Author Year; Country Score Research Design Total Sample Size	Methods	Outcome
Korsten et al. 2004 USA RCT Level 1 (PEDro = 6) N=8	**Objective:** Assess colonic motor activity using a solid-state manometry probe **Population**: 8 male participants (6 tetraplegia; 2 paraplegia); age mean(SD): 48(14)yrs; duration of injury mean(SD):13(8)yrs. **Treatment:** An abdominal belt with embedded electrodes was wrapped around at the umbilicus level and was used in conjunction with the participant's regular bowel care but activation of the device was randomized. Participants used the belt for six bowel care sessions over 2 weeks (the belt was activated for three sessions and deactivated for three sessions). **Outcome Measures:** Time to first stool, time for total bowel care.	1. Time to first stool and time for total bowel care were significantly shortened in the 6 participants with tetraplegia ($p<0.01$), but not in the 2 participants with paraplegia ($p=0.02$).
Hascakova-Bartova et al. 2008 Belgium Prospective controlled trial Level 2 N=10	**Objective:** The effect of abdominal neuromuscular electrical stimulation (NMES) in patients with spinal cord injury. The principal parameters observed in this study are lung capacity, colonic transit, patient satisfaction of used method and of aesthetics effect on abdominal wall. **Population:** 7 participants in the electrical stimulation	1. Accelerated colonic transit (ascending, transverse, and descending colon) in all participants who received treatment. The ESG group had a significant decrease in % of number of markers in the ascending, transverse, and descending colon after the NMES treatment (8.86 +/- 8.65% markers before NMES vs. 4.57 +/- 5.99% after NMES).

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	group (ESG) with level of injury ≥ T10 and complete paralysis of abdominal muscles (6M 1F; mean (SD) age: 42(19) yrs). 3 additional participants (all male, ages 25, 43, 63) were in the placebo group (PG). **Treatment:** Surface abdominal neuromuscular electrical stimulation. administered 25 min/day, 5 days/wk, for 8 wks **Outcome Measures:** colonic transit measured by radiopaque markers	2. No significant changes in the colonic transit for PG (% number of markers in the A+T+D colon: before NMES = 9.17 +/- 5.91 vs. 9.17 +/- 5.04).
Tsai et al. 2009 Taiwan Pre-post Level 4 N=22	**Objective:** The aims of this study were to assess the usefulness of functional magnetic stimulation in controlling neurogenic bowel dysfunction in spinal cord injured patients with supraconal and conal/caudal lesions, and to investigate the efficacy of this regimen with a 3-month follow-up. **Population:** 22 chronic SCI participants with intractable neurogenic bowel dysfunction (19M, 3F), mean age 46.7 yrs, range 22–65yrs); divided into group 1 (supraconal lesion, N=15) and group 2 (incomplete conal/caudal lesion, N=7) **Treatment:** Participants underwent a	1. Mean colonic transit times decreased from 62.6 hrs to 50.4 hrs. 2. Frequency of laxative use, unsuccessful evacuation attempts, feeling of incomplete defecation, difficulty with evacuation, and time taken to evacuate significantly decreased. 3. Mean scores on the KESS significantly decreased from 24.5 to 19.2 points, indicating a significant overall improvement in bowel symptoms.

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	3-week stimulation period, consisting of 20-min stimulation sessions twice a day. Each session contained 10 min of thoracic nerve stimulation with the centre of the coil placed at the T9 spinal process, and another 10 min of lumbosacral nerve stimulation with the coil at the L3 spinal process. Participants underwent stimulation from a sitting position. The stimulation intensities were set at 50% on the first day, 60% on the second day, and then stabilized at 70% for the remaining days. The stimulation frequency, burst length, and interburst intervals were fixed at 20 Hz, 2 sec, and 28 sec, respectively. **Outcome Measures:** Colonic transit times; Knowles-Eccersley-Scott Symptom Questionnaire (KESS, evaluates frequency of bowel movement using existing therapy, difficulty of evacuation, laxative use, and time taken for bowel evacuation)	
Lin et al. 2001 USA Pre-post Level 4 N=15	**Objective:** To evaluate the usefulness of functional magnetic stimulation (FMS) as a noninvasive method to stimulate the colon in	1. Rectal pressures increased with sacrolumbar stimulation, and with transabdominal stimulation.

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	individuals with spinal cord injury (SCI). **Population:** 13 SCI, 2 non-SCI controls; Level of injury: C3-L1; Duration of injury 11-35 yrs (protocol 2 only); AIS classes: 7 A, 3 B, 1 C. **Treatment**: FMS was delivered via a magnetic coil placed on the trans-abdominal (suprapubic region while participants lay supine) and lumbosacral (L3-L4 along midline) regions. Protocol 1: measured the immediate effects of FMS on rectal pressure Protocol 2: measured the effects of FMS on total and segmental colonic transit times after a 5-week stimulation period (20 min sessions twice a day). Outcomes were collected before and after the 5-wk stimulation program. **Outcome Measures:** rectal pressure, total and segmental colonic transit times	2. After protocol 2, the mean (SD) colonic transit times decreased from 105.2(6.66) to 89.4(6.94) hours.
Lin et al. 2002 USA Pre-post Level 4 N=9	**Objective:** To evaluate the effect of functional magnetic stimulation (FMS) on gastric emptying in able-bodied and spinal cord injury (SCI) subjects. **Population:** 4 participants with SCI between C3-C7, AIS class: 3 B,1 D; 5 controls, mean (SD) age:	1. Gastric emptying time post-stimulation was significantly shorter than the baseline for both AB and SCI groups. Mean (SE) $GE_{t1/2}$ for the groups were: AB: baseline= 36(2.9); post-stim=33(3.1) SCI: baseline=84(11.1); post-stim=59(12.7). 2. There was significantly more

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	42(5.8) yrs **Treatment:** Each individual participated in a 3-day protocol; day 1: baseline gastric emptying study, day 2: no change in the eating pattern and no intervention, day 3: participants received functional magnetic stimulation (FMS) while undergoing a second gastric emptying study. **Outcome Measure:** Rate of gastric emptying and time to reach gastric emptying half time ($GEt_{1/2}$)	gastric emptying at 30, 60, 90 and 120 min after FMS than at baseline. For the SCI group, % of gastric emptying at 30, 60, 90 and 120 min were: - baseline: 6(2.9); 16(7.6); 38(5.2); 55(6.7) - post-stim: 26(8); 49(10.2); 61(9); 69(8.6).
Worsoe et al. 2012 Denmark Pre-post Level 4 N=7	**Objective:** To study the effect of acute DGN stimulation on the rectal cross sectional area (CSA) in SCI patients. **Population:** Participants with supraconal SCI (6M, 1F); Age: median (range) age: 50 (39-67); median (range) DOI: 19 (12-33). **Treatment:** Dorsal genital nerve (DGN) stimulation using an amplitude of twice the genito-anal reflex threshold. A pressure controlled phasic rectal distension protocol was repeated 4 times with participants randomized to stimulation during 1st and 3rd distension series or 2nd and 4th distension series.	1. Median rectal CSA was smaller with than without stimulation in all patients at 20cmH_2O distension pressure (median decrease of 9%) and in 6/7 patients at 30cmH_2O distension pressure (median decrease 4%) above resting rectal pressure. 2. Rectal pressure-CSA relation was significantly reduced during stimulation at 20cmH_2O and 30cmH_2O distension.

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	Outcome Measures: Rectal cross-sectional area (CSA) and rectal pressure	

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Parittotokkaporn et al. 2020 New Zealand Systematic review N=46 studies	**Objective:** To perform a systematic literature review of clinical studies investigating the use of non-invasive neuromodulation in restoring bowel, bladder and sexual functions following SCI **Methods:** The review was designed using the PRISMA checklist and eligible studies included a clinical design based on human populations, participants over 18 years old with SCI, non-invasive neuromodulation/stimulation as the intervention, and diagnostic criteria of neurogenic bowel/bladder dysfunction **Databases:** PubMed/Medline, EMBASE, Web of Science, Scopus and Cochrane databases, with reference lists from previous publications	1. 43/46 studies reported improvements in bowel (5/5), bladder (32/35) and sexual dysfunction (6/6) in people with SCI. 2. For people with SCI, an increase in rectal pressure at application and a decrease in colonic transit the following few weeks was observed in studies that applied acute functional magnetic stimulation (Lin et al. 2001; Morren et al. 2001; Tsai et al. 2009).
Deng et al. 2018 Systematic Review	**Objective:** To perform a systematic review of the clinical trial evidence on electrical	**1.** Majority of studies reported that electrical stimulation was

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China N=11 studies	stimulation for the treatment of neurogenic bowel dysfunction (NBD) after spinal cord injury (SCI). **Methods:** Systematic literature search of studies limited to English/Chinese which had a controlled clinical design based on human population, people with SCI, disorders of bowel function as the main outcome, and electrical stimulation as the intervention. **Databases:** PubMed/Medline, EMBASE, Cochrane Central Register of Controlled Trials, and China National Knowledge Infrastructure databases, and the reference lists in the included studies	safe and effective for people with NBD after SCI. **2.** Many reported it was noninvasive approach that was easy to use. **3.** Most studies reported that fecal incontinence episodes decreased.
Worsoe et al. 2013 Denmark Systematically reviewed articles from databases listed to the right (dates searched not listed) Number of studies not listed Level of evidence: methodological	**Objective:** Review NBD treated by sacral anterior root stimulation (SARS), sacral nerve stimulation (SNS), peripheral nerve stimulation, magnetic stimulation, and nerve re-routing **Method:** Systematic literature search of neurogenic bowel disorder in patients with SCI treated by sacral anterior root stimulation (SARS), sacral nerve stimulation (SNS), peripheral nerve stimulation, magnetic stimulation, and nerve rerouting. **Databases:** PubMed, Embase, Scopus, Cochrane Library	1. SARS improves bowel function in some patients with complete SCI. 2. Nerve re-routing may facilitate defecation through mechanical stimulation of dermatomes in patients with complete or incomplete SCI or myelomeningocele. 3. SNS can reduce NBD in selected patients with a variety of incomplete neurologic lesions. 4. Peripheral stimulation using electrical stimulation or magnetic stimulation may present non-invasive alternatives.

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quality not assessed Type of study: No RCTs, all lower-level studies AMSTAR: 2		