# Pilot Project:
# Indwelling Urinary Catheters at Ste. Anne's Hospital

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**Introduction**

In nursing home settings, urinary tract infections (UTIs), defined as the presence of bacteria or yeast in the urine which is normally sterile, are not only common but contribute importantly to costs for investigation and treatment, impair quality of life, increase morbidity and mortality, and sometimes engender conflict between nursing staff and physicians about whether to investigate or not, and whether to treat or not.

When indwelling urinary catheters (IUCs) are used on a longterm basis, the likelihood of UTIs together with their attendant problems, increases greatly. Studies show that the risk of bacteriuria is close to 100% in patients with longterm IUCs, and this after only a few weeks.

Many attempts have been made to manufacture catheters with materials and coatings intended to diminish the risk of bacteriuria developing, especially since catheters provide convenient surfaces for bacteria to form biofilms which greatly increase the ability of the bacteria to withstand antibiotic treatments. Unfortunately, while some of these approaches, such as coatings of silver, silver alloy, or antibiotics, appear to provide benefit for short-term catheterization (as in the acute care setting), results have been disappointing for longer IUC use. Newer technologies such as surface acoustic waves which can mechanically disrupt biofilms on catheter surfaces, as well as proprietary coatings, are in development or coming onto the market, but there are likely to be significant costs.

What remains, then, is to avoid the use of longterm IUCs when possible, if the available alternatives (such as in-and-out catheterization, suprapubic catheters, or urethral stents) have better benefit to risk ratios. Additionally, because the indications for the use of a longterm IUC in a particular patient may change over time, its deployment should be for the briefest period consistent with good medical practice.

With these considerations in mind, it is worthwhile to ask the following questions about the use of longterm IUCs at Ste. Anne's Hospital (SAH):

- Is the rate of longterm IUC use consistent with rates in similar institutions?
- For each instance of longterm IUC use, were the initial indications appropriate?
- Are indications reviewed on a regular basis?
- Have alternatives to longterm IUC use been considered?
- What is the rate of symptomatic UTI associated with longterm UICs at SAH? Is this rate consistent with rates for similar institutions?
- What are the protocols for screening, investigation, and treatment of symptomatic UTIs associated with longterm IUCs? Are these protocols being consistently applied?

**Urinary tract infections in nursing home settings**

UTI is the most common infection occurring in elderly nursing home residents, with a prevalence for asymptomatic UTI (also called bacteriuria) ranging from 25 to 50% for female and 15 to 40% for male residents without indwelling catheters (1). Symptomatic UTI is less frequent, and incidence rates vary depending on case definition. For example, a study with a restrictive definition reported a rate of 0.11 per patient-year for elderly institutionalized men (2). For a nursing home with 400 residents, this translates into 44 new cases per year. Other studies have found rates ranging from 0.1 to 2.4 cases/1000 resident days (3). Again, for 400 residents, this translates into between 14.6 and 350 cases per year.

An important consideration in the case definition is whether symptomatic UTI occurs only if there are new urinary tract symptoms such as frequency, urgency, dysuria, new incontinence, or costovertebral or suprapubic tenderness (4), or if a broader case definition is used, eg (5).

Midthun (5) points out that the classical symptoms of UTI may be absent or masked in the elderly, and may also be difficult to elicit in cognitively impaired elderly. In catheterized patients, burning is rarely complained of, and frequency and urgency are absent. Fevers may also be absent or muted in elderly. She thus proposes this composite case definition for UTI:

1. Bacteriuria $\geq 10^5$ Colony Forming Units (CFU) per ml of a single pathogen;
2. Pyuria ≥ 10 WBCs per High Powered Field (HPF)
3. Symptoms:
   - New or increased burning pain with urination, frequency, or urgency
   - Change in character of urine: cloudy, bloody, or malodorous
   - Elevated temperature
   - Chills
   - New or worsening pain: suprapubic, flank, or costovertebral angle
   - New or increased incontinence
   - Decline in mental or functional status

The decline in mental or functional status is further broken down:

1. Decline in Mental Function:
   - Confusion or delirium
   - Unexplained change in behaviour
   - Malaise
   - Lethargy
   - Coma
2. Decline in Functional Status
   - Inability to perform usual ADLs
   - Decreased appetite or anorexia
   - Unexplained weight loss
   - Immobility
   - Weakness

- Fatigue
- Falls

Because all of these symptoms can be caused by UTI, it becomes apparent that UTIs can have significant impact on quality of life, morbidity, and mortality. For example, UTI is the most common cause of bacteremia in long term care facilities (LTCFs) and may be a frequent cause of transfer for acute-care hospitalization, although urosepsis is not believed to be a frequent direct cause of death (1).

**Impact of longterm IUCs on UTIs**

Catheter-associated UTIs (CAUTIs) are believed to account for 34% of all health care associated infections in the United States (6), although the great majority of these are for short-term catheter use. However, in a study of mostly male elderly war veterans in a nursing home, the presence of an indwelling urinary catheter increased the likelihood of developing bacteremia almost 40-fold (7) compared to residents without catheters.

In hospitalized patients who have a urinary catheter placed during their stay, between 3 and 10% (average 5%) will develop a nosocomial UTI for each day of catheterisation. Thus after a month, 90% or more of catheterised patients will have a UTI (8). Patients who develop a nosocomial UTI are nearly three times more likely to die during hospitalization than patients without such an infection (9).

It has been found that up to 40% of physicians may be unaware of the presence of an IUC in their patients (10). This greatly increases the risk that a catheter will be kept in place even when the indication for catheterisation is no longer present.

**Other effects of IUCs**

Besides UTIs, IUCs can cause urethral trauma, loss of function (an IUC is sometimes called a "one-point restraint"), pain, and discomfort (10). They are also a significant risk factor for delirium in the elderly (11) although this is probably a consequence of UTI.

**Indications for IUCs**

Given the risks, it is important that IUCs be used only when necessary, when safer alternatives cannot be used, and for the shortest period possible. Unfortunately, studies have shown that in hospitalized patients approximately 14–38% of IUCs are placed without a specific medical indication (12). Often, indications are not documented. For example, in a study of the medical records of 412 residents of three nursing homes with a mean age of 84.1 years, 9.7% had a urinary catheter, while an indication for catheterization was recorded in the medical records of only 27.5% of these patients (13).

The indications for IUC use are (10):

- Acute urinary retention or obstruction
- Incontinence in a patient at the end of life or with a perineal wound
- Critical monitoring of urinary output in the care of an incontinent patient

- Perioperative settings.

**Alternatives to IUC use**

Intermittent catheterisation, including self-catheterisation for selected patients;

In males, discomfort or periurethral suppurative conditions should lead to consideration of suprapubic placement (14);

Urethral stents, including those made with nitinol, can be used for patients with bladder outlet obstruction. One study showed that nitinol stents had half the UTI rate of longterm IUCs, one month after insertion (15).

**When IUC use is unavoidable**

When there are no alternatives to using a longterm IUC, are there ways to minimize the risk of nosocomial UTI or other adverse effects? A number of studies have looked at the role played by catheter materials in modifying the risk for bacteriuria. For example, a recent study from the UK (16) compared silver alloy, nitrofural, and PTFE coated latex catheters, and found no significant differences in CAUTI rates after 6 weeks, in acute care hospitalized patients requiring short-term urinary catheterization. Earlier studies were recently reviewed by Tenke et al (17) who conclude that catheters impregnated with antibiotics were effective at reducing asymptomatic bacteriuria at one week but the effect was no longer statistically significant after one week; silver alloy catheters continued to be effective past one week, but they found no clinical trials for long-term catheterization. These authors remark on a technology currently in development as showing promise: gendine-coated catheters (gendine is an antiseptic containing Gentian Violet and chorhexidine).

Yet another technology that may help to deal with catheter-related infection employs surface acoustic waves to mechanically disrupt biofilms on catheter surfaces (18, 19).

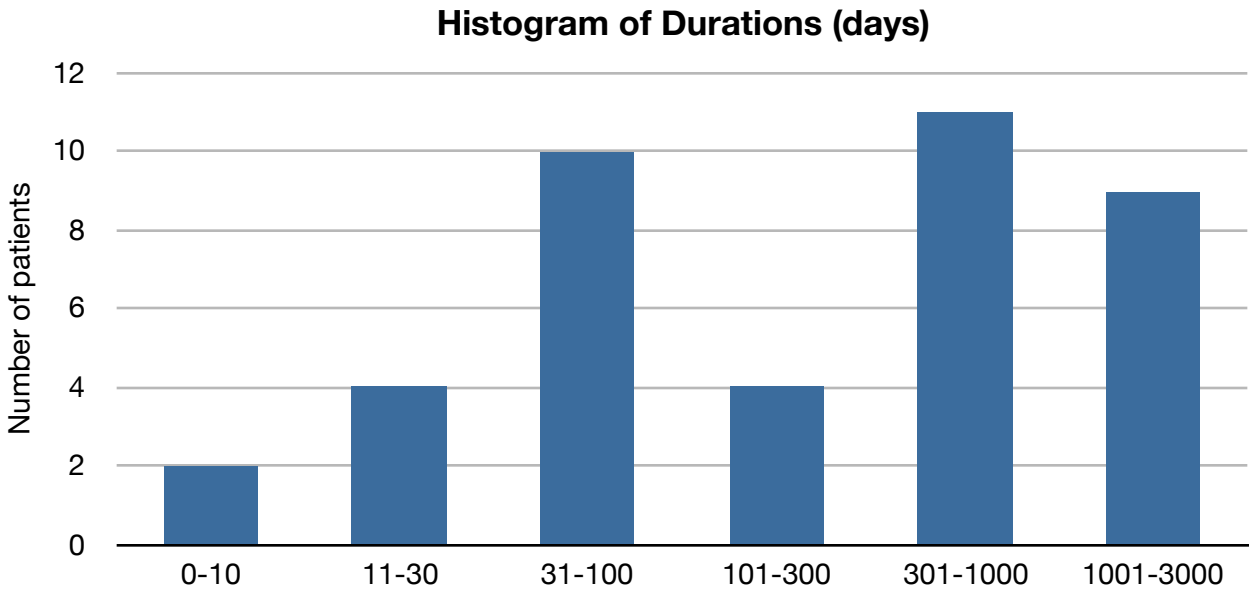
A proprietary coating for medical devices, Byotrol() G32, has been found to inhibit both planktonic and biofilm bacteria (20).

**Current use of IUCs at SAH**

At SAH, members of the Infection Control Team collect information about the use of IUCs on a monthly basis. For February 2013, this data collection indicated that there were 37 patients with an IUC at the start of the month, of whom 3 died during the month, and 3 had the IUC discontinued; there were three new patients with IUCs in place who were admitted during the month.

For these 40 patients (39 M, 1 F) the mean duration of IUC placement was 595 days (median 389 days, range 6 - 2940 days). The frequency distribution is shown here:

Of the 40 cases, urinary retention is listed as either a diagnosis or an indication for 20, or 50%. Prostate cancer was given as a diagnosis for 4 cases (10%), bladder cancer (2 cases, or 5%), neurogenic bladder (2 cases, or 5%), while no diagnosis or indication was listed for 8 cases (20%).




Perusal of the medical charts for several patients showed that it is often difficult to know from the documentation whether a given patient has an IUC, or for how long, or what the indications were or continue to be.

**Pilot project: IUC use at SAH**

We propose to do a pilot study to look at the how indwelling urinary catheters are used at SAH, and at the accompanying morbidity. The study would involve, for each patient at SAH identified as having an IUC, a chart review, and interviews with the patient, with the primary nurse, and with the patient's treating physician. If the significant morbidity associated with IUCs in the literature is also found at SAH via the pilot study, we propose to develop a protocol, including charting tools, to minimize the future use of IUCs and to optimize their use when no alternatives can be employed.

**Extraction of information from the chart and from interviews:**

- History of IUC use: how long, what kind of catheter, problems, care issues
- Medications
- Medical diagnoses
- Mobility status
- Risk of falling
- Cognitive status
- Quality of Life (QOL) rating
- Initial indications for use
- Current status of initial indications
- History of UTIs: symptoms/signs, how diagnosed, how treated
- CAM for assessment of delirium

**Budget:**

Research assistant for 100 days, plus 10 days for training (this is based on assessment of 50 patients requiring 2 days per patient for the chart review, interviews, and documentation).

**Followup:**

We propose to present the results of the study to medical and nursing staff. If the results suggest that we could make improvements to our protocols and/or documentation, those improvements will be put in the form of recommendations to the appropriate authorities.

A smaller study is envisaged after the results of the pilot study have been presented to staff. This study would aim to see whether there has been any change in the utilisation of IUCs, and could possibly serve as a model for a periodic audit. This study would be the subject of a separate proposal.

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