

REVIEW

Management of macroscopic haematuria in the emergency department

Derek Hicks, Chi-Ying Li

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Macroscopic haematuria is a commonly seen condition in the emergency department (ED), which has a variety of causes. However, most importantly, macroscopic haematuria has a high diagnostic yield for urological malignancy. 30% of patients presenting with painless haematuria are found to have a malignancy. The majority of these patients can be managed in the outpatient setting. This review of current literature suggests a management pathway that can be used in the ED. A literature search was done using Medline, PubMed and Google. In men aged >60 years, the positive predictive value of macroscopic haematuria for urological malignancy is 22.1%, and in women of the same age it is 8.3%. In terms of the need for follow-up investigation, a single episode of haematuria is equally important as recurrent episodes. Baseline investigation in the ED includes full blood count, urea and electrolyte levels, midstream urine dipstick, β human chorionic gonadotrophin, and formal microscopy, culture and sensitivities. Treatment of macroscopic haematuria aims at RESP—Resuscitation, Ensuring, Safe and Prompt. Indications for admission include clot retention, cardiovascular instability, uncontrolled pain, sepsis, acute renal failure, coagulopathy, severe comorbidity, heavy haematuria or social restrictions. Discharged patients should drink plenty of clear fluids and return for further medical attention if the following occur: clot retention, worsening haematuria despite adequate fluid intake, uncontrolled pain or fever, or inability to cope at home. Follow-up by a urological team should be promptly arranged, ideally within the 2-week cancer referral target.

patients confirmed as having a urological malignancy.⁶ The sensitivity of macroscopic haematuria in identifying these malignancies is relatively high: bladder carcinoma 0.83, ureteric carcinoma 0.66 and renal carcinoma 0.48.⁷ In short, 79–90% of patients with bladder tumours present with haematuria, and 30% of patients with painless haematuria are found to have a malignancy.^{3–8} As the emergency department (ED) is often the first avenue of presentation, it is important that these patients are identified and entered into the appropriate diagnostic pathway.⁹

The majority of patients presenting with macroscopic haematuria can be managed on an outpatient basis, with follow-up arranged under the 2-week cancer target.^{8–10} However, there are some situations in which patients would be more appropriately managed as an inpatient under a urological team.

At present, there are no ED guidelines to help direct the management of these patients, and inappropriate referral/discharge decisions are common.

The aim of this literature review is to suggest a treatment pathway that might be used for the management of patients presenting to the ED with macroscopic haematuria.

METHODS/SEARCH STRATEGY

The primary question to be answered was how to manage and investigate an adult patient presenting with macroscopic haematuria to the ED. Electronic databases (Medline and PubMed) were consulted using the following search strategy: [haematur\$.ti] AND [macroscopic.ti OR frank.ti OR emergency.ti] NOT [child\$.ti OR microscopic.ti] LIMIT to Human AND English.

The references obtained were assessed for their relevance based on the titles and abstracts. This yielded a total of 438 papers, of which 23 were found to be directly relevant. Further references were identified from the selected relevant papers. An internet search was also undertaken via the search engine Google.

OUTCOME

Patient history

A number of conditions, benign and malignant, serious and trivial, can cause macroscopic haematuria. It is important to remember that macroscopic haematuria should never be dismissed as a

Macroscopic haematuria engenders a great deal of anxiety in patients and their relatives. It may be due to a variety of causes, the most serious of which are urological malignancies (most commonly transitional cell carcinoma of the bladder, but potentially anywhere along the urinary tract—that is, renal (kidney and renal pelvis), ureteric, prostatic and urethral malignancies). Benign causes include benign prostatic hyperplasia, urinary tract calculi, urinary tract infections (UTIs) and nephrological problems, whereas others include trauma.

Macroscopic haematuria has a high diagnostic yield for urological malignancy.^{1–5} It has been found to be a presenting feature in >66% of

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normal consequence of conditions such as UTI or anticoagulation, without first undertaking investigations to exclude urological malignancies.^{11 12}

A careful history and examination may give some indications as to the origin of the haematuria:

- Painless haematuria is classically associated with the underlying malignancies, whereas haematuria associated with pain may be more suggestive of stone disease (urinary calculi) or UTI.
- Blood at the start of the urinary stream is suggestive of lower urinary tract malignancy, but is by no means diagnostic.
- The age and sex of the patient may indicate the likelihood of malignancy being discovered. In men aged >60 years, the positive predictive value of macroscopic haematuria for urological malignancy is 22.1%, whereas in women of the same age it is 8.3%; in all patients of age <60 years, the positive predictive value falls to 2.6%.^{13 14} However, it is important to remember that 10–20% of men aged <60 years will be found to have a urological malignancy during the investigation process.^{15–17}
- In terms of the need for follow-up investigations, a single episode of haematuria is equally important as recurrent episodes.^{1 18 19}

Box 1 gives the summary of differential diagnoses in macroscopic haematuria.

Associated symptoms that must be elicited include

- ability to pass urine and evidence of clots, as this may influence management decisions; (Patients who are able to pass urine should be asked about the presence of clots in the urinary flow, the size of any clots seen, and the ease, or difficulty, with which these were passed).
- fever, urgency and urinary incontinence, which are suggestive of UTI.

Predisposing factors that should be sought in the history are the following.

- Occupational history—in particular, exposure to chemicals and smoking, as these predispose to risks of transitional cell carcinoma of the bladder.

Box 1: Differential diagnoses in macroscopic haematuria

- Urinary tract malignancy: kidney, renal pelvis, ureter, bladder, prostate, urethra
- Urinary calculi
- Infections: urinary tract infection, schistosomiasis
- Trauma: penetrating or blunt
- Benign prostatic hyperplasia
- Haemorrhagic cystitis
- Endometriosis
- Nephrological disease: IgA nephropathy, glomerulonephritis
- Postprocedural bleeding—for example, transurethral surgery
- Bleeding disorders, anticoagulation therapy above therapeutic range
- Arteriovenous malformation/angiomyolipoma

- History of bleeding disorders or concomitant use of anticoagulants may prompt investigation with clotting profile.
- History of trauma is important, as this dictates a different diagnostic approach and may be a contraindication to urinary catheterisation.
- History of recent sore throat/upper respiratory tract infection in young patients may be suggestive of IgA nephropathy.
- Travel history, as schistosomiasis is a risk factor for squamous cell carcinoma of the bladder and in itself causes macroscopic haematuria.

Other features that should be elicited are gynaecological history, as the origin of bleeding may not be urological, and, in particular, a history of endometriosis.^{20 21}

Important social history includes ensuring that patients are independent and self-caring.

Clinical examination

During the physical examination of the patient, it is important to elicit the following signs:

- Cardiovascular status.
- Presence of a palpable bladder, which may be indicative of acute or imminent urinary retention.
- Careful palpation for a tumour mass (potential sites include renal, bladder or gynaecological origin).
- In females, a vaginal examination should be performed to ensure that the blood comes from the urethra rather than the vagina. In males, the external genitalia should be examined.²²
- In both sexes, a digital rectal examination should be performed to exclude tumour masses either in the prostate or in the pouch of Douglas.

Investigations

In the emergency department

Urine tests

In making the diagnosis of macroscopic haematuria, it is most important that true “frank haematuria” is seen in the urine sample. The degree of blood staining in the urine has traditionally been described in relation to shades of red wine namely, Rosé, Claret. The presence or absence of clots should also be noted.

A dipstick urine test should be performed in the ED. It is quick and cost effective, and may indicate the presence of infection. Even in apparently clear urine, microscopic haematuria may be detected—this is important as macroscopic haematuria may clear over the course of the day as the patient drinks. It is also important to recognise that a negative dipstick result does not exclude UTI, so the microscopy, culture and sensitivities results should be checked.^{5 23}

Patients with incidental microscopic haematuria will also require follow-up, but this can be safely arranged via their general practitioner.

- β -Human chorionic gonadotrophin dipstick testing should be performed in all women of childbearing age.
- A sample of midstream urine should also be sent for microbiological testing. Any infection should be treated according to local antibiotic guidelines.
- Urine cytology is of little use in the ED setting. Despite being highly specific, it has an estimated sensitivity of only 25%. Its use is probably more appropriate as a second-line investigation.^{6 24}

Blood tests

Macroscopic haematuria is not associated with any specific diagnostic tests; however, it is important to know a number of indices in order to decide whether a patient will be suitable for outpatient management.

- *Full blood count*—A full blood count indicates a baseline haemoglobin level and ensures that there is no underlying thrombocytopenia that may need to be addressed.
- *Urea and electrolytes* -Urea and electrolyte levels indicate whether the patient has acute renal failure. Again, this may necessitate admission for investigation to exclude urinary outflow-tract obstruction.
- *Clotting*—There is some debate as to whether a clotting screen should be a standard investigation in these patients, as it has a low yield for new diagnoses of bleeding diatheses. A pragmatic approach is advised. For patients with known clotting disorders, those taking anticoagulant drugs, those having hepatic disease or very heavy bleeding, a clotting screen should be done; for those without risk factors for bleeding and with mild haematuria, it may be omitted.
- *Group and save (with or without cross-match)*—In patients with large amount of macroscopic haematuria, group and save should be considered, and in these patients admission is warranted. In those with haemodynamic compromise, cross-matching should be requested as a priority.

Radiological imaging

Kidney, ureters, bladder (KUB) x ray is easily available and simple to perform. Although there is limited diagnostic information, it may be a useful first-line test in patients for whom contrast radiography is contraindicated. However, in cases where renal calculi are suspected, a KUB x ray may prove to be of value, as 70–80% of urinary tract calculi are radio-opaque.²⁹ Further investigation with complete intravenous urography (IVU)/ultrasound scanning (USS)/CT-KUB should be performed in this group of patients.

After referral to the urologist

Urine cytology

Despite being highly specific, urine cytology has an estimated sensitivity of only 25%. There is some debate on its more appropriate use as a second-line investigation.^{5 6 10 26 27} However, the current European Association of Urology guidelines continue to advocate its use in the diagnostic pathway.²⁸

Radiological imaging

Some of the radiological imaging techniques may be instituted in the ED, depending on the local policy and the availability of resources. In all, 25% of urologists use USS imaging of the urinary tract as their first-line investigation for haematuria, 24% use IVU and 51% use a combination of both of these.^{10 27 29}

- USS is a non-invasive test, but may be limited by its operator dependence. In combination with plain KUB radiographs, USS by a radiologist has been shown to have a diagnostic accuracy comparable to that of IVU.⁶
- IVU has a number of contraindications—asthma, use of metformin, renal impairment, seafood/contrast allergy, hepatic impairment and pregnancy. This may limit the usefulness of this investigation as a first-line choice.
- CT-KUB may be a useful second-line investigation in those patients with normal first-line tests and persistent haematuria. The “pick-up rate” for current first-line radiological investigations is high, particularly when the radiological tests are reported by specialist urologists.^{5 30}

Box 2: Abbreviation of goals for treatment of macroscopic haematuria

- R—resuscitate as appropriate
- E—ensure that urine can drain freely with or without catheter insertion
- S—safe discharge from the ED where appropriate
- P—prompt follow-up and further investigation

Flexible cystoscopy

In addition to the investigations listed above, all patients with macroscopic haematuria should undergo a flexible cystoscopy.

This is a minimally invasive, outpatient procedure to directly visualise the urethra and bladder. Most urologists would agree that all patients with macroscopic haematuria should undergo this procedure on at least one occasion during the diagnostic process.^{1 5} It is possible to take biopsy specimens to obtain a tissue diagnosis at the time of this procedure.

TREATMENT

The goals of treatment for macroscopic haematuria in the ED are straightforward, and are shown in box 2. (These can be abbreviated asRESP.)

RESUSCITATION

In the ED, a patient with evidence of cardiovascular compromise because of blood loss should be resuscitated in the usual way, with therapy directed towards volume replacement, correction of any coagulopathy and haemostasis. Under these circumstances, the urological team should be involved at an early stage, as emergency surgical intervention may be required.³¹

ENSURE URINARY DRAINAGE

It is important to ensure free drainage of urine, in order to avoid urinary retention and, ultimately, obstructive uropathy.

All patients with macroscopic haematuria should be examined carefully to ensure that they are not in urinary retention due to clot formation. Patients who are able to pass urine should be asked about the presence of clots in the urinary flow, the size of any clots seen, and the ease, or difficulty, with which these were passed.

The presence of small clots that easily pass need not be a bar to outpatient management. Suitable patients should be mobile, sensible and have the ability to return for further assistance if clot retention occurs.

Often a few small clots will be seen in the stream, particularly during the first few voidings of the day, as urine has accumulated in the bladder overnight, allowing clots to form. These small clots will frequently be easily passed and clear during the course of the day as the patient drinks fluid.

If clot retention is present, the treatment of choice is insertion of a three-way Foley catheter, in the same manner as a standard two-channel catheter. The additional channel allows irrigation fluid to be passed through the bladder, clearing clots from the site of bleeding.

Inserting a two-channel Foley catheter is a much less satisfactory solution, but may provide an adequate relieving measure if no three-way catheter is available. However, it must be of adequate size to allow both drainage of clots and intermittent irrigation using a catheter syringe (ideally size 16Ch or above). It is important to remember that a two-channel catheter will often require changing to a three-way catheter at a later point, as two-channel Foley catheters are prone to

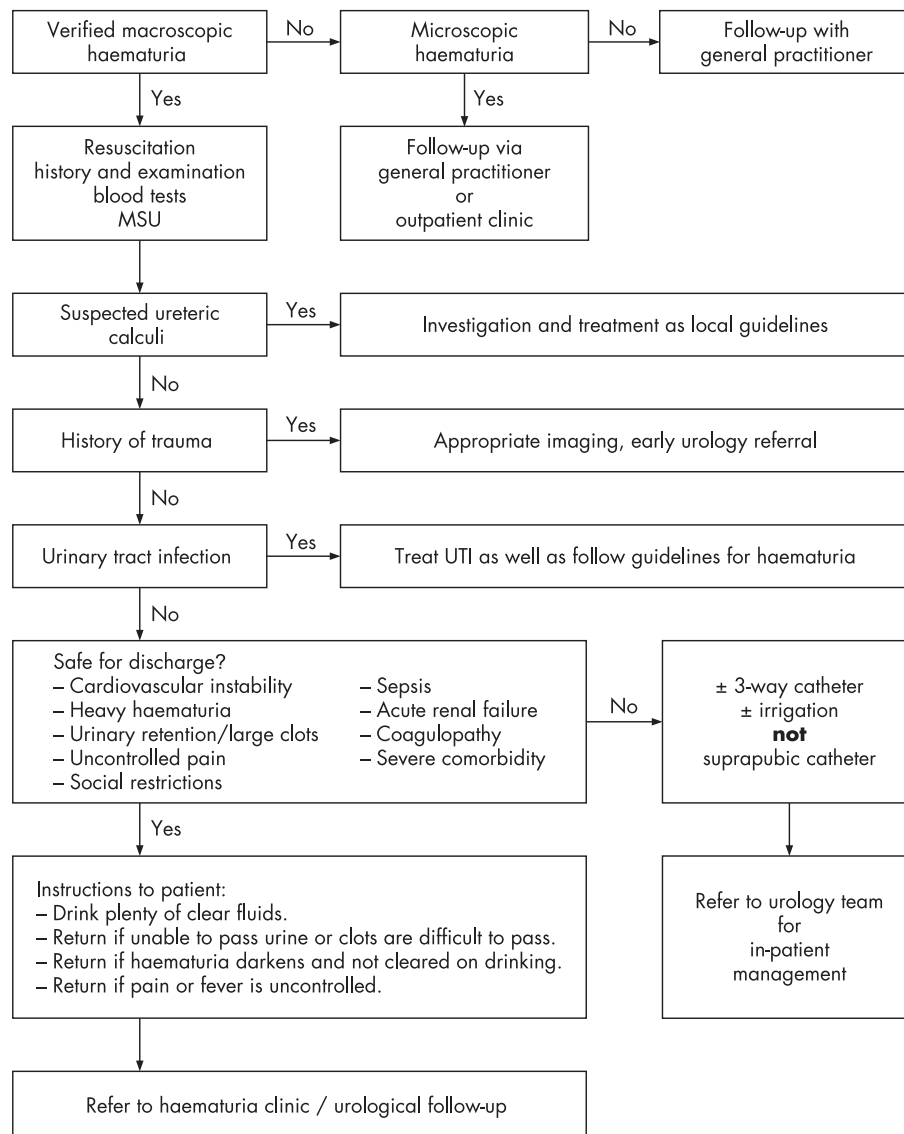


Figure 1 Proposed guidelines for the management of macroscopic haematuria.

blockage and do not allow constant irrigation to take place. A change of catheter can be extremely uncomfortable for the patient, particularly if the initial catheterisation process was difficult.

In patients with a suprapubic catheter already in situ, irrigation can be commenced down the suprapubic catheter and out through a two-channel urethral catheter of adequate size.

If it proves impossible to pass a urethral Foley catheter, the temptation to site a suprapubic catheter in the acute stage or perform an aspiration of the bladder should be resisted, as seeding of a bladder tumour to the abdominal wall may occur.³² It may, on rare occasions, ultimately prove necessary to perform a suprapubic catheterisation in this onerous situation, but this is a decision best taken by a urologist, having exhausted all means of inserting a urethral catheter.

Safe discharge

In patients without cardiovascular compromise and in those for whom there is no other reason to remain as an inpatient—that is, with no evidence of sepsis, acute renal failure, clot retention,

inability to take adequate oral fluids, serious comorbidity or social circumstances requiring admission—outpatient management can be considered.

Having decided that a patient is safe for discharge, it is important that he or she is given clear instructions on how to manage his or her haematuria, and informed when and how it would be appropriate to seek further medical attention.

Patients should be advised to drink plenty of clear fluids, in order to flush plenty of urine through the urinary tract. This helps to clear the haematuria, and prevent clot formation and urinary retention. In addition, patients should be advised that if urine is allowed to accumulate in the bladder after a period without voiding, due to, for example, inadequate fluid intake or overnight while sleeping, they might see a darkening of the haematuria or passage of small clots. This should not be considered a worrying sign and should be expected to clear within a few voidings, once adequate fluid intake has been resumed.

Box 3 summarises the indications for seeking further medical attention.

Box 3: Indications for seeking further medical attention

- Darkening of the haematuria that does not clear after a few voidings, despite adequate fluid intake.
- Increasing clot formation that does not clear easily on voiding, or development of urinary retention.
- Worsening pain or fever, despite using analgesics or antibiotics.

Prompt follow-up

Ideally, written information should be given and follow-up at a specialist haematuria clinic arranged within 2 weeks.^{33–35} In many National Health Service trusts, this task is devolved in urology nurse specialists who can ensure that all the necessary first-line investigations have been performed and that the patient is coping at home before his or her outpatient clinic appointment. This system also allows for a secure audit trail to optimise good practice in both the emergency and urology departments. Whatever the system used, the most important objective is to ensure that no patient is lost to urological follow-up.

The management of macroscopic haematuria can be summarised in the proposed guideline as shown in fig 1.

SPECIAL CIRCUMSTANCES

This article is not intended to provide an exhaustive guide to the management of all urological conditions that might result in macroscopic haematuria; there are, however, some common presentations that warrant further mention.

Ureteric calculi

Patients will often present with a history of ureteric calculi, or with obvious signs and symptoms suggestive of ureteric colic. All patients should be given adequate analgesia. Local guidelines dictating the investigation of ureteric colic may vary, but the gold standard test for locating the position of a ureteric calculus is a CT-KUB.³⁶ Management of urinary calculi will depend on the size and location of the stone; however, in patients who are otherwise well, this condition can usually be managed conservatively, and the stone dealt with in the outpatient setting. Patients with signs of sepsis must be admitted, and an obstructed, infected kidney excluded.

It should be remembered, in the context of macroscopic haematuria, that the passage of clots down the ureter may induce ureteric colic in the same way as the passage of a stone.

Solitary kidney

In patients with a solitary kidney, a much lower threshold must be adopted for inpatient investigation, treatment and early referral to the urology team.

Urinary tract infection

If the patient is clinically well, but has a UTI diagnosed on dipstick testing, local guidelines for antibiotic therapy should be followed, pending the result of urine microscopy, culture and sensitivities.³⁷ Further investigation of the macroscopic haematuria should be undertaken in the normal way following treatment for the UTI.

Haematuria after trauma

This article does not aim at a thorough description of the investigation and management of haematuria after trauma; other comprehensive reviews covering this area are accessible.³⁸ The general principle of management for patients presenting

with macroscopic haematuria and a history of recent trauma is that they should be assessed and resuscitated as required in the usual way. Penetrating injuries should be referred to the urological team for acute assessment. Blunt injuries involving the upper tracts should have a urinary catheter inserted, and further imaging with a low threshold for admission and observation should be considered. Presence of blood at the meatus of the penis or perineal bruising may suggest urethral injury; where this is suspected, or in cases of bladder injury or fractured penis, a urethrogram should be obtained before catheterisation is attempted, and early referral should be made to the urological team.^{39 40}

CONCLUSION

Macroscopic haematuria is a common presenting condition in the ED, as a high-yield indicator of urological malignancy. It is important that every case of macroscopic haematuria is appropriately treated and fully investigated.

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