Complications Audit of Urological Issues in Spinal Cord Injury Evaluation Study (CAUSES)

Dr Andrew Nunn
Ms Melinda Millard
Ms Janette Alexander
Ms Louise MacLellan
Ms Catherine Byrne

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This research report was prepared by
Janette Alexander and Melinda Millard
Victorian Spinal Cord Service, Austin Health, Heidelberg, Victoria

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Purpose

The primary purpose of this project was to conduct a file audit of spinal cord injured (SCI) patients admitted to the Victorian Spinal Cord Service (VSCS) to establish incidence of urological complications, in particular urinary tract infection, incidence of multi resistant organism colonisation, systemic symptoms, treatment, patterns and current practice of catheter usage and to suggest management strategies.

The aims of this project included:

(a) Retrospective analysis of existing practices and associated currently available clinical data in relation to urological complications at a hospital level.

(b) Inform how to apply best practice and remeasure outcomes using the above audits as a basis.

(c) Generate questions for the next phase of research.

Background

SCI is one of the most catastrophic disabilities to afflict humans. The paralysis is permanent and the disability severe. One of the organs that is particularly affected by SCI is the urinary bladder otherwise referred to as Neurogenic Bladder. Following SCI, individuals no longer have voluntary control over their bladder and need to have an indwelling catheter (IDC) to drain urine from the bladder, prevent over distension and manage fluids.

The prolonged use of IDCs has been shown to increase the risk of urinary tract infections (UTI) particularly within the first few weeks following injury. The use of Intermittent Catheters (IC’s) in SCI has been shown to reduce urological complications, specifically UTIs, compared with use of IDCs.

As SCI patients do not have bladder sensation, they frequently fail to detect the onset of UTIs, which generally produce pain and discomfort in the able-bodied. As a consequence, by the time UTIs are diagnosed in SCI individuals, there is an increased risk that the organisms have invaded other organs such as the kidney or prostate. The resulting infection often requires prolonged periods in hospital to treat, with a concomitant increased risk of an antibiotic resistant infection.

UTIs are a significant secondary complication of SCI. They are the leading cause of presentation to the Emergency Department (ED) and of hospital readmissions and the impact for people living with SCI, their family and community is significant. SCI individuals rank bladder related issues as one of the greatest problems they face in the long term.

The Complications Audit of Urological Issues in Spinal Cord Injury Evaluation Study (CAUSES) was done to more closely observe the secondary complication of bladder dysfunction immediately following SCI and its management.
The project findings inform on how to apply best practice and remeasure outcomes within the system. This study was complementary to the outcomes obtained from the ‘Rate, type and cost of complications experienced by SCI patients: Usage of linked data sources’. The two projects were done in parallel and used common coding criteria for complications of SCI. Together these study findings provided the information required for future research commitments. In particular, the consecutive phases for the Secondary Complications of SCI Program, the next phase of which will develop an intervention focusing on treatment and management strategies that will aim to improve clinical practice at the VSCS and within the community.

Method

Study Design
Austin Health relevant SCI complication coding datasets were identified together with the Health Information Services Department. This enabled identification of hospital presentations and admissions (patient UR’s) with both a spinal diagnosis and a urological complication over the 5 year period from 1st of Jan 2009 – 31st of Dec 2013. From this, the incidence of urological complications and UTI’s over the same time period was determined.

Following from this, a retrospective file audit of patients admitted to Austin Health for traumatic spinal cord injury with a date of admission between 13/06/2012 to 24/08/2014 was undertaken using Austin Health’s Scanned Medical Record and Citrix databases.

This enabled linkage with other data such as pathology and pharmacology results associated with each UTI episode.

Ethics statement
Ethics approval for this project was obtained from Austin Health’s Human Research Ethics Committee (HREC) – Project Number LNR/14/Austin/585.

Participants
All medical histories of consecutive SCI admissions to the VSCS during the time period outlined above were examined for incidence of UTIs. Only patients with “symptomatic” (clinically unwell), treated UTIs were added to the database and subsequently analysed.

For some of the high cervical spine injuries, and for several elderly patients in the cohort, an IDC was the only viable option for long-term bladder-management. While this data was included to analyse the total number of symptomatic UTIs and to gain an understanding of the organisms that were occurring, the data was not included in any further analysis as there was no change in bladder management for these individuals. This allowed for a fair comparison to be made between the type of bladder management and how this related to the prevalence of symptomatic UTIs.

A range of data points were examined as outlined below.

- Demographics, including the patient’s admission date, injury level and ASIA score.
- Bladder emptying method including timing of first intervention, type of catheter if used and subsequent bladder management.
• UTIs were recorded as distinct time based episodes
• Organism/s associated with these episodes ascertained through Catheter Sample of Urine (CSU) and blood culture microbiology
• Incidence of multi resistant organism (MRO) colonisation, defined to be when a patient develops resistance to two or more antibiotics
• Systemic symptoms which included vital signs such as temperature, blood pressure, heart rate, and other symptomatic signs such as increased spasm, nausea and vomiting
• Incidence of urosepsis - febrile T°C > 38.5, White Cell Count (WCC) >11, elevated C-Reactive Protein (CRP)
• Antibiotics used, dose, frequency and duration,

This data was then analysed to make a comparison between the prevalence of symptomatic UTIs and the patient's bladder management at the time, using paired t-tests.

**Research Findings and Implications**

The Austin spinal admission coding data showed there were 2988 inpatient hospital admissions for complications over the 5 year period from 1st of Jan 2009 – 31st of Dec 2013. Urological complications as the principle diagnosis accounted for 1317 of these admissions.
Of these, approximately 268 were TAC funded and 40 Workcover funded.

UTIs accounted for 640 of these 1317 urological complications.

In addition to this, there were a further 266 presentations to Austin’s emergency department (56 TAC, 4 WorkCover) who were treated for urological complications but did not require hospital admission. 76 of these were coded as UTI. This provided a window into community UTI incidence.
Using this coding audit, a clinical file audit was performed.

Of the 143 new acute SCI admissions audited during the period 13th of June 2012 to 24th August 2014, 41% (n=59) experienced a symptomatic UTI, 52 were male and 7 were female.
While there is a gender bias towards male SCI admissions, there was also a pronounced bias towards males developing symptomatic UTIs during their admission.
Of the 103 male admissions, 50.5% developed symptomatic UTIs, compared to 17.5% of the 40 female admissions.

The number of symptomatic UTIs recorded from the cohort totalled 125, with an average of 2.08 symptomatic UTIs per patient or 1.34/100 person-days.
In relation to bladder management, the presence of an IDC resulted in a significantly greater occurrence of symptomatic UTIs when compared to all other bladder management (p=0.001).
The total number of symptomatic UTIs diagnosed with IDCs in-situ was 68, with an average of 1.36 per patient and an incidence rate of 1.49/100 person-days.

Furthermore, there was a greater incidence of severe UTIs, with 69% of urosepsis cases occurring during IDC use. The average number of days an IDC was in situ prior to change to long term bladder management in this population was 85.94.

The total number of symptomatic UTIs diagnosed with Intermittent Catheters (ICs) was 22 with an average occurrence of 0.79 per patient. The use of ICs resulted in a significant reduction in the number of symptomatic UTIs diagnosed (p=0.023). Similarly, there was a considerable reduction in the risk of urosepsis, with 22% of cases being diagnosed during IC use.

Of the 125 recorded symptomatic UTI's there were 53 instances of MRO colonisation and 36 of these instances (68%) occurred in people with an IDC insitu. It was also noted that these resistance patterns developed rapidly, often after the first course of an antibiotic.

A conservative annual costing can be related to symptomatic UTI incidence from this audit.
A calculation has been made for the audit cohort as well as each subset, ie UTI diagnosed with IDC bladder management, and UTI diagnosed with IC bladder management.
Each symptomatic UTI episode has been costed at 5 additional bed days to the patient’s length of stay at a bed day rate of $1200.
The audit overall symptomatic UTI incidence rate of 62.5 episodes per year results in an annual cost of $750,000.
The same method applied to the subset of UTI’s diagnosed with an IDC insitu (34 episodes per year) results in an annual cost of $204,000
For the subset of UTI’s diagnosed with an IC insitu (11 episodes per year) results in an annual cost of $66,000.
Limitations

There were several unexpected limitations to conducting this audit. Firstly, it was anticipated that hospital coding systems would enable the most efficient identification of urological complication and UTI incidence. However, through the audit process it became apparent that urological complications and UTI’s in particular were often underestimated. In some cases only one complication is coded per admission or a UTI, being closely related to another urological diagnosis may be coded as such. A more accurate process was to identify positive microbiology results for a particular admission, and then confirm the diagnosis of a symptomatic, treated UTI through patient admission notes and medication charts. The audit process has provided significantly more accurate data regarding recording of complications including UTI incidence and appropriate treatment.

Secondly, the number of years able to be audited in the agreed timeframe was reduced to two (2012 - 2014) due to medications not being electronically available for admissions prior to mid 2012. It was not feasible, nor would the results be as accurate, to conduct a paper audit of patient’s medications in the timeframe available.

Two years of data has provided adequate evidence of relationship between bladder management and UTI incidence and the need for practice change to earlier removal of IDC’s.

Use of the Research

This project had demonstrated that the use of hospital coding data to identify the incidence of urological complications and UTIs in the spinal population has limitations. A comparison of data collected from the file audit and that collected from hospital coding systems highlighted some coding system flaws and emphasises the importance of ensuring coding is completed accurately. False positive and false negative coding was identified in the audit process.

The audit has shown there is a very high rate of UTI incidence and MRO colonisation in the Austin admitted recently injured SCI population. The most likely reason for this is the ongoing presence of a foreign body, the IDC, providing a site for bacteria to grow and flourish and optimal conditions for recurrent infections. MRO colonisation in people who have an IDC insitu likely results in ongoing recurrent infections, where the same organism continues to reinvade the bladder even after the removal of the IDC. The pattern of increased UTI’s in males is contrary to the normal population and suggests a greater risk with an IDC. This further supports the argument for early removal of IDC’s in this population.

MRO colonisation in the admitted spinal population has significant financial and general health implications. An inpatient infected with a MRO may require isolation in a private room, contact precautions to help prevent cross infection to others and the repeated use of expensive antibiotics. This results in increased care and treatment costs. In addition, there is the risk of resistance patterns developing and these transferring to other, more resistant
organisms within the health care system. These results illustrate the importance of antibiotic stewardship in this population.

The results of this audit concur with the literature and add to the pool of evidence supporting earlier removal of IDC’s and initiation of long term bladder management. Furthermore, these results will help inform how to apply best practice such as early removal of IDC’s at the VSCS and bladder management practice change. The data will help guide improved data collection and outcome measures associated with any bladder management practice change in the future. Appropriate re-measure outcomes would include number of days prior to IDC removal, the incidence of UTI’s during an acute/rehabilitation admission, the number of patients discharged performing IC’s and the longer term sustainability of continuing IC’s.

This project’s data will be able to be used as a baseline for a retrospective comparison.

An abstract summarising the results of this audit has been submitted for presentation at the 2015 ANZSCoS conference in Perth. In addition, a paper is currently being prepared to submit for journal publication.

This preliminary data provides impetus for further research in this area, in particular around the higher incidence of UIT’s in males and the significant MRO colonisation in this population. Opportunities are currently being explored for a PhD stemming from this preliminary work.

**Conclusion/Potential impact of the Research**

The method of using complication codes and linking a unique identifier UR no) with hospital and system databases provides an efficient way of looking at issues particularly for those with SCI both acutely and across the care continuum

The data obtained illustrates the high incidence of urological complications and UTIs experienced by the SCI population, both acutely and later in the community, with the compensable and non-compensable groups having similar patterns of presentation.

The audit shows that males in particular have a considerably higher risk of developing symptomatic UTIs during their acute admission. In terms of bladder management, it emphasises the need to reduce the duration that IDCs remain in-situ and push towards a more long-term solution earlier in the patients’ hospital admission.

If the long-term bladder management is initiated earlier, it is likely there will be a significant reduction in the number of cases of UTIs and urosepsis, fewer transfers back to acute from rehabilitation, less interruptions to the patients’ rehabilitation and an overall reduction in admission length.

In addition, the incidence of MRO colonisation and recurrent infections will likely be reduced with significant health, economic and social implications.