Trial removal of indwelling urinary catheters in stroke patients: a clinical audit at North Shore Hospital

Dushiyanthi Rasanathan, Xu Wang

ABSTRACT

BACKGROUND: This is a baseline clinical audit looking at indwelling urinary catheter (IDC) use and trial removal of catheter (TROC) in stroke patients. We collected data on stroke patients admitted to North Shore Hospital between 26 November 2018–24 May 2019, who underwent insertion of an IDC as an inpatient. A minority of patients had TROC within the recommended guideline period. A high incidence of urinary tract infection (UTI) was found in this patient population. Insufficient documentation and inappropriate indications for IDC insertion were features noted during this audit. Daily electronic reminders and prompting by all members of the rehabilitation team concerning TROC are important to reduce catheter days and reduce UTI rates.

AIMS: To identify if the trial removal of indwelling urinary catheters (TROC) in stroke patients complies with the 2016 American Heart Association/American Stroke Association (AHA/ASA) AHSA guidelines, and to identify any precipitating factors that prevent compliance with the guidelines.

METHODS: We performed a clinical baseline audit that identified patients who were admitted to the acute stroke ward at North Shore Hospital with a diagnosis of stroke from 26 November 2018–24 May 2019 and had an indwelling urinary catheter (IDC) inserted during their admission. The audit consisted of both retrospective and prospective components. Data was collected on patient demographics, the documented indication for IDC insertion, total number of catheter days, the incidence of UTIs and the outcomes after catheter removal.

RESULTS: A total of 49 patients were included. 4.1% of patients had catheters removed within 24 hours (95% confidence interval: 0.011–0.137). The average number of catheter days before removal of IDC was approximately five days. 24.5% of our patient sample went on to develop a urinary tract infection.

CONCLUSIONS: Insufficient documentation and inappropriate indications for IDC insertion were features noted during this audit. Daily electronic reminders and prompting concerning TROC are important to reduce catheter days and reduce infection rates. Indwelling catheters and associated infections impact the length of hospitalisation, mortality and morbidity of stroke patients.

Indwelling urinary catheters (IDCs) are commonly used in stroke patients; yet they also present unique challenges for this population. It is vital that IDCs are used only when necessary and removed when appropriate to prevent the development of complications. As such, we wanted to investigate whether IDCs were removed within a stated guideline period for stroke patients admitted to the acute stroke ward at North Shore Hospital, Auckland, New Zealand. To distinguish IDCs from the various other types of urinary catheters, an IDC is defined as a draining tube inserted into the urinary bladder through the urethra. It is connected to a closed collection system. Alternative forms of urinary catheters include intermittent catheterisation, external catheters and suprapubic catheters. An IDC is the most common form of urinary catheterisation.
The indications for appropriate urinary catheterisation include acute urinary retention, bladder outlet obstruction and to improve comfort during end of life cares. Inappropriate indications for IDC insertion include urinary incontinence, monitoring of urine output without a critical need and using catheters to obtain urine samples for diagnostic testing, despite a patient being able to voluntarily void. Priority recommendations for appropriate IDC use include inserting catheters only for appropriate indications and to leave them in place only as long as needed. It is estimated that approximately one quarter of catheterisations are unnecessary.

Stroke patients have a number of risk factors that predispose them to acute urinary retention and thereby requiring urinary catheterisation. Urinary retention, urgency, frequency and incontinence occur in approximately 29–58% of patients after stroke. Bladder dysfunction following a stroke is classically due to interference in the central nervous system control and the coordination of voiding reflexes. Psychological mechanisms can also contribute to these problems. The potential loss of privacy with bladder functioning after a stroke can interfere with normal bladder patterns and subsequently lead to urinary retention, as psychological factors may prevent easy evacuation. Speech dysfunction and alterations in mental status also impair the ability to communicate a voiding problem, which can also induce urinary retention. The impact on continence and dignity that a stroke can cause is an important focus for all members of the stroke rehabilitation team.

Urinary tract infections (UTIs) are the most common form of hospital-acquired infection and are estimated to account for more than 30% of all infections in hospitals. An estimated 80% of UTIs in hospitals are attributable to an IDC. A UTI is the most important adverse outcome of urinary catheter use. Bacteraemia and sepsis can develop in a small proportion of infected patients. As early as the first day after catheterisation, a biofilm develops on both extraluminal and intraluminal surfaces of the catheter, increasing the capability of micro-organisms to adhere to the surfaces and promoting colonisation. This is an important factor in the pathogenesis of many catheter-associated UTIs (CAUTIs). CAUTIs may be caused by exogenous contamination from the hands and equipment of health professionals. Endogenous contamination can occur from nearby internal colonisation of bacteria in a patient. The duration of catheterisation is the most important risk factor for the development of infection. In the general medical population, the risk of UTI is 3–10% per day of catheterisation. The longer an IDC is in place, the greater the likelihood of bacteria and UTI.

A UTI can result in further medical complications for patients who have had a stroke. Stroke patients are particularly prone to developing UTIs due to immunosuppression, bladder dysfunction and increased use of urinary catheters. Studies suggest that ischaemia in the brain may lead to a systemic immunodepression that predisposes patients to infection. A UTI can cause electrolyte disturbances, hypoxia and fevers. These can have a detrimental effect upon the vitality of neurons within the ischaemic penumbra; the area of reversible injured brain tissue around the ischaemic core, thus delaying the recovery of the brain. Fever can alter the blood-brain barrier permeability, increase cerebral metabolic demands and promote acidosis, as well as the release of excitatory amino acids. Fever and the systemic inflammatory response associated with UTIs can thus impair stroke recovery. A population-based study found that the length of inpatient stay was extended by an average of 41% in patients with ischaemic stroke who developed a UTI. Infection is also a risk factor for delirium, which worsens neurological state and adversely affects the length of admission and mortality in stroke patients.

UTI in a stroke patient can impair the process of rehabilitation. UTI and catheter use can prolong the period of immobility for patients as systemic illness, intravenous antibiotics and urinary catheters make it more difficult to begin intensive physical therapy. UTIs are related to undesirable outcomes, including deterioration in neurological state, increased length of hospitalisation and long-term disability. Infections and other adverse effects associated with IDCs therefore lead to increases in patient discomfort, morbidity, mortality and amplifies the economic burden of care. Thus it is vital that IDCs are only used when necessary, and that they are removed as soon as possible.
Aim and objectives
The aim of this audit is to identify if the practice of trial removal of indwelling urinary catheter (TROC) complies with the 2016 American Heart Association/American Stroke Association (AHA/ASA) AHSA guidelines, and to identify any precipitating factors that prevent compliance with the guidelines.

Criteria and standards

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Standard</th>
<th>Class</th>
<th>Evidence base</th>
</tr>
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<tbody>
<tr>
<td>Removal of the urinary catheter within 24 hours of insertion, after admission for acute stroke is recommended.</td>
<td>100%</td>
<td>Class I (Benefit&gt;RI) Procedure/treatment SHOULD be performed</td>
<td>Level B</td>
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This audit used the 2016 American Heart Association/American Stroke Association (AHA/ASA) Guidelines for Adult Stroke Rehabilitation and Recovery, which states that TROC should be attempted within 24 hours after insertion. The NICE accredited ‘National Clinical Guidelines for Stroke’ published in 2016 were also consulted, which recommended that people with stroke should not have an IDC inserted unless indicated to relieve urinary retention or when fluid balance is critical.

Methodology
This is a baseline audit that identified patients admitted to the acute stroke ward at North Shore Hospital with a radiological or clinical diagnosis of stroke from 26 November 2018–24 May 2019. The audit consisted of both retrospective and prospective components. The retrospective component covered the period between 26 November 2018–24 February 2019. The nursing handover software program ‘Trendcare’ was used to identify patients during this period who were admitted to the ward with a stroke and had an IDC inserted during their admission. The prospective aspect of the audit was conducted from 25 February–24 May 2019. This aspect of the audit identified all new patients admitted with a stroke and followed up patients who had an IDC inserted. Patients who had symptoms of UTI and had a mid-stream urine sample indicative of infection were considered to have developed a UTI.

Data was collected from clinical notes, Trendcare and discharge summaries and entered into a Microsoft Excel spreadsheet. The data collected included:
- patient demographics
- the nature of stroke
- date and documented indication of catheter insertion
- number of catheter days (the number of days the patient had a catheter in-situ)
- whether patients went on to develop a UTI
- outcomes of catheter removal
- patient discharge destination

Minor statistical analysis was also conducted using a spreadsheet and associated statistical functions. A 95% confidence interval for the average number of catheter days for our patient sample was estimated using a t-test based method.

Results
A total of 49 patients had an IDC inserted during their admission for stroke during the six-month audit period (n=49).

<table>
<thead>
<tr>
<th>Documented indication for catheterisation</th>
<th>N/49 (%)</th>
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<tbody>
<tr>
<td>Urinary retention</td>
<td>24 (49.0)</td>
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<tr>
<td>Monitoring for acutely unwell/unstable patient</td>
<td>5 (10.2)</td>
</tr>
<tr>
<td>Incontinence</td>
<td>4 (8.2)</td>
</tr>
<tr>
<td>Comfort cares</td>
<td>3 (6.1)</td>
</tr>
<tr>
<td>Immobility</td>
<td>2 (4.1)</td>
</tr>
<tr>
<td>Urgency</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Not documented/unknown cause</td>
<td>10 (20.4)</td>
</tr>
</tbody>
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Table 1: Documented indications for IDC insertion for stroke patients during the audit period.
Catheter removal within 24 hours happened in only 2 of 49, 4.1% (95% CI 1.1–13.7) of patients. The average number of catheter days for our patient sample before TROC was approximately five days. The mean time to catheter removal was 5 (5.1) days, with a standard deviation of 4.4. The 95% confidence interval for the average number of catheter days before TROC is between 3.5–6.7 days. Because this confidence interval does not include the number 1, indicative of 24 hours, the analysis is significant in showing that we are not TROCing patients according to the AHA/ASA guidelines recommendation of 24 hours.

UTI developed in 12/49 (24.5%) of patients. 29.0% of patients who were TROCd (9/31 patients) were considered to have a failed TROC and underwent reinsertion of an IDC. 32.7% of patients who had an IDC inserted went on to their discharge destination with their IDC in situ. This encompassed 16 patients out of the 49 patients who had an IDC inserted. Discharge destinations were most commonly rehabilitation wards or a private hospital.

**Discussion**

This audit generated a number of noteworthy conclusions. The most critical of which highlighted that our average period of catheter days before TROC on the stroke ward does not meet the recommended period of 24 hours, as per the AHA/ASA guidelines. A minor portion of our patients with IDC had TROC within 24 hours (4.1%). Of the patients who had an IDC inserted during their time as an inpatient, 24.5% went on to develop UTIs. Concerningly, 29% of patients had failed TROCs. This raises a number of questions regarding exactly when it is appropriate to TROC a patient.

Waitemata District Health Board’s guidelines concerning catheter management denote how a patient’s risk factors for an unsuccessful TROC include difficulty voiding prior to IDC insertion, chronic retention, diabetes mellitus, Parkinson’s disease and difficulty with catheter insertion. Situational risk factors for unsuccessful TROC include having unrelieved pain, having had anticholinergic drugs such as Oxybutynin in the last 10 hours, recent surgery, constipation and ongoing haematuria with clots. Removing an IDC for a patient who cannot empty their bladder increases their overall number of catheter days, as catheters need to be re-inserted and monitored. A key feature noted during this audit was the issue of insufficient documentation of the indications for IDC insertion. Waitemata DHB uses specifically designed IDC insertion stickers for health professionals to complete in clinical notes. 20.4% of the patients’ notes in this audit did not have any documented indication for IDC. Several also stated an inappropriate reason for catheterisation, including urinary incontinence, agitation and patient discomfort. This appears to be a universal issue as the literature commonly notes inappropriate documentation of the indications for an IDC and the use of limited clinical reasoning to determine if an IDC is required for a patient. Understandably, there are circumstances where IDCs are used for patient comfort and nursing convenience. These include IDC insertion for terminally ill patients which can ease the inconvenience, pain and hygiene difficulties related to uncontrolled voiding. A competing pressure also exists on nurses to mitigate the development of hospital-acquired pressure ulcers. This can lead to the perception that urinary catheters reduce the risk of skin breakdown, despite IDCs rarely being appropriate for patients with incontinence and sacral wounds. Completion of these IDC stickers in the clinical notes can however, encourage appropriate clinical reasoning for the appropriateness of IDC insertion. They can also serve to remind the multidisciplinary team to question when a catheter is no longer indicated and consider removal.

Another notable factor that contributed to the increase in catheter days for our patients was the practice of TROC on the wards between 6–7am. There were several instances where a TROC was requested on the previous day, with no subsequent TROC occurring the next day. The TROC would then be completed the following day as the time period for TROC had passed. There were also numerous patients for whom a TROC was decided during the morning ward round, around 0830 for example, who were only TROCd the following day at 0600. This rendered the patients with another catheter day and thus with a proportional increase in risk of infection. Coleman Gross’ study did not show a difference in voiding based on
whether the catheter was removed at 7am or at 10pm in their sample of stroke rehabilitation patients. Aiming for the removal of IDC between midnight and midday is preferable as it entails time for adequate assessment during the day and the availability of trained staff to re-catheterise if needed. The TROC period of 0600–0700 often results in another catheter day for patients, when it may have been possible to TROC them later in the morning, while there is still time to monitor patients with sufficient numbers of staff.

As UTIs are such a significant cause of healthcare infection, other measures to reduce infection, aside from limiting catheter use and removing catheters as soon as possible, should be briefly considered. Intervention strategies that have been previously described in the literature include prophylactic antibiotics, anti-septic impregnated catheters and quality improvement interventions to reduce inappropriate catheterisation. Stat dose peri-catheterisation antibiotic prophylaxis is generally only indicated in high-risk patients, including those with recent artificial joint replacements, mechanical heart valves, previous infective endocarditis, recurrent UTIs, immunosuppressed patients and patients who have needed recurrent attempts to insert the catheter. Low-quality evidence has suggested little to no benefit in antimicrobial prophylaxis for patients undergoing urinary catheterisation. A recent literature review showed many of the studies addressing strategies to prevent CAUTI were not of sufficient quality to allow conclusions to be formed regarding these interventions. The literature is consistent in that limiting catheter use and minimising the duration of catheterisation are the primary strategies for CAUTI prevention.

The most significant feature noted during this audit and also reflected in the literature is the importance of the medical team being aware of IDCs in their patients. Within the rotating members of a medical team, physicians may not even recognise which patients have IDCs. Catheters are often used and managed inappropriately, and doctors are often unaware that urinary catheterisation has been excessively prolonged in patients until a catheter-related complication occurs. Unlike an intravenous luer which is removed when a patient is deemed ready for purely oral fluids and medications, the only way to determine if a patient can empty their bladder successfully after using an IDC is to remove the catheter itself. Furthermore, the presence of a urinary catheter is not always documented in clinical notes. This audit used the nursing handover software ‘Trendcare’ because it was the only clinical software that specifically mentions which patients on the ward had IDCs. This software is not used by members of the medical team. This highlights the limited involvement that the medical teams can have with the management of IDCs.

To reduce the number of catheter days for patients, Meddings et al describes the lifecycle of the urinary catheter and the four steps or checkpoints in order to remove a catheter. Firstly, the physician must recognise that their patient has an IDC. Secondly, the physician identifies that the IDC is no longer needed or indicated. Thirdly the clinician documents or instructs the need to TROC. Finally, the TROC occurs. These four steps all take time, potentially rendering a patient with an increasing number of catheter days. These four steps also provide points of intervention to fast-track this process. The removal of urinary catheters should be assessed on a daily basis.

The literature highlights the importance of ongoing reminders, both electronically and by nursing and MDT staff to the medical team with regards to the appropriate time for TROC. Interventions trialled previously include stop orders directed at physicians, requiring an order to be renewed or discontinued on the basis of review at regular intervals. A notification on our Clinical Portal system, for example on the ‘Inpatient Snapshot’ page which is reviewed at least daily by the medical team, stating that the patient has an IDC could be an effective reminder to TROC when appropriate. Parry et al staged an intervention at Stamford Hospital, Connecticut whereby nurses led the prompting and auditing for TROC, with use of a nurse-directed urinary catheter removal protocol. This was an extremely successful intervention which saw a 50% reduction in catheter use and a 70% reduction in CAUTIs throughout the hospital. It highlighted the importance of a multidisciplinary approach to the management of IDCs. The intervention caused a culture
change for the facility, enhancing teamwork and ownership among disciplines involved in the care of patients with IDCs.\textsuperscript{15}

The limitations of this audit include the small sample size of the audit, limiting the propensity for greater statistical analysis due to the potential for significant random error. A longer audit period would enable the inclusion of more patients, increasing the possibilities for more extensive statistical analysis. There was also limited information on the patients’ follow up urinary patterns, including whether patients required another IDC at their discharge destination. Furthermore, the patients who were discharged with a catheter in situ were not followed up in terms of TROC and UTI outcomes. The measurement of catheter days in the retrospective component of our audit was also dependent on the accuracy of nursing documentation in the Trendcare program.

The main goals in the acute stroke unit include commencing early rehabilitation, as well as the prevention, diagnosis and management of stroke complications.\textsuperscript{3} There is limited high-quality data on the frequency, type, duration and indications for urinary catheter use in stroke patients. This is attributable to poor clinical documentation and because the topic has previously received little focus. Preventing UTI after stroke can reduce length of hospitalisation and decrease the cost of care.\textsuperscript{2}

The simple measures of eliminating the use and duration of unnecessary IDCs have the potential to decrease the incidence of UTI, reduce the time to mobilisation, improve patient comfort and ultimately result in improved outcomes for our stroke patients.

**Conclusion and recommendations**

- 4.1% of the sample had their IDCs removed within the recommended 24 hours. The analysis is significant in showing that we are not removing catheters in patients according to the AHA/ASA guidelines recommendation of 24 hours.
- The average number of catheter days for our patient sample before removal of IDC was approximately five days.
- 24.5% of our patient sample went on to develop a urinary tract infection. This is concerning for the adverse impact that infections have upon the rehabilitation process of stroke patients.
- Consider if a patient has an appropriate clinical indication for urinary catheterisation and document this, before inserting an IDC.
- Daily electronic reminders and prompting by all members of rehabilitation team concerning TROC are important to reduce catheter days and reduce infection rates.
- Limited literature exists concerning IDC removal in stroke patients. There is significant scope for further research.
- Recommendations for re-audit include having a longer time-period to capture a greater sample size. A re-audit in one year’s time is recommended to examine the rates of TROC within the guidelines, the rates of UTI and the rates of failed TROC in comparison to this baseline audit.
Competing interests:
Nil.

Author information:
Dushiyanthi Rasanathan, House Surgeon, Department of General Medicine, Waitemata District Health Board, Auckland; Xu Wang, General Medicine and Stroke Physician, Department of General Medicine, Waitemata District Health Board, Auckland.

Corresponding author:
Dr Dushiyanthi Rasanathan, House Surgeon, Department of General Medicine, Waitemata District Health Board, Shakespeare Road, Auckland. dushi@windowslive.com

URL:

REFERENCES:


