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### Literature search results

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### Search details

E.coli, bacteremia in urinary catheters, infection rates, prevention of urinary catheters because of infection rates

### Resources searched

NHS Evidence; TRIP Database; Cochrane Library; CINAHL; EMBASE; MEDLINE; Google Scholar; Google Advanced Search

**Database search terms**: URINARY CATHETERIZATION, ("urinary catheter**" OR "urethra* catheter**" OR "bladder catheter**"), ESCHERICHIA COLI, "escherichia coli" OR "e.coli", "e coli", exp BACTEREMIA, (bacteremia OR bacteraemia), exp CATHETER-RELATED INFECTIONS, exp INFECTION CONTROL, ("infection rate**" OR "infection prevent**" OR infection* OR "infection control"). ("catheter associated urinary tract infection**" OR "catheter-associated urinary tract infection**" OR CAUTI* OR "catheter infection**")

**Google search string**:

### Summary

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**Clinical Knowledge Summaries**
Urinary tract infection in men with an indwelling urinary catheter, 2010

Urinary tract infection in women with an indwelling urinary catheter, 2010

**European Association of Urology**
Guidelines on Urological Infection, 2010
In particular Section 6, p. 61
### Strategies for Preventing Infection in Catheterized Patients

- Daily cleaning of the urethral meatus and catheter with soap and water
- Using the smallest gauge catheter possible
- Increasing the patient's fluid intake
- Draining the drainage bag when it becomes full, or at least once every 8 hours, to prevent migration of bacteria
- Keeping the drainage bag lower than the level of the patient's bladder to prevent backflow of urine into the bladder
- Cleaning the drainage bag outlet valve with soap and water
- Disinfecting the drainage bag with vinegar or chlorine bleach and water and allowing it to air dry
- Alternating indwelling catheter use with either suprapubic (i.e., a catheter inserted through the abdomen and placed directly into the bladder) or intermittent catheterization
- Removing the catheter as soon as possible
- Washing hands and wearing gloves before handling the catheter and drainage bag
- Emptying the drainage bag prior to patient transport and avoiding clamping the catheter during transport
- Replacing the entire catheter and drainage bag if leakage or obstruction occurs
- Avoiding kinks in the catheter tubing
- Securing the catheter tubing to the thigh/body, which can help reduce urethral irritation, injury, infection, and bladder neck trauma as well as increase patient comfort

### Evidence-based Reviews

#### Cochrane Database of Systematic Reviews

**Types of urethral catheters for management of short-term voiding problems in hospitalised adults, 2010**

Urinary catheters are small tubes inserted through the urethra (outlet for urine). They are often used for a short time after major surgery or to monitor urine output in hospitalised patients. About half of all hospitalised adults who have urinary catheters in for longer than a week will get a urinary tract infection. The review of trials found that silver alloy (antiseptic) coated or nitrofurazone-impregnated (antibiotic) urinary catheters might reduce the presence of bacteria in the urine of hospitalised adults with temporary urinary catheters, and siliconised catheters might cause the least adverse effects in men, but the evidence was weak. Larger, more scientifically rigorous, trials are needed to determine if catheters impregnated with antibiotics or antiseptics can reduce urinary tract infection.

#### Database of Abstracts of Reviews of Effects

**Systematic review: antimicrobial urinary catheters to prevent catheter-associated urinary tract infection in hospitalized patients, 2006**

Compared with standard catheters, antimicrobial urinary catheters can prevent catheter-associated bacteriuria in hospitalised patients during short-term catheterisation. The effect size varied according to the type of catheter coating and publication year of the study.

#### NHS Economic Evaluation

**Systematic review: antimicrobial urinary catheters to prevent catheter-associated urinary tract infection in hospitalized patients, 2004**

The objectives of the study were to determine the efficacy of a silver alloy/hydrogel-coated urinary catheter in the prevention of catheter-associated UTI, to assess the cost-effectiveness of the coated catheter, and to test for the emergence of silver resistance in urinary microbial isolates. The study perspective was not explicitly stated, but it appears to have been that of the hospital.
The introduction of a silver alloy/hydrogel catheter was associated with a significant decline in nosocomial urinary tract infections (UTIs), and cost-savings over a range of cost estimates.

**Hydrogel/silver ion-coated urinary catheter reduces nosocomial urinary tract infection rates in intensive care unit patients: a multicenter study, 2004**

The objective of the study was to investigate whether the use of the Bardex I.C. catheter would reduce the rate of nosocomial urinary tract infections (NUTIs) in patients receiving catheters in critical care units. The comparator was the latex Foley catheter, which was considered the standard catheter in use. The standard Foley and the Bardex I.C. catheters differ in that the latter (Bardex I.C.) has a monolayer of silver metal on its inner and outer surfaces. The authors hypothesised that, on the basis of the results of an earlier published study, the silver coating could lead to a reduction in NUTIs. The perspective of the study, although not explicitly reported, appears to have been that of the hospital. The authors concluded that there was a trend in the reduction of NUTIs with the Bardex I.C. catheter, although this was not statistically significant in terms of the adjusted catheter-associated infection rate.

**The potential clinical and economic benefits of silver alloy urinary catheters in preventing urinary tract infection, 2002**

The authors make detailed suggestions. To make the most effective use of this new catheter, health care systems should estimate the average duration of catheterisation for patients admitted to the different hospital wards, providing either silver-coated or standard catheters. This study found that most indwelling catheters were used between 2 and 10 days in all catheterised adult patient groups except those in the obstetric wards and patients undergoing some surgical procedures. Thus, one potential strategy would be to stock silver-coated catheters throughout the hospital except in the obstetric ward and in the operating room. Further studies are needed to identify more clearly those patient groups likely to derive the greatest benefit from silver-coated catheters. However, given the difficulties in preventing catheter-related UTI and the potential clinical and economic benefit associated with silver alloy catheters, this relatively simple intervention, the authors suggested, should be strongly considered in the appropriate clinical settings.

**Published research**

12. **Novel antiseptic urinary catheters for prevention of urinary tract infections: correlation of in vivo and in vitro test results.**


Citation: Antimicrobial Agents & Chemotherapy, December 2009, vol./is. 53/12(5145-9), 0066-4804;1098-6596 (2009 Dec)

Publication Date: December 2009

Abstract: Urinary catheters are widely used for hospitalized patients and are often associated with high rates of urinary tract infection. We evaluated in vitro the antiadherence activity of a novel antiseptic Gendine-coated urinary catheter against several multidrug-resistant bacteria. Gendine-coated urinary catheters were compared to silver hydrogel-coated Foley catheters and uncoated catheters. Bacterial biofilm formation was assessed by quantitative culture and scanning electron microscopy. These data were further correlated to an in vivo rabbit model. We challenged 31 rabbits daily for 4 days by inoculating the urethral meatus with 1.0 x 10(9) CFU streptomycin-resistant Escherichia coli per day. In vitro, Gendine-coated urinary catheters reduced the CFU of all organisms tested for biofilm adherence compared with uncoated and silver hydrogel-coated catheters (P < 0.004). Scanning electron microscopy analysis showed that a thick biofilm overlaid the control catheter and the silver hydrogel-coated catheters but not the Gendine-coated urinary catheter. Similar results were found with the rabbit model. Bacteriuria was present in 60% of rabbits with uncoated catheters and 71% of those with silver hydrogel-coated catheters (P < 0.01) but not in those with Gendine-coated urinary catheters. No rabbits with Gendine-coated urinary catheters had invasive bladder infections. Histopathologic assessment revealed no differences in toxicity or staining. Gendine-coated urinary catheters were more efficacious in preventing catheter-associated colonization and urinary tract infections than were silver hydrogel-coated Foley catheters and uncoated catheters.

Source: MEDLINE
15. Reducing the risk of catheter-related urinary tract infection.
Author(s): Nazarko L
Citation: British Journal of Nursing, September 2008, vol./is. 17/16(1002, 1004, 1006 passim), 0966-0461;0966-0461 (2008 Sep 11-24)
Publication Date: September 2008
Abstract: Primum non nocere (first do no harm) is the ancient Latin phrase that reminds nurses that first principle of healthcare is not to harm those entrusted to our care. Yet, common healthcare interventions, such as urinary catheterization, have the potential to do patients great harm. The patient may even pay with his or her life if a urinary catheter is inserted without clinical indications or if the nurse fails to do his or her utmost to protect the patient from infection. Urinary tract infection (UTI) is the most common of healthcare-related infection. UTI in hospital inpatients normally occurs in people who have a urinary catheter inserted. Urinary catheterization is common and although the risks of catheter-associated UTI are small, the consequences or catheter-associated UTI can be life threatening. Urinary catheterization increases morbidity by a factor of three. Restricting catheterization to those who clinically require this invasive procedure can reduce the number of people who developed infection and life threatening bacteraemia. The use of silver-coated catheters can reduce the risks of infection. Evidence based practice can further reduce risks of catheterization. It is important that informed consent is obtained prior to catheterization. If a person lacks capacity the clinician must act in the person's best interests.
Source: MEDLINE
Full Text: Available in fulltext at Highwire Press
Available in fulltext at National Library of Medicine

Author(s): Jacobsen SM, Stickler DJ, Mobley HL, Shirtliff ME
Citation: Clinical Microbiology Reviews, January 2008, vol./is. 21/1(26-59), 0893-8512;1098-6618 (2008 Jan)
Publication Date: January 2008
Abstract: Catheter-associated urinary tract infections (CAUTIs) represent the most common type of nosocomial infection and are a major health concern due to the complications and frequent recurrence. These infections are often caused by Escherichia coli and Proteus mirabilis. Gram-negative bacterial species that cause CAUTIs express a number of virulence factors associated with adhesion, motility, biofilm formation, immunoavoidance, and nutrient acquisition as well as factors that cause damage to the host. These infections can be reduced by limiting catheter usage and ensuring that health care professionals correctly use closed-system Foley catheters. A number of novel approaches such as condom and suprapubic catheters, intermittent catheterization, new surfaces, catheters with antimicrobial agents, and probiotics have thus far met with limited success. While the diagnosis of symptomatic versus asymptomatic CAUTIs may be a contentious issue, it is generally agreed that once a catheterized patient is believed to have a symptomatic urinary tract infection, the catheter is removed if possible due to the high rate of relapse. Research focusing on the pathogenesis of CAUTIs will lead to a better understanding of the disease process and will subsequently lead to the development of new diagnosis, prevention, and treatment options.
Source: MEDLINE
Full Text: Available in fulltext at Highwire Press
Available in fulltext at National Library of Medicine

27. Catheter-associated urinary tract infection.
Author(s): Danchaivijitr S, Dhiraputra C, Cherdruengsi R, Jintanothaitavorn D, Srihapol N
Citation: Journal of the Medical Association of Thailand, December 2005, vol./is. 88 Suppl 10/(S26-30), 0125-2208;0125-2208 (2005 Dec)
Publication Date: December 2005

Abstract: OBJECTIVES: To study the incidence, risk factors, clinical outcomes and antibiotic costs of catheter-associated urinary tract infections (CAUTI) in patients with indwelling urinary catheter for one week and longer

MATERIAL AND METHOD: Patients in neurology and neurosurgery wards in a teaching hospital were studied. Patients with UTI before catheterization and in whom the catheter was removed before one week were excluded. Urine cultures were done immediately after catheterization and 3 times a week thereafter. Patients were followed for symptoms of UTI for 1 week after catheter removal, for 4 weeks without evidence of UTI or until discharge.

RESULTS: One hundred and one patients met the inclusion criteria. The incidence of CAUTI was 73.3%. High incidence of CAUTI was found in the first 2 weeks after catheterization. About one-half of the patients with CAUTI had a single episode and were symptomatic. None of the 132 episodes of CAUTI were associated with secondary bacteremia. Risk factors for CAUTI identified were prolonged catheterization and change of the catheter. Nosocomial pathogens were found in urine and yeast was the commonest. Eleven patients (14.9%) with CAUTI died and only in 2, CAUTI was considered a contributory factor for mortality. The cost of antimicrobials for treating one episode of CAUTI was 8,180 baht and this rose to 49,983 baht for CAUTI associated with concurrent infections at other sites.

CONCLUSION: Catheter-associated urinary tract infection was common. Uropathogens were nosocomial micro-organisms with high incidence of resistance to antimicrobials. Impacts on morbidity, mortality and costs were substantial. Better management of urinary catheter is to be explored and implemented.

Source: MEDLINE

Author(s): Godfrey H, Fraczyk L
Citation: British Journal of Community Nursing, May 2005, vol./is. 10/5(205-6, 208-12), 1462-4753;1462-4753 (2005 May)
Publication Date: May 2005

Abstract: Since the Foley catheter was introduced in the 1930s it has become one of the primary sources of hospital acquired infections and long term urinary catheters used in community based patients account for some 4% of community nurses' time. This burden is likely to increase given the projected rise in life expectancy and size of the ageing population. This article considers the current literature around indwelling urinary catheterization and its management with a focus on long term catheterization in the community. The authors discuss contemporary strategies to manage or prevent CAUTI that are based on best practice guidelines. However, it is clear from the dearth of empirical evidence that there is an urgent need to establish well-constructed research studies to investigate the prevalence of long term urinary catheterization in the community and the prevention and management of CAUTI.

Source: MEDLINE

Full Text: Available in fulltext at EBSCO Host

31. Intravesical nitric oxide delivery for prevention of catheter-associated urinary tract infections
Author(s): Carlsson S, Weitzberg E, Wiklund P, Lundberg JO
Citation: Antimicrobial Agents & Chemotherapy, June 2005, vol./is. 49/6(2352-5), 0066-4804;0066-4804 (2005 Jun)
Publication Date: June 2005

Abstract: The use of indwelling urinary catheters is a major risk factor for urinary tract infection; and despite the availability of numerous preventive regimens, this condition is still extremely common. In earlier studies we have demonstrated the inhibitory effects of nitrite and ascorbic acid on bacterial growth in urine. When combined, these compounds generate antibacterial reactive nitrogen species, including the gas nitric oxide. We have now tested in a laboratory model of the urinary bladder whether filling of the catheter retention balloon with nitrite and ascorbic acid would generate measurable amounts of NO outside the membrane and whether this would affect bacterial growth in the surrounding urine. Two strains of Escherichia coli, one strain isolated from a patient (U1106024) and one reference strain (ATCC 25922), were tested. Nitric oxide gas was generated in the silicone balloon and readily diffused into the urine. When control catheters with ascorbic acid but without nitrite were used, bacterial counts increased from 9.0 x 10(5) to 2.0 x10(8) CFU/ml (strain U1106024) and from 2.5 x 10(6) to 2.7 x 10(8) CFU/ml (strain ATCC 25922).
after 24 h. In contrast, in test catheters with ascorbic acid and nitrite, both strains tested were effectively killed. The NO donor \([\text{DETA NONOate, (Z)}-1\text{-}[N-(2\text{-aminoethyl})-N-(2\text{-ammonioethyl})\text{amino}]\text{diazene-1-ium-1,2-diolate}]\) also showed antibacterial activity in the same model, thereby supporting a central role of NO in achieving the observed effects. Future clinical trials will reveal whether this novel approach for the intravesical delivery of an antibacterial gas could be used to prevent catheter-associated infections.

Source: MEDLINE

Available in fulltext at Highwire Press
Available in fulltext at National Library of Medicine

32. Role of biofilm in catheter-associated urinary tract infection.

Author(s): Trautner BW, Darouiche RO

Citation: American Journal of Infection Control, May 2004, vol./is. 32/3(177-83), 0196-6553;0196-6553 (2004 May)

Publication Date: May 2004

Abstract: The predominant form of life for the majority of microorganisms in any hydrated biologic system is a cooperative community termed a "biofilm." A biofilm on an indwelling urinary catheter consists of adherent microorganisms, their extracellular products, and host components deposited on the catheter. The biofilm mode of life conveys a survival advantage to the microorganisms associated with it and, thus, biofilm on urinary catheters results in persistent infections that are resistant to antimicrobial therapy. Because chronic catheterization leads almost inevitably to bacteriuria, routine treatment of asymptomatic bacteriuria in persons who are catheterized is not recommended. When symptoms of a urinary tract infection develop in a person who is catheterized, changing the catheter before collecting urine improves the accuracy of urine culture results. Changing the catheter may also improve the response to antibiotic therapy by removing the biofilm that probably contains the infecting organisms and that can serve as a nidus for reinfection. Currently, no proven effective strategies exist for prevention of catheter-associated urinary tract infection in persons who are chronically catheterized.

Source: MEDLINE

38. The direct costs of nosocomial catheter-associated urinary tract infection in the era of managed care.

Author(s): Tambyah PA, Knasinski V, Maki DG

Citation: Infection Control & Hospital Epidemiology, January 2002, vol./is. 23/1(27-31), 0899-823X;0899-823X (2002 Jan)

Publication Date: January 2002

Abstract: OBJECTIVE: To determine the additional direct costs of hospitalization attributable to catheter-associated urinary tract infection (CAUTI) in 1,497 newly catheterized patients.DESIGN: Prospective observational and laboratory study.SETTING: University hospital.METHODS: Data were collected on risk factors for CAUTI (defined as > 10³ colony-forming units [CFU]/mL), severity of illness, and diagnostic and therapeutic interventions in consenting newly catheterized patients. Daily urine cultures were obtained from each newly catheterized patient, but the results of these cultures were not revealed to his or her physician. During the study, one of the investigators (DGM) reviewed each patient's record and made a judgment as to which of the diagnostic tests and treatments ordered and what incremental length of stay could reasonably be ascribed to his or her CAUTI. The total hospital costs for each patient were also obtained.RESULTS: Overall, 235 patients acquired CAUTIs during the study; most of the CAUTIs were completely asymptomatic, and only 52% were diagnosed by the patients' physicians using the hospital laboratory. Only 1 patient with a CAUTI had a secondary bloodstream infection. Thirty-three (13%) of the CAUTIs were caused by Escherichia coli; 63 (25%) by Klebsiella, Enterobacter, Citrobacter, Pseudomonas aeruginosa, or other antibiotic-resistant, gram-negative bacilli; 87 (35%) by enterococci or staphylococci; and 67 (27%) by Candida species. The 123 CAUTIs diagnosed by the hospital laboratory were judged to have been responsible for an additional $20,662 in extra costs of diagnostic tests and $35,872 in extra medication costs, a mean of $589 (median, $356) per CAUTI. CAUTIs caused by E. coli cost considerably less than infections caused by other gram-negative bacilli ($363.3 +/- $228.2 vs $690.4 +/- $783.7; P = .02) or yeasts ($821.2 +/- $2,169.9). There were less striking differences in the costs per CAUTI caused by staphylococci or enterococci ($387.1 +/- $434.8).CONCLUSIONS: The extra direct costs associated with nosocomial CAUTI found in this prospective study, which was done in the era of managed care during the late
1990s, are substantially lower than those reported in the largest comparable studies done more than 15 years ago, most of which were retrospective, reflecting the powerful impact of cost-containment measures that are now implemented in managed care.

Source: MEDLINE
Full Text: Available in print at Grantham Hospital Staff Library

9. The effect of an educational intervention to nosocomial catheter-associated urinary tract infection rates
Author(s): Erbay A., Cabadak H., Tezer Tekce Y., Sen S.
Citation: Clinical Microbiology and Infection, April 2010, vol./is. 16/(S684), 1198-743X (April 2010)
Publication Date: April 2010
Abstract: Objectives: To obtain the incidence of nosocomial catheter-associated urinary tract infections (CAUTIs), microbiological profiles and bacterial resistance in intensive care units (ICUs) and observe the effect of an educational intervention to the CAUTIs rates.
Methods: Prospective cohort surveillance of CAUTIs was conducted in five ICUs with 96 beds in Turkiye Yuksel Ihtisas Education and Research Hospital in Turkey, by applying the definitions of the Centers for Disease Control during 2 year period. Rates of CAUTIs per 100 patients and per 1000 device days were determined. In January 2008 urinary catheter implementations were reviewed and an educational program was carried out. Results: From January 2007 to December 2008 CAUTIs were followed up. The mean age was 65.2 and 57% of the patients were male. In 2007, 4886 patients followed up in ICUs for an aggregate of 18013 ICU days. Of these, 86 CAUTIs were detected in 73 (1.49%) patients. The rate for CAUTIs was 7 cases per 1000 catheter-days. Urinary catheter use rate was 0.71. In 2008, 5591 patients followed up in ICUs for an aggregate of 21055 ICU days. Of these, 51 CAUTIs were detected in 45 (0.8%) patients. The rate for CAUTIs was 2.6 cases per 1000 catheterdays. Urinary catheter use rate was 0.79. The period between ICU admission and CAUTIs ranged 3-126 days. The most commonly isolated microorganisms were as follows; Escherichia coli, Enterococcus spp., Klebsiella spp., Acinetobacter baumannii, Pseudomonas aeruginosa. E. coli isolates were resistant to cefotaxime in 64%, were resistant to ciprofloxacin in 86%, and were resistant to pipercillin-tazobactam in 26%. Seventy percent of Klebsiella spp. isolates were resistant to ciprofloxacin, 62% were resistant to cefotaxime and 54% were resistant to pipercillin-tazobactam. All of the A. baumannii isolates were resistant to ciprofloxacin, and 40% were resistant to imipenem. Fifty percent of P. aeruginosa isolates were resistant to ciprofloxacin, all of them were resistant to ceftazidime and pipercillin-tazobactam, and 30% were resistant to imipenem. Ampicilin resistance was detected in 28% of the Enterococcus spp. isolates and vancomycin resistance was not observed. Conclusions: The CAUTIs rates in our hospital decreased after educational intervention. However antimicrobial resistance rates were high in this study.
Source: EMBASE

15. Urinary bacteria sensitivity and resistance in patients with chronic urinary catheter
Author(s): Esquivel J.G., Arreguin A.G., Sandoval L.B., Gante E.L., Enciso I.D.
Citation: Internet Journal of Infectious Diseases, 2009, vol./is. 7/1, 1528-8366 (2009)
Publication Date: 2009
Abstract: Antecedents: Catheter-Associated Urinary Tract Infection (CAUTI) is a common infection often resulting in severe complications. The objective of this study was to identify the microorganisms present in patients with chronic urinary catheter and to determine antibiotic sensitivity and resistance. Materials and Methods: A cross-over study was carried out in Colima, Colima, Mexico. Patients over18 years of age with chronic urinary catheter (>30days) were included in the study. Urine samples were taken directly from the catheter and processed immediately. Qualitative-quantitative urine cultures were obtained. Results: A total of 38 samples were studied. The principle bacteria isolated in our study was Escherichia coli. Of the 27 isolated Escherichia coli strains, 100% were sensitive to: ampicillin/clavulnate, ampicillin/sublactam, lomefloxacin, ofloxacine, tetracycline, tobramycin, and trimethoprim/ sulphametoaxze. One hundred percent of the Escherichia coli strains were resistant to ampicillin. Conclusions: This study can serve the community and especially health institutes in providing patients with efficient medical treatment.
Source: EMBASE

Author(s): Pollara G., Sivananthan A., Schwenk A., Adhami Z.
Citation: Clinical Microbiology and Infection, May 2009, vol./is. 15/(S162-S163), 1198-743X (May 2009)
Abstract: Objective: Urinary catheters introduce a portal for invasion by infectious organisms, resulting in catheter associated urinary tract infections (CAUTI), the source of 8% of hospital acquired bacteraemia. North Middlesex University Hospital, London, UK guidelines on managing CAUTI indicated the need for catheter change and sensitivity-guided antibiotic usage, but did not focus on distinguishing between asymptomatic bacteriuria and septic patients. Thus, a clinical audit was carried out to identify clinical parameters involved in the detection and management of microbiologically confirmed catheter associated bacteriuria. Methods: Patients were identified from catheter specimen urine (CSU) that had grown a single organism >10^5 cfu/ml. Their medical records were then analysed to assess the parameters being audited: the indication for CSU collection (clinical suspicion, costovertebral tenderness or fever), change of catheter (+/- antibiotic prophylaxis) and antibiotic usage. Overall 41 patient records were collected over a 2 month period. 30/41 patients were female and the median age was 75 (range 38-98). Results: Only 13/41 (32%) of samples originated from patients with pos-sible symptomatic UTI. While 21/41 (52%) of catheters were removed, this occurred only in 6/13 (46%) of patients where symptomatic infection was suspected. Furthermore, 15 catheters were removed when not clinically indicated, and 6 of these were replaced, potentially introducing a second bacteraemic event. Of the 21 removed catheters, only 9 patients (43%) received gentamicin prophylaxis. With regards to treatment of suspected CAUTI, of the 20 patients that received antibiotics, only 8 (40%) had a clinical indication for doing so at the time of sample collection. Furthermore, there was no association between catheter removals and administration of antibiotics to treat a suspected UTI. Conclusion: The variability in clinical practice identified by this audit have resulted in new hospital guidelines, specifying clear indications for CSU collection (fevers, localising tenderness, rigors) and gentamicin prophylaxis (history of CAUTI following catheter manipulation, recent catheterisation following urinary tract instrumentation, neutropaenia). An education programme has been rolled out to reinforce these new guidelines, prior to a comprehensive re-audit. This audit may serve as a template for other hospitals to compare local practice in the management of CAUTI to evidence based standards.
Source: EMBASE
Full Text: Available in fulltext at EBSCO Host

22. Catheter-associated urinary tract infections in a geriatric ward

Author(s): Lanzafame P., Dallape P., Scartezzini L., Monterosso M., Caola I., Baldantoni E.
Citation: Clinical Microbiology and Infection, May 2009, vol./is. 15/(S162), 1198-743X (May 2009)
Abstract: Objective: Catheter-associated urinary tract infections (CA-UTIs) in the elderly represent the most common nosocomial infections; about 15 to 30% of hospitalised elderly patients with acute conditions usually undergo urinary catheterisation. This study was done to describe the incidence of catheter-related infections, the risk factors associated with the duration of catheterism and the microbiological pathogens involved. Methods: An active surveillance system of nosocomial infections associated with CA-UTIs in patients hospitalised in the geriatric ward of a country hospital (720 beds) was carried out from January 2006 to December 2007, and a study of prevalence was made in July 2008. The surveillance was based on CDC's Guideline for prevention of Catheter-associated Urinary Tract Infections. Standard clinical and microbiological criteria were used to define colonisation and infection. Results: A total of 122 patients, negative for bacteriuria, underwent urinary catheterism during the observation phase. The incidence rate/100 catheter days was 7.09% for 57 cases of infections. The average days of catheterisation was 6.6 days. We calculated the average catheter-days of the infections for each year of the study; the results were 10.28 and 17.42, with a significant correlation between the infection and the catheter days. The percentage of catheterisation was 12.88%. The study of prevalence made in July 2008 confirmed the previous data: the prevalence rate of infections/catheter-days was 8.3%, the percentage of patients undergoing urinary catheter was 25%. The bacterial aetiology of CA-UTIs generally involved a single uropathogen,
mainly E. Coli, but several other bacterial pathogens and yeasts were detected: P. mirabilis, K. pneumoniae, E. faecalis, Citrobacter spp., P. stuartii, M. morganii, and Candida spp. Conclusions: Urinary catheters are used frequently in elderly populations. The infection rate is about 7-8% per day. Escherichia coli remains the most common infecting organism, but a wide variety of other organisms may be isolated, including yeast species. The duration of catheterism is a confirmed risk factor for developing CA-UTIs.

Source: EMBASE

Full Text: Available in fulltext at EBSCO Host

28. Retrospective observational study of the incidence of short-term indwelling urinary catheters in elderly patients with neck of femur fractures

Author(s): Kamdar A., Yahya A., Thangaraj L.
Citation: Geriatrics and Gerontology International, 2009, vol./is. 9/2(131-134), 1444-1586;1447-0594 (2009)
Publication Date: 2009

Abstract: Background: 15-25% of general hospital admissions tend to involve patients that have had a short-term indwelling urinary catheter (IDC) inserted some time during their stay. There is little data on the specific incidence and complications of short-term urinary catheterization in elderly patients with neck of femur fractures. Methods: Data was collected from the notes of 50 patients at Hemel Hempstead General Hospital with neck of femur fractures retrospectively from 31 August 2007. Specific information on patient demographics, premorbid status, record and reason for urethral catheterization, place of insertion, gentamicin cover pre- and post-removal of IDC, residual volumes, duration of catheter insertion, catheter clamping prior to removal of IDC, urinary tract infection with IDC, post-IDC removal newly incontinent/in retention were collated from patient notes. Patients with prior chronic catheterization were excluded from the study. Results: 78% of the patients had an IDC insertion (95% confidence interval, 64-88.4%). Most of the catheters were inserted on the ward (75%) with the rest being inserted mostly in theatre and recovery. Only approximately one-third of the sample that had IDC inserted had residual volume documented in the notes. Of these patients, the majority had residual volume above 300 mL. The main reasons for IDC insertion were urinary retention (50%), incontinence (30.8%) and fluid monitoring (11.5%). Of the patients, 31.4% had documented urinary tract infection as a result of IDC insertion. Conclusion: This study revealed a higher incidence of short-term IDC insertion (~75%) in elderly patients with neck of femur fractures in comparison to general hospital admissions of 15-25%. There is a role for more effective documentation in patient notes on the reasons behind urinary IDC insertion and increased clinical vigilance in preventing unnecessary catheterizations. 2009 Japan Geriatrics Society.

Source: EMBASE

30. Reduction of symptomatic catheter associated urinary tract infections in the critical care unit with implementation of a 5-element indwelling urinary catheter management bundle

Author(s): Fruci C., Callender C., Liske T., Darwin S.
Citation: Critical Care Medicine, December 2009, vol./is. 37/12 SUPPL.(A221), 0090-3493 (December 2009)
Publication Date: December 2009

Abstract: Introduction: Indwelling urinary catheters (IC) are a leading cause of nosocomial infection in acute care patients, with bacteriuria developing in 10-25%, and bacteremia in 1-3%, with associated prolonged hospital stays and increased costs. A large number of catheter associated urinary tract infections (UTI) could likely be prevented with proper management of indwelling catheters and decreasing device days per patient. Hypothesis: Institution of an indwelling urinary catheter management bundle (ICMB) in the critical care unit (CCU) that included standardized criteria for IC insertion/discontinuation would decrease the IC device utilization ratio (ICDUR = total CCU patient IC catheter days/total patient CCU days) and the rate of symptomatic catheter associated UTIs (SCA UTI rate = [number of SCA UTIs / number of IC days] x 1000) in the CCU setting. Methods: A quality improvement project was conducted in the seven CCU's consisting of 75 beds at Sentara Norfolk General Hospital, in Norfolk Virginia from January 2008 through July 2009. Over a 1.5 year period an initial 4 element ICMB was introduced followed by addition of a 5th element that included criteria for IC insertion/discontinuation. The four initial elements included: Silver impregnated catheter, proper perineum and catheter care, closed system
(red seal) remains intact and IC stabilization device properly applied. Both initiatives included nursing education, bundle compliance monitoring, data distribution, and incentives. Results: From the time of introduction of the initial (4 element) ICMB, until introduction of the 5th element, the CCU ICDUR decreased 1% and the SCA UTI rate in the CCU decreased from 2.26 to 1.44 (36%). Following introduction of the 5th element, the CCU ICDUR decreased an additional 6% to 0.76 YTD 2009 and the CCU SCA UTI rate decreased from 1.44 in 2008 to 0.86 in YTD 2009, an additional 40% decline. Conclusions: Implementation of a five element ICMB across 7 CCUs, with a total of 75 patient beds, in a tertiary care hospital was associated with a decrease in CCU ICDUR and SCA UTI rate. Source: EMBASE

41. Catheter-associated urinary tract infections: new aspects of novel urinary catheters
Author(s): Ha U.-S., Cho Y.-H.
Citation: International Journal of Antimicrobial Agents, December 2006, vol./is. 28/6(485-490), 0924-8579 (Dec 2006)
Publication Date: December 2006
Abstract: Nosocomial urinary tract infection is the most common infection acquired both in hospitals and nursing homes and is usually associated with catheterisation. These catheter-associated urinary tract infections (CAUTIs) have been reported to increase mortality and have a considerable economic impact. To date, the sole effective preventative strategy is the use of a closed drainage system and removal of the catheter as soon as possible. The underlying cause of CAUTI is the formation of a pathogenic biofilm on the surface of the indwelling urinary catheter. Currently, researchers seek to alter the catheter surface in order to inhibit biofilm formation. Many substances are being studied for their potential as biofilm-disrupting catheter coatings. Among these substances, recently developed antibiotic-coated catheters may provide promise for the control of CAUTI. More basic research at the level of pathogenesis and catheter substance is needed to design novel strategies. 2006 Elsevier B.V. and the International Society of Chemotherapy.
Source: EMBASE

46. Urinary-catheter-associated infections in the elderly
Author(s): Kunin C.M.
Citation: International Journal of Antimicrobial Agents, August 2006, vol./is. 28/SUPPL. 1/78-81), 0924-8579 (Aug 2006)
Publication Date: August 2006
Abstract: The indwelling urinary catheter is the leading cause of complicated urinary tract infections and Gram-negative bacteraemia in this age group. It accounts for about 40% of life-threatening septicemia. There is a progressive increase in mortality independently associated with the duration of catheterization. Polymicrobial bacteriuria is common. Urease-producing bacteria lead to encrusted and blocked catheters. The current challenges are to develop effective methods to sensitize healthcare workers to avoid the routine use of indwelling catheters, remove them when no longer needed, develop alternative methods for care of incontinence, employ non-invasive methods to measure urine output, and improve urine drainage systems. The research paradigm needs to focus on prevention of catheter-associated infections rather than on futile attempts to treat irreversible sepsis. 2006 Elsevier B.V. and the International Society of Chemotherapy.
Source: EMBASE

51. Catheter-associated urinary tract infection
Author(s): Danchaivijitr S., Dhiraputra C., Cherdrungsi R., Jintanothaitavorn D., Srihapol N.
Citation: Journal of the Medical Association of Thailand = Chotmaihet thangphaet, December 2005, vol./is. 88 Suppl 10/(S26-30), 0125-2208 (Dec 2005)
Publication Date: December 2005
Abstract: OBJECTIVES: To study the incidence, risk factors, clinical outcomes and antibiotic costs of catheter-associated urinary tract infections (CAUTI) in patients with indwelling urinary catheter for one week and longer MATERIAL AND METHOD: Patients in neurology and neurosurgery wards in a teaching hospital were studied. Patients with UTI before catheterization and in whom the catheter was removed before one week were excluded. Urine cultures were done immediately after catheterization and 3 times a week there after. Patients were followed for symptoms of UTI for 1 week after catheter removal,
for 4 weeks without evidence of UTI or until discharge. RESULTS: One hundred and one patients met the inclusion criteria. The incidence of CA UTI was 73.3%. High incidence of CAUTI was found in the first 2 weeks after catheterization. About one-half of the patients with CAUTI had a single episode and were symptomatic. None of the 132 episodes of CAUTI were associated with secondary bacteremia. Risk factors for CAUTI identified were prolonged catheterization and change of the catheter Nosocomial pathogens were found in urine and yeast was the commonest. Eleven patients (14.9%) with CAUTI died and only in 2, CAUTI was considered a contributory factor for mortality. The cost of antimicrobials for treating one episode of CAUTI was 8,180 baht and this rose to 49,983 baht for CAUTI associated with concurrent infections at other sites. CONCLUSION: Catheter-associated urinary tract infection was common. Uropathogens were nosocomial microorganisms with high incidence of resistance to antimicrobials. Impacts on morbidity, mortality and costs were substantial. Better management of urinary catheter is to be explored and implemented.

Source: EMBASE

54. Prevention of catheter-associated urinary tract infection
Author(s): Trautner B.W., Hull R.A., Darouiche R.O.
Citation: Current Opinion in Infectious Diseases, 2005, vol./is. 18/1(37-41), 0951-7375 (2005)
Publication Date: 2005
Abstract: Purpose of review: The underlying cause of catheter-associated urinary tract infection is biofilm formation by uropathogens on the urinary catheter. Biofilm is a relatively new concept in medicine, and current measures to prevent biofilm formation are inadequate. Considerable work is being done in this area, but little clinical progress has been made. The purpose of this review is to analyze recent publications concerning prevention of catheter-associated urinary tract infection. Recent findings: Several recent studies have elucidated aspects of biofilm formation in catheter-associated urinary tract infection. Other researchers are working on methods to disrupt biofilm formation on catheter surfaces. At the same time, the magnitude of the problem of catheter-associated urinary tract infection has increased awareness of the effectiveness of basic infection control measures. A modern approach to infection control may include computerized ordering systems that minimize unnecessary days of catheterization. Finally, consumption of cranberry juice products and bacterial interference are two novel approaches to urinary tract infection prevention. Summary: Biofilm-disrupting strategies offer promise for the future but have little immediate applicability. Implementation of infection control measures to improve catheter function and remove unnecessary catheters can be done at the present time. In general, prevention of catheter-associated urinary tract infection remains an elusive goal. More basic research at the level of pathogenesis is needed so that novel strategies can be designed. 2005 Lippincott Williams & Wilkins.
Source: EMBASE

58. Catheter-related urinary tract infection
Author(s): Nicolle L.E.
Citation: Drugs and Aging, 2005, vol./is. 22/8(627-639), 1170-229X;1170-229X (2005)
Publication Date: 2005
Abstract: Indwelling urinary catheters are used frequently in older populations. For either short- or long-term catheters, the infection rate is about 5% per day. Escherichia coli remains the most common infecting organism, but a wide variety of other organisms may be isolated, including yeast species. Bacteria tend to show increased resistance because of the repeated antimicrobial courses. Urinary tract infection (UTI) usually follows formation of biofilm on both the internal and external catheter surface. The biofilm protects organisms from both antimicrobials and the host immune response. Morbidity from UTI with short-term catheter use is limited if appropriate catheter care is practised. In patients with long-term catheters, fever from a urinary source is common with a frequency varying from 1 per 100 to 1 per 1000 catheter days. Long-term care facility residents with chronic indwelling catheters have a much greater risk for bacteraemia and other urinary complications than residents without catheters. Asymptomatic catheter-acquired UTI should not be treated with antimicrobials. Antimicrobial treatment does not decrease symptomatic episodes but will lead to emergence of more resistant organisms. For treatment of symptomatic infection, many antimicrobials are effective. Wherever possible, antimicrobial selection should be delayed until culture results are available. Whether to administer initial treatment by an oral or parenteral route is determined by clinical presentation. If empirical therapy is required,
antimicrobial selection is based on variables such as route of administration, anticipated infecting organism and susceptibility, and patient tolerance. Renal function, concomitant medications, local formulary and cost may also be considered in selection of the antimicrobial agent. The duration of therapy is usually 10-14 days, but patients who respond promptly and in whom the catheter must remain in situ may be treated with a shorter 7-day course to reduce antimicrobial pressure. Relevant clinical trials are necessary to define optimal antimicrobial regimens for the management of catheter-acquired UTI. Prevention of catheter-acquired UTI and its complications is a major goal. With short-term catheters, avoiding their use or limiting the duration of use to as short a time as possible are the most effective prevention strategies. Maintaining a closed drainage system and adhering to appropriate catheter care techniques will also limit infection and complications. As the duration of catheterisation is the principal determinant of infection with long-term indwelling catheters, it is not clear that any interventions can decrease the prevalence of bacteriuria in this setting. Catheter flushing or daily perineal care do not prevent infection and may, in fact, increase the risk of infection. Complications of infection may be prevented by giving antibacterials for bacteriuria immediately prior to any invasive urological procedure, and by avoiding catheter blockage, twisting or trauma. The major focus of future advances in prevention of catheter-acquired UTI is the development of biomaterials resistant to biofilm formation. There is substantial current research addressing this issue, but current catheter materials all remain susceptible to biofilm formation. 2005 Adis Data Information BV. All rights reserved.  

Source: EMBASE  
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Available in fulltext at EBSCO Host  

67. Biofilms and catheter-associated urinary tract infections  
Author(s): Saint S., Chenoweth C.E.  
Citation: Infectious Disease Clinics of North America, June 2003, vol./is. 17/2(411-432), 0891-5520 (Jun 2003)  
Publication Date: June 2003  
Abstract: Urinary catheter-related infections are commonly seen in several different patient populations and lead to substantial morbidity. The overall health care costs caused by these infections are sizable given how often urinary catheters are used in acute care settings, extended care facilities, and in persons with injured spinal cords. Recent attention has appropriately focused on biofilm development on the catheter surface because biofilm has important implications for the pathogenesis, treatment, and prevention of catheter-related infection. Because the most important risk factor for infection is duration of catheterization, indwelling urethral catheterization should be avoided or at least limited whenever possible. Additional methods to prevent this infection include aseptic insertion and maintenance, use of a closed drainage system, anti-infective catheters in patients at high-risk for infection, and systemic antibiotics in select patients. Alternative urinary collection strategies may be appropriate in certain patient groups. Specifically, condom catheters should be considered in men likely to be adherent with this urinary collection method, suprapubic catheters should be considered in patients requiring long-term indwelling drainage, and intermittent catheterization seems appropriate in patients with injured spinal cords. Future research should focus on additional methods for preventing this common infection.  
Source: EMBASE  

1. Good practice in management of patients with urethral catheters.  
Author(s): Pratt R, Pellowe C  
Citation: Nursing Older People, 01 October 2010, vol./is. 22/8(25-29), 14720795  
Publication Date: 01 October 2010  
Abstract: Urinary tract infections are a well-known hazard associated with the use of indwelling urethral catheters in older people in hospital. These infections can have serious consequences for older people, including an increased risk of death in hospital. This consequence can be minimised by ensuring that all nurses and other healthcare workers consistently incorporate evidence-based guideline recommendations into their routine practice. The background to these infections is explained and the recommendations for minimising risk and enhancing patient safety are described.  
Source: CINAHL  
Full Text:
6. **Reminder systems to reduce the duration of indwelling urinary catheters: a narrative review.**

Author(s): Blodgett TJ
Citation: Urologic Nursing, 01 September 2009, vol./is. 29/5(369-379), 1053816X
Publication Date: 01 September 2009
Abstract: Catheter-associated urinary tract infection (CAUTI) is a common and costly problem for hospitalized patients. Policymakers have taken notice of the importance of these infections, and changes to the prospective payment rules of Medicare, Medicaid, and many additional third-party payers have been implemented to hold hospitals accountable for the delivery of poor quality health care services. As key members of the health care team, nurses must be prepared to utilize evidence-based practices to prevent CAUTI in hospitalized patients. This article describes several variable-technology interventions to remind clinicians to remove unnecessary urinary catheters and proposes potential roles for nursing informatics in the prevention of CAUTI in hospitalized adults.

Source: CINAHL
Full Text: Available in fulltext at EBSCO Host

9. **Internal and external urinary catheters: a primer for clinical practice.**

Author(s): Newman DK
Citation: Ostomy Wound Management, 01 December 2008, vol./is. 54/12(18-33), 08895899
Publication Date: 01 December 2008
Abstract: Internal and external urinary catheters are used to manage urinary incontinence and incomplete bladder emptying. Bladder dysfunction cause determines whether short- or long-term catheter use is required which, in turn, determines whether an indwelling, intermittent, or external catheter should be used. The method of catheterization is based on the underlying bladder condition, the goals of treatment, and gender appropriateness. Complications such as infection (eg, catheter-associated urinary tract infection, sepsis) and its related sequelae have been found to be directly related to length of time of catheter use (eg, women are at greater risk for catheter-associated urinary tract infection when an indwelling catheter is in place >2 weeks); thus, catheter use must be medically justified and in the case of an indwelling catheter, involve the shortest period possible to ensure patient safety and regulatory compliance. Some newer catheter systems include coatings to prevent complications; complications specific to indwelling catheter use include obstruction from encrustations, urethral trauma and erosion, bladder stones and bladder cancer, and, in men, epididymitis. Complications from external catheters may occur when skin condition is compromised. Overuse of catheters has reimbursement ramifications. Numerous guidelines reflect the need for the judicious use of urinary catheters, particularly in long-term care patients. Because evidence-based research on long-term use of these devices is lacking, clinicians should use clinical experience when caring for patients with catheters.

Source: CINAHL

21. **Long-term urinary catheter-associated urinary tract infection (UTI).**

Author(s): Paul M
Citation: Australian & New Zealand Continence Journal, 01 March 2005, vol./is. 11/1(4-8), 14480131
Publication Date: 01 March 2005
Abstract: This paper reviews the literature on the current management of symptomatic urinary tract infections (UTIs) in those with long-term urinary catheters. Long-term is defined as being in situ for more than 1 month. The discussion refers to published guidelines and relevant clinical trials.

Source: CINAHL
Full Text: Available in fulltext at EBSCO Host

23. **Catheter-associated urinary tract infections in intensive care units can be reduced by prompting physicians to remove unnecessary catheters.**

Citation: Infection Control & Hospital Epidemiology, 01 November 2004, vol./is. 25/11(974-978), 0899823X
OBJECTIVE: Indwelling urinary catheters are the most common source of infections in intensive care units (ICUs). The aim of this study was to evaluate the efficacy of nurse-generated daily reminders to physicians to remove unnecessary urinary catheters 5 days after insertion.

Source: CINAHL
Full Text: Available in print at Grantham Hospital Staff Library

28. Care of patients with long-term indwelling urinary catheters.
Author(s): Madigan E, Neff DF
Citation: Online Journal of Issues in Nursing, 01 September 2003, vol./is. 8/3(0-9), 10913734
Publication Date: 01 September 2003
Abstract: The complications and management of long-term indwelling catheters used for urinary retention and incontinence were reviewed. Research evidence from 1992 - 2002 was located through searches of CINAHL (38 articles), and Medline (89 articles). Fifty studies were critiqued for this review. The most common complications of long-term indwelling catheters are bacteriuria, encrustation, and blockage. Less common is the prevalence of bacteremia and renal disease. Risk factors for bacteriuria include female gender, older age, and long-term indwelling catheter use. Urinary white blood cells are the best indicator of urinary tract infection. For drainable catheter systems used by community dwelling adults, daily bag cleaning with a diluted bleach solution (1:10) is effective in reducing bacterial counts to negligible numbers. Application of topical antibiotic cream to the meatus around the catheter does not reduce bacteriuria. Silicone catheters and larger lumen size catheters are more resistant to encrustation than other catheter types and smaller lumen size catheters. Acidifying the urine without removing the urease-producing bacteria does not reduce encrustation. Removal of catheter blockage is preventive for renal disease. Because of the complications of long-term indwelling catheter usage, periodic assessment and voiding trials should be used to determine the continued need for a catheter. Evidence-based recommendations for managing indwelling urinary catheters include screening for risk factors and evaluating urinary white blood cell count for infection, and assessment of the continued need for a catheter. Interventions include consideration of closed versus open drainage systems, type of catheter, and size of catheter lumen. CO 2003 Online Journal of Issues in Nursing June 30, 2003
Source: CINAHL
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