

Evaluation of Microscopic Hematuria in Children

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Detection

- Hematuria is defined by the presence of increased number of red blood cells (RBCs) in the urine
- It can be visible (gross) or apparent only upon urinalysis (microscopic), which many times is an incidental finding
- **Urinary Dipstick** – the most common screening test for hematuria
 - The strip used can detect 5-10 intact RBCs/microL which is roughly 2-5 RBCs per high-power on UA
- **Microscopic Urinalysis** – a positive dipstick for hematuria is confirmed by a microscopic examination.
 - Microscopic hematuria is defined as the presence of **>5 RBCs** per high-power field

Glomerular Bleeding Signs on UA

- A UA with microscopic examination may identify a potential site of bleeding – glomerular vs. non-glomerular and help in determining the underlying cause
- Signs of glomerular bleeding in children with microscopic hematuria include the following:
 - Red cell casts (pathognomonic)
 - Protein excretion greater than $100\text{mg}/\text{m}^2$ at a time when there is no gross bleeding
 - RBCs having a dysmorphic appearance

Distinguishing extraglomerular from glomerular hematuria

	Extraglomerular	Glomerular
Color (if macroscopic)	Red or pink	Red, smoky brown, or "Coca-Cola"
Clots	May be present	Absent
Proteinuria	Usually absent	May be present
RBC morphology	Normal	Dysmorphic
RBC casts	Absent	May be present

RBC: red blood cell.

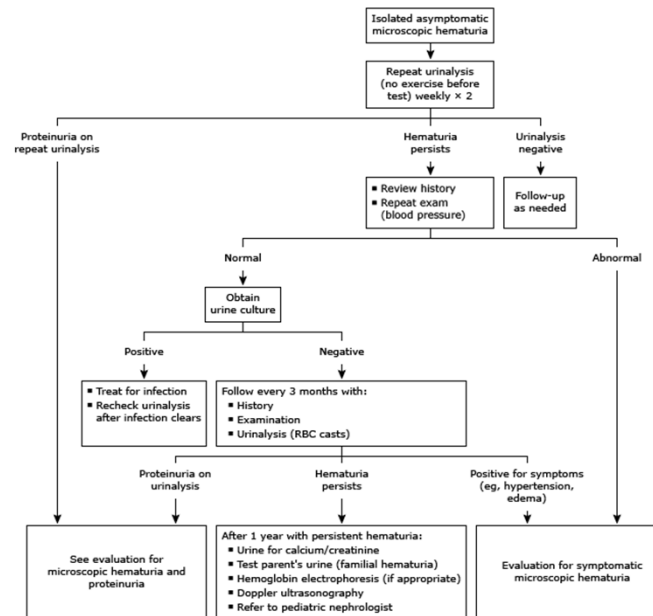
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Etiology

- Transient Hematuria
 - UTI, trauma, fever and exercise
- Persistent Hematuria
 - **IgA Nephropathy/HSP** - with episodes of gross hematuria triggered by a URI or GI illness
 - **Alport Syndrome** – recessive X-linked disorder typically in males, with hearing loss and vision changes
 - **Thin Basement Membrane Disease** – autosomal dominant, family history
 - **Post-streptococcal Glomerulonephritis** – antecedent history of GAS skin or throat infection
 - **Hypercalciuria**
 - **Nephrolithiasis** and **Nephrocalcinosis** – although typically seen with gross hematuria
 - **Nutcracker Syndrome** – compression of L renal vein, occasionally with L flank pain
 - **Lupus Nephritis** – typically a known diagnosis or systemic symptoms apparent

Workup – Asymptomatic Microscopic Hematuria

Algorithm for isolated asymptomatic microscopic hematuria in children

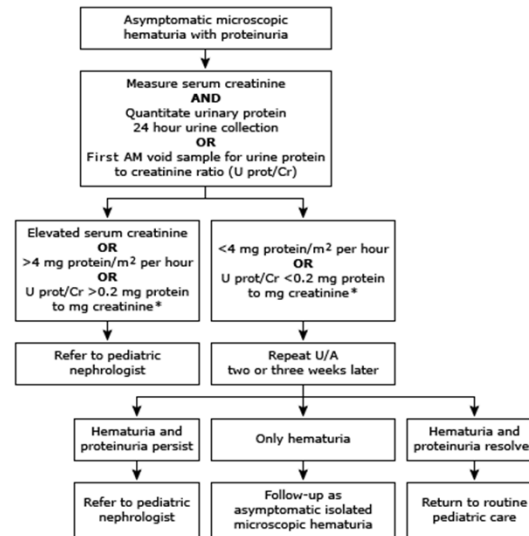


RBC: red blood cell.

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Workup — Asymptomatic Microscopic Hematuria AND Proteinuria

Diagnostic algorithm for asymptomatic microscopic hematuria with proteinuria in children



U/A: urinalysis.

* For children between 6 and 24 months, the threshold value is 0.5 mg protein to mg creatinine.

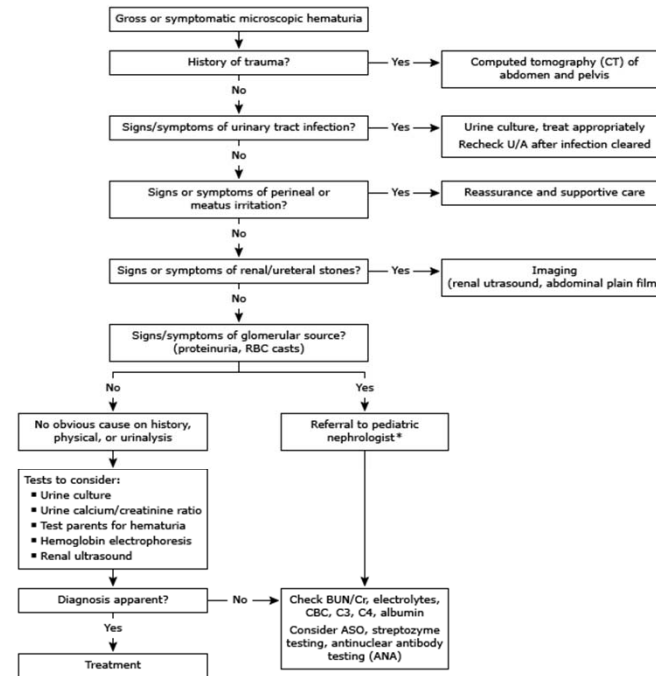
Modified from: Diven SC, Travis LB. A practical primary care approach to hematuria in children. *Pediatr Nephrol* 2000; 14:65.

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Symptomatic Microscopic Hematuria

- This evaluation differs in that it is guided by the patient's symptoms, which can make it challenging since it encompasses a wide range of diseases with varying clinical presentations
- Symptoms can be nonspecific (fever, malaise, weight loss), extrarenal (rash, purpura, arthritis) or related to kidney disease (edema, hypertension, dysuria, oliguria)
- History in this case is more important
 - Recent trauma
 - New onset of incontinence, dysuria, frequency or urgency (UTI)
 - Unilateral flank pain that radiates (calculus vs. blood clot)
 - History of pharyngitis or impetigo
 - Personal or family history of SS trait or hemophilia, or deafness (Alport)

Algorithm for gross or symptomatic microscopic hematuria in children



Refer to UpToDate topics on the evaluation of microscopic hematuria in children and the evaluation of gross hematuria in children for further details.

U/A: urinalysis; RBC: red blood cell; BUN: blood urea nitrogen; Cr: creatinine; CBC: complete blood count; C3: complement component 3; C4: complement component 4.

* Manifestations such as proteinuria, red blood cell casts, edema, and hypertension suggest a glomerular source for the hematuria. The evaluation includes serum creatinine, complete blood count, C3, C4, and serum albumin. Other tests to consider based upon the history and the physical examination include antistreptolysin (ASO) titer and/or streptozyme testing to detect poststreptococcal glomerulonephritis, and antinuclear antibody testing to detect lupus nephritis. Such patients should be referred to a pediatric nephrologist (or a clinician with expertise in the care of children with renal disease).

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Summary

- Microscopic hematuria is a **common** finding in children, with 3-4% having a positive dipstick
- Confirmed by UA with microscopic examination, showing **2-5 RBCs per high-power field**
- Presence of **red cell casts, proteinuria** and/or **dysmorphic RBCs** can indicate a **glomerular** source
- Evaluation is based on the **clinical presentation** and falls into three categories:
 - Asymptomatic isolated microscopic hematuria – ***most common, usually transient***
 - Asymptomatic microscopic hematuria WITH proteinuria
 - Symptomatic microscopic hematuria

Sources

- Gillion Boyer, O., Niaudet, P., Drutz, Jan E., Kim, M. *Evaluation of microscopic hematuria in children*. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA. (Accessed on June 8, 2020).
- Massengill, S. *Hematuria*. *Pediatrics in Review* Oct 2008, 29 (10) 342-348; DOI: 10.1542/pir.29-10-342
- Bernarda Viteri, Jessica Reid-Adam. *Hematuria and Proteinuria in Children*. *Pediatrics in Review* Dec 2018, 39 (12) 573-587; DOI: 10.1542/pir.2017-0300