infections (CAUTI) as a control measure. Adults with peripherally inserted central catheters inserted during hospitalization having 5+ consecutive line-days gave consent and were enrolled, and 1.5 mL of blood was withdrawn from each lumen not in use and quantitatively cultured.ResultsContamination was 12.7% (32/252) during P1; 5.5% (20/364) in P2 (P = .002), and 12.0% (22/183; P = 0.88 vs P1 and P = .01 vs P2) in P3 (P = .001 vs P2). The median colony-forming units per milliliter was 4 for P1, 1 for P2 (P = .009), and 2 for P3 (P = .05 vs P2). CLABSI rates declined from 1.43 per 1,000 line-days (16/11,154) to 0.69 (13/18,972) in P2 (P = .04) and increased to 1.31 (7/5,354) in P3. CAUTI rates remained stable between P1 and P2 (1.42 and 1.41, respectively, P = .90) but declined in P3 (1.04, P = .03 vs P1 and P2).ConclusionDisinfecting caps reduce line contamination, organism density, and CLABSIs.

20. Reducing the risk of surgical site infections: Does chlorhexidine gluconate provide a risk reduction benefit?

May 2013

Charles E. Edmiston Jr. | Benjamin Bruden | Maria C. Rucinski | Cindy Henen | Mary Beth Graham | Brian L. Lewis

Chlorhexidine gluconate (CHG) has been available as a topical antiseptic for over 50 years, having broad clinical application throughout the health care environment. Evidence-based clinical studies have shown chlorhexidine gluconate to be a safe and effective perioperative skin-prepping agent. Renewed interest has emerged for use of the antiseptic bath/shower to reduce the microbial skin burden prior to hospital admission. Recent clinical studies have documented that multiple applications of 2% or 4% CHG using a standardized protocol results in high skin surface concentrations sufficient to inhibit/kill skin colonizing flora, including methicillin-resistant Staphylococcus aureus. A new focus for the use of CHG in surgical patients involves irrigation of the wound prior to closure with 0.05% CHG followed by saline rinse. Recent laboratory studies suggest that, following a 1-minute exposure, 0.05% CHG produces a >5-log reduction against selective health care-associated pathogens and reduces microbial adherence to the surface of implantable biomedical devices. General, orthopedic, cardiothoracic, and obstetrical surgical studies have documented the safety of selective CHG formulations in elective surgical procedures. The following discussion will address both the evidence-based literature and preliminary findings suggesting that CHG has a broad and safe range of applications when used as an adjunctive interventional strategy for reducing the risk of postoperative surgical site infections (SSI).

21. Daily chlorohexidine gluconate bathing with impregnated cloths results in statistically significant reduction in central line-associated bloodstream infections

December 2010

Jessica M. Dixon | Robin L. Carver

BackgroundCentral line-associated bloodstream infections (CLABSI) contribute to increased morbidity, mortality, length of stay, and excessive cost of care.MethodsThis study was an observational cohort study using historical controls in the setting of a 9-bed surgical intensive care unit in a Level I trauma center; all patients admitted or transferred into the unit were enrolled in the study.ObjectivesA quality improvement intervention protocol was instituted to reduce CLABSI incidence with a 3-month effectiveness study using 2% chlorhexidine gluconate-impregnated cloths for daily patient bathing; education of surgical intensive care unit staff on changes to CLABSI prevention protocol and all existing CLABSI prevention policies and bundles already in place; and compliance monitoring and documentation.ResultsThe 3-month effectiveness study showed a decrease in CLABSI rates from 12.07 CLABSIs per 1000 central line-days to 3.17 CLABSIs per 1000 central line-days (73.7% rate reduction; P = .0358).ConclusionCLABSI incidence rates were reduced in a high-risk patient population using evidence-based prevention bundles and implementing daily bathing with 2% chlorhexidine gluconate nonrinse cloths.

22. The reduction of risk in central line-associated bloodstream infections: Knowledge, attitudes, and evidence-based practices in health care workers

February 2013

Aida Bianco | Pierluigi Coscarelli | Carmelo G.A. Nobile | Claudia Pileggi | Maria Pavia

BackgroundWe set out to acquire information about the knowledge, attitudes, and evidence-based practices associated with the insertion and maintenance of central vascular catheters (CVC) for the prevention of central line-associated bloodstream infections (CLABSI).MethodsWe selected all health care workers (HCW) in all units using CVCs in the Calabria region of Italy.ResultsCorrect answers about the knowledge of physicians and nurses ranged from 43% to 72.9% and were significantly higher in respondents who worked in intensive care unit (ICU) wards in hospitals that had a written policy about CVC maintenance and had active formal training. Respondents' attitudes toward general aspects of CLABSI prevention were very positive and were significantly higher for HCWs working in regional general hospitals, practicing in ICU wards, and having appropriate knowledge. Concerning HCWs, 83.9% reported that, if patients had any manifestations suggesting local or bloodstream infection, the dressing was removed for assessment purposes; this practice was significantly more likely to occur in HCWs having appropriate knowledge and positive attitudes and who worked in hospitals with a written policy about CVC maintenance.ConclusionThe study demonstrated that written policies, formal training, and years of experience contributed to an increase in knowledge, practice, and positive attitudes toward CLABSI prevention. In addition the paper demonstrates how great this need is, having reported many non-evidence-based practices still continuing despite new evidence.

23. Bundling hand hygiene interventions and measurement to decrease health care–associated infections

May 2012

Ted Pincock | Paul Bernstein | Shawn Warthman | Elizabeth Holst

Proper performance of hand hygiene at key moments during patient care is the most important means of preventing health care–associated infections (HAIs). With increasing awareness of the cost and societal impact caused by HAIs has come the realization that hand hygiene improvement initiatives are crucial to reducing the burden of HAIs. Multimodal strategies have emerged as the best approach to improving hand

hygiene compliance. These strategies use a variety of intervention components intended to address obstacles to complying with good hand hygiene practices, and to reinforce behavioral change. Although research has substantiated the effectiveness of the multimodal design, challenges remain in promoting widespread adoption and implementation of a coordinated approach. This article reviews elements of a multimodal approach to improve hand hygiene and advocates the use of a “bundled” strategy. Eight key components of this bundle are proposed as a cohesive program to enable the deployment of synergistic, coordinated efforts to promote good hand hygiene practice. A consistent, bundled methodology implemented at multiple study centers would standardize processes and allow comparison of outcomes, validation of the methodology, and benchmarking. Most important, a bundled approach can lead to sustained infection reduction.

24. Designing a protocol to reduce catheter-associated urinary tract infections among hospitalized patients

December 2012

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Hospital-acquired urinary tract infections comprise 40% of hospital-acquired infections with over 80% of these hospital-acquired urinary tract infections associated with the use of urinary catheters. The process that was used to establish a new hospital protocol using the “IAIMS” (identifying, assessing, implementing, modifying/maintaining, spread/surveillance) model to reduce the incidence of catheter-associated urinary tract infections is described. The example is intended to serve as a framework for the development of protocols to address other hospital-acquired infections.

25. Dissemination of health information through social networks: Twitter and antibiotics

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BackgroundThis study reviewed Twitter status updates mentioning “antibiotic(s)” to determine overarching categories and explore evidence of misunderstanding or misuse of antibiotics.MethodsOne thousand Twitter status updates mentioning antibiotic(s) were randomly selected for content analysis and categorization. To explore cases of potential misunderstanding or misuse, these status updates were mined for co-occurrence of the following terms: “cold + antibiotic(s),” “extra + antibiotic(s),” “flu + antibiotic(s),” “leftover + antibiotic(s),” and “share + antibiotic(s)” and reviewed to confirm evidence of misuse or misunderstanding.ResultsOf the 1000 status updates, 971 were categorized into 11 groups: general use (n = 289), advice/information (n = 157), side effects/negative reactions (n = 113), diagnosis (n = 102), resistance (n = 92), misunderstanding and/or misuse (n = 55), positive reactions (n = 48), animals (n = 46), other (n = 42), wanting/needing (n = 19), and cost (n = 8). Cases of misunderstanding or abuse were identified for the following combinations: “flu + antibiotic(s)” (n = 345), “cold + antibiotic(s)” (n = 302), “leftover + antibiotic(s)” (n = 23), “share + antibiotic(s)” (n = 10), and “extra + antibiotic(s)” (n = 7).ConclusionSocial media sites offer means of health information sharing. Further study is warranted to explore how such networks may provide a venue to identify misuse or misunderstanding of antibiotics, promote positive behavior change, disseminate valid information, and explore how such tools can be used to gather real-time health data.