

Improving ward-based neurogenic bladder and bowel care after acute spinal cord injury: a narrative review

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ABSTRACT

Objectives There is a risk that early neurogenic bladder and bowel dysfunction following acute spinal cord injury (SCI) may not be adequately managed on the acute hospital wards. The aim of this paper was to review optimal assessment and management of patients with neurogenic bladder and/or bowel dysfunction during acute care immediately following SCI. A secondary aim was to translate these findings into an accessible policy for clinical staff involved in the care of acute SCI patients.

Methods A literature review was performed to identify the protocols and research describing the management of bladder and bowel dysfunction after acute SCI. The measures extracted were principles of practice, threshold measures and evaluation tools, and timelines of best care. Key findings relating to assessment, management and identification of the benefits of adhering to a protocol of clinical practice were summarised. Fidelity with evidence identified was evaluated, and practice gaps were recognised.

Results A total of 12 papers and six guidelines for providing excellent care to patients with SCI were identified. Overall, a systematic and comprehensive assessment of bladder and bowel function and neurological impairment should be completed early following SCI. Management is best individualised to both prevent known sequelae and optimise current function and quality of life. Acute SCI bladder and bowel management pathways were developed based on evidence identified.

Conclusions The study has identified that timely assessment and management of patients with spinal cord neurogenic bladder and/or bowel dysfunction during the acute phase is pivotal to optimising continence and mitigating risk of preventable harm prior to discharge to specialised spinal rehabilitation.

Keywords acute spinal cord injury, neurogenic bladder, neurogenic bowel, early spinal cord injury continence management pathway

BACKGROUND

Acute spinal cord injury (SCI) results from insults to the spinal cord and has permanent consequences, affecting independence and every aspect of life¹. Individuals may develop motor and sensory impairment and autonomic dysfunction caudal to the level of injury². The presence and severity of SCI is determined by the American Spinal Injury Association (ASIA) Impairment Scale (AIS) grade. In patients with an AIS grade A to D³ (which correlates with one or more impairments of light touch S4–5, pin prick S4–5, deep anal pressure S4–5 or voluntary anal contraction) elimination symptoms are common.

It should be noted that spinal shock lasts for around 3 months and is characterised by a loss of spinal reflexes and muscle tone below the level of injury⁴. Neurogenic bladder and/or bowel dysfunction during the period of spinal shock is not indicative of function in the chronic phase. The type of neurogenic bladder and/or bowel dysfunction is determined by the Neurological Level of Injury (NLI) and whether or not the sacral outflow is impacted.

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Conflict of interest

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Neurogenic bladder dysfunction in patients with acute SCI is characterised by detrusor areflexia, impaired bladder sensation, non-relaxing bladder neck and proximal urethra, and possible impairment of pelvic floor muscle coordination⁴. Symptoms may include urinary frequency, urinary urgency, urinary incontinence⁴. Injuries below the conus medullaris (usually at T12 or below) usually lead to flaccid detrusor muscle and loss of innervation to the external urethral sphincter⁴. Filling of the bladder will occur at a low pressure; however, voiding is dysfunctional⁴. This results in bladder distension and high bladder volumes⁵. Injuries above the conus medullaris usually lead to spasticity of the muscles after resolution of spinal shock and are implicated in urinary tract infections and deterioration of the upper urinary tract⁵. Lesions at the level of the conus medullaris commonly cause pelvic floor dysfunction⁵.

Neurogenic bowel dysfunction occurs in 27–62% of patients with SCI and is characterised by dysfunction of the colon, abdominal muscles, pelvic floor muscles, rectum and external anal sphincter as well as impaired rectal and/or anal sensation^{6–8}. Symptoms may include constipation, abdominal distention and pain, bleeding (consequence of straining) and faecal incontinence⁶. Injuries below the conus medullaris generally lead to

flaccid pelvic floor muscles and external anal sphincter with no reflex response to increase intra-abdominal pressure. In addition, the tone of the external anal sphincter is affected⁷. The loss of descending inhibitory modulation significantly delays colonic transit time and may reduce compliance of the colon. Injuries above the conus medullaris lead to a reduced ability to effectively increase intra-abdominal pressure as well as an increased tone of the rectum and external anal sphincter⁸. Table 1 describes objective presentation and symptoms seen in the lower urinary tract and bowel after SCI.

The care for patients with SCI who have an acute neurogenic disruption to bladder and bowel function is complex and requires specialist knowledge and skills. Sequelae in both systems must be anticipated, recognised and managed appropriately in the acute phase. Prioritising this before patients arrive in post-acute rehabilitation minimises negative patterns and reduces the risk of complications developing^{4,8}.

The aim of this project was twofold. Firstly, to outline optimal assessment and management of patients with bladder and/or bowel dysfunction immediately following acute SCI based on research and best clinical practice. Secondly, to translate findings into a policy applicable to all clinical staff involved in the care of

Table 1. Important variables for bladder and bowel function in patients with SCI

Reflexive – spastic NLI above the conus medullaris (usually at T12)	Areflexive – flaccid NLI below the conus medullaris (usually T12 or below)
Bladder presentation	
<ul style="list-style-type: none"> • Intact micturition reflex • Increased tone of the detrusor muscle and external urethral sphincter • Impaired bladder sensation • Impaired voluntary control of the detrusor muscle and external urethral sphincter • High bladder pressures 	<ul style="list-style-type: none"> • Absent micturition reflex • Reduced tone of the bladder • Absent tone of the external urethral sphincter • Impaired bladder sensation • Impaired voluntary control of the detrusor muscle and external urethral sphincter • High bladder volume
Bladder symptoms	
<ul style="list-style-type: none"> • Urinary frequency • Urinary urgency • Urinary nocturia • Urine leakage • Bladder over-extension • Sexual dysfunction 	<ul style="list-style-type: none"> • Urinary overflow incontinence • Urinary retention • Bladder over-extension • Sexual dysfunction • Pelvic pain
Bowel presentation	
<ul style="list-style-type: none"> • Positive defecation reflex • Inability to effectively increase intra-abdominal pressure • Increased tone of the rectum and external anal sphincter • Impaired rectal sensation • Impaired voluntary control of the external anal sphincter 	<ul style="list-style-type: none"> • Absent defecation reflex • No reflex response to increase intra-abdominal pressure • Reduced tone of the rectum • Absent tone of the external anal sphincter • Impaired anal and rectal sensation • Impaired voluntary control of the external anal sphincter and pelvic floor muscles
Bowel symptoms	
<ul style="list-style-type: none"> • Faecal impaction proximal colon • Overflow incontinence • Haemorrhoids • (Less commonly) faecal incontinence 	<ul style="list-style-type: none"> • Faecal incontinence • Faecal impaction in the rectum • Overflow incontinence • Haemorrhoids

patients with acute spinal cord neurogenic bladder and/or bowel dysfunction.

METHODS

A literature review was performed for papers from the last decade that described management of bladder and bowel dysfunction after acute SCI. The databases of CINAHL Plus, Embase and MEDLINE were searched. Searches were restricted to English language only. A search strategy was developed that focussed on the following keywords as search terms: 'acute spinal cord injury', 'bladder or urinary bladder', 'bowel', 'incontinence or urinary incontinence or bowel incontinence', 'complications', 'assessment' and 'management'. Search terms were established by scoping using free text terms and exploding Medical Subject Headings (MeSH).

Studies in English and from the last decade that describe bladder and or bowel care early after any type of SCI were eligible for inclusion. No limits were placed on study types. Studies describing children or adolescents, neurological conditions aside from SCI or samples of SCI patients more than 3 months post-injury were excluded from the search. Information extracted were principles of practice, threshold measures and evaluation tools and timelines of best care.

All studies identified through the search results as describing assessment and treatment of bladder and bowel dysfunction after acute SCI were reviewed. Duplicate references were identified and removed. The titles and abstracts of the search results were screened, and full texts were retrieved for the relevant articles. Two reviewers completed this process independently. Any disagreements were resolved by consensus.

Articles were scrutinised for key findings related to systems, assessment, management and benefits of adhering to a protocol. Two authors independently identified and extracted data. No risk of bias assessment was performed as all study types were included. Current ward practice at our institution was benchmarked against variables identified. Findings were presented to the multidisciplinary team caring for patients with SCI and the evidence-practice gap between published regimes and routine assessment and management was discussed.

An optimal clinical pathway informed by study findings was formulated to align with the ward culture of our institution. This was then devolved into a policy that could be integrated into the local standards of care. The new policy was reviewed by the following key institutional stakeholders: director of neurosurgery, head of neurology, senior neurosciences pharmacist, urology clinical nurse consultants (CNCs), nursing unit managers for neurology and neurosurgery wards, policy coordinator and nurse educators. Feedback was integrated into the final documents and separate pathways for bladder and bowel care in the acute period following SCI were described.

RESULTS

In total, 31 papers were identified from the literature search; all were screened by two people. Following this, 12 papers⁹⁻²⁰ and six guidelines from SCI services²¹⁻²⁶ were relevant to the study aim and were included in the narrative review. The overall key findings were that a systematic and comprehensive assessment of bladder and bowel function and neurological impairment should be completed early following SCI before developing a management plan^{9,10,12,18,23}. Table 1 summarises the status of clinically important variables that should be evaluated in both systems to confirm the impact of SCI on bladder and bowel function.

It can be seen that the level of neurological injury dictates function and bladder and bowel symptoms. AIS grade and NLI (using the International Standards for Neurological Classification of SCI (ISNCSCI)) should be established to differentiate between three possible types of spinal cord neurogenic bowel and/or bladder dysfunction – reflexive (spastic), areflexive (flaccid) or mixed (spastic and flaccid) presentation. This should be re-assessed periodically as neurological improvement during admission may change the AIS grade. The Bulbocavernosus Reflex Test, reflecting the integrity of spinal reflex arcs at sacral levels 2-4, should be conducted serially to monitor for resolution of spinal shock. Additionally, a comprehensive post-SCI assessment should identify relevant medical details and medication use (particularly those that induce constipation), onset of autonomic dysreflexia and paralytic ileus. Evaluation will also establish fluid intake, diet and cognitive and functional capacity, for example hand skills and positioning.

Key findings related to management following acute SCI prioritised early education with patients and their family/carers to engage them in establishing an optimal management plan⁷. This education includes alteration in anatomy and physiology, understanding the need for ongoing assessment, management options, prognosis and rehabilitation planning¹⁴. Management is ideally individualised to both prevent known sequelae and optimise current function and quality of life.

With respect to bladder function, preservation of both the upper and lower urinary tracts are inter-related. Over-distention of the bladder, a trigger for autonomic dysreflexia, is prevented by insertion of an indwelling catheter (IDC). Transitioning from an IDC to intermittent catheterisation (IC) when the patient is medically stable is important to reduce the incidence of complications such as urinary traction infections (UTI)^{13,14}. Long-term suprapubic catheters (SPC) may be more suitable for patients with limited hand function or restricted carer support. Adherence to a daily routine minimises the risk of incontinence and UTIs. Multidisciplinary consultation will precede trial of void (TOV), ideally following the steps summarised in Figure 1¹⁷. Identification of detrusor pressures during bladder filling and smooth and musculoskeletal activity during filling and any emptying are clarified by urodynamic studies performed at least 6 weeks post-SCI or after resolution of spinal shock¹⁹.

Bowel management should similarly identify precursors of preventable changes (for example onset of paralytic ileus) and individualise intervention to avoid incontinence, optimise stool consistency and toileting at a suitable time and place, prevent complications, and enhance quality of life^{10,12}. This will include monitoring for signs of loose or hard stool, faecal impaction, faecal overflow incontinence, faecal incontinence and hyperkalaemia/hyponatremia. Digital rectal examination (DRE) should be performed to identify rectal fullness prior to inserting rectal stimulants or enemas and to remove rectally impacted faeces (DRF)¹¹. Follow-up DREs may be indicated at times but could potentially be replaced by small volume rectal washouts.

Six papers^{9,10,13-15,17} described the benefits of adhering to a protocol of clinical practice with respect to bladder and bowel function after acute SCI. An evidenced framework will clarify status, identify complications, prevent adverse changes (for example bladder over-distension), standardise transition of care components (e.g., from IDC to IC / the TOV process) and determine the need for specialist referrals for spinal rehabilitation. From a consumer perspective, educational content to support understanding of prognosis and informed decision-making based on the individual needs were highlighted.

Acute SCI bladder and bowel management pathways were developed to provide clear guidance to assist

1. Educate the patient to drink regularly, void as needed and to notify the nurses after each spontaneous micturition.
2. Perform a bladder scan 4–6 hours post-removal of the IDC.
3. Record three consecutive PVR volumes for up to 48 hours.
 - If the PVR is <200ml for three consecutive bladder scans and the patient is continent of urine, the bladder function is considered intact.
 - If the PVR is >200ml and/or the patient is incontinent of urine, the bladder is considered dysfunctional and an IC must be immediately completed or an IDC immediately re-inserted to empty the bladder completely.
4. If the patient does not void for 6 hours, use bladder scan to assess the urine volume.
 - If the bladder volume is >300ml, the bladder is considered dysfunctional and immediately re-insert an IC or an IDC to empty the bladder completely.
 - If the bladder volume is <300ml, the patient should be monitored for an additional 4 hours. If there is spontaneous micturition, continue the TOV process from step 3. If there is no spontaneous micturition, the bladder is considered dysfunctional and an IC or an IDC is re-inserted to empty the bladder completely.

If the patient who has been diagnosed with a dysfunctional bladder improves neurologically, the TOV process should be commenced.

IDC: indwelling catheter; PVR: post-void residual; IC: intermittent catheterisation; TOV: trial of void

Figure 1. Trial of void process for bladder management

clinicians with timely and appropriate assessment, management and treatment of patients with spinal cord neurogenic bladder and/or bowel dysfunction. The protocol was intended to be implemented within 24 hours of acute SCI and had utility for use by all clinicians involved in the care of patients with a SCI, eg, nurses, allied health clinicians, neurosurgical, neurology and urology medical clinicians and pharmacists. Separate pathways developed for bladder and bowel management are presented in Figures 2&3.

DISCUSSION

Functional limitations related to neurogenic bladder and bowel symptoms are profound, being ranked higher than loss of walking¹⁷. Not only can appropriate surveillance of bladder and bowel symptoms optimise continence, it can also identify adverse changes and prevent longer term complications. As described by the recently published *Australian and New Zealand clinical practice guidelines for the physiotherapy management of people with spinal cord injury*²⁷, the care of patients with SCI is complex, and bladder and bowel function is an important part of early rehabilitation. Bladder and bowel care in the presence of neurogenic disorders requires specialist knowledge and multidisciplinary skills. In the acute hospital setting, once SCI is diagnosed or suspected, neurogenic bladder and bowel dysfunction is anticipated and appropriate management commenced.

Our institution is not a recognised specialist service for people with SCI; however, spinal operations are frequently performed, generating a cohort of patients with some form of SCI. Non-specialist nurses, medical and allied health clinicians assess and plan treatment for SCI patients. As wait time for transfer to specialist spinal rehabilitation services is lengthy, patients with SCI often remain on the acute ward for an extended period. The risk of bladder or bowel complications developing during the patient’s acute admission should be appreciated. Benchmarking against evidence synthesised from the current literature review indicated that present practice on the acute wards in our non-specialised service does not align with best evidence. To address current gaps in practice recommendations, evidence gathered was tabulated as separate bladder and bowel management pathways.

Barriers and facilitators to the translation of these pathways into clinical processes of care within our institution’s unique culture and environment can be anticipated. Guihan¹⁵ reported the majority of barriers centred around current hospital workflow, policies, resources, education and training. Specifically, it is anticipated junior medical staff will require upskilling in performing ISNCSCI and Bulbocavernosus Reflex Tests and that nursing staff need more education on how to initiate and perform IC, particularly for males. This was identified by Goodes¹³ who noted that despite evidence supporting early implementation of IC, there were substantial delays in transitioning from IDC to IC due to staff training. Additionally, it is anticipated ward staff may be reluctant to complete invasive interventions

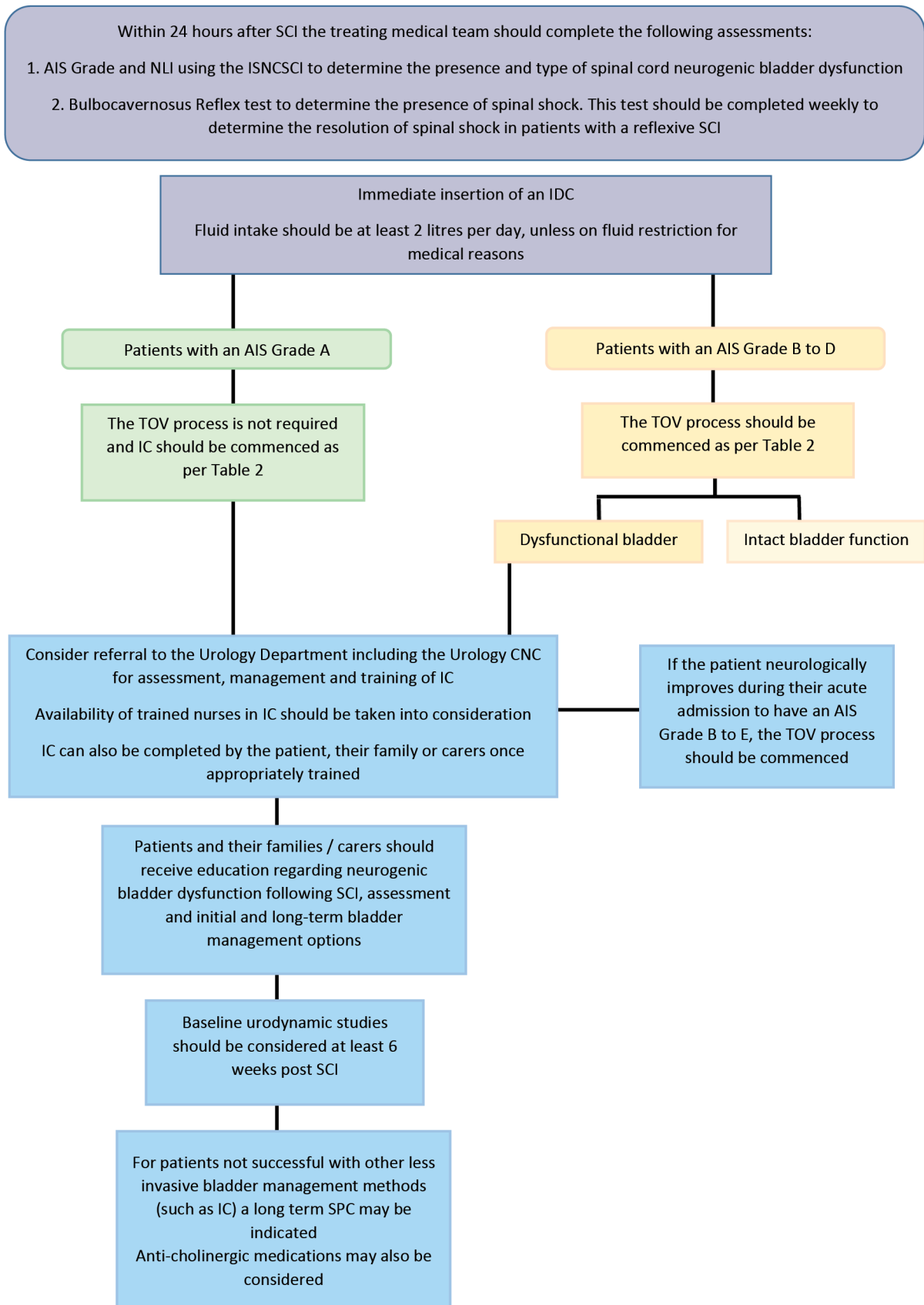


Figure 2. Bladder management in acute SCI pathway

AIS: ASIA (American Spinal Injury Association) Impairment Scale; NLI: Neurological Level of Injury; ISNCSCI: International Standards for Neurological Classification of SCI; IDC: indwelling catheter; TOV: trial of void; CNC: clinical nurse consultant; IC: intermittent catheterisation; SPC: suprapubic catheter

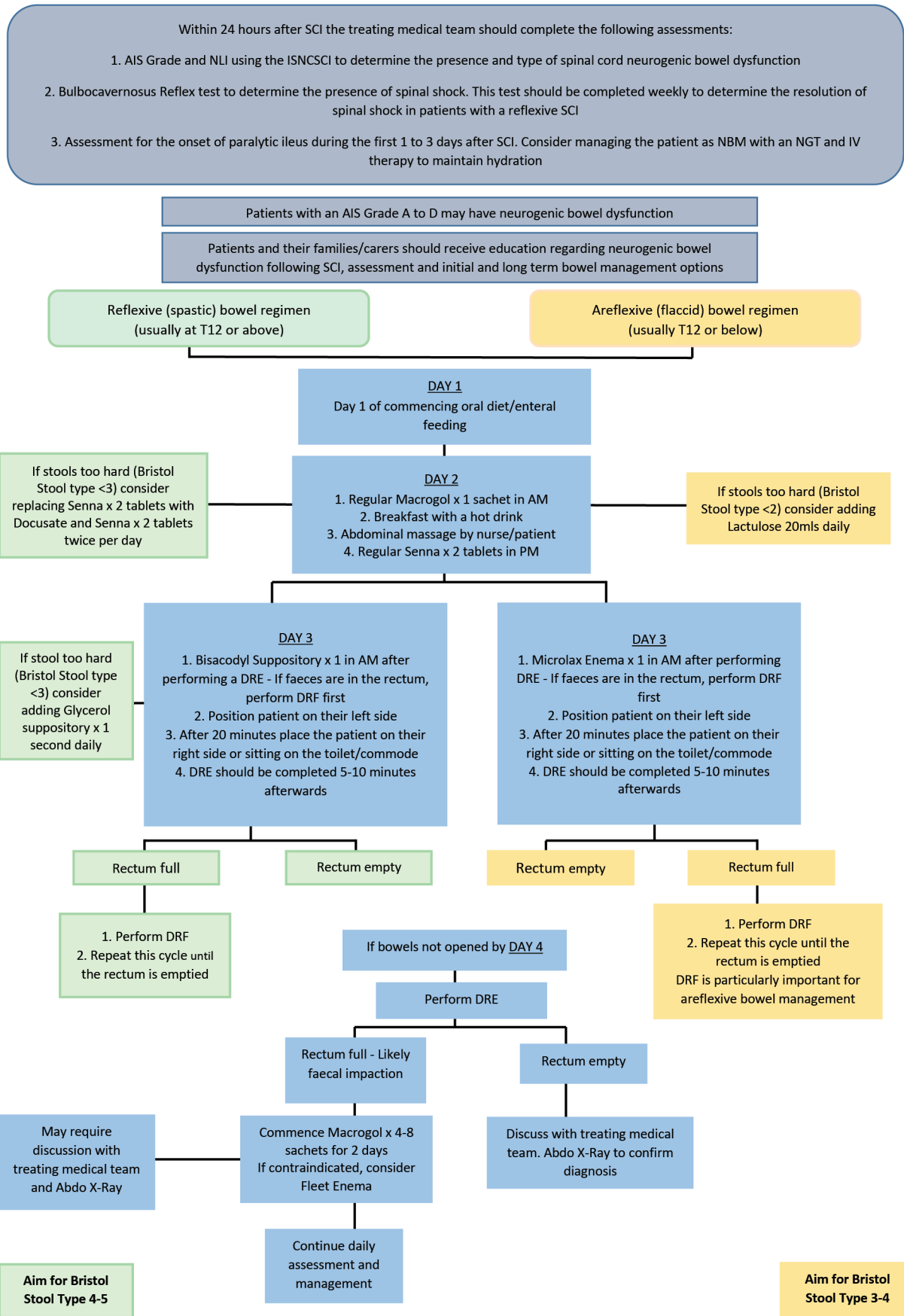


Figure 3. Bowel management in acute SCI pathway
 AIS: ASIA (American Spinal Injury Association) Impairment Scale; NLI: Neurological Level of Injury; ISNCSCI: International Standards for Neurological Classification of SCI; IDC: indwelling catheter; DRE: digital rectal examination; DRF: digital removal of faeces

such as DRE and DRF. The development of educational in-services, training, online learning resources and targeted competencies will be implemented to address these barriers. The upskilling of clinicians is consistent with previous research demonstrating that in-service training for staff working in the acute SCI setting resulted in improved clinician knowledge, enhanced patient knowledge and job satisfaction¹⁰.

The introduction of the newly developed clinical pathways after acute SCI will fail unless the roll out follows implementation science principles. Prior to a change in practice, clinical staff will require access to education about the underlying rationale for modification and the opportunity to be part of an iterative process that optimises acceptability^{9,14}. The fit of the pathway process to the organisational culture should be negotiated, particularly whether additional tasks can be completed with current resources and technology. The documentation of the impact on patient status, for example the prevalence of complications after implementation, will ideally be embedded in electronic medical recording to facilitate audit and evaluation. In the interim, clinicians can endeavour to include more optimal continence strategies into their usual care of SCI patients. Future work will include the evaluation of educational components and co-design of optimal resources.

The strengths of this study include the benchmarking of current care against the latest evidence and clinical guidelines to provide a focus for change. Best practice management can potentially be individualised to target specific underlying dysfunction in each patient with acute SCI. The limitations of this work relate to our target as a single centre of care with unique culture and attributes and a low volume of acute SCI patients. The pathways require clinical champions to optimise implementation and a community of practice that prioritises bladder and bowel care in the acute phase of SCI.

In summary, this work has proactively addressed the issue of preventable complications in bladder and bowel function after acute SCI in a non-specialised hospital environment. Strategies that can be applied in the clinical context during patient assessment and management have been identified and integrated into system-specific multidisciplinary care pathways. Formal implementation to enhance continence care within our institution after SCI has been initiated, beginning with stakeholder consultation.

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