Urinary catheter associated infections - controversies and opportunities for action

Professor Jacqui Reilly
Health Protection Scotland and Glasgow Caledonian University
Controversy

‘When a thing ceases to be a subject of controversy, it ceases to be a subject of interest.’

William Hazlitt, 1830
Overview

Controversy and opportunity for action with:

• The epidemiology of CAUTI
  – What is the size of the problem?

• IPC measures to prevent CAUTI
  – What is the evidence base and where are the gaps?

• Applying guidance in practice
  – What is stopping it happening?
The epidemiology of CAUTI: What is the size of the problem?
The problem with CAUTI....

- Urinary tract infection (UTI) is the single most common hospital-acquired infection
- The majority of cases of nosocomial UTI are associated with an indwelling urinary catheter.
- ↑ Length of stay and cost
- Cost to the patient
  - Pain and discomfort
  - Complicated upper urinary tract infection
  - Bacteraemia and possible death
- The longer the catheter is in place the greater the risk of CAUTI
  - Leads to unnecessary antimicrobial use
  - Leads to multi-drug resistant (MDR) bacteria
  - Leads to untreatable infection longer term

Ref:
Prevalence of HAI/UTI/CAUTI

- UTI identified as the most prevalent HAI
  - 22.6% of all HAI in Scottish acute hospitals
  - 39.0% of all HAI in non-acute hospitals

- Urinary catheter use and CAUTI
  - 1 in 5 patients in acute care had a urinary catheter at any one time
  - Half of UTI occurred in patients with urinary catheter
  - In acute settings significantly higher urinary catheter prevalence in surgical and care of elderly compared to medical specialties
  - In non-acute the highest prevalence found in medical and geriatric medicine specialties

UTI AM issues arising from PPS

Acute
• Four of the most common diagnoses (respiratory, S&ST, GI and UTI) account for 80% of prescribing
• Almost half parenterally
• Burden of medical prophylaxis: A fifth of medical prophylaxis for UTI

Non acute
• Four of the most common diagnoses (respiratory, S&ST, ENT and UTI) account for 80% of prescribing
• 1 in 10 AMs for medical prophylaxis- …UTI

Paediatrics
• A quarter of all AMs for medical prophylaxis (1 in 5 for UTI, 1 in 3 for respiratory)

Results of the Pilot Study in Long Term Care Settings

- A total of 5 Boards, 6 Hospitals participated

- Data
  - 659 patients admitted
  - 122 catheters inserted
  - 19 infections of which 15 CAUTI

- The main indications for urinary catheterisation were identified as
  - Urinary retention (38.5%)
  - Measurement of urine output (19.7%)
  - Urinary incontinence (15.6%)
  - Other recorded reasons for catheterisation included (15%):
    » deterioration in medical condition
    » renal dysfunction,
    » maintenance of skin integrity and immobility
  - Indications not recorded (11%)

- The overall incidence of CAUTI was of 10.1 per 1000 catheter-days

http://www.hps.scot.nhs.uk/
UTI and urinary catheters within Care homes

- During July 2010 a European HAI prevalence study was carried out across 28 countries in volunteer care homes

- A total of 4870 residents from 83 care homes were surveyed in Scotland.
  - Of the residents surveyed where data were supplied, 66.6% were incontinent.

- A total of 358 residents had a urinary catheter in situ.

- The prevalence of CAUTI was 6.4%.

- UTI accounted for 52.7% of all of the HAIs identified.

http://www.hps.scot.nhs.uk/
Controversies with the size of the problem

“Not everything that counts can be counted, and not everything that can be counted counts”

Albert Einstein (1879-1955)
ECDC definitions for UTI and CAUTI

- **UTI-A: microbiologically confirmed symptomatic UTI**
  - Patient has at least one of the following signs of symptoms with no other recognized cause: fever (>38°C), urgency, frequency, dysuria, or suprapubic tenderness **and**
  - Patient has a positive urine culture, that is, ≥ 105 microorganisms per ml of urine with no more than two species of microorganisms.

- **UTI-B: not microbiologically confirmed symptomatic UTI**
  - Patient has at least two of the following with no other recognized cause: fever (>38°C), urgency, frequency, dysuria, or suprapubic tenderness **and** at least one of the following:
    - Positive dipstick for leukocyte esterase and/or nitrate
    - Pyuria urine specimen with ≥10 WBC/ml or ≥ 3 WBC/high-power field of unspun urine
    - Organisms seen on Gram stain of unspun urine
    - At least two urine cultures with repeated isolation of the same uropathogen (gram-negative bacteria or *S. saprophyticus*) with ≥ 102 colonies/ml urine in nonvoided specimens ≤105 colonies/ml of a single uropathogen (gram-negative bacteria or *S. saprophyticus*) in a patient being treated with effective antimicrobial agent for a urinary infection
    - Physician diagnosis of a urinary tract infection
    - Physician institutes appropriate therapy for a urinary infection

- **Asymptomatic bacteriuria are excluded.**
- **A UTI is defined as catheter-associated if a urinary catheter was present (even intermittently) in the 7 days preceding the onset of infection.**
Definitions for CAUTI

- **CDC/ NHSN**
  - changed in 2009 to remove:
    - asymptomatic bacteriuria criteria
    - refined criteria for symptomatic UTI,
    - aligned to 48 hour rule for devices (previously 7 days after removal)
- **ECDC**
  - CDC definition used for EU PPS-with 7 day rule
  - Validation study points to variation in sens/ spec of HAI
- **McGeer**
  - Used in long term care- based on clinical signs and symptoms
- **Harm free care**
  - Count catheters and antimicrobials as a proxy
The problem with definitions

• Studies have used different definitions to date
  • heterogeneity of these makes comparisons difficult
• Interpretation is impeded by the failure to distinguish between symptomatic CAUTI and ASB in the study outcomes.
  • This distinction currently relies on clinical symptoms and is not easily made, even with the help of various guidelines.
• Outside acute care the microbiology requirements of criteria make it difficult to use definitions
• Substantial variations in hospital reporting even when same definitions are used indicates issues of sensitivity and specificity
  • Pooled mean CAUTI rates of 3.1-7.5 infections per 1000 catheter days
  • Training in the definitions is required to maximise IRR and validity

Reference:
Gould CV et al (2009) HICPAC Guideline for the prevention of catheter associated UTI USA
Methods for surveillance

- Intensity of surveillance for nosocomial infections was the single most important predictor of prevention in the Study of the Efficacy of Nosocomial Infection Control (SENIC).
  - Used suboptimally by most hospitals in the SENIC study.
- Surveillance is probably conducted even less today.
- There is no national or mandatory surveillance of CAUTI in UK—although reporting in the USA is now in place.
  - Surveillance for HAI CAUTI is performed in at least one inpatient location in the healthcare institution for at least one calendar month as indicated in the Patient Safety Monthly Reporting Plan (CDC 57.106).
- Health and social care integration means that surveillance can no longer be hospital based and needs to happen in a joined up way
  - Very little on post discharge surveillance to date
Recommendations for surveillance-opportunity for action

• Consider based on risk assessment at specialty/ facility based level
• Used a standardised method (national protocols are available)
  – Train the data collectors
• Use standardised metrics
  – No. of CAUTI per 1000 catheter days
  – Number of BSI secondary to CAUTI per 1000 catheter days
  – Catheter utilisation ratio (urinary catheter days/ patient days) x100
• Use active feedback of data to maximise impact of surveillance
• Do not routinely screen for asymptomatic bacteriuria
• *We should also consider PDS*

IPC measures to prevent CAUTI: What is the evidence base and where are the gaps?
Preventability

• An estimated 17% to 69% of CAUTI may be preventable with recommended infection prevention and control measures
• Which means that up to 380,000 infections and 9000 deaths related to CAUTI per year could be prevented in the USA

http://www.cdc.gov/hicpac/cauti/005_background.html
Risk Factors

• Major risk factor is the presence of an indwelling catheter
  • Insertion technique risk
• Each day increases the risk of infection
  • There is 3-10% risk of bacteriuria per day approaching 100% after 30 days
  • Maintenance technique risk
• Other factors include:
  • A history of previous catheter use
  • Length of stay in hospital prior to catheter insertion
  • Location of catheter insertion e.g. on ward, A&E, theatre
  • Female gender
  • Increasing age
  • General debilitation / impaired immunity

Ref:
GUIDELINE FOR PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS 2009

IDSAGUIDELINES

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

• A wealth of guidelines but a relative paucity of evidence, particularly when trying to determine the best practices for management of CAUTI.

• HICPAC >80 recommendations- little based on high quality evidence and
  – 80 things to do for just one aspect of care in 1 in 5 patients?
Nurse, get on the internet, go to Surgery.com and click on 'just about to insert a catheter and totally lost?'
How UCs cause infection

Urinary catheters (UCs) increase the risk of UTI by:
- Enabling organisms to gain entry to the bladder - via external surface or opened connection.
- Reducing the body's defence of flushing out organisms during micturition.
- Facilitating biofilm formation. The organisms causing UTI, can be endogenous - from the patient's own gut flora, or cross-transmitted through poor infection control practices.

Environment

Create a culture where HCWs strive for excellence in performance and patient safety.
Maintain a clean ward, free from clutter. Do not undertake clinical procedures during ward cleaning procedures.
Avoid, as far as possible, caring for a patient with a catheter close to (in the same bay as) other patients with catheters.

Equipment

Store catheters and other sterile single-use items in clean dry areas, away from any splash contamination and following any manufacturer's instruction. Pre-use check the packaging is intact, correctly marked, undamaged and is within expiry date.

Ensure there is a selection of the most appropriate catheters (size and material) on the ward. Consider expert help in assessing ward catheter stocks.

Health Care Workers (HCWs)

There must be sufficient HCWs on the ward to enable clinical procedures to be performed as per the procedure.
HCWs caring for patients with UCs do not wear jewellery. HCWs don PPE, i.e. sterile gloves for insertion; clean gloves for maintenance, apron for all procedures and perform hand hygiene effectively.

Minimising catheter associated urinary tract infections

Only competent HCWs, or those working under close supervision who are committed to infection control and patient safety, may catheterise patients and undertake catheter care procedures.

Methods Pre Insertion

- Alternatives to indwelling catheterisation have been considered and the need for catheterisation in this patient outweighs possible catheter related complications.
- Explain the reason for a UC to the patient and gain consent.
- Use an insertion checklist to document care/reason for catheterisation.
- The UC material will depend on usage.
- Choose the smallest gauge catheter for effective drainage.
- Use a small sized balloon - 10ml (adult).
- Prior to commencement, reassure the patient and explain the procedure.

Methods - Catheterisation

- The procedure is performed aseptically using: sterile gloves, apron and creating a sterile field.
- The catheter is lubricated with a sterile gel.
- The urethral meatus is cleaned with sterile saline.
- To ensure the balloon is inflated in the bladder and not urethra, insert the catheter a little further once urine starts to drain before inflating the balloon.
- The catheter is connected to a closed sterile approved drainage bag.
- If a pre-existing UTI is thought possible, a specimen of urine is sent for culture.
- The UC drainage bag is positioned below the level of the bladder to facilitate drainage.
- Perform a daily review of the need for the UC.

Methods - Maintenance

- Hand hygiene is performed, and gloves & apron worn before catheter maintenance procedures; when finished, hand hygiene is repeated after PPE removed.
- Urinary drainage bags are not routinely changed, but are emptied regularly, as separate procedures, each into a clean container (avoiding contact between the container and the top).
- UCs are continuously connected to the drainage bag.
- Patients are involved in their UC care and educated as to how they can minimise complications.
- Routine daily mealal hygiene is performed.
- HCWs monitor for signs of infection, e.g. fever, pain, cloudy urine. Abnormal findings are reported.
- Samples are taken aseptically from the sample port if infection is suspected.
Prevention-Opportunities for action

- The greatest common strength of all guidelines relates to strategies to avoid unnecessary catheterization and to remove urinary catheters that are no longer necessary.
  - *Surveillance in action needed here*

- Gaps in evidence
  - Clinical trials concerning use of antimicrobial catheters for prevention of CAUTI are limited by poor study design or by a failure to understand the difference between CAUTI and ASB.
  - Few studies have addressed the symptoms and signs that distinguish CAUTI from ASB.
  - Very little new evidence is available to guide diagnosis and treatment strategies.
    - *Research needed here*

Prevention controversies

• Various other prevention strategies generally fall under the headings of:
  – different types of catheters,
  – different catheter materials,
  – alternatives to indwelling urinary catheters.

• The evidence is insufficient to recommend the following potential alternatives to indwelling urinary catheters as a means to prevent CAUTI: antimicrobial catheters, intermittent catheterization, suprapubic catheters, and condom catheters (Cochrane reviews)

• ‘The concept of antimicrobial urinary catheters continues to receive considerable press, somewhat out of proportion to the information available. ‘ (Truatner 2010)

Applying guidance in practice:
What is stopping it happening?
"Thank God!! A panel of experts"
Tools available

The Bundle
1. Perform a **daily review** of the need for the urinary catheter.
2. Check the catheter has been **continuously connected** to the drainage system.
3. **Ensure patients are aware** of their role in preventing urinary tract infection. (Alternative bundle criterion if the patient is unable to be made aware: Perform routine daily **meatal hygiene**).
4. Regularly empty urinary drainage bags as separate procedures, each into a clean container.
5. **Perform hand hygiene** and don gloves and apron prior to each catheter care procedure; **on procedure completion**, remove gloves and apron and perform hand hygiene again.

![CAUTI Insertion Checklist](http://www.documents.hps.scot.nhs.uk/hai/infection-control/evidence-for-care-bundles)

Visit [here](http://www.documents.hps.scot.nhs.uk/hai/infection-control/evidence-for-care-bundles) for more information.
Applying guidance in practice in reducing CAUTI

• Little UK data available beyond single hospital studies
• Patient safety initiatives in England (high impact intervention) and Wales (STOP) have no data on uptake or outcome available.
• A survey in 719 US hospitals of their UTI prevention practices found that:
  – Fewer than 25% of hospitals had a system for monitoring which patients had urinary catheters, and
  – fewer than 20% monitored the duration and/or discontinuation of urinary catheters.

Ref:
Surveillance in action?

Surveillance using NHSN definitions
Bundle of four evidence-based interventions
- silver alloy catheters
- securing device to limit the movement of the catheter after insertion.
- repositioning of the catheter tubing if it was found to be touching the floor.
- removal of the indwelling urinary catheter on postoperative Day 1 or 2, for most surgical patients.

Issues of bias
Confounders

Strategies for applying guidance in practice to reduce CAUTI: opportunity for action

• Several strategies show promise for decreasing inappropriate insertion of urinary catheters and duration of catheterization, including:
  – A combined educational intervention and an indication checklist for use
  – Nurse-led multidisciplinary rounds in the hospital.
  – Catheter passport schemes

• These studies confirm earlier work on computerized stop orders for urinary catheters, computer-based order entry for urinary catheters, nurse-generated reminders, and nurse empowerment to remove catheters.

• All of these strategies require surveillance at the heart of the quality improvement

Ref:
Summary

• Catheter associated urinary tract infection (CAUTI) continue to be a public health threat and a patient safety concern in the UK
• The burden is described in an inconsistent way due to variation in definitions and methods used for surveillance
• Despite prevalence surveys indicating this is the most frequently occurring HAI few national surveillance protocols available, little local surveillance published in the literature, and fewer national programmes of surveillance in place
• Risk factors described however limited by the lack of good epidemiology
• Evidence base for many areas of practice lacking
• Several strategies show promise for decreasing inappropriate insertion of urinary catheters and duration of catheterisation
• How much of the evidence which is available is implemented in practice?
• There is a need for more (and better) measurement to enable further prevention of CAUTI
CAUTI needs to be a subject of continued controversy

‘When a thing ceases to be a subject of controversy, it ceases to be a subject of interest.’

William Hazlitt, 1830