



## “Doctor, It’s Red”

*An Approach to Hematuria in the ED*



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### Arnold’s Case

Arnold, a 66-year-old male, presented to the ED with a one-day history of lower abdominal pain, urinary frequency with decreased output, and frank hematuria with large clots but no obstructive symptoms.

The patient’s past medical history includes prostate cancer, which was treated with radiation seven years ago, infrequent angina, well-controlled hypertension, Barrett’s esophagus, and occasional anxiety.

On examination, he appeared to be in discomfort. His abdomen was soft and non-tender to palpation. There was no costovertebral angle tenderness. No prostatic tissue was felt upon rectal examination.

Read on for more on Arnold

presence of heme. A positive dipstick

test is at least as sensitive as urine sediment, which is the gold-standard; however, it does rarely produce false positives. There are also several rare causes of red-tinged urine that are categorized as pseudo-hematuria; this may be caused by certain foods or drugs (see Table 1) and should be suspected clinically with the presence of red-tinged urine and a negative dipstick test. Any episode of true hematuria warrants investigation.

### Questions and Answers

#### 1. What is hematuria?

Hematuria is defined as the presence of blood in urine and is often categorized into gross and microscopic hematuria. Gross hematuria is often identified by patients and typically evokes considerable anxiety. Healthcare workers may also identify red- or brown-tinged urine upon urine specimen collection.

Microscopic hematuria is detected in the ED using a urine dipstick test for the

#### 2. What causes hematuria?

There are a number of common causes of hematuria, including urinary tract calculi, urinary tract infections, and benign prostatic hyperplasia, as well as more serious causes — the most concerning of which would be urological malignancies. Indeed, 30% of patients presenting with painless hematuria are found to have malignancy; this statistic increases with age to over 50%

Table 1

## Etiology of Hematuria by Type

Pre-renal	Renal	Post-renal	Pseudohematuria
<ul style="list-style-type: none"> <li>• Anticoagulants</li> <li>• Coagulation defects</li> <li>• Sickle cell disease</li> <li>• Neoplasms</li> <li>• Leukemia</li> <li>• Thromboembolism</li> </ul>	<ul style="list-style-type: none"> <li>• Stone</li> <li>• Trauma</li> <li>• Carcinoma</li> <li>• Wilm's tumour</li> <li>• Pyelonephritis</li> <li>• Glomerulonephritis</li> <li>• Interstitial nephritis</li> <li>• Tuberculosis</li> <li>• Infarct</li> <li>• Polycystic kidneys</li> <li>• Arteriovenous malformation</li> <li>• Exercise-induced (non-traumatic)</li> <li>• Hypercalciuria</li> <li>• Hyperuricosuria</li> </ul>	<ul style="list-style-type: none"> <li>• Stone</li> <li>• Tumour</li> <li>• Cystitis</li> <li>• Urethritis</li> <li>• Polyps</li> <li>• Foreign body</li> <li>• Urethral stricture</li> <li>• Endometriosis (of the urinary tract)</li> <li>• Benign prostatic hyperplasia (BPH)</li> </ul>	<ul style="list-style-type: none"> <li>• Vaginal bleeding</li> <li>• Dyes (beets, rhodamine B in candy and juices)</li> <li>• Hemoglobinuria (hemolytic anemia)</li> <li>• Myoglobinuria (rhabdomyolysis)</li> <li>• Porphyrria</li> <li>• Laxatives (phenolphthalein)</li> <li>• Drugs (rifampin, phenazopyridine, pyridium, phenytoin)</li> <li>• Factitious</li> </ul>

of those older than 50. Up to 90% of patients with bladder tumours present with an initial complaint of hematuria, and their first presentation is often to the ED. As a general rule, gross painless hematuria in adults should be assumed to be due to a malignancy until proven otherwise.

Transient hematuria, without an obvious cause, is fairly common, particularly in young adults, and is often of no consequence; however, transient hematuria in a patient older than 50 should always be investigated. A more extensive

list of the many causes of hematuria can be found in Table 1, and a helpful list, broken down by age and most common etiology can be found in Table 2. Screening for microscopic hematuria in the absence of urinary symptoms is not recommended.

### 3. *Are there any clues from the history or physical examination to suggest a particular diagnosis?*

- Concurrent pyuria and dysuria as well as

Table 2

## Etiology by Age Group

Age (years)	Etiology (in order of decreasing frequency)	
0–20	Glomerulonephritis, UTI, congenital anomalies	
20–40	UTI, stones, bladder tumour	
40–60	<b>Male:</b> bladder tumour, stones, UTI	<b>Female:</b> UTI, stones, bladder tumour
>60	<b>Male:</b> BPH, bladder tumour, UTI	<b>Female:</b> bladder tumour, UTI

- urinary frequency are usually indicative of a UTI, but may also occur with bladder malignancy
- A recent URI raises the possibility of postinfectious glomerulonephritis
  - A positive family history of renal disease, as in hereditary nephritis, polycystic kidney disease, or sickle cell disease
  - Patients of African descent should be screened for sickle cell trait or diseases that can lead to papillary necrosis and hematuria
  - Unilateral flank pain, which may radiate to the groin, suggests ureteral obstruction due to a calculus or blood clot, but is occasionally seen with malignancy
  - Symptoms of prostatic obstruction in older men, such as hesitancy and dribbling
  - Recent vigorous exercise, which often leads to microscopic hematuria of no consequence
  - Trauma
  - History of a bleeding disorder (note: chronic anticoagulation therapy alone should not be assumed as the cause of hematuria; anticoagulated patients with evidence of bleeding require further investigation)
  - Cyclic hematuria in women that is prominent during, and shortly after, menstruation suggests endometriosis of the urinary tract, and contamination with menstrual blood should be ruled out
  - Medications that may cause nephritis or pseudohematuria (e.g., rifampin, beta-lactam antibiotics, loop & thiazide diuretics, extensive NSAID use)
  - Food or dye consumption that may cause pseudohematuria (e.g., beets)
  - Travel or residence in areas endemic for *Schistosoma haematobium* or tuberculosis
  - Sterile pyuria with hematuria, which may occur with renal tuberculosis, analgesic nephropathy, and other interstitial diseases
  - Palpable mass of renal, bladder, or gynecologic origin
  - Genital exam confirming that blood isn't originating from an extra-urethral source
  - Digital rectal exam (DRE) to exclude a mass in the prostate or rectouterine pouch

#### 4. *What investigations are appropriate?*

A detailed history should guide your approach to investigating the patient's hematuria. Gross hematuria and symptomatic hematuria require a full workup, likely by urology in early follow-up. In the ED, a urine dipstick (specifically for blood, nitrites and leukocytes), BUN, CBC, electrolytes, and creatinine are initially appropriate. A  $\beta$ -HCG level is recommended in all women of childbearing age. Uncomplicated UTIs do not usually require investigation, however, a complicated UTI — presenting with persistent symptoms after treatment, recurrent or persistent infection, or severe infection with creatinine elevation — warrants a mid-stream urine collection for microscopy, culture, and sensitivities. If a stone is suspected, a kidney, ureter, and bladder (KUB) x-ray is often valuable, as 70 to 80% of urinary tract calculi are radio-opaque. If you suspect a renal cause, it is appropriate to investigate the upper tracts using a CT/IVP (intravenous pyelogram) or CT, IVP, or ultrasound scanning (USS).

Microscopic hematuria found incidentally should be investigated, but this can be arranged by the patient's primary care physician.

## 5. Treatment

Treatment for macroscopic hematuria in the ED is primarily concerned with resuscitation to correct hypovolemia and coagulopathies and to initiate hemostasis in cases of significant bleeding. In patients with passage of clots and obstructive symptoms, a three-way Foley catheter is ideal to allow for irrigation and drainage. Suprapubic catheterization is not recommended, as it may seed a bladder tumour to the abdominal wall. Treatment is highly variable depending on the etiology of the hematuria. UTIs should be treated in accordance with local guidelines; a stone may require surgery depending on the size, location, and associated symptoms. Patients without urinary obstruction, who are suitable for discharge, should be advised to drink generous amounts of clear fluids and to return to the ED if they have darkening or excessive hematuria, obstruction or retention, and worsening pain or fever, despite using analgesics or antibiotics. **It is** important to note that new onset of fever in a patient with a stone requires an immediate urol-

### Take Home Points

- Gross hematuria requires a work-up to exclude urological malignancy and should not be dismissed due to the presence of other causes, such as UTI or anticoagulation therapy
- Painless hematuria is classically associated with malignancy, whereas painful hematuria usually indicates a stone or UTI
- A single episode of hematuria is as important as recurrent episodes
- Microscopic hematuria found incidentally should be investigated, but can be arranged by the patient's primary care physician

### Back To Arnold

After obtaining a mid-stream urine sample, dipstick test results were significant for 4+ blood. Considering he had no other urinary symptoms and unimpressive bloodwork, he was referred to the Urology clinic with an appointment for the following week. After a normal renal ultrasound, cystoscopy revealed dilated veins near the bladder neck that were actively bleeding. Arnold was diagnosed with post-radiation cystitis. No treatment was initiated, as the bleeding was mild, and he was scheduled to follow up with his urologist after 3 months.

ogy consultation. Patients are often reassured in knowing that small amounts of blood can produce impressively coloured urine.

All cases of macroscopic hematuria require a prompt Urology or Nephrology consultation, either in the ED or in an ambulatory clinic.

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