Standardization of Pediatric Renal/Bladder Ultrasounds within a Large Group Practice

Rebecca M. Scalabrino, DO; Kyle J. Morris, MD; James Hogan, MD; Sharon Underberg-Davis, MD
Department of Radiology, Robert Wood Johnson University Hospital, New Brunswick, New Jersey

Background on the UTD Classification System[1]

Advances in medical imaging have allowed for increased prenatal/perinatal diagnosis of urinary tract dilation (UTD), resulting in a significant expenditure of healthcare resources devoted to the clinical management and continued surveillance of prenatal UTD. Prompt accurate diagnosis of significant uropathies is clinically indicated to prevent long-term complications such as scarring and diminished renal function secondary to recurrent urinary tract infections. However, most cases of prenatal/perinatal UTD are ultimately characterized as physiologic and transient.

The UTD classification system was designed to identify high risk patients, while avoiding unnecessary expenditure of finances and time spent on imaging/interpretation for low risk cases. In addition, it allowed for a unified description of UTD with consistent medical terminology. Ultrasound-specific criteria allowed simple yet detailed communication between ultrasound technologists, pediatric radiologists, general pediatricians, pediatric urologists, and neonatologists.

The goal of these ultrasound-specific metrics is to accurately predict which children will progress to a clinically significant uropathy and therefore benefit from repeat imaging/early intervention to avoid the development of complications. It also limits the expenditure of resources on patients with more physiologic/transient cases.

Stratification within the UTD classification system is based on the most concerning sonographic finding. The integral measurement is the AP renal pelvis diameter (APRPD: measured in millimeters at the hilum, in the transverse plane at the maximum diameter of the intrarenal pelvis in the prone position). The larger the APRPD, the more likely the patient's UTD is caused by an obstructive uropathy, the greater the risk of requiring postnatal intervention, and the lower the spontaneous resolution rate. The higher the UTD grade, the greater the risk for urinary tract infection, possibly necessitating the use of prophylactic antibiotics. A risk-based management chart was also created to stratify patients based on the UTD grading system into different categories of clinical management.

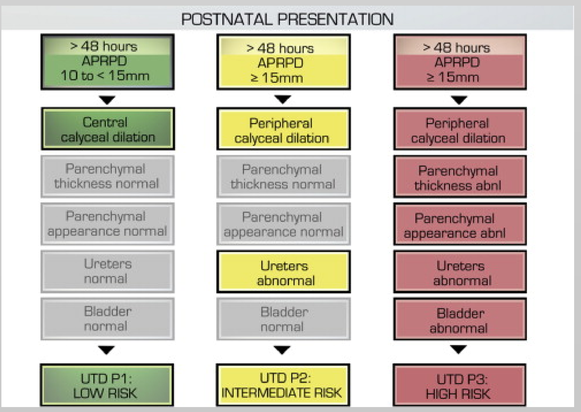


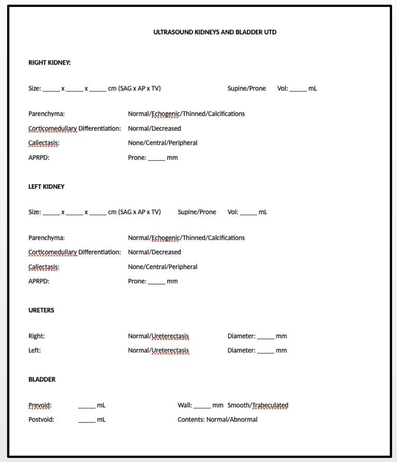
Figure 1: UTD Classification Algorithm[1]

Objectives

- Implement a structured ultrasound technologist worksheet and radiologist dictation template for pediatric renal/bladder ultrasounds in order to **standardize imaging parameters/descriptors** using metrics from an evidenced-based classification system.
- Calculate the percentage of ultrasound technologist worksheets and final dictations that included the aforementioned key metrics pre and post implementation (**inter-interpreter variability**).

Materials/Methods

- A team of pediatric radiologists and two diagnostic radiology residents reviewed the current literature on ultrasound imaging of the pediatric genitourinary system.
- Statistical analysis was performed to objectively measure current inter-interpreter variability within ultrasound technologist and attending radiologist pediatric renal/bladder ultrasound reports (81 pediatric renal/bladder ultrasounds performed at 5 affiliated sites within a 12 month period).
- After completion of data interpretation and resultant committee review, a new ultrasound technologist worksheet and dictation template were designed (Figures 2 and 3). Key features included the avoidance of nonspecific descriptors such as "hydronephrosis" and emphasis on detailing the severity of the UTD using empirically based sonographic findings (APRPD, degree of calyceal dilation, renal parenchymal thickness, renal parenchymal echogenicity, corticomedullary differentiation, ureteral dilation, bladder wall appearance, etc).
- Ultrasound technologists and radiology staff were briefed on the new guidelines and templates. A Power Point presentation summarizing the research and new materials was provided to essential staff, and also sent in an email for future reference.
- Subsequent data collection was performed approximately 9 months after implementation of the revised ultrasound technologist worksheet and dictation template (40 pediatric renal/bladder ultrasounds performed at the same 5 affiliated sites).



ULTRASOUND KIDNEYS AND BLADDER UTD

RIGHT KIDNEY:

Size: _____ x _____ x _____ cm (SAG x AP x TV) Supine/Prone Vol: _____ mL

Parenchyma: Normal/Echogenic/Thinned/Calcifications
Corticomedullary Differentiation: Normal/Decreased
Calectasis: None/Central/Peripheral
APRPD: Prone: _____ mm

LEFT KIDNEY

Size: _____ x _____ x _____ cm (SAG x AP x TV) Supine/Prone Vol: _____ mL

Parenchyma: Normal/Echogenic/Thinned/Calcifications
Corticomedullary Differentiation: Normal/Decreased
Calectasis: None/Central/Peripheral
APRPD: Prone: _____ mm

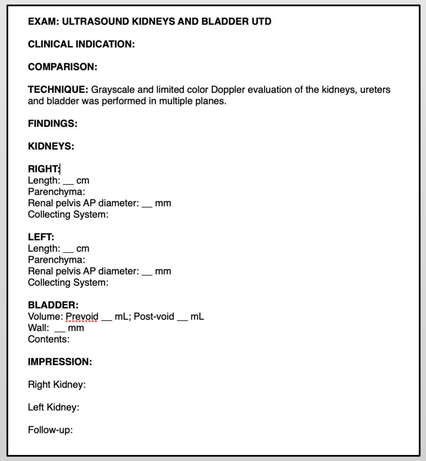
URETERS

Right: Normal/Ureterectasis Diameter: _____ mm
Left: Normal/Ureterectasis Diameter: _____ mm

BLADDER

Prevoid: _____ mL Wall: _____ mm Smooth/Trabeculated
Postvoid: _____ mL Contents: Normal/Abnormal

Figure 2: Technologist Worksheet for Pediatric Renal/Bladder Ultrasound



EXAM: ULTRASOUND KIDNEYS AND BLADDER UTD

CLINICAL INDICATION:

COMPARISON:

TECHNIQUE: Grayscale and limited color Doppler evaluation of the kidneys, ureters and bladder was performed in multiple planes.

FINDINGS:

KIDNEYS:

RIGHT:
Length: __ cm
Parenchyma:
Renal pelvis AP diameter: __ mm
Collecting System:

LEFT:
Length: __ cm
Parenchyma:
Renal pelvis AP diameter: __ mm
Collecting System:

BLADDER:
Volume: Prevoid __ mL; Post-void __ mL
Wall: __ mm
Contents:

IMPRESSION:

Right Kidney:

Left Kidney:

Follow-up:

Figure 3: Pediatric Renal/Bladder Dictation Template

Results

Following implementation of the novel standardized dictation template, there was a substantial increase in the percentage of finalized reports which included an accurately measured APRPD, as well as an appropriate description of UTD by the pediatric radiologists. A larger percentage of cases included appropriate prone and coronal images (see Table 1).

One unexpected finding during data analysis was the slight decrease in percentage of ultrasound technologists using appropriate descriptors of UTD post-implementation of the new technologist worksheet.

	Pre-Implementation	Post-Implementation
APRPD measurement included in final report	26%	97.5%
Accurate measurement of APRPD	86%	95%
Prone images obtained	63%	70%
Coronal images obtained	35%	55%
Post-void images obtained when possible	42%	100%
Appropriate description of UTD by ultrasound technologists	7%	0%
Appropriate description of UTD by pediatric radiologists	24%	75%

Table 1: Comparison of finalized pediatric renal/bladder ultrasound report measures pre and post implementation of a new standardized ultrasound technologist worksheet and dictation template. *For the purposes of this table, an appropriate description of UTD includes mention of pelviectasis and/or caliectasis as opposed to nonspecific descriptors such as "hydronephrosis" or "renal pelvic fullness".

Conclusion

In an effort to standardize interdisciplinary communication and decrease inter-interpreter variability, guidelines from a multidisciplinary consensus on the classification of prenatal and postnatal urinary tract dilation were implemented into the construction of a new pediatric renal/bladder ultrasound technologist worksheet and radiologist dictation template. Data analysis revealed a **statistically significant increase in the inclusion of standardized imaging parameters and terminology** among pediatric radiologists post-implementation. However, findings suggested more thorough and/or frequent education may be required for ultrasound technologists to improve consistency in descriptive terminology in the ultrasound technologist worksheets.

References

1. Nguyen HT, Benson CB, Bromley B et al. Multidisciplinary consensus on the classification of prenatal and postnatal urinary tract dilation (UTD classification system). J Pediatr Urol. 2014 Dec; 10(6): 982-98.