CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS

Rehabilitation, Recovery and Community Participation Following Stroke

Part Two: Delivery of Stroke Rehabilitation of Optimize Functional Recovery Evidence Tables

7th edition, update 2025

Bowel & Bladder Function

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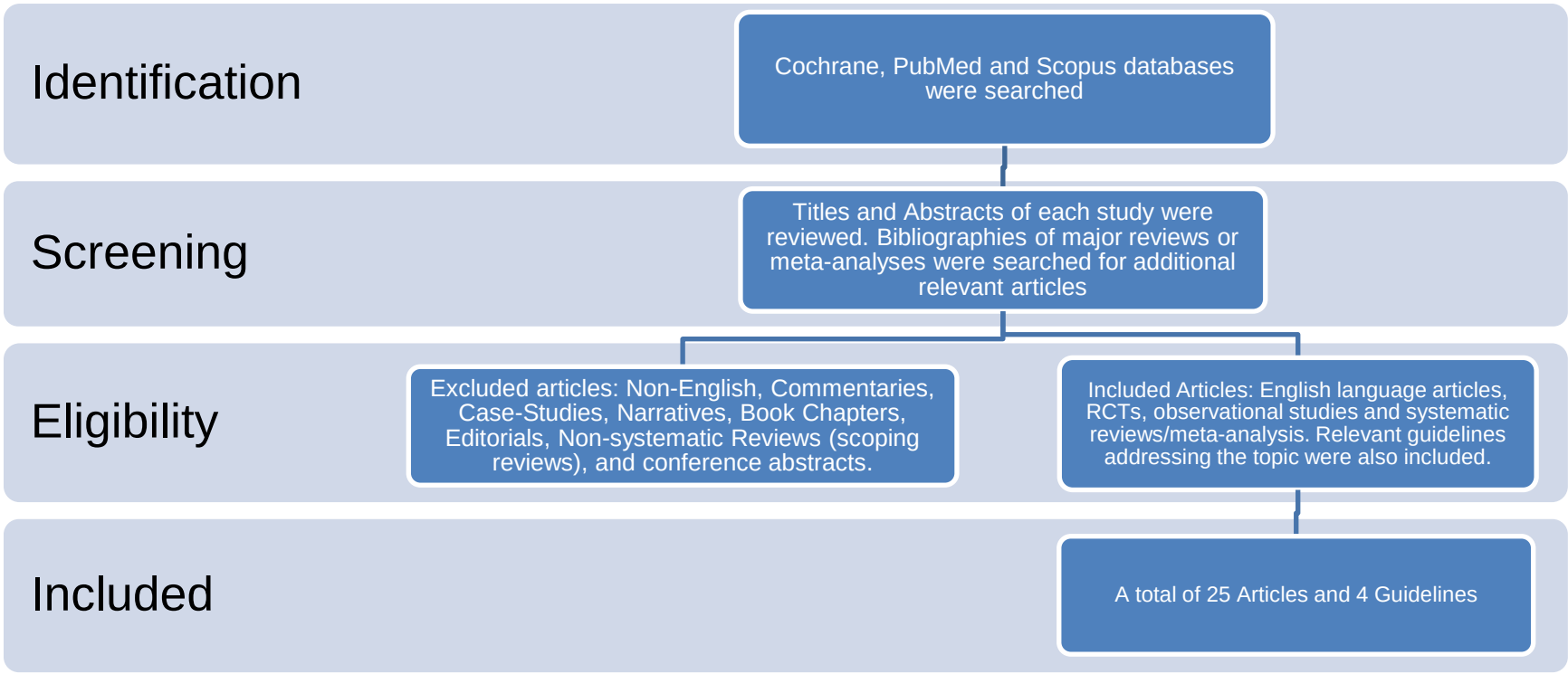
Table of Contents

Search Strategy



Cochrane, PubMed and Scopus database were search using terms such as “stroke” and (fecal incontinence or constipation or diarrhea); stroke and urinary incontinence). Titles and abstract of each article were reviewed for relevance. Bibliographies were reviewed to find additional relevant articles. Articles were excluded if they were: non-English, commentaries, case-studies, narrative, book chapters, editorials, non-systematic review, or conference abstracts. Additional searches for relevant best practice guidelines were completed and included in a separate section of the review. A total of 25 articles and 4 guidelines were included and were separated into separate categories designed to answer specific questions.

Published Guidelines

Guideline	Recommendations
National Clinical Guideline for Stroke for the UK and Ireland. London: Intercollegiate Stroke Working Party; 2023 May 4. **Available at:** www.strokeguideline.org. **(selected)**	*No new recs for 2023* Urinary/fecal incontinence • Stroke unit staff should be trained in the use of standardised assessment and management protocols for urinary and faecal incontinence and constipation in people with stroke. • People with stroke should not have an indwelling (urethral) catheter inserted unless indicated to relieve urinary retention or when fluid balance is critical. • People with stroke who have continued loss of bladder and/or bowel control 2 weeks after onset should be reassessed to identify the cause of incontinence, and be involved in deriving a treatment plan (with their family/carers if appropriate). The treatment plan should include: – treatment of any identified cause of incontinence; – training for the person with stroke and/or their family/carers in the management of incontinence; – referral for specialist treatments and behavioural adaptations if the person is able to participate; – adequate arrangements for the continued supply of continence aids and services. • People with stroke with continued loss of urinary continence should be offered behavioural interventions and adaptations such as: timed toileting; prompted voiding; review of caffeine intake; bladder retraining; pelvic floor exercises; external equipment prior to considering pharmaceutical and long-term catheter options. • People with stroke with constipation should be offered: \advice on diet, fluid intake and exercise; a regulated routine of toileting; a prescribed drug review to minimise use of constipating drugs; oral laxatives; a structured bowel management programme which includes nurse-led bowel care interventions; education and information for the person with stroke and their family/carers; rectal laxatives if severe problems persist.
Clinical Guidelines for Stroke Management 2022. Melbourne (Australia): National Stroke Foundation. Part 6. Managing Complications	*Incontinence* Weak recommendation • All stroke survivors with suspected urinary continence difficulties should be assessed by trained personnel using a structured functional assessment For stroke survivors, a portable bladder ultrasound scan should be used to assist in diagnosis and management of urinary incontinence. Weak recommendation • Stroke patients in hospital with confirmed continence difficulties, should have a structured continence management plan formulated, documented, implemented and monitored. • A community continence management plan should be developed with the stroke survivor and family/carer prior to discharge, and should include information on accessing continence resources and appropriate review in the community. • If incontinence persists the stroke survivor should be re-assessed and referred for specialist review. Weak recommendation For stroke survivors with urge incontinence: • anticholinergic drugs can be tried

Guideline	Recommendations
	• a prompted or scheduled voiding regime program/ bladder retraining can be trialled • if continence is unachievable, containment aids can assist with social continence. **Faecal Incontinence** Weak recommendation • All stroke survivors with suspected faecal continence difficulties should be assessed by trained personnel using a structured functional assessment. • For stroke survivors with constipation or faecal incontinence, a full assessment (including a rectal examination) should be carried out and appropriate management of constipation, faecal overflow or bowel incontinence established and targeted education provided. Weak recommendation For stroke survivors with bowel dysfunction, bowel habit retraining using type and timing of diet and exploiting the gastro-colic reflex should be used.
Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC et al; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research. **Guidelines for adult stroke rehabilitation and recovery: A guideline for healthcare professionals from the American Heart Association/American Stroke Association.** ***Stroke* 2016;47:e98–e169**	A history of urological issues before stroke should be obtained. Class of recommendation I; level of evidence B Assessment of urinary retention through bladder scanning or intermittent catheterizations after voiding while recording volumes is recommended for patients with urinary incontinence or retention. Class of recommendation I; level of evidence B Assessment of cognitive awareness of need to void or having voided is reasonable. Class of recommendation IIa; level of evidence B Removal of the Foley catheter (if any) within 24 hours after admission for acute stroke is recommended. I B It is reasonable to use the following treatment interventions to improve bladder incontinence in stroke patients: Class of recommendation IIa; level of evidence B It may be reasonable to assess prior bowel function in acutely hospitalized stroke patients and include the following: Class of recommendation IIb; level of evidence C
Summers D, Leonard A, Wentworth D, Saver JL, Simpson J, Spilker JA, Hock N, Miller E, Mitchell PH; on behalf of the American Heart Association Council on Cardiovascular Nursing and the Stroke Council.	1. Early bowel and bladder care should be instituted to prevent complications such as constipation and urinary retention or infection (Class I, Level of Evidence A). Use of indwelling catheters should be avoided if possible because of the risk of UTI (Class I, Level of Evidence A). 2. If an indwelling catheter is required, excellent pericare and prevention of infection modalities should be instituted to prevent complications (Class IIa, Level of Evidence C).

Guideline	Recommendations
Comprehensive overview of nursing and interdisciplinary care of the acute ischemic stroke patient: a scientific statement from the American Heart Association. ***Stroke* 2009;40:2911–2944.**	

Evidence Tables

Indwelling Catheters & Urinary Incontinence as Predictors of Death after First-ever Stroke

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
John et al. 2018 **Switzerland** **Prospective study**	NA	4,477 patients included in the South London Stroke Register (January 1, 1995, to December 31, 2011). Among the 4 groups assembled (urinary incontinence [UI] y/n; indwelling catheter [IUC] y/n), mean ages ranged from 69.2 to 76.6). The percentage of men ranged from 43.5% to 55.7%). Patients with UI and those with an IUC were older, more frequently women, and had the worst functional status or neurological deficit when compared with patients without UI or without IUCs.	Regression models were developed to examine the relationship between presence of UI (assessed at maximal neurological deficit [i.e. admission] and within the first 7 days of stroke), and IUC and death, adjusting for age, sex, Glasgow Coma Scale, prestroke and poststroke Barthel Index, swallow test, motor deficit, diabetes, and year of inclusion.	**Primary outcome:** One-year mortality	Urinary incontinence was present at maximal neurological deficit in 43.9% of patients. After 1 year, the risk of death was significantly higher in patients with UI (56.8% vs.11.9%; adjusted HR= 1.78, 95% CI 1.46-2.19). The risk was significantly higher in patients >70 years and in men. 31.2% of patients had an IUC, most of whom had urinary incontinence (91.1%). After 1 year, the risk of death was significantly higher in patients with IUC (62.3% vs. 18.2%: adj HR=1.84, 95% CI 1.54- 2.19). The risk was significantly higher in patients>70 years and in men. Compared with patients without UI or IUCs, the risk of one-year mortality was higher in patients with IUC (adj HR=1.75, 95% CI 1.10-2.82), UI but no IUCs (adj HR=1.47, 95% CI 1.14-1.89) and in patients with UI and IUCs (adj HR=2.39, 95% CI 1.88-3.04). UI at 7 days post stroke, with or without pre-existing UI was found to be the best predictor of one-year mortality (vs. maximal neurological deficit).

Management of Bladder Incontinence

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Systematic reviews					
Özden et al. 2023 **Turkey** **Systematic review & meta-analysis**	PEDro scores ranged from 3 to 7.	8 RCTs including men and women with urinary incontinence post stroke. In 4 trials 100% of participants were women, in 3 trials, 100% were men and in one trial, 71% were women.	Trials compared pelvic floor muscle training (PFMT) vs. standard care. In most trials, patients practiced PEMF1-2x/day for 12 weeks.	**Primary outcome:** SF-36 (social function subscore), 3-day voiding diary	Pooled analyses were possible for 2 outcomes. PFMT was not associated with significantly better SF-36 scores at 12 weeks of therapy (SMD=0.47, 95% CI −0.16 to 0.96, 2 trials, n=54). PFMT was not associated with significantly better performance on the 3-day voiding diary (total) at 12 weeks (SMD=0.30, 95% CI −0.23 to 0.95, 2 trials, n=48). Other outcomes included the 24-h pad test, vaginal palpation or anal palpation or perineometer, and Incontinence Impact Questionnaire, each measured in 2 trials. The International Index of Erectile Function, pelvic floor electromyograph, Bristol Female Urinary Symptoms Questionnaire, Nocturia Quality of Life Questionnaire, Danish Prostatic Symptom Score Questionnaire, Incontinence Quality of Life Scale, International Incontinence Questionnaire Short Form, Broome Pelvic Floor Muscle Exercise Self-Efficacy Scale and Burden Interview, were each measured in a single trial. PFMT was associated with improved daytime urination frequency and urinary incontinence in pad tests.
Cruz et al. 2022 **Australia** **Systematic review & meta-analysis**	PEDro scores ranged from 5-8	10 RCTs including 894 persons with post-stroke urinary (n=9) or fecal incontinence (n=1). Mean ages ranged from 38 to 67 years. The ratio of men to women was 6:5. Mean time from stroke onset to treatment ranged from 10 days to	Trials compared non-implantable electrical stimulation with sham stimulation, alternative treatments or no treatment. Interventions included TENS (n=6), electroacupuncture (n=4). The frequencies ranged from 10 to 75 Hz for TENS, and 1 to 85 Hz for electroacupuncture. Duration and frequency of	**Primary outcome:** Incontinence severity measures	Treatment with TENS was associated with significantly greater improvements in urinary incontinence measures (SMD=-1.99, 95% CI -3.48 to -0.49, n=4 trials). Treatment started <3 months since stroke was associated with greater benefit, as was greater frequency of treatment (>5 sessions/week vs. ≤5).

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
		>5 years.	therapy ranged from 2-7 x/week provided for 1.4-10 weeks		
Thomas et al. 2019 **UK** **Cochrane Review**	One trial was judged to be at low risk of bias. All others were judged to have an unclear risk of bias.	20 RCTs (n=1338) including participants from a mixture of settings, age groups, and phases of stroke recovery. Five trials enrolled only women or men. 11 trials, included participants who were continent prior to the stroke.	Trials comparing usual treatment vs. active treatment included behavioral interventions (n=1), specialized professional input (n=1), complementary medicine (n=5), and physical therapy (n=2). Trials comparing active treatment vs. placebo included physical therapy (n=1) and pharmacotherapy (n=1) Trials comparing active intervention vs. another intervention included behavioral therapy (n=1) and complimentary therapy (n=1). One trial compared dual interventions vs. one intervention. One trial compared behavioral therapy vs. attention control.	**Primary outcome:** Incontinence **Secondary outcomes:** Symptom scores, physical measures, health status	Compared with usual care or no intervention, behavioral interventions did not significantly reduce the number of incontinence episodes per 24 hours period (0.2 vs. 1.2; MD= -1.00, 95% CI -2.74 to 0.74. Results of a single trial included), nor were they associated with improvements in QoL (SMD= -0.99, 95% CI -2.83 to 0.86). GRADE: low certainty Compared with usual care, complimentary medicine (acupuncture, moxibustion) increased the likelihood of achieving continence after treatment (RR=2.82, 95% CI 1.57 to 5.07. Results from 5 trials included). GRADE: low certainty. Compared with usual care, physical therapy (TENS) reduces the number of incontinent episodes in 24 hours (MD= -4.76, 95% CI -8.10 to -1.41. Results from 2 trials included) and improved functional ability based on Barthel Index scores (MD= 8.97, 955 CI 1.27 to 16.68). GRADE: moderate certainty All other treatment comparisons were associated with very small or non-significant differences between groups. The authors concluded there is insufficient evidence to guide continence care of adults in the rehabilitative phase after stroke.
Behavioral Interventions					
Watkins et al. 2022 **UK** **RCT** ***Identifying***	CA: ☑ Blinding: Patient ☒ Assessor ☒ ITT: ☑	The planned sample size was 1,024 patients, with urinary incontinence which were to be recruited from 18 stroke units.	Patients were randomized 1:1 to the systematic voiding programme (SVP) group and received assessment, behavioural interventions (bladder training or prompted voiding) or to a usual care group.	**Primary outcome:** Severity of urinary incontinence at 3 months, measured using the International Consultation on Incontinence	At 3 months, 45% of outcome data were missing due to patient attrition. At 3 and 6 months, data were available for 66 and 55/78 patients, respectively in the usual care group. The corresponding numbers for the SVP group were 57 and 51/79.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Continence OptioNs after Stroke (ICONS)-II		The trial was paused due to Covid-19, restarted, and then halted. At that time, 157 patients had been recruited. Median age was 77 years, 51.6% were men.	In the SVP group, patients who were not catheterized, were cognitively able and had some control of their bladder were allocated bladder training; those with cognitive impairment or with no control over their bladder were allocated to prompted voiding	Questionnaire (ICIQ-UI-SF) total score **Secondary outcomes:** severity of urinary incontinence at discharge and 6 months, urinary symptoms, number of UTIs, number of days indwelling urinary catheter, functional independence, quality of life, falls, mortality rate and costs	Mean total ICIQ-UI-SF (unadjusted) scores at baseline, discharge, 3 months and 6 months were 14.2, 8.0, 7.2 and 6.3 in the usual care group and 14.3, 8.7, 7.8 and 7.5 in the SVP group. After adjusting for baseline ICIQ-UI-SF scores, mean total ICIQ-UI-SF scores at 3 months were 9.1 (usual care) and 8.1 (SVP), mean difference between groups= –1.4, 95% CI –4.4 to 1.7. Mean scores at 6 months were 7.9 (usual care) and 8.5 (SVP), mean difference between groups=0.7, 95% CI –2.0 to 3.4. The authors concluded that the trial was not feasible owing to the combined problems of poor recruitment, poor retention and COVID-19.
Tibaek et al. 2017 a,b **Denmark** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☑ ITT: ☒	31 men ≥ one month post stroke with lower urinary tract symptoms, who were outpatients, and able to ambulate to the toilet independently. Median age was 68 years.	After a 4-week run-in period, patients were randomized 1:1 to a pelvic floor muscle training (PFMT) group and received 12 weekly, 60 minutes sessions + at home exercise program or a control group (usual care).	**Primary outcomes:** Danish Prostatic Symptom Score (DAN-PSS-1) questionnaire (12 questions, each ranked 0-3, with lower scores indicating fewer symptoms), voiding diary, and 24-hour pad test	There were no significant differences between groups in median DAN-PSS-1 symptoms scores at the end of treatment (6 vs. 5) or at 6-month follow-up (7 vs. 7). Median baseline scores were 9 (treatment) and 10 (control). There were no significant differences between groups in median DAN-PSS-1 bother scores at the end of treatment (3 vs. 6) or at 6-month follow-up (3 vs. 6). Median baseline scores were 7 (treatment) and 11 (control). There were no significant differences between groups in median DAN-PSS-1 total scores at the end of treatment (3 vs. 6) or at 6-month follow-up (5 vs. 8). Median baseline scores were 11 (treatment) and 17 (control). There were no significant differences between groups in median voiding frequencies (total, daytime or nighttime) at the end of treatment or follow-up. **2017b**

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					Quality of Life outcomes There were no significant differences between groups in mean scores for any of the SF-36 components post intervention or at 6-month follow-up.
Shin et al. 2016 **South Korea** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor ☑ ITT: ☒	31 women with stress urinary incontinence following stroke of duration ≥3 months. Mean age was 62 years.	Participants were randomized to receive pelvic floor muscle training (PFMT) for 3 months (50 minutes, 3x/week) or no PFMT. Participants in both groups received general rehabilitation exercise for 6 weeks, including gait training and stretching for 50 minutes, 3x/week.	**Primary outcome:** Maximal vaginal squeeze pressure **Secondary outcomes:** Pelvic floor muscle activity (assessed by intra-vaginal electromyography), Bristol Female Lower Urinary Tract Symptom questionnaire	Mean maximal vaginal squeeze pressure (mmHg) at baseline and post intervention Intervention group: 8.50, 17.81, Δ 9.31 Control group: 8.51, 8.83, Δ 0.32 Mean difference between groups p<0.001 Pelvic floor muscles activity (μV) The improvement during resting, contraction and rested was significantly greater in the intervention group from pre-to post-intervention. Bristol Female Urinary Symptoms Questionnaire Mean Inconvenience in the ADL component scores at baseline and post intervention Intervention group: 40.3, 24.4, Δ 15.9 Control group: 39.2, 39.1, Δ 0.08 Mean difference between groups p<0.001 Mean Urinary symptoms component scores at baseline and post intervention Intervention group: 11.5, 7.5, Δ 4.0 Control group: 12.3, 12.6, Δ 0.31 Mean difference between groups p<0.001
Thomas et al. 2014 **UK** **RCT (feasibility)** ***Identifying Continence Options after Stroke (ICONS-1)***	CA: ☒ Blinding: Patient ☒ Assessor ☒ ITT: ☑	413 patients ≥18 years, admitted to one of 12 specialized units with urinary incontinence (UI) secondary to stroke. Median age was 79 years, 46% were male, 82% of patients had mRS score of 0-2 prior to stroke	Centres were randomized to participate in a systematic voiding program (SVP; n=4 centres, 164 patients), SVP + supported implementation (n=4 centres, 125 patients) or usual care (n=4 centres, 124 patients)	**Primary outcome:** Urinary continence at 6 and 12 weeks post stroke	At 6 weeks, compared with usual care, the odds of being continent were not significantly increased with SVP (OR=0.94, 95% CI 0.46-1.94) or SVP + supported implementation (OR=0.62, 95% CI 0.28-1.37). The response rate was 85%. At 12 weeks, compared with usual care, the odds of being continent were not significantly increased with SVP (OR=1.02, 95% CI 0.54-1.93) or SVP+ supported implementation (OR=1.06, 95% CI 0.54-2.09). The response rate was 88%.
Cournan et al. 2012	NA	70 females with impaired bladder management	The outcomes of patients who had been admitted to the unit	**Primary outcome:** Admission and	The average length of stay was 21 days.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
USA **Controlled trial**		admitted to a rehabilitation unit following stroke and who had been continent prior to stroke. The mean age was 72 years. Mean time since stroke was12 days.	prior to the implementation of a standardized bladder management program (n=35) were compared with those admitted following the establishment of the program (n=35) during hospital stay. Bladder management strategies included timed/prompted voiding, bathroom training, and pelvic floor exercises).	discharge scores of the 2 FIM bladder items.	Women who received the interventions experienced a significantly greater improvement in mean FIM bladder scores (2.83±2.23 vs. 1.6±2.17, p=0.01).
Tibaek et al. 2005, 2007 **Denmark** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☒ ITT: ☒	24 women with stress/urge urinary incontinence following first-ever ischemic stroke, ≥one month previously who were independent in toileting. Median age was 60 years. Mean time since stroke was 12 months.	After a 4 weeks run-in period, patients were randomized 1:1 to a pelvic floor muscle training (PFMT) group and received 12 weekly, 60 minutes sessions + a home-based exercise program or a control group (usual care).	**Primary outcomes:** Diary recording the frequency of voiding, the number of incontinence episodes and used pads and 24-hr home pad test.	There was a significant decrease in the voiding frequency (total) from baseline in the intervention group at 12 weeks, but not the control group, using a 2-day voiding diary (from 10 to 8, p=0.028 vs. 9 to 8, p=0.171). There was a significant decrease in the voiding frequency (total) from baseline in the intervention group at 12 weeks, but not the control group, using a 2-day voiding diary (from 7 to 5, p=0.021 vs. 8 to 6, p=0.074). There were no significant differences in the median number of incontinence episodes/day between groups post intervention (0 vs. 0). There were no significant differences in the median number of pads used in a 24-hour period between groups. From baseline, the median number of pads used increased from zero to one in the intervention group fell from 2 to one in the control group. **2007 (6-month follow-up)** There were no significant differences within or between groups in mean scores of the 8 sub-scales of SF-36 or the Incontinence Impact Questionnaire.
Eustice et al. 2000	Risk of bias was difficult	9 RCTs including 674 men and women +/-	All trials compared prompted voiding (PV) programs vs. no	**Primary outcomes:** Improvement in the	There was no significant increase in the number of wet episodes in 24 hours associated with PV

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
UK **Cochrane review**	to assess due to lack of reporting detail.	cognitive impairment with urinary incontinence. Mean age was 84 years. There were more women than men in most trials. Participants were living in care homes and at home with caregivers. No trials included participants with stroke.	prompted voiding. In one trial prompted voiding was one component was part of a more comprehensive program. Duration of the intervention ranged from 21 days to 32 weeks.	number of wet episodes, self-initiated episodes of toileting in 24 hours, pad changes in 24 hours, number of incontinent episodes in 24 hours	(OR= 0.60, 95% CI 0.29 to 1.26, 1 trial, n=110). PV was associated with a significant reduction in the number of incontinent episodes of incontinence (MD= -0.92, 95% CI -1.32 to -0.53, 2 trials, n=257) and the number of self-initiated episodes of toileting in 24 hours (MD= -1.90, 95% CI -2.29, to-1.51, 1 trial, n=126). No trials assessed pad changes in 24 hours
Bladder reconditioning					
Moon et al. 2012 **South Korea** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☒ ITT: ☒	60 patients admitted to a stroke rehabilitation unit following ischemic (n=25) or ICH (n=35). Mean age was 63 years, 50% male.	Patients were randomized to 1 of 3 groups evaluating indwelling urethral catheter (IUC) clamping prior to removal: no clamping (n=20) and clamping for 4hrs followed by 5 min of urinary drainage, for 24 hrs (n=20) or 72-hrs (n=20).	**Primary outcome:** Time to first void, first voided volume, voiding method (self-voiding (SV) or intermittent catheterization (IC) and residual urine volume following first void. **Secondary outcomes:** Symptomatic urinary tract infections (UTI)	Indwelling catheters had remained in place prior to removal for an average of 33-41 days. There were no significant differences between groups on any of the outcomes. No clamping vs. clamping groups combined Mean time to first void: 308 vs. 273 min, p=0.17 Mean volume of first void: 216 vs. 239 mL, p=0.37 Mean residual volume: 79 vs. 60, p=0.26 Method of first void (SV/IC): 15/5 vs. 24/16, p=0.39 Number of UTIs: 0 vs. 3, p=0.54
Transcutaneous Electrical Nerve Stimulation (TENS)					
Liu et al. 2016 **RCT** **China**	CA: ☑ Blinding: Patient ☑ Assessor ☑ ITT: ☑	81 patients with poststroke urinary incontinence. Mean age was 66 years, 65% were men. Mean time since stroke was 67 days.	Patients were randomized 1:1:1 to receive treatment with 20-Hz (Group 1), or 75-Hz (Group 2) for 30 mins with pulse durations of 150 µsecs once daily x 90 days in the hospital (as inpatients or outpatients) or no TENS (Groups 3). Unclear if additional rehabilitation therapies were provided.	**Primary outcomes:** Overactive Bladder Symptom Scores (OABSS), BI (total score) **Secondary outcomes:** Urinary dynamics (maximum cystometric capacity; maximum flow rate, detrusor pressure) and voiding diary parameters (voiding frequency per 24 hrs, average voided volume,	Mean OABSS before and after treatment Group 1: 12.33, 7.56, p<0.0001 Group 2:13.09, 9.81, p=0.0003 Group 3: 12.54, 11.83, p=0.329 Difference between groups: Grp 1 vs. Grp 2 p=0.029; Grp 1 vs. Grp 3 p<0.0001, Grp 2 vs. Grp 3 p=0.046 Mean BI scores before and after treatment Group 1: 50.9, 65.8, p=0.0002 Group 2: 45.3, 57.9, p=0.0002 Group 3: 47.7, 52.5, p=0.091 Difference between groups: Grp 1 vs. Grp 2 p=0.041; Grp 1 vs. Grp 3 p=0.0005, Grp 2 vs. Grp 3 p=0.038

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				incontinence episodes per 24 hrs) Outcomes were assessed before and after treatment.	There were significant improvements in urodynamic measures and voiding diary parameters in groups 1 and 2 but not group 3 No adverse events were reported.
Pharmacotherapy					
Stoniute et al. 2023 **UK** **Cochrane review**	Across 7 domains assessed using the Cochrane RoB tools, the risk of bias was uncertain	104 RCTs including 47,106 men and with a symptomatic diagnosis of overactive bladder syndrome (n=77 trials), a urodynamic diagnosis of detrusor overactivity (either idiopathic or neurogenic, n=12 trials), or both. Ages ranged from 21 to 93 years, with most trials including persons aged 40-70 years. 9 trials included women only. No trials included participants with stroke.	Trials compared an anticholinergic drug vs. placebo. Active drugs included darifenacin (n=9), fesoterodine (n=14), imidafenacin (n=3), oxybutynin (n=9), propiverine (n=12), solifenacin (n=19), tolterodine (n=33) and propantheline (n=1) 22 trials compared different doses of the same anticholinergic medication. 18 trials compared ≥2 different anticholinergic drugs compared with placebo. Duration of treatment was commonly 12 weeks.	**Primary outcomes:** Condition-specific quality of life, perception of cure or improvement and number of urinary urgency episodes per 24 hours **Secondary outcomes:** Adverse events, withdrawals due to adverse events, and number of micturitions per 24 hours Outcomes were assessed before and after treatment.	Anticholinergic drugs were associated with a significantly greater improvement in mean change from baseline in condition-specific quality of life (MD=-4.41, 95% CI -5.28 to -3.54, 12 trials, n=6,804. GRADE: low) Anticholinergic drugs were associated with a significantly greater improvement in patient perception of cure or improvement (RR=1.38, 95% CI 1.15 to 1.66, 9 trials, n=8,457. GRADE: moderate). Anticholinergic drugs were associated with a significant reduction in the mean number of urgency episodes per 24 hours (MD=-0.85, 95% CI -1.03 to -0.67, 23 trials, n=16,875. GRADE: moderate). Anticholinergic drugs were associated with a significant increase in adverse events including dry mouth and urinary retention (RR=3.50, 95% CI 3.26 to 3.75 [66 trials, n=38,368] and RR=3.52, 95% CI 2.04 to 6.08 [17 trials, n=7,862, respectively. GRADE: low). The risk of study withdrawal due to adverse events was significantly higher in the anticholinergic drug group (RR=1.37, 95% CI 1.21 to 1.56, 61 trials, n= 36,943. GRADE: low). Anticholinergic drugs were associated with significantly fewer micturitions per 24 hours (MD=-0.85, 95% CI -0.98 to -0.73, 30 trials, n=19,395. GRADE: moderate).

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Cho et al. 2021 **South Korea** **RCT** ***Parkinson's Disease Overactive bladder Mirabegron, (PaDoMi) Study***	CA: ☒ Blinding: Patient ☑ Assessor ☑ ITT: ☒	136 patients recruited from 5 institutions with overactive bladder secondary to Parkinson's Disease. Mean age was 68 years, 53% were men.	After a 2-week wash-out period, patients were randomized to receive 50 mg mirabegron or placebo for 8 weeks, after which both groups received mirabegron for 2 weeks.	**Primary outcomes:** Overactive bladder symptom score (OABSS), International Prostate Symptom Score (IPSS), Overactive Bladder Questionnaire (OAB-q), post-void residual urine volume (PVR) values, Treatment satisfaction questionnaires (TSQ), Patient perception of bladder condition (PPBC) and Global response assessment (GRA)	92 patients completed the trial. At weeks 4 and 8, the total mean OABSS were significantly lower in the mirabegron, with no significant difference between groups at week 12. There were no significant differences between groups in mean IPSS at baseline or weeks 2, 4, 8 or 12. At week 8, the mean OAB-q score was significantly lower in the mirabegron group, but not at any other assessment point. At 12 weeks post void residual volume (mL) was significantly greater in the mirabegron group 64.3 vs. 36.7, p=0.022). At weeks 4, 8 and 12 there were no significant differences between groups in mean PPBC, TSQ, or GRA scores. There were 7 moderate or severe adverse events (unclear which group).
Vasudeva et al. 2021 **India** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor ☒ ITT: ☒	60 participants with a history of stroke of duration ≥3 months with overactive bladder symptoms. Mean age was 58.5 years, 72% were men. Mean time post stroke was 7 months.58% of participants had a normal MoCA score at baseline (≥26).	Participants were randomized 1:1 to receive darifenacin (7.5 mg) or mirabegron (25 mg) daily for 3 months. After one month, for those who were unsatisfied with the treatment and had not reported intolerable side effects, the doses of each drug were doubled for the rest of the trial period.	**Primary outcomes:** International Consultation on Incontinence Questionnaire (ICIQ) bladder diary, and MoCA **Secondary outcomes:** Adverse events	After one month, 9 (30%) patients in the darifenacin arm and 10 (33.3%) patients in the mirabegron arm had their doses increased. Mean frequency/24 hours, mean frequency of Grade 3/4 bladder sensation/24 hours, mean incontinence episodes/24 hours, and mean maximum voided volume (ml) were all significantly improved in both groups with no significant differences between groups. Only participants in the darifenacin group experienced a mean reduction in nocturia episodes. There was no significant decline in mean MoCA scores in either group (from 26.5 to 26 in the

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					darifenacin group and was unchanged from 26 in the mirabegron group). One participant in the darifenacin group and 2 in the mirabegron group reported constipation.
Chen & Kuo 2019 **Taiwan** **Clinical trial**	NA	44 patients with overactive bladder of duration >3 months +/- urinary incontinence resulting from stroke (n=27), Parkinson's disease (n=6) or dementia (n=11). Mean age was 78 years, 73% were men.	After a 2-week washout period, patients received 25 mg mirabegron daily for 12 weeks.	**Primary outcome:** Urge Severity Scale (USS) **Secondary outcomes:** Overactive Bladder Symptom Score (OABSS), Urinary Sensation Scale (USS), International Prostate Symptom Score (IPSS), and Patient Perception of Bladder Condition (PPBC), urodynamic parameters	By 3 months there were significant improvements in mean USS, OABSS, IPSS and PPBC scores, with no significant change in maximum flow rate, post-void residual volume or voided volume. There were 3 complaints of adverse effects.
Krhut et al. 2018 **Czech Republic** **RCT**	CA: ☒ Blinding: Patient ☑ Assessor ☑ ITT: ☒	66 patients recruited from 3 tertiary centres with neurogenic detrusor overactivity secondary to spinal cord injury (≥12 months duration) or multiple sclerosis (≥6 months duration). Mean age was 44 years, 74% were men.	Patients were randomized 1:1 to receive 50 mg mirabegron (Group A) or placebo (Group B) for 4 weeks.	**Primary outcomes:** Urodynamic parameters including cystometric capacity (CC), volume at the first detrusor contraction (VFDC), compliance (C), defined as the change in volume divided by the change in the detrusor pressure during filling, and the maximal detrusor pressure (pdetmax), defined as the maximum value of detrusor pressure during filling, severity of incontinence, determined using the 24 h pad-weight test (24PWT), performed on	From baseline to end of treatment, there was no significant difference in the mean difference in CC (mL), pdetmax (cmH2O), 24PWT (mL) or PPBC scores within, or between groups. There was significant improvement in mean VFDC (mL) and TS-VAS in Group A, but not Group B. The difference between groups was significant, favouring Group A. From baseline to end of treatment, there was no significant improvement in either group in the mean difference in C (mL/1 cmH2O) or I-QoL scores, although the difference between groups was significant, favouring Group A. There was a single study-drug-related adverse event (not specified).

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				3 consecutive days, The Patient Perception of Bladder Condition (PPBC), I-QoL questionnaire (I-QoL), and Treatment Satisfaction-Visual Analog Scale (TS-VAS)	
Amarenco et al. 2017 **France** **RCT** ***Solifenacin (SONIC)***	CA: ☒ Blinding: Patient ☑ Assessor ☑ ITT: ☒	189 persons from 32 sites (11 countries) were recruited with neurogenic detrusor overactivity secondary to spinal cord injury or multiple sclerosis. Mean age was 44 years, 50.3% were men.	Participants were randomized 1:1:1:1 to receive active treatment with 5 or 10 mg solifenacin or 15 mg oxybutynin vs. placebo for 4 weeks, following a 2-week run-in period. The primary analysis compared 10 mg solifenacin mg vs. placebo.	**Primary outcome:** Maximum cystometric capacity (MCC) **Secondary outcomes:** Urodynamic variables, micturition diary variables, patient perception of bladder condition (PPBC), Quality of Life (I-QoL), visual analogue scale to rate treatment and satisfaction [VAS-TS] Outcomes were assessed at baseline (after run-in) and end of treatment.	*Solifenacin mg vs. placebo* The mean increase in mean MCC from baseline was significantly greater in the solifenacin group (134.2 mL vs. 5.41 mL, p<0.001). There was significantly greater improvement in all the urodynamic variables (bladder volume at first involuntary contraction, detrusor pressure at first leak, bladder volume at first leak, and maximal detrusor pressure) and in the number of daily incontinence episodes in the solifenacin group. Improvements in the number of natural daily micturitions. and the need for daily catheterizations, were similar between groups. There was significantly greater improvement in PPBC score and VAS-TS in the solifenacin group. There was no significant difference between groups in the change in mean total I-QoL scores between groups. Compared with placebo, all other treatments were associated with significantly greater improvements in the primary outcome. The incidence of adverse events was low.
Jiang et al. 2014 **Taiwan** **Retrospective study**	NA	40 patients >60 years with overactive bladder (OAB) due to stroke (n=23), Parkinson's Disease (n=9), and dementia (n=8) +/- urinary incontinence,	100 IU Onabotulinumtoxin A was injected into the bladder suburothelium at 20 sites.	**Primary outcome:** Urgency Severity Score (USS) graded from 0-4, (verified using a 3-day voiding diary. An improvement in USS ≥1 was considered	There was significant improvement in mean USS scores in both groups from baseline to 3 months, from 3.72 to 2.83 in the CNS lesion group and 3.68 to 2.70 in the control group; however, the improvement was not significant in the stroke subgroup (from 3.57 to 3.0, p=0.103).

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
		which was refractory to previous behavioral modification and antimuscarinic therapy for >3 months. Mean age was 75 years. Sex breakdown was not reported. 160 patients with OAB, but without CNS lesions served as a control group. Mean age was 74 years.		successful treatment. **Secondary outcomes:** Urgency Urinary Incontinence (UUI), maximum flow rate (Qmax), detrusor pressure at Qmax (Pdet.Qmax), post-void residual (PVR) Outcomes were assessed as baseline and 3 months.	There was significant improvement in mean UI/3 days in both groups from baseline to 3 months, from 12.4 to 4.25 in the CNS lesion group and 19.3 to 10.7 in the control group. The improvement in the stroke subgroup barely reached significance. (from 13.5 to 5.67, p=0.05). There was no significant improvement in either group in mean Pdet.Qmax (cmH2O) or Qmax (mL/s). There was a significant increase in mean PVR in both groups (from 47.9 to 157 mL in the CNS lesion group and from 41.4 mL to 120 mL in the control group). In the stroke subgroup, mean PVR increased from 56.5 mL to 169 mL, p=0.002). In the stroke subgroup, there were 4 cases of acute urinary retention, 12 cases of PVR>150 mL, which were not significantly higher than the control group. Patients with stroke had a higher frequency of straining to void (73.9% vs. 50%).

Management of Bowel Incontinence

	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Todd al. 2024 **UK** **Cochrane review**	Risk of bias was generally low or uncertain among the 7 domains assessed using the Cochrane RoB tool. Risk of bias	25 RCTs including 1,598 participants with central neurological disease or injury including spinal cord injury (SCI, n=7), Parkinson's Disease (PD, n=8), stroke (n=5), MS (n=2), and miscellaneous conditions (n=3), and with constipation or fecal incontinence.	Trials were sought that evaluated treatments for the management of fecal incontinence and constipation. Interventions included 13 trials of conservative treatments (probiotics or prebiotics, a stepwise protocol of increasingly invasive methods from massage to manual	**Primary outcomes:** Self-reported improvements in bowel symptoms (constipation and incontinence), Neurogenic Bowel Dysfunction (NBD) Score **Secondary outcomes:** Number of incontinence	*Conservative interventions vs. no active treatment, placebo or usual care* Conservative interventions (nursing interventions) were associated with a significantly reduced risk of fecal incontinence (SMD=-1.85, 95% CI -3.47 to -0.23, 3 RCTs, n=405; GRADE: low). Conservative interventions (probiotics, nursing interventions, individual cognitive function training, FMT, bowel and posture training) were associated with improvements in symptoms of constipation.

	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
	was highest for blinding of participants and selective reporting.		evacuation, nursing interventions, psyllium, bowel training and posture, and fecal microbiota transplantation (FMT). 12 trials evaluated physical therapies (massage, visceral manipulation, electrical stimulation, standing, and transanal irrigation). The comparator in all trials was no active treatment, placebo or usual care. Trials of surgical interventions were also sought but no trials were identified.	and constipation episodes per week, time spent per week on bowel care, condition-specific quality of life measures	Although no pooled analysis was conducted, there was some improvement in all individual trials. No trials reported NDB scores. Evidence from 4 trials suggested that conservative interventions may result in little to no difference in condition-specific quality of life, although no pooled analysis was conducted. Conservative interventions may result in a reduction in time spent on bowel care, based on the results from 5 trials. *Physical therapies vs. no active treatment, placebo or usual care* Transanal irrigation (vs. usual bowel programme) and standing interventions were associated with a decrease in fecal incontinence scores (MD=-2.60, 95% CI -4.91 to -0.29, 3 trials, n=155; GRADE: low). Physical therapies (abdominal massage, standing intervention, transanal irrigation, osteopathic manipulative treatment) were associated with a significant reduction in constipation symptoms (SMD=0.62, 95% CI -1.10 to -0.14, 9 trials, n=431; GRADE: low) and significant improvement in NDB scores (MD=-1.94, 95% CI -3.36 to -0.51, 7 trials, n=358; GRADE: low). No pooled analysis was conducted for reduction in time spent on bowel care. The evidence from individual trials varied (no effect, time increased and time decreased). Based on the results from 3 trials, the evidence is very uncertain about the effect of physical therapies on condition-specific quality of life.

	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Omar et al. 2013 **UK** **Cochrane review**	70% of trials were at high risk of attrition bias, 10% of trials failed to blind patients and outcome assessors, and in 25% of trials, bias was present due to the potential of carry-over effects	16 RCTs (11 crossover) including 558 participants with fecal incontinence. Medical conditions included those who had previously undergone restorative proctocolectomy (n=5), and rectal cancer (n=1). Persons with fecal incontinence associated with other causes or conditions included persons with passive fecal incontinence (n=2), fecal incontinence associated with fecal impaction (n=1), geriatric patients (not specified), and other causes.	Treatments evaluated were anti-diarrheal drugs including loperamide vs. placebo (n=2), 2 routes of administration of loperamide (oral vs. suppository, n=2), loperamide oxide vs. placebo (n=1), diphenoxylate plus atropine vs. placebo (n=1), and loperamide vs. codeine vs. diphenoxylate plus atropine (n=1). 7 trials evaluated drugs enhancing anal sphincter function including phenylepinephrine gel vs. placebo (n=5), sodium valproate (n=1) and zinc-aluminum ointment vs. placebo (n=1). All trials were of short duration.	**Primary outcomes:** Reduction in symptoms **Secondary outcomes:** Fecal urgency, frequency of defecation, stool weight or consistency, incontinence scores, adverse events, and satisfaction with treatment	No pooled analyses were conducted. 7 trials compared anti-diarrheal drugs vs. placebo to reduce fecal incontinence and other bowel symptoms (loperamide [n=3], diphenoxylate plus atropine [n=1], and codeine [n=0]). In these trials, patients in the drug groups fared better than those in the placebo groups, with more people achieving full continence, or reported improvement in their incontinence symptoms. More adverse events (constipation, abdominal pain, diarrhea, headache, and nausea) were reported in the drug group in 2 trials. 6 trials compared drugs that enhance anal sphincter function vs, placebo (phenylepinephrine gel [n=5] and sodium valproate [n=1]). In these trials, patients in the drug groups fared better than those in the placebo group, with more people achieving full continence, or reported improvement in their incontinence symptoms. In one trial, zinc-aluminum ointment was found to improve mean Fecal Incontinence Quality of Life (FIQL) scores significantly more compared with the placebo group. In one trial, lactulose was found to reduce nursing time related to bowel function in geriatric nursing home residents, compared to no treatment. 4 trials compared one drug vs. ≥1 drug or different dose. Diphenoxylate was found to be inferior to loperamide and codeine in reducing the number of episodes of fecal incontinence. In one trial, the number of episodes of fecal incontinence and soiled laundry did not differ significantly among 2 treatment groups (lactulose vs. lactulose + a rectal stimulant with weekly enemas. In 2 trials, oral

	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					loperamide was better than rectal administration by suppository in reducing stool frequency).
Harari et al. 2004 **UK** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☒ ITT: ☒	146 stroke patients with constipation or fecal incontinence (122 community, 24 stroke rehabilitation inpatients). Mean age was 72 years, 41% female. The average time from stroke onset to study entry was 2 years.	Patients were randomized to an intervention (n=73) or routine care group (n=73). The intervention consisted of a 1-time nursing assessment (history and rectal examination), followed by patient/carer education (booklet) and provision of diagnostic summary and treatment recommendations to the patient's general practitioner.	**Primary outcome:** Number of bowel movements (BM)/week. **Secondary outcomes:** Percentage of BM graded as normal by the patient, episodes of fecal incontinence. Assessments were conducted at 1, 3, 6, and 12 month, using postal prospective 7-day stool diaries.	The mean number of BMs/week was significantly higher in the intervention group at 1 month (5.5 vs. 4.1, p=0.011) and 6 months (5.2 vs. 3.6, p=0.005). There were no differences between groups on any of the other outcomes, at any of the assessment points. Persons in the intervention group had an average of 5 episodes of FI at 1 and 6 months, compared with 12 and 6 episodes, respectively among persons in the control group.

Abbreviations

CA: concealed allocation	CI: confidence interval	ITT: intention-to-treat
NA: not assessed	mRS: modified Rankin Scale	MoCA: Montreal Cognitive Assessment
OR: odds ratio	PEDro: Physiotherapy Evidence Database	RR: relative risk
SMD: standardized mean difference	UTI: urinary tract infection	

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