Table 2. Non-pharmacologic Treatment of Neurogenic Bladder

<table>
<thead>
<tr>
<th>BEHAVIORAL</th>
<th>TECHNIQUES TO FACILITATE BLADDER EMPTYING</th>
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<tbody>
<tr>
<td>Fluid and caffeine regulation, Timed voiding</td>
<td>Adjust fluid intake if catheterized volumes &gt; 500 mL. Adapted to patient’s voiding diary, fluid intake, PVRs, and urodynamics parameters.</td>
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**Triggered Reflex Voiding**

- Crede (bladder compression) and Valsalva (abdominal straining): Not recommended when DSD present: Risks high bladder pressures. Avoid in reflux, urethral pathology and UTI. Consider in lower motor neuron injuries (areflexic bladders) or those who had sphincterotomy.

- Reflex voiding: Can generate unacceptably high bladder pressures. Needs hand skills or willing caregiver to apply collecting device.

**Catheterization**

- Intermittent catheterization: Safe and effective; perform 4-6 x/day with goal catheterized volumes < 500 mL. Needs sufficient hand skills or willing caregiver. Avoid in urethral pathology; high fluid intake regimen; bladder capacity < 200 mL; development of AD with bladder filling in spite of treatment; poor cognition, motivation, and compliance.

- Indwelling catheterization: Consider in patients with poor hand skills, high fluid intake, cognitive impairments, elevated detrusor pressures, or need for temporary management of vesicoureteral reflux.
  1. Transurethral: Use if no blockade or urethral/bladder neck erosion.
  2. Suprapubic catheter: Use if urethral pathology/catheter obstruction is present or for difficult catheter insertion.

**EXTERNAL APPLIANCES**

- Condom catheters, incontinence underwear and pads: Use to achieve social continence.

**SURGICAL**

- Endourethral stents or transurethral sphincterotomy: For patients with DSD who void reflexively, have insufficient hand skills or lack caregiver assistance to perform intermittent catheterization. Patients rely on external catheter for continence.

- Bladder augmentation: Patients with overactive small capacity detrusor.

- Urinary diversion (example: ileovesicostomy): Consider if other methods are not feasible or failure of all other treatment. Usually necessitates an external collecting device.

- Electric sacral stimulation (usually performed with selective sacral rhizotomy): Electrical stimulation causes bladder contraction. Consider in patients with bladder retention and overactive bladder who have failed other treatment.

**OTHER PROCEDURES**

- Injections: Botulinum Toxin Type A: For overactive bladder/detrusor overactivity, sometime also used for overactive sphincters.

- Neuromodulation:
  1. Percutaneous tibial nerve stimulation (PTNS): Stimulation of the posterior tibial nerve inhibits detrusor activity.
  2. Transcutaneous tibial nerve stimulation (TTNS): Minimally invasive, useful in medically refractory overactive bladder.
  3. Transcutaneous electrical spinal cord neuromodulator (TESCoN): Stimulation of the dorsal surface or dorsal roots of the spinal cord promoted detrusor storage and voiding. The efficacy of this device is being studied in SCI.