Canadian Urological Association
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Canadian Urological Association Clinical Practice Guideline on Pediatric Patients with Neurogenic Lower Urinary Tract Dysfunction

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on behalf of Pediatric Urologist of Canada

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Disclosure

Introduction

- **Neurogenic lower urinary tract dysfunction** (NLUTD)
  - abnormal function of the bladder, bladder neck, and/or sphincters associated with any neurologic disorder
- Congenital pediatric NLUTD is mainly caused by spinal dysraphism (**commonly spina bifida**)
- Pediatric NLUTD is **increasingly prevalent** in Canada
  - Neural Tube Defects increased from 3.6 in 2004 to 4.6 per 10,000 in 2015.
  - SB was the only NTD subtype with an increasing prevalence over time
- Pediatric NLUTD are at risk for
  - **Recurrent urinary tract infections** (UTI)
  - Upper tract damage leading to **chronic kidney disease**

Purpose and Scope

- **Evidence-based recommendations** for the diagnosis, management, and treatment aims to **optimize the management** of pediatric NLUTD.
- **Target readers** : pediatric urologists, general urologists, pediatricians, and allied health professionals.
- The definition, terminology, and classification of NLUTD
  - prior CUA clinical practice guidelines on adult patients with NLUTD
  - adapted from the International Continence Society (ICS)
  - pediatric NLUTD-specific descriptions (ICCS 2016)

Definitions and Terminologies

Table 1. Indicators of NLUTD patient characteristics potentially at higher risk of urological morbidity

Basis of high-risk diagnoses	Features of bladder hostility
Etiology of neurogenic bladder	Spinal cord injury (SCI), spina bifida, advanced multiple sclerosis, SCI patients with autonomic dysreflexia associated with bladder function
Bladder management method	Valsalva/crede/reflexive bladder emptying, indwelling catheter
Video Urodynamics (VUDS) or urodynamics + voiding cystourethrogram (VCUG)	Detrusor Sphincter Dyssynergia (DSD), Neurogenic Detrusor Overactivity (NDO), impaired compliance (<20 mL/ cmH2O), Detrusor Leak Point Pressure (DLPP) >40 cmH2O), vesicoureteral reflux (VUR), trabeculated irregular bladder wall on VUDS/ VCUG
Renal-bladder imaging	New-onset/worsening hydronephrosis, stone disease, renal atrophy/scarring, abnormal bladder morphology
Renal function	New-onset/worsening renal insufficiency

Additional Definitions and Terminologies

Detrusor overactivity is the occurrence of involuntary detrusor contractions during filling cystometry.

Detrusor underactivity denotes a voiding contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or a failure to achieve complete emptying within a normal time span.

Compliance is calculated by dividing the volume change (ΔV) by the change in detrusor pressure (ΔPdet) during that change in bladder volume (C= ΔV/ΔPdet). Compliance is expressed as ml per cm H_2O.

High DLPP (e.g., >40 cmH_2O) is associated with reduced bladder muscle compliance and poses risk for upper urinary tract deterioration.

DSD is discoordination between detrusor and external urethral sphincter muscles during voiding (i.e., detrusor contraction synchronous with contraction of the urethral and/or periurethral striated muscles).

--Adopted from Kavanagh et al 2019 with permission (7); additional caveat definition from ICCS (9).

Methodology

- **CUA Guidelines Committee pre-approved** the pediatric NLUTD guideline methodology
  - ADAPTE approach
  - Critical appraisal of guidelines using AGREE II
  - Pediatric NLUTD guidelines up to March 2022, then an updated search on September 2022
- **Top three guidelines** identified were NICE, SBA, and Irish guidelines
  - appraisal of the guidelines and consolidation of the key recommendation statements
  - Stakeholders involvement
- **De novo literature search** on Medline-indexed peer-reviewed publications
  - **Up to April 2023**
- **Modified Delphi methodology**
  - Consensus within the author group
  - **PUC members** : response rate of at least 60%

Level of evidence (LoE)
Grade of Recommendation (GoR)

International Consultation on Urologic Diseases (ICUD)/WHO-modified Oxford Center for Evidence-Based Medicine grading system

Modified GRADE methodology

- Prior CUA guideline formulation

The strength of each recommendation

- Represented by the words STRONG or WEAK

Antenatal Period management

- Clinicians should **convey information** about the medical care and lifelong functional impact of SB in an evidence-based, collaborative manner while seeking from families an understanding of their needs, values, and beliefs.
- Clinicians should **review evidence-based treatment options** with the family, including fetal surgery.
- Clinicians should offer families the opportunity to **meet with key members of the SB team**.

Level of evidence III- IV,

Strong Recommendation based on available evidence and best practice

Multidisciplinary Spina Bifida (MDT) service/ clinic

- Children with NLUTD should be reviewed **at least annually** at the MDT Spina Bifida clinic.
- A fully-staffed MDT Spina Bifida clinic ideally consists of the following **key professionals**: neurosurgeon, urologist, orthopedic surgeon, Spina Bifida Nurse Specialist, advanced nurse practitioner, pediatrician, social worker, physiotherapist, and occupational therapist. Other healthcare professionals of benefit may include a dietitian.

Level of evidence III-IV,

Strong recommendation based on evidence reports and best practice

History and physical examination

Table 2. Clinical history and physical examination
a. urinary tract symptoms, such as symptomatic urinary tract infections, bladder management and condition (including bladder diary or frequency/volume chart)
b. neurological symptoms and diagnosis (if known)
c. clinical course of the neurological disease
d. bowel symptoms and management
e. sexual function in adolescent patients
f. comorbidities
g. use of prescription and other medication and therapies
h. mobility hand function
i. cognitive function
j. social support
k. lifestyle
l. measuring blood pressure
m. an abdominal examination
n. an external genitalia examination
o. a vaginal or rectal examination if clinically indicated (for example, to look for evidence of fecal loading or alterations in anal tone).

-When assessing lower urinary tract dysfunction in patients with pediatric NLUTD, **clinicians should take a clinical history and physical examination**, including information detailed in Table 2.

Renal and bladder ultrasound

- For children **with NLUTD** or at **high-risk of developing NLUTD**
  - **Baseline** renal/bladder ultrasound, **within three months of birth** and **repeat in six months**.

- For children with NLUTD,
  - **Every six months** when the child is under the age of two.

- Above 2 years of age
  - **yearly** if the child is stable, without UTIs nor imaging changes.

- As needed,
  - **Recurring symptomatic UTIs** or if urodynamic testing identifies **bladder hostility**.

Level of evidence II-III,

Strong Recommendation based on evidence report and current best practice

Assessment of renal function

- Obtain **a baseline serum creatinine within three months** of birth and repeat as clinically indicated

- Obtain **a serum creatinine test when a child with NLUTD is between 1 -5 years** old

- At **five years old**. Thereafter, **a serum creatinine test yearly**

- Low muscle mass, consider an alternative measure such as **cystatin C or nuclear studies**.

- Only order **DMSA scans** in infants
  - Febrile UTI & Vesicoureteral reflux

Level of evidence II-III,

Strong Recommendation based on evidence and current best practice

Urodynamic studies

- B**aseline video urodynamic (or Urodynamic + VCUG)** testing **within 3 to 12 months**.
- **Annually until the child is 3 years old**
- **Between the ages of 3-5 years old**, only if the following are present:
  - Upper tract changes
  - Recurring UTIs
  - Patient and family's interest in beginning a urinary continence program
- **Over the age of 5 years old**
  - when initiating a urinary continence program, or if the following are present:
  - Hydronephrosis or renal scarring, recurring symptomatic UTIs, changes in urinary continence status

Level of evidence II-III,

Weak Recommendation based on evidence and current best practice

Clean Intermittent Catheterization (CIC)

- **Initiate CIC** and antimuscarinic therapy
  - bladder hostility when indicated
- **Age of 3 or older**
  - Re-evaluate and initiate CIC and antimuscarinic therapy when indicated

  - *Level of evidence II-III,*
  - *Strong Recommendation based on evidence*

Antibiotic prophylaxis

- **Not routinely** use antibiotic prophylaxis

- Consider using antibiotic prophylaxis for **recurrent or severe urinary tract infections** within the last 3-6 months.

- Consider antibiotic prophylaxis for history of symptomatic UTI **after catheter change or experience trauma during catheterization**.

Level of evidence II-

Strong Recommendations based on evidence

Anticholinergics

- Offer antimuscarinic with symptoms of an overactive bladder

  - such as increased frequency, urgency, and incontinence.

- Consider antimuscarinic drug treatment **conditions affecting the brain** (i.e., cerebral palsy) and symptoms of an overactive bladder.

- Consider antimuscarinic drug treatment in urodynamic investigations showing **impaired bladder storage** (NDO and poor compliance).

- Should **monitor residual urine volume** who are not using intermittent or indwelling catheterization

Level of evidence II-III,

Strong Recommendation on evidence and current best practice

Botulinum toxin injection

Should consider in:

- with **spinal cord disease** and symptoms of an **overactive bladder**

- antimuscarinic drugs have proved **ineffective or poorly tolerated**

- urodynamic investigations showing **impaired bladder storage**

Level of evidence II-III,

Strong Recommendation based on evidence

Surgical Management

- **Vesicostomy**
  - with high-grade reflux and recurrent febrile UTI to protect the upper tract
- **Continent catheterizable channel**
  - to select school-aged or all adolescent NLUTD who have difficulties performing CICs via the urethra

Level of evidence III-IV,

Weak Recommendation on evidence and current best practice

Surgical Management

- **Augmentation cystoplasty**
  - with nonprogressive neurological disorders and complications of impaired bladder storage (for example, hydronephrosis or incontinence)
  - only after a thorough clinical and urodynamic assessment and discussion

Level of evidence III-IV,

Weak Recommendation on evidence and current best practice

Surgical Management

- **Slings, bulking agents, and artificial urinary sphincters (AUS)**
  - For neurogenic stress incontinence

- **Antegrade Continence Enema (ACE) or Cecostomy tube**
  - severe constipation who have failed dietary changes, oral laxatives, rectal therapy, and transanal irrigations

Level of evidence III-IV,

Weak Recommendation on evidence and current best practice

Lifelong follow-up and Transitional care

Follow-up monitoring and surveillance protocols

Transitional Care

- Should be offered to promote access to uninterrupted, developmentally appropriate SB condition management and preventative care throughout transition – **around ages 14–21 years old**.

Level of evidence III-IV,

Strong Recommendation based on evidence and best practice

Future Considerations

- Beta-3 agonist
- α-Adrenergic antagonists
- Neurostimulation
- Intrasphincteric Botulinum toxin Injection

Thank You

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