Post-Stroke Urinary Tract Infections

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Infectious Complications of Stroke

• Two most common:
  – Pneumonia
    • Already discussed
  – Urinary Tract Infection
    • 11-23% of patients with stroke within 7-10 days
UTI General Statistics

• Most common healthcare-associated infection
  • 1/3 of all infectious complications

• Indwelling urinary catheters associated with >1 million cases each year in US hospitals and nursing homes

• Catheter-associated UTI (CAUTI) is the second leading cause of secondary nosocomial bloodstream infections.

• Cost of 1 CAUTI is $500-1500
Stroke and Urinary Tract Infections

• Why not just use studies done on the general hospitalized population?

• Stroke Population ≠ General Hospitalized Population
  – Higher risk of developing UTI compared with general hospitalized population
  – More severe consequences resulting from UTI
  – Barriers to prevention
High Risk of UTI after Stroke

• Possible explanations:
  – Immunosuppression
  – Bladder dysfunction
  – Increased likelihood of catheter placement?
ACUTE BRAIN INJURY

Brain cytokines

SNS activation

HPA activation

↑ Monocyte IL-10

↑ Tissue chemokines

Dysfunction of intestinal permeability

↑ Endotoxin absorption

Immunodepression
- apoptotic loss of lymphocytes
- shift from Th1 to Th2 cytokines
- ↓ NK cell activity
- ↓ lymphocyte response to PHA

Inflammation in peripheral organs
- heart
- lung
- liver
- kidney

Acute phase reaction
- ↑ leukocytes
- ↑ acute phase proteins
Bladder Dysfunction after Stroke

• 29-58% of patients after acute stroke

• Hemorrhagic stroke
  – Higher incidence of storage disorder – leads to incontinence

• Ischemic stroke
  – Higher incidence of emptying disorder – leads to retention
  – Storage and emptying disorders common in ischemic stroke, either independently or in combination
Bladder Dysfunction after Stroke

• Increased risk associated with:
  – Aphasia
  – Cognitive dysfunction
  – Severe functional impairment
  – Size: Large infarcts
  – Location: cortical infarcts
    • No correlation with lateralization
Foley Catheters

- 15-25% of all hospitalized patients receive short-term indwelling catheters
- 3-10% risk of UTI per day of catheterization
- Often (34-50%) placed for inappropriate reasons
- Physicians often unaware that they are in place
CDC Guidelines for CAUTI Prevention

*Selected* indications for indwelling catheter use:

- Acute urinary retention or obstruction
- Need for accurate measurements of urinary output in critically ill patients
- To assist in healing of open sacral or perineal wounds in incontinent patients
- Patients who require prolonged immobilization (e.g. uncleared thoracic or lumbar spine)
- To improve comfort for end of life care if needed

Gould et al, 2009
CDC Guidelines for CAUTI Prevention

Indwelling catheters *should not* be used:
- As a substitute for nursing care in those with incontinence

Alternatives to indwelling urethral catheters:
1. Condom catheter drainage (when appropriate)
2. Intermittent catheterization
3. An ultrasound to assess urine volume may be used for those undergoing intermittent catheterization to reduce unnecessary catheter insertions.

Gould et al, 2009
Increased Likelihood of Catheter Placement after Stroke

• Unclear frequency of use after stroke
  – Small studies have shown 25-50%
    • likely more than published 15-25% in general hospitalized population

• Characteristics increasing likelihood:
  – Poor communication
  – Mental status changes
  – Bladder dysfunction
  – Limited mobility
Reasons for Catheterization

• Recent mixed-methods study at 4 sites found:
  – Most were retention related (28-48%)
  – Other reasons for catheterization given:
    • Monitor output (16-30%)
    • Continence issues (0-20%)
  – 12-30% with no reason given for catheterization

• Difficult to study due to poor documentation.
Stroke and Urinary Tract Infection

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  - More severe consequences
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Increased Consequences

• Typical complications of UTI
  – Increased length of stay
    • LOS 41% higher in patients with ischemic stroke complicated by UTI. (Tirschwell 1999)
  – Increased cost of care
  – Exposure to IV antibiotics
  – Risk of bacteremia
Increased Consequences

• Poorer Neurologic Outcome
  – 5-fold increased odds of neurologic decline during hospitalization
  – 3-fold odds of scoring poorly on mRS at 90 days
  – 4.5 fold increase in combined endpoint of death or disability at 3 months

Why Increased Consequences?

• Marker of more severe stroke?
  • Higher baseline NIHSS associated with increased risk

• Likely multifactorial
  • **Fever** - Correlates with increased mortality, poor functional outcome (mRS and BI), and longer length of stay in patients with any brain injury.
  • **Delirium** - Associated with increased mortality, poor functional outcome and longer LOS in patients with stroke
  • **Increased time to mobilization**

Greer et al, 2008; Idenbeuving et al, 2007
Increased Time to Mobility

- IV antibiotics, catheters act as “tethers”
- More difficult to begin intensive PT
- Early and aggressive mobilization
  - one of most important factors in
    - discharge to home
    - functional ability on discharge from acute rehabilitation

Indredavik et al, 1999
Interventions for UTI Prevention

• Stroke literature
  - Several studies evaluating prophylactic antibiotics to reduce post-stroke infections: ESPIAS, PANTHERIS, MISS
  - Otherwise prevention in stroke patients is very understudied.

• Medical literature
  - Decrease infectious risk from Foley catheters
  - Decrease the use of Foley catheters
Decrease Infectious Risk from Catheters

• Antiseptic-coated catheters (e.g. silver alloy) and antibiotic impregnated catheters
  • May reduce asymptomatic bacteriuria in short term catheterization

• Condom Catheters
  – Decreased incidence of bacteriuria, symptomatic UTI or death, and increased patient comfort
  – Especially men without dementia or urinary retention
Decrease Use of Foley Catheters

• **Educational intervention in ED** (Gokula 2007)
  – Face-to-face education, check list with Foley kit
  – Increase in “appropriate” use of catheters, overall decrease in hospital-wide use

• **Computer order entry** (Topal 2005)
  – Alerted physicians when patients had Foley in place, forced to continue or discontinue
  – Nursing protocol to discontinue catheters without physician order in patients without indications
  – 65% reduction in Foley use, 81% reduction in CAUTI
Decrease Use of Foley Catheters

• No studies looking at stroke population
• Barriers to reducing catheter use in stroke
  – Bladder dysfunction
    • Urinary Retention – may increase UTI risk
    • Urinary Incontinence - Incontinence-associated dermatitis (30% with incontinence)
  – Increased burden of care
    • Mobility
    • Communication
    • Fall risk
A. Every 2 hours, patient should be assessed and asked if he/she needs to void.
   1. If able to ambulate (per orders and safety assessment), they should be assisted to the bathroom.
   2. If unable to ambulate (per orders and safety assessment), consider assisting patient to a bedside commode if appropriate.
   3. If unable to ambulate to bathroom or use bedside commode, consider use of a urinal for male patients or bedpan for female patients.
   4. If unable to use the urinal or bedpan, consider using a diaper/brief.

B. For urinary retention (no void for 4 hours or complaints of bladder fullness or inabililt to void)
   1. Perform a bladder scan.
   2. If bladder scan shows >250cc of urine in bladder, perform an intermittent straight catheterization (ISC).
   3. After one episode of urinary retention, begin bladder scans every 4 hours, or after patient voids (post-void residual). Continue ISC every 4 hours for bladder scan showing >250cc of urine in bladder.

C. For incontinence
   1. Perform a post-void residual bladder scan once every shift. If scan shows >250cc of urine, follow instructions under B.
   2. Place a brief/diaper on patient.
   3. Assess patient frequently, asking if they need to void and following instructions in A.
   4. Perform skin checks for skin breakdown with every brief/diaper change and clean-up. If skin breakdown is present, notify clinical nurse specialist for further care.

D. If concerned that patient needs catheter, call house officer on call for the patient.
Why Study This?

• Improve patient outcomes
• Cost-effective care
  – Decrease length of stay
  – Increase discharges to home
• New safety measures and consequences
CMS “Preventable Conditions”

- October 2008 – Medicare
- July 2011 – Medicaid
- Selected preventable conditions
  - Pressure ulcers
  - Falls
  - Catheter-associated urinary tract infection
- Stop hospital payment for these conditions
- Private insurance companies following suit
Potential Cost Savings

- 526,000 hospitalizations/year for stroke (HCUP 2005)
- UTI risk ~16% (11-23%)
- Direct costs of UTI ~$600
- If an intervention decreases the relative risk of UTI by 25% (i.e. 16% → 12%)
- $12.6 million savings/year
- Does not take stroke outcomes into consideration OR cost from CMS stop-payment
Where to Go From Here

• Fill in gaps in knowledge:
  – Frequency of Catheter use and CAUTI incidence after stroke.

• **Decreasing Foley use** - likely the most simple way to decrease UTI complications after stroke
  – Need to find a safe, effective, and tolerable intervention
Thank You