

ist librarians performed the initial search on relevant pediatric NLUTD guidelines up to March 2022, then an updated search on September 2022. The search included both 'Medical Subject Heading (MeSH)' and 'free text' protocols, focusing on four broad concepts: 1) neurogenic bladder; 2) pediatrics; 3) diagnosis and treatment; and (4) guidelines. References were selected if they contained at least one term from each concept.

Electronic databases searched included EMBASE, Google Scholar, MEDLINE, AAP, CPS, and NICE. Five reviewers conducted an initial screening of search records, followed by a full-text assessment by three reviewers to determine eligibility. The selected guidelines were then appraised by a team of six reviewers using the AGREE II instrument, which consists of 23 items covering six domains. Ratings were given on a scale of 1–7, with 1 representing "strongly disagree" and 7 representing "strongly agree." Quality scores were calculated for each domain, and scores below 70 were considered low, while an average total score of 80 or higher was considered satisfactory.

The AGREE II appraisal results were published for the available guidelines specific to pediatric patients with NLUTD, which included: the National Institute for Health and Care Excellence (NICE), European Society for Pediatric Urology (ESPU), ICCS, Irish, Spina Bifida Association (SBA), and *International Brazilian Journal of Urology* guidelines. The top three guidelines identified based on domain scores were NICE, SBA, and Irish guidelines. The appraisal of the guidelines and consolidation of the key recommendation statements involved considering the expertise and perspective of all relevant stakeholders. In the process of evaluating the recommendation statements from the top three guidelines identified, evaluators included a general urologist, pediatrician, pediatric surgeon, pediatric urologists, adult reconstructive urologist, functional urologist, transitional care/adolescence specialist, pediatric nephrologist/medical urologist, and an advanced specialty nurse practitioner, as well a patient with NLUTD and their parents.¹²

The key recommendation statements were direct quotations and/or adaptations, with some modification from the referred guidelines. Additional modifications to key recommendation statements were congregated from a de novo literature search on Medline-indexed peer-reviewed publications up to April 2023. The key recommendation statements were also linked to the most recent evidence relevant to the topic. A consensus on the recommendations was formed using a two-round modified Delphi process. In the first round, the author group drafted recommendation statements based on key recommendations from the evaluated guidelines and specific recommendations tailored to

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	SCI, SB, advanced MS, SCI patients with autonomic dysreflexia associated with bladder function
Bladder management method	Valsalva/Credé/reflexive bladder emptying, indwelling catheter
VideoUrodynamics (VUDS) or urodynamics + voiding cystourethrogram (VCUG)	DSD, NDO, impaired compliance (cystometric bladder capacity/end filling pressure <20 mL/cmH ₂ O), DLPP >40 cmH ₂ O, 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 (ΔP_{det}) during that change in bladder volume ($C = \Delta V / \Delta P_{det}$). Compliance is expressed as mL per cmH₂O.
- High DLPP (e.g., >40 cmH₂O) is associated with reduced bladder muscle compliance and poses a risk for upper urinary tract deterioration.
- DSD is discoordination between the 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 2016.⁵ DLPP: detrusor leak point pressure; DSD: detrusor sphincter dyssynergia; MS: multiple sclerosis; NDO: neurogenic detrusor overactivity; NLUTD: neurogenic lower urinary tract dysfunction; SB: spina bifida; SCI: spinal cord injury; VCUG: urodynamics + voiding cystourethrogram; VUDS: video-urodynamics; VUR: vesicoureteral reflux.

the Canadian context. In the second round, the draft was shared with PUC members to obtain their agreement on the statements. A response rate of at least 60% among PUC members was achieved to ascertain the majority perspective.¹³

Level of evidence, grade of recommendation

The levels of evidence (LE) and grades of recommendation for this guideline employ the International Consultation on Urologic Diseases (ICUD)/WHO-modified Oxford Center for Evidence-Based Medicine grading system.¹⁴ In addition, based on a modified GRADE methodology from prior CUA guideline formulation, the strength of each recommendation is represented by the words STRONG or WEAK.¹⁵

RECOMMENDATIONS

A summary table and citation of the corresponding source of guideline adaptation were generated to facilitate better adaptation and clinical application of the key recommendation statements into practice (Table 2). Table 3 presents a summary of the investigations recommended for different age ranges in pediatric NLUTD, whereas Table 4 provides a brief overview of the considerations for surgical interventions in pediatric NLUTD.