# Joint Guideline for the Postnatal Management of Antenatally Diagnosed Hydronephrosis

## A clinical guideline recommended for use

<table>
<thead>
<tr>
<th>For Use in:</th>
<th>NICU, Delivery Suite, Post-natal Wards and Paediatric Surgeons</th>
</tr>
</thead>
<tbody>
<tr>
<td>By:</td>
<td>Doctors, Midwives, Advanced Neonatal Nurse Practitioners, Radiologists / Sonographers and Paediatric Surgeons</td>
</tr>
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<td>Postnatal Management of Antenatally diagnosed Hydronephrosis</td>
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<td>Compliance links: (is there any NICE related to guidance)</td>
<td>None</td>
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<tr>
<td>If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?</td>
<td>N/A</td>
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This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes. The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document.
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**Fig 1:** Postnatal Pathway for Unilateral Hydronephrosis (check for antenatal counselling)

- **Unilateral Antenatal Hydronephrosis**
  - **Mild (PD 7-8mm)**
    - Prophylactic Trimethoprim
    - USS within 6 weeks
  - **Moderate (PD 9 to 15mm)/Severe (PD >15mm)**
    - Prophylactic Trimethoprim
    - USS within 4 weeks

**Postnatal Renal USS findings:** (If Hydroureter → for MCUG)

- **PD <15mm and no other abnormality & normal calyces:**
  - Stop prophylaxis
  - Discharge with advice to seek medical review if any suspected UTI

- **PD 15-20mm with no/mild calyceal dilatation**
  - MAG 3 & USS at 3 months

- **PD >20mm**
  - Obstruction/slow drainage → Ref to Paediatric Urology
  - MCUG/Repeat USS at 4-6 weeks
  - MAG3 at 3 months
  - Refer to Paediatric Urology
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Fig 2: Postnatal Pathway for Bilateral Hydronephrosis (check for antenatal counselling)

Bilateral Antenatal Hydronephrosis

Both PD <15mm

- Prophylactic oral Trimethoprim 2mg/kg
- If clinical well and PU with no palpable bladder, then: U&E prior to discharge
- Book USS within 6 weeks

Either PD ≥ 15mm

- Prophylactic oral Trimethoprim 2mg/kg
- If clinical well and PU with no palpable bladder, then: U&E prior to discharge
- Book USS within 4 weeks & MCUG & discuss with paediatric urologist

Post-natal renal USS and MCUG Results

VUR on MCUG

Continue prophylaxis
Refer to Urology

Posterior Urethral Valves or Bladder Pathology

IV access
FBC, U&E’s, Group & Save
Inform on-call Paediatric Urology team

No VUR on MCUG

PD >15mm

Obstruction:
Refer to Paediatric Urology

PD <15mm

Repeat USS at 6 months and if ≥15mm, refer to Paediatric Urology
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Objectives

To ensure appropriate investigation, management and follow up is carried out postnatally in all newborns with antenatally hydronephrosis in 2nd or 3rd trimester scans.

Rationale

Dilatation of the fetal renal collecting system or antenatal hydronephrosis (ANH) is one of the most commonly detected abnormalities during prenatal ultrasonography, affecting 1-5% of all pregnancies. ANH may represent a wide spectrum of urological conditions ranging from transient dilatation with no clinical significance to significant urinary tract obstruction or reflux with long term implications. Most ANH will resolve by 3 years of age. Approximately 8% (universally severe ANH) will require a surgical intervention.

Figure  Kaplan–Meier curve depicting resolution for patients initially presenting with SFU Grade 1 (grey) or Grade 2 (black) hydronephrosis censored for follow-up and surgical intervention. At 6 months, the probability of resolution for both grades is 10%. At 2 years, the probability of resolution for Grade 1 is 71% and Grade 2 is 58%. At 2.5 years, the probability of resolution is 100% for Grade 1 and 72% for Grade 2.

The challenge and goals in evaluating children with ANH are to distinguish children that require intervention and follow-up from those that do not. This will prevent potential complications and preserve renal function, whilst ensuring that children with a clinically insignificant abnormality are not subjected to excessive imaging and unnecessary surgery.

By standardising post-natal management of ANH, medical care can be optimised; investigations and costs minimised and parental advice can be consistent.

Broad recommendations

Defining Antenatal Hydronephrosis (ANH)

The table below demonstrates the classification & definition of ANH based on Antero-Posterior Diameter (APD) of renal pelvis. It is generally agreed that APD >15mm represents significant hydronephrosis.
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Table: Definition of ANH by APD (SFU & Canadian Urology Association)

<table>
<thead>
<tr>
<th>Degree of ANH</th>
<th>2nd Trimester</th>
<th>3rd Trimester</th>
<th>Risk of any post-natal pathology</th>
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<tbody>
<tr>
<td>Mild</td>
<td>4 to &lt;7mm</td>
<td>7 to &lt;9mm</td>
<td>11.9%</td>
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<tr>
<td>Moderate</td>
<td>7 to 10mm</td>
<td>9 to 15mm</td>
<td>45.1%</td>
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<tr>
<td>Severe</td>
<td>&gt;10mm</td>
<td>&gt;15mm</td>
<td>88.3%</td>
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Grading: A commonly used system to grade hydronephrosis is that of the Society of Fetal Urology (SFU). The SFU grading system is as follows

Grade 0
- no dilatation, calyceal walls are apposed to each other

Grade 1 (mild)
- dilatation of the renal pelvis without dilatation of the calyces (can also occur in the extrarenal pelvis)
- no parenchymal atrophy

Grade 2 (mild)
- dilatation of the renal pelvis (mild) and calyces (pelvicalyceal pattern is retained)
- no parenchymal atrophy

Grade 3 (moderate)
- moderate dilatation of the renal pelvis and calyces
- blunting of fornices and flattening of papillae
- mild cortical thinning may be seen

Grade 4 (severe)
- gross dilatation of the renal pelvis and calyces, which appear ballooned
- loss of borders between the renal pelvis and calyces
- renal atrophy seen as cortical thinning

*There can be significant inter-operator differences in interpretation of this grading system*

Post-Natal Management

The antenatal findings will dictate:
(a) Admission to neonatal unit straight after birth
(b) Prophylactic antibiotics
(c) Out-patient Investigations
(d) Consultation with Paediatric Urology
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(A) Admission after birth

Neonates with a severe urinary tract abnormality will require admission to Neonatal Unit soon after birth.

<table>
<thead>
<tr>
<th>These include the fetus with:</th>
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<tr>
<td>• An abnormal bladder</td>
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<tr>
<td>• History of oligo/anhydramnios</td>
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<tr>
<td>• Severe bilateral upper tract dilatation (APD &gt;15mm)</td>
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<tr>
<td>• Solitary kidney with severe dilatation (APD&gt;15mm)</td>
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<tr>
<td>• Bilateral echogenic kidneys (discuss with Paediatric Urologist)</td>
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</tbody>
</table>

Many of the neonates in this group will require an in-patient Micturating cystourethrogram (MCUG) and intervention.

Some neonates have pre-natal findings that do not warrant admission but require early outpatient investigation and even intervention in the first few months of life.

These cases should be discussed with the local urologist so that the timing and location of the imaging can be clarified.

<table>
<thead>
<tr>
<th>These include the fetus with:</th>
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<tbody>
<tr>
<td>• Severe unilateral hydronephrosis (APD &gt;15mm) with or without dilated ureter</td>
</tr>
<tr>
<td>• Bilateral hydronephrosis (APD &gt;15mm)</td>
</tr>
<tr>
<td>• A large Multicystic Dysplastic Kidney (&gt;7cm)</td>
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<tr>
<td>• Duplex kidney with an ureterocele.</td>
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(B) Antibiotic Prophylaxis

The role of prophylactic antibiotics in children with antenatal hydronephrosis is controversial. A very recent meta-analysis by European Society of Paediatric Urology has remained inconclusive on this subject. All patients should be placed on prophylactic antibiotics until the evaluation is performed and management discussed with family.

The rationale for antibiotic prophylaxis in children with a history of ANH is to prevent Urinary Tract Infections (UTI), as infants with hydronephrosis are at higher risk. Rates appear to be as high as 40% in children with SFU Grade 4 hydronephrosis. Incidence of infection is highest during first year of life. An increased risk is also noted with hydroureter/hydronephrosis even without reflux or an obstructive pattern on renal scan.
(C) Out-Patient Investigations

Neonates investigated as out-patient require one of the following imaging sequences:

- USS only
- Ultrasound (USS), Micturating cystourethrogram (MCUG) and DMSA if reflux suspected
- USS and mercaptoacetyltriglycine (MAG3) scan if obstruction suspected or

Ultrasound Scan

For mild abnormalities, USS may be the only imaging required both initially and for long-term follow-up. However, the event of systemic urinary tract infection should stimulate re-evaluation which may include diuretic renography.

The widespread practice of arranging the same investigations in the same sequence for every child is no longer appropriate. Where more than one modality is required, the examinations should be synchronous. Even if there has been an early post-natal USS, this should be repeated in conjunction with a later investigation such as a MAG3 or MCUG to ensure that both anatomical and functional information are obtained at the same point of time.

AP Diameter

Accurate measurement of the size of the renal pelvis is crucial in assessment and it is imperative that appropriate images are taken and the dimensions measured. The (AP Diameter) is maximum diameter of the renal pelvis in the transverse plane.

Grading

Postnatally, a commonly used system to grade hydronephrosis is that of the Society of Fetal Urology (SFU). Only grades 3 and 4 are felt to be clinically significant with respect to obstruction. Unlike with obstruction, the grade of ANH does not positively correlate with the likeliness of diagnosing vesico-ureteric reflux (VUR).

Renal Parenchymal Status

Any scarring is noted. Comment is also made on echogenicity of the renal parenchyma

Micturating cysto-urethrogram (MCUG)

MCUG is the preferred investigation to diagnose & grade VUR. It also allows for anatomical assessment of the urethra to exclude posterior urethral valves (PUV) and bladder. The overall incidence of VUR is 30% in children with ANH including those with resolved hydronephrosis. Of these, the majority will have normal kidneys with an excellent prognosis and can be followed without surgical intervention.

High-grade VUR however may predict renal damage and need for long-term nephrological follow-up. In such cases, efforts should be made to decrease risk of UTI-.
An urgent MCUG before discharge from hospital is essential in any child with ANH where this is a suspicion of bladder outlet obstruction.

There is a recognised (1-2%) risk of introducing urinary infection at the time of a MCUG. It is recommended that prophylactic antibiotic therapy is increased to therapeutic doses (e.g. trimethoprim 4mg/kg) for a 48 hour period around the procedure.

**Functional Imaging – Radioisotope**

Not all infants require functional kidney assessment with either $^{99m}$Tc MAG3 (mercaptoacetyltriglycine) or $^{99m}$Tc DMSA (dimercaptosuccinic acid). A radioisotope study is not indicated for children with a mild dilatation as previously discussed.

A MAG3 study is recommended in the presence of significant upper tract dilatation. Children with a dilated renal pelvis between 15 to 20mm without significant calyceal dilatation can safely have their MAG3 study at about 3-4 months of age.

A radioisotope study is essential for duplex kidneys with dilatation of one or both moieties. The timing should be discussed with the urology team who will be managing the child.

**(D) Consultation with Paediatric Urology**

**Urgent in-patient referral**

- Severe bilateral antenatal hydronephrosis
- Failure to pass urine within 12 hours of birth or palpable bladder at birth
- Suspected PUV
- Oligohydramnios
- Suspected urinary ascites
- Spina bifida

**Outpatient referral**

- Refer to Fig 1 & 2
Postnatal follow up

In most studies that follow patients with an APD<10mm, no significant uropathy is detected. However, close clinical follow-up may be needed for UTI and progression of mild hydronephrosis during infancy. One study has shown that the risk of pyelonephritis during infancy is increased 12-fold if hydronephrosis was detected in the first year of life.

The incidence of late worsening or recurrent hydronephrosis is approximately 1-5% with this risk applying to all grades of initial hydronephrosis. When there is late worsening or recurrence, the severity of hydronephrosis is significant (grade 3 to 4) and most patients are likely to be symptomatic. The timing of the late worsening or recurrence ranges from a few months to 5 years. Consequently, long-term follow-up is recommended but the appropriate length of follow-up is tailored on a case to case basis.

Special Cases

Solitary Kidney

- Where one kidney is seen, the differential diagnosis includes unilateral renal agenesis, antenatally involuted Multicystic Dysplastic Kidney (MCDK) and ectopic kidney.
- Needs prophylactic trimethoprim from day zero.
- Following confirmation with a renal USS at 1-2 weeks, a DMSA scan is indicated to confirm non-function or ectopic kidney (please make nuclear medicine aware of indications)
- There is a high incidence of VUR with both single & ectopic kidneys and an MCUG is indicated
- Any abnormality of the solitary functioning contralateral kidney will require early discussion with the paediatric urologist.

MCDK

- Requires confirmation post-natally with a renal USS in 2-4 weeks
- Children with MCDK and a normal contralateral kidney will need only a DMSA at about 3 months of age.
- Will require an MCUG if the contralateral kidney was dilated or if there was ureteric dilatation or any lower urinary tract abnormality pre- or post-natally. Contralateral VUR is present in 10-20%.
- Refer to the Paediatric Urology team if MCDK >3cm

Clinical audit standards

- Criteria defining ANH
- Criteria for starting antibiotics prophylaxis
- Adherence to radiological investigation protocol
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- Medical and Paediatric Urology follow up

**Recommendations based on results of recent audit**

- Strict adherence to the existing high standards of antenatal USS documentation
- Antenatal counselling either by fetal medicine or paediatric surgery to be separately documented and filed preferably on a coloured paper for easy referencing
- Contact details of patients to be ensured for post-natal follow up
- All data to be entered in the excel sheet created by the author which will ensure an excellent data base for future research

**Summary of development and consultation process undertaken before registration and dissemination**

The author has written the guideline. The guideline has been circulated to the Paediatric, Radiology and Fetal Medicine departments. It was discussed at length in a MDT. Comments made have been addressed and modifications made as necessary.

This version has been endorsed by the Clinical Guidelines Assessment Panel.

**Distribution list**

Trustdocs NICU, Delivery Suite, Postnatal Wards, Radiology, Paediatric Surgery, Intranet.
Referral Form for Antenatally Diagnosed Hydronephrosis

Mother’s Name: 

Mother’s Contact No: 

Antenatal USS Urology Findings: 
- APD in mm
  - Side: R: L: B/L: 
- Hydroureter: Yes: No:
- Bladder: Normal: Trabeculated: Not Seen:
- Oligohydramnios: Yes: No:
- Other Anomalies: Yes: No:

Antenatal Counselling: Yes: No: 

Urine passed: Yes: No: 

U/E 
- Urea: 
- Creatinine: 
- Na: 
- K: 

Prophylactic Antibiotic 
- Name: 
- Dosage:

Post-natal Radiology 
- USS: 
- MCUG: 
- DMSA: 
- MAG 3: 

Urinary Tract Infection: Yes: No: 

Referrer’s Name: ………………………………………….. 

Designation: …………………………………………… 

Date (dd/mm/yyyy): ………………………………………
References
