Urinary Catheters in Acute Care: State of the Evidence in the New Frontier

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Outline

- What do we know about catheters in 2014?
- What’s new in research?
  - Silver alloy, nitrofurantoin
  - Attitudes to catheter insertion
  - Support
  - Meatal cleansing
  - Role of acute care RN
State of Science in 2014

- We know:
  - CAUTI is a major healthcare & personal cost
  - Duration of catheterisation affects onset of CAUTI
  - Prophylactic ABX/routine cultures are not recommended
  - Most effective prevention is early removal (or alternative bladder emptying)
  - Aseptic insertion/closed system are mandatory
  - Evidence-based guidelines are readily available:


So .. If we know all that where are the gaps?

Site of insertion: OR, in-patient or Emergency

- OR, catheter size documented; securement varied, no other orders (Appah et al, 2013)
- In-patient, reasons for insertion usually failure to void but documentation often missing
- Emergency, no documenting or rationale in most cases (May et al, 2014).
Why does this matter?

- With short stays and staff inconsistencies, follow up of catheter care is ‘sketchy’
- Places patient at risk for having a catheter in situ unnecessarily or being discharged with no stop orders – especially true on medical units and leading to all the problems of prolonged catheterisation.
Attitudes & Beliefs about catheter insertion
(Murphy, Prieto, Fader, 2014 ICS Abstract 317).

Qualitative study (n=22 physicians; 8 nurses) re: the decision making to place an IUC.

Results:

- AUR: uncertainty about defn of AUR – volume, fear of being negligent
- Monitoring output: ‘don’t want to miss a single precious drop’
- Skin protection: even with intact skin
- Managing UI: ‘comfort and dignity’ but overall indicated not appropriate use.
Attitudes & Beliefs about catheter insertion (Murphy, Prieto, Fader, 2014 ICS Abstract 317).

- Older people more likely to have a catheter inserted for any reason
- Long term risk of catheters not part of decision-making for some
- Not inserting a catheter increased workload

Conclusion: *Clinical reasoning inconsistent. Understanding of attitudes to IUC is required if practice is to change.*
Guidelines for appropriate insertion of catheter in acute care

(Gould et al. Guideline for prevention of CAUTI. CDC.gov/hicpac/cauti2009-abbrev.html)

- Close monitoring of output in critically ill patients
- Selected perioperative use
- Prolonged immobilization – eg; unstable SCI, multiple trauma
- Comfort in palliative care
- UI in presence of sacral/perineal PU
- AUR or obstruction
Inappropriate Catheterizations
(according to CDC 2009)

In Non-critically ill patients

- manage urinary incontinence
- patient not mobile
- manage confusion or dementia
- obtain a urine sample
- Stroke
- Manage obesity
- Others
Indwelling catheters and Emergency care
(Ma et al 2014; Abstract 318 ICS 2014)

- N=150 Emerg patients; 63% > 65 yrs
- Data from interviews and chart review

Results:
- 43% had a written order for catheterisation
- 5.3% had a documented reason for insertion
- Only 41% were deemed appropriate as per guidelines

Authors Recommend:
Updating guidelines to be more specific on terms such as ‘critically ill’, haematuria, stroke; knowledge translation that fits the context of ED.
Results of 1 day prevalence study:
14 units
Documentation: 65%
Catheter management plan: 43%
Securement: 36%

So et al (2014) IUC: pattern of use...Urol Nrsg 34(2): 69
Etiology of AUR

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obstructive</strong></td>
<td>BPH, PCa, stricture, BT, ? constipation</td>
<td>POP, fibroid, pelvic Ca</td>
</tr>
<tr>
<td><strong>Neurogenic</strong></td>
<td>MS, PD, Stroke, DM, SCI, head injury</td>
<td></td>
</tr>
<tr>
<td><strong>Infectious</strong></td>
<td>Prostatitis; Urethral herpes, Periurethral abscess</td>
<td></td>
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<tr>
<td><strong>Anaesthesia</strong></td>
<td>Excessive fluid overload; post op pain; back, hernia, hip surgery</td>
<td></td>
</tr>
<tr>
<td><strong>Medications</strong></td>
<td>regional anaes; ETOH, opiates.</td>
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</table>

AUR: Catheterizing an obstructed patient

- **Rules:** NEVER force the catheter
- **Risk of false passage, permanent urethral damage, fistula**
- **Use anaesthetic gel**
- **Give pain control if necessary**
- **Use stiff, large catheter**
- **If not successful on first try get expert assistance (urology service)**
Case Study AUR: Catheterization

- Mr. Blockage admitted to ER; PHx of urethral stricture with previous dilatations; Sx of ↓ stream, straining
- Jr. medical staff (not urology) tried catheterising with #14 Fr then #12 Fr -- not successful & frank bleeding; called urology
- Cysto by urology- edema, haematuria, false passage – catheter inserted with guide wire

Treatment Injury claim lodged as a result of the catheterisation -- Successful
Predictors of success in Trial without Catheter (TWC) for AUR

(Fischer et al, Cochrane Review 2014)

- Addition of alpha blocker
- Low IPSS symptom score
- Duration of symptoms prior to AUR
- Prostate volume on US
- Age of patient
- Volume of urine drained < 900 ml
Volume of urine to drain in AUR/CUR

- How much to drain?
- Clamping myth or reality?
- Risks?
Volume of urine to drain

No evidence to support incremental bladder drainage

Hypotension?
Haematuria?
Patient comfort?

Post Obstructive Diuresis

Physiologic factors: Excess sodium and water retention
- Accumulation of urea and other non-reabsorbable solutes resulting in an osmotic diuresis.

Pathologic factors:
- Decreased tubular reabsorption of sodium secondary to altered expression of proximal and distal sodium transporters.
- Inability to maximally concentrate urine, secondary to a decreased medullary concentrating gradient, leading to decreased response to ADH
- Increased tubular transit flow time reducing equilibration time for absorption of sodium and water.
- Increased production of prostaglandins immediately following relief of obstruction.
AUR: post obstructive diuresis

- Monitor intake and out closely, esp if unable to eat and drink on their own.
- Once the accumulated excess of sodium and water has been excreted, severe volume contraction and hypokalemia can occur.
- Once the patient has diuresed to the point of euvolemia, fluid replacement should be administered as needed to prevent volume contraction. This is done by replacing 75% of the urine losses with 0.45% NS.
- This condition is usually self-limiting and resolves over several days to a week.
- Persistent polyuria beyond a week is often due to overzealous volume repletion.
Silver alloy or antibiotic coated vs. uncoated urinary catheters in prevention of UTI

- Evidence suggests that in short term use (approx. 1 wk), there is a reduction in onset of positive urine culture.
- Significance: in vulnerable, at risk patients (ICU, immunocompromised) may improve outcomes.
- For every patient? Need to balance cost benefit.

(Beattie & Taylor 2011 J Clin Nrsg; Schumm & Lam 2008 Cochrane Review)
Clamp and release? Or remove?

- N=50 women SUI surgery
- clamp and release before catheter removal with free drainage.
- UTI was higher in the clamp and release group (RR 4.00, 95% CI 1.55 to 10.29)
- More participants experienced delay in return to normal bladder function (RR 2.50, 95% CI 1.16 to 5.39, compared to the free drainage group.
- Conclusion: remove

Pre-filling of the bladder with fluid prior to catheter removal?

- Prefilling of the bladder with saline before catheter removal to removal without prefilling in post TURP.

- Results: no statistically significant differences in
  - need to recatheterise,
  - number of people ready for discharge or
  - actually discharged on the day of catheter removal

(Lyth 1997; Wilson 2000)
Should all units shift to silver alloy "infection control" catheters or antibiotic coated?

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Antiseptic n/N</th>
<th>Standard n/N</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
<th>Weight</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Silver oxide versus standard</strong></td>
<td></td>
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</tr>
<tr>
<td>Johnson 1990</td>
<td>19/207</td>
<td>28/275</td>
<td></td>
<td>7.4 %</td>
<td>0.90 [0.52, 1.57]</td>
</tr>
<tr>
<td>Riley 1995</td>
<td>85/745</td>
<td>73/564</td>
<td></td>
<td>25.6 %</td>
<td>0.88 [0.66, 1.18]</td>
</tr>
<tr>
<td>Takeuchi 1993</td>
<td>26/26</td>
<td>11/11</td>
<td></td>
<td>4.9 %</td>
<td>1.00 [0.88, 1.14]</td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td>978</td>
<td>850</td>
<td></td>
<td>37.8 %</td>
<td>0.90 [0.72, 1.13]</td>
</tr>
<tr>
<td><strong>Total events</strong>: 130 (Antiseptic), 112 (Standard)</td>
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<tr>
<td><strong>Heterogeneity</strong>: Chi² = 2.55, df = 2 (P = 0.28); I² = 22%</td>
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<tr>
<td><strong>2 Silver alloy versus standard</strong></td>
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</tr>
<tr>
<td>Liedberg 1990a</td>
<td>3/30</td>
<td>25/60</td>
<td></td>
<td>5.1 %</td>
<td>0.24 [0.08, 0.73]</td>
</tr>
<tr>
<td>Liedberg 1990b</td>
<td>6/60</td>
<td>22/60</td>
<td></td>
<td>6.8 %</td>
<td>0.27 [0.12, 0.62]</td>
</tr>
<tr>
<td>Liedberg 1993</td>
<td>8/75</td>
<td>23/96</td>
<td></td>
<td>6.2 %</td>
<td>0.45 [0.21, 0.94]</td>
</tr>
<tr>
<td>Lundeberg 1986</td>
<td>6/51</td>
<td>17/51</td>
<td></td>
<td>5.2 %</td>
<td>0.35 [0.15, 0.82]</td>
</tr>
<tr>
<td>Maki 1998a</td>
<td>64/407</td>
<td>94/443</td>
<td></td>
<td>27.7 %</td>
<td>0.74 [0.56, 0.99]</td>
</tr>
<tr>
<td>Thibon 2000</td>
<td>7/90</td>
<td>10/109</td>
<td></td>
<td>2.8 %</td>
<td>0.85 [0.34, 2.14]</td>
</tr>
<tr>
<td>Verleyen 1999b</td>
<td>8/79</td>
<td>31/101</td>
<td></td>
<td>8.4 %</td>
<td>0.33 [0.16, 0.68]</td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td>792</td>
<td>920</td>
<td></td>
<td>62.2 %</td>
<td>0.54 [0.43, 0.67]</td>
</tr>
<tr>
<td><strong>Total events</strong>: 102 (Antiseptic), 222 (Standard)</td>
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<tr>
<td><strong>Heterogeneity</strong>: Chi² = 13.29, df = 6 (P = 0.04); I² = 55%</td>
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<tr>
<td><strong>Test for overall effect</strong>: Z = 5.64 (P &lt; 0.000001)</td>
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</tbody>
</table>

**Total (95% CI)**

**Total events**: 232 (Antiseptic), 334 (Standard)

**Heterogeneity**: Chi² = 56.04, df = 9 (P<0.000001); I² = 84%

**Test for overall effect**: Z = 4.99 (P < 0.000001)
Antibiotic impregnated catheters
(nitrofurantoin, minocycline and rifampicin)

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Antibiotic n/N</th>
<th>Standard n/N</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
<th>Weight</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Antibiotic-impregnated (minocycline and rifampicin) versus standard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darouiche 1999</td>
<td>8/56</td>
<td>27/68</td>
<td>29.3 %</td>
<td>0.36   [0.18, 0.73]</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>56</strong></td>
<td><strong>68</strong></td>
<td>29.3 %</td>
<td><strong>0.36</strong></td>
<td><strong>[0.18, 0.73]</strong></td>
</tr>
<tr>
<td>Total events: 8 (Antibiotic), 27 (Standard)</td>
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<tr>
<td>Heterogeneity: not applicable</td>
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<tr>
<td>Test for overall effect: Z = 2.84 (P = 0.0045)</td>
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<tr>
<td>2 Antibiotic-impregnated (nitrofurazone) versus standard</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee 2004</td>
<td>14/92</td>
<td>19/85</td>
<td>23.7 %</td>
<td>0.68   [0.36, 1.27]</td>
<td></td>
</tr>
<tr>
<td>Maki 1997</td>
<td>8/170</td>
<td>14/174</td>
<td>16.6 %</td>
<td>0.58   [0.25, 1.36]</td>
<td></td>
</tr>
<tr>
<td>Stensballe 2007</td>
<td>9/104</td>
<td>25/102</td>
<td>30.3 %</td>
<td>0.35   [0.17, 0.72]</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>366</strong></td>
<td><strong>361</strong></td>
<td>70.7 %</td>
<td><strong>0.52</strong></td>
<td><strong>[0.34, 0.78]</strong></td>
</tr>
<tr>
<td>Total events: 31 (Antibiotic), 58 (Standard)</td>
<td></td>
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<tr>
<td>Heterogeneity: Chi² = 1.93, df = 2 (P = 0.38); P =0.0%</td>
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<tr>
<td>Test for overall effect: Z = 3.17 (P = 0.0015)</td>
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<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>422</strong></td>
<td><strong>429</strong></td>
<td><strong>100.0 %</strong></td>
<td><strong>0.47</strong></td>
<td><strong>[0.33, 0.67]</strong></td>
</tr>
<tr>
<td>Total events: 39 (Antibiotic), 85 (Standard)</td>
<td></td>
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<tr>
<td>Heterogeneity: Chi² = 2.78, df = 3 (P = 0.43); P =0.0%</td>
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</tr>
<tr>
<td>Test for overall effect: Z = 4.19 (P = 0.000027)</td>
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</tbody>
</table>
Secure catheter & tubing to reduce trauma, improve drainage & improve patient comfort
Catheter securement devices: ensure the catheter cannot slide in the device

Ensure catheter cannot slide in the device and has no tug on urethra
Complications of catheters in men: untreatable urethral tears

(LeBlanc & Christensen. JWOCN, 2005; 32: 131)
Unsupported Catheter from web
Ensure accuracy of patient education brochures -- What is wrong with this picture?
Ensure accuracy of patient education brochures -- What is wrong with this picture?

- Dependent penis;
- Traction on BN; risk of meatal injury and pt. discomfort
What is the best way to support catheter to prevent trauma?
Dependent loops result in stagnation, slow drainage, poor bladder emptying, increased bladder pressure.

Dependent loops: bladder pressure

Figure 2.
The initially empty drainage tubing (“Start”) and its first and successive (numbered 1 to 8) crested configurations at which meniscus heights and bladder and air space pressures were recorded. White arrow points to meniscus.
Catheter tubing position (courtesy Bard)

A. Keep the drainage bag lower than the catheter and the patient’s bladder.

B. Never allow tubing to loop or kink.

C. Position the drainage bag at the foot of the bed.
Support Summary

- Catheter support prevents urethral trauma, maintains patient comfort, and may prevent UTI.

- Tubing support prevents increased bladder pressure, improves drainage, and reduces collection of stagnant urine.
How far to Insert Catheter?

- Till urine flows – be patient
- Up to bifurcation for males
- 3-4” after urine flows for women
- What if patient says ‘ouch’ when balloon is being inflated?
Catheterization technique

Quizz question:

- Which solution is best for cleansing the meatus prior to catheterisation?
  - Betadine
  - Chlorhexadine
  - Sterile water
  - Soap and water
Periurethral cleaning prior to urinary catheterization: antiseptic or water?

  Results: no difference in UTI incidence

- N=5 studies Cochrane review (> 250 participants)
  Results: no difference between two solutions; trend to reduced UTI in sterile water group (Cunha M., et al. 2013, Rev Esc Enferm; 47(6): 1410
Insertion of Coude tip catheter

French silicone Foley catheter
French latex Foley catheter
French latex coudé catheter

May be slight resistance at sphincter. Apply steady, gentle pressure.
Nursing Unit Strategies to reduce CAUTI

- Chart reminders: RCT automatic stop orders
- Computerized Reminder system: initial rationale then Q3 Days reminder if still necessary
- Nursing rounds: daily review of indications & contact physician if not appropriate

Outcomes: length in situ, incidence of CAUTI – both significantly improved with systematic monitoring system.
In summary

- Hand washing between patients – is this new?
- Written catheter protocols and stop orders
- Documentation of reasons for catheter insertion
- Silver alloy in critically ill patients
- Drain urine in AUR