



University
of Glasgow

School of Medicine, Dentistry & Nursing

Urinalysis Clinical Skills Guidance



Learning Objectives

- Understand the importance of Infection control protocols when carrying out a simple urinalysis test
- Describe the reasons for specimen collection
- Discuss how to obtain a specimen of urine from a patient
- Consider the procedure and steps required to carry out a simple urinalysis test
- Be able to carry out a simple urinalysis test in a simulated or clinical setting.
- Understand the abnormal findings from a urinalysis test

Introduction

Urinalysis is a common investigative procedure which may aid a diagnosis. A relevant patient history and appropriate further investigations should be performed if an abnormal result is obtained. Urinalysis provides results within minutes and may aid the detection of a number of diseases including:

- Diabetes
- Renal Stones
- Urinary Tract Infection

Infection Control Protocols

Please refer to the prevention and control of infection manual for updates or changes in policies or procedures locally or nationally.

Responsibilities

- Healthcare workers must adhere to the prevention and control of infections policy.
- Healthcare workers immunisation must be up to date. All HCW's involved in specimen collection must be immunised against the Hepatitis B virus.
- Ensure all equipment used is safe and leak proof specimen containers are used.

Standard Precautions

- All cuts and abrasions must be covered with waterproof dressings
- Wear gloves when in contact with blood or body fluid contamination
- If there is a risk of splash, face protection must be worn
- Wash hands after procedure regardless of whether gloves are used.
- All spillages of blood and body fluids must be decontaminated appropriately.

Reason for specimen collection

- To aid diagnosis of a disease
- For the purpose of screening in health to facilitate cancer diagnosis, staging and type.
- To monitor the effects of treatment.
- To permit laboratory culture to identify pathogenic micro-organisms and determine drug sensitivity.

Types of specimens collected

- Mid stream specimen of urine (MSSU)
- Catheter specimen of urine (CSU)

Mid-Stream Specimen of Urine (MSSU)

An MSSU must be obtained in a bottle containing boric acid. These are normally red top bottles. When collecting the specimen you should request that the patient attends to personal hygiene in the genitalia area prior to collection.

The patient is asked to commence passing urine initially, and then collect a small sample into a sterile bowl before allowing the patient to pass the remainder into the toilet or a bedpan. The urine is then transferred into the specimen container.

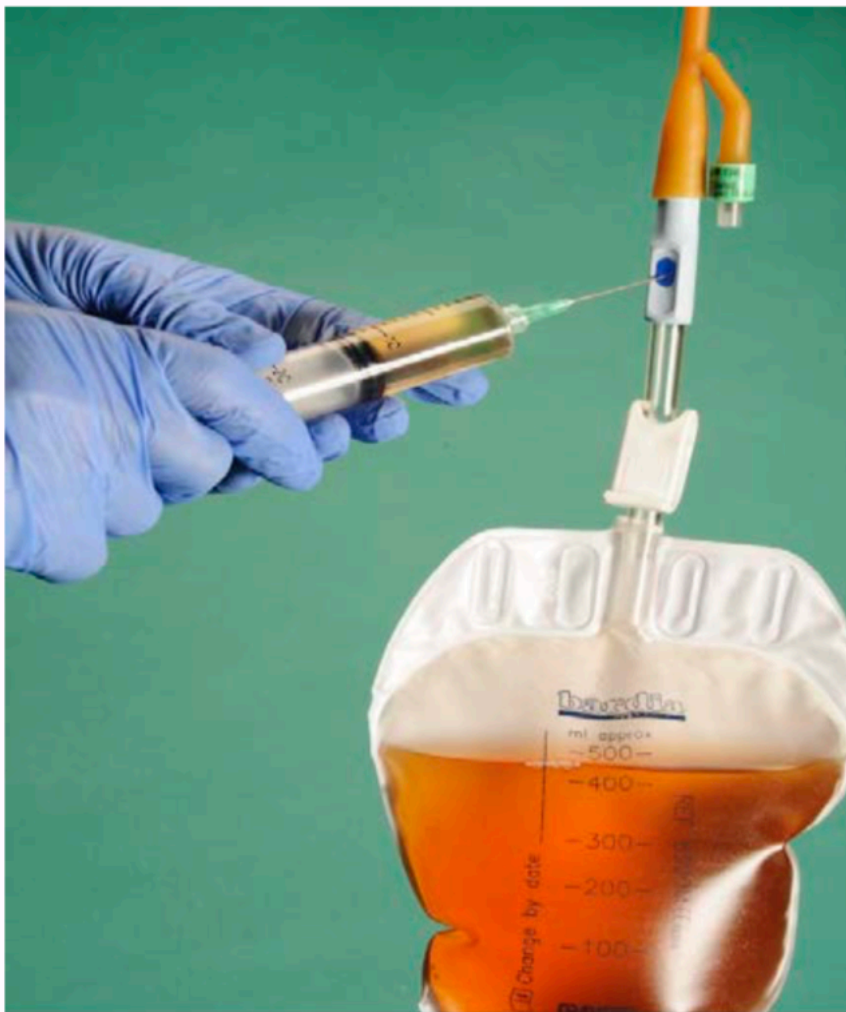
Equipment required for mid-stream urine specimen:



CATHETER SPECIMEN OF URINE (CSU)

The following equipment is necessary to obtain a CSU: -

- Disposable gloves
- A sterile needle
- A sterile syringe
- Two alcohol-impregnated swabs
- A boric acid urine container (red top bottle)
- Sharps disposal bin



Procedure

- Explain the procedure to the patient and ensure that you have obtained consent
- Carry out hand hygiene
- Apply disposable gloves

- Wipe the catheter sampling point with an alcohol-impregnated swab
- Connect the needle and syringe and insert into the sampling point. Gently withdraw the required amount of urine necessary for the test.
- Transfer the urine into a sampling bottle immediately
- Dispose of the sharp into a sharps disposal unit immediately after filling the urine container. Ensure the container lid is sealed prior to moving the specimen. Excess urine may be disposed of into the toilet bowl.
- The sampling port should be wiped with an alcohol-impregnated swab at the end of the procedure
- Dispose of equipment into a waterproof bag and place it into the patient's outside bin
- Hand hygiene must be carried out following procedure
- Ensure that the specimen container is labelled with the correct patient details prior to leaving their home.
- Ensure the patient's privacy and dignity are maintained throughout procedure.
- Ensure the patient is aware on how to obtain their results
- Details of the specimen should be recorded in the patient's notes
- Ensure the appropriate laboratory form is completed and labelled appropriately

Specimen Collection

- Confirm the identity of the patient
- Explain the procedure to the patient and obtain consent.

Introduce yourself

- ▶ Give your name, clinical title and the reason why you have come to see the patient (e.g. Hello my name is .. I am a junior doctor and ..)

Check patient identification

- ▶ Check addressograph details on request form with the patient
- ▶ Ask the patient, if they are able, to tell you their: full name, date of birth & address
- ▶ If an in-patient check hospital ID band with request form

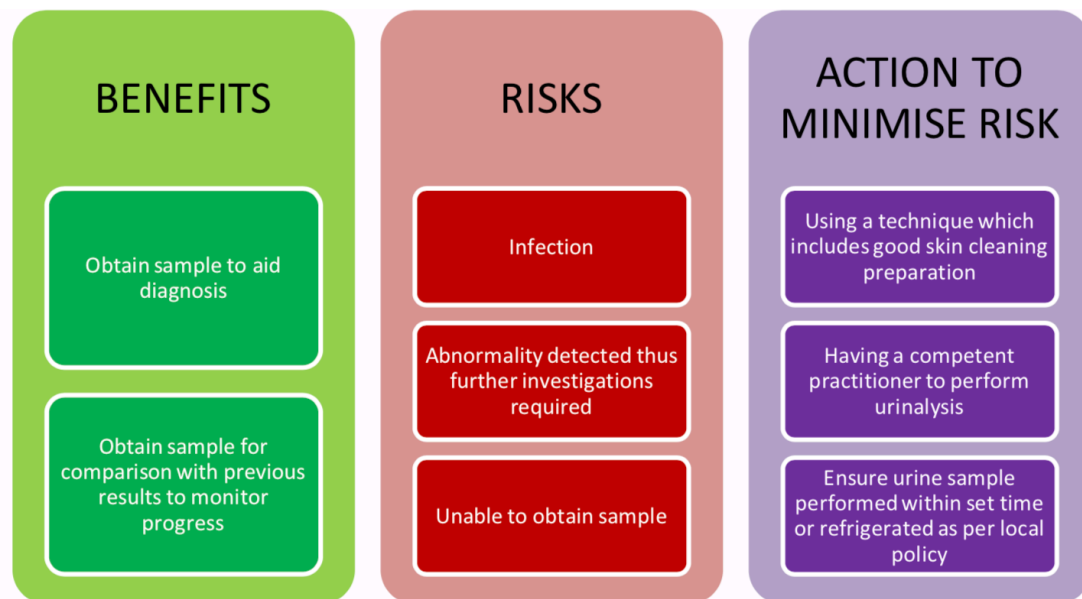
Explanation

- ▶ Explain procedure to patient, include reason for the procedure and that if any abnormality is identified further investigations may be necessary. Include benefits, risks, what will be done to minimise risks and why the benefits outweigh the risks

- Check you have the appropriate container for the test.
- Check the container lid securely fits the specimen container.
- Check the container is free from obvious contamination.
- Perform hand hygiene to prevent contamination of the specimen.
- Gloves must be worn prior to commencing the procedure.
- Take all the required equipment to the patient.
- Throughout the procedure ensure patient privacy.
- As soon as the specimen is obtained, secure the lid to the container.
- Every effort must be made to prevent contamination of the outside of the container.
- Thank the patient for their cooperation and inform them when the result can be expected and who to contact to obtain i.e. GP.
- Dispose of any excess urine in the toilet bowl and place any receptacles used in a waterproof disposal bag and place it directly into the patients **OUTSIDE** bin.
- Remove personal protective equipment.

- Decontaminate hands.
- Label the sample prior to leaving the patients home confirming the patient's details. Name, D.O.B, specimen type, date and time should be included on the container.
- If possible place the specimen in a sealed plastic envelope.
- Decontaminate hands.
- Document in patients notes that the specimen has been obtained.
- The specimen should be transported to the appropriate collection area with the suitable laboratory form.
- The appropriate laboratory form should be folded and placed within the sleeve of the bag. The patient's details should not be visible to the outside ensuring confidentiality is not breached.

Should the container leak a new specimen must be obtained and an incident form completed.



Specimen Forms

Specimen forms vary depending on the type of test required. When screening a specimen for infection a bacteriology form should be completed. Clinical reasons should be included when giving a summary of details i.e. you may include the patient has been experiencing pain on passing urine (dysuria), frequency of micturition or the patients urine may be fowls smelling.

Hazardous Labelling of Specimens

All specimens pose a risk of infection but where a specimen is known or suspected to contain a transmissible agent then the appropriate labelling should be used to highlight the danger. The form should state the hazard clearly and the labelling should be placed on both sides to alert staff. Please see consult your prevention and control of infection manual for details.

Urinalysis

Testing urine involves assessing the constituents of the urine by observational, biochemical and mechanical means: -

- To aid in the diagnosis of disease
- To assist in the monitoring of disease and treatment
- To assist in the assessment of the health of an individual
- To exclude pathology

Urine testing does not require an aseptic technique; all equipment should be clean and disposable.

Observations

ODOUR. Fresh urine from a healthy individual should not have an offensive odour, but decomposing urine will smell like ammonia. A patient whose urine is found to have a 'sweet' smell may be investigated further for diabetes mellitus. Urine smelling of fish can be an indication of infection of the urinary system.

COLOUR. The normal colour of urine ranges from pale straw to dark amber and will vary according to the amount of fluid that has been taken into the body.

The type and amount of urinary constituents also affects the colour of urine; dark-coloured urine can, for example, be an indication of dehydration or the presence of bile pigments, a manifestation of liver or biliary tract disease. Certain food and drugs alter the colour of a patient's urine: beetroot can cause the urine to take on an orange-red hue.

HAEMATURIA. This is the term to describe blood in the urine. This can vary from microscopic haematuria i.e. that is detected only by testing, to frank

haematuria, with an obvious red colouration. Blood in the urine is suggestive of disease or damage to the renal system.

GLYCOSURIA. This refers to the presence of glucose in the urine, which can be suggestive of diabetes mellitus.

PROTEINURIA. This term is used when there is protein in the urine, which can be a manifestation of acute or chronic renal disease.

KETONES. When the body metabolises fat, ketones are one of the products of this metabolism. Ketones are acidotic so if the excessive metabolism of fat persists, a state of metabolic acidosis develops, which can, if untreated, lead to coma and death.

At a certain stage of acidosis, the ketones are excreted by the urinary system they may be indicative of excessive fasting or uncontrolled or poorly controlled diabetes mellitus.

NITRITES

This test relies on the breakdown of urinary nitrates to nitrites, which are not found in normal urine. Many Gram-negative and some Gram-positive bacteria are capable of producing this reaction and a positive test suggests their presence in significant numbers (i.e. more than 10,000 per ml). A negative result does not rule out a urinary tract infection.

LEUCOCYTES

This relies on the reaction of leukocyte esterase produced by neutrophils and a positive result suggests pyuria associated with urinary tract infection.

False positive results may occur.

SPECIFIC GRAVITY varies with the state of hydration.

PH of urine reflects the function of the kidney in maintaining the acid-base balance.

EQUIPMENT

- Clean dry bowl
- Reagent strips (check expiry date prior to using)
- Bedpan or urinal
- Watch with a second hand
- Gloves
- Waterproof bag to dispose of equipment



PROCEDURE

- Explain procedure and obtain consent from patient
- Perform hand hygiene
- Gloves must be applied
- Request patient to pass urine into container
- Observe urine for sediment, colour and odour
- Remove reagent strip ensuring that you do not touch the reagent squares as this may contaminate strips

- Immerse the strip fully in urine



- Withdraw the strip from the urine and gently tap on the rim of the container to remove the excess.
- Hold the strip at an angle to prevent cross contamination from one reagent pad to another
- Hold the strip vertically or horizontally against the results guidance chart to ensure an accurate interpretation of the colour change
- Read the reagent strip after the recommended time has elapsed to ensure accurate results



- Note the results providing an accurate written record
- Dispose of the excess urine into the toilet bowl
- Dispose of equipment in a waterproof bag. The bag should be placed in the patients outside bin.
- Hand hygiene must be carried out after procedure
- All results should be documented with abnormal results highlighted to a member of the nursing staff or GP
- The privacy and dignity of the patient should be maintained throughout the procedure
- The patient should be reassured regarding the results

Urinalysis Machines









Some clinical areas will have a machine, also known as a urinalysis analyser, that will evaluate the urine and provide a print out of the results. This is known as Point of Care Testing. You **must not** use a Point of Care machine unless you have received specific training for doing so.



Causes of Urine Discolouration







Orange/ brown	▶ Liver failure, metronidazole, ingesting carrots
Red	▶ Frank haematuria, lead or mercury poisoning, rifampicin – pink, ingesting beetroot or rhubarb
Green/ Blue	▶ Urinary tract infection (pseudomonas), hypercalcaemia, amitripyline
Colourless	▶ Excessive fluid intake, diabetes insipidus, diuretics

FACTS ABOUT THE TEST STRIP

	Leukocytes
	Nitrite
	Protein
	pH
	Blood
	Specific Gravity
	Ketone
	Glucose

Leukocytes

The presence leucocytes may indicate a urinary tract infection (UTI) or more severe renal problems. However, they may be present without bacterial infection (sterile pyuria).

-  Leukocytes
-  **Nitrite**
-  Protein
-  pH
-  Blood
-  Specific Gravity
-  Ketone
-  Glucose

Nitrites

The presence of nitrates is associated with infection. Most organisms that are responsible for UTI's convert nitrate to nitrite.

-  Leukocytes
-  Nitrite
-  **Protein**
-  pH
-  Blood
-  Specific Gravity
-  Ketone
-  Glucose

Protein

Albumin proteins are too large to pass through the glomerular filtrate barrier, so a presence may indicate an increased permeability due to infection or renal damage.

-  Leukocytes
-  Nitrite
-  Protein
-  **pH**
-  Blood
-  Specific Gravity
-  Ketone
-  Glucose

pH

The pH of urine is normally acidic. A pH range of 5.0-8.0 is considered normal. High acidity may indicate kidney stones. Alkalinity may indicate the presence of certain bacteria such as Pseudomonas, Klebsiella or Proteus mirabilis. A protein rich diet can also make the urine more acidic, whilst a vegetarian diet may show alkaline results.

-  Leukocytes
-  Nitrite
-  Protein
-  pH
-  **Blood**
-  Specific Gravity

Blood

The presence of blood in the urine is abnormal. It is associated with problems in the urinary tract such as urological disease and /or infection. Check that a female patient is not menstruating before rushing to send the sample for further testing.

-  Leukocytes
-  Nitrite
-  Protein
-  pH
-  Blood
-  **Specific Gravity**

Specific Gravity

A measure of the total solute concentration. Normal is 1.001-1.035. A high value may indicate the patient is dehydrated. High levels of a solute-such as glucose will raise specific gravity levels. Low value represents dilute urine-occurs when patient has diabetes insipidus or hypercalcaemia.

-  Leukocytes
-  Nitrite
-  Protein
-  pH
-  Blood
-  Specific Gravity

Ketones

These are acidic chemicals formed during an abnormal excessive breakdown of fat. This can occur if there is a prolonged period of vomiting, fasting, starvation, and poorly controlled diabetes mellitis.

-  **Ketone**
-  Glucose



General appearance

A fresh urine sample is straw coloured, transparent and free from debris

Odour

Foul smelling – May indicate an infection or dehydration
 Sweet smelling – May indicate ketoacidosis

pH

Urine is normally acidic (pH 4.5-7)
 Increased acidity – high meat diet, dehydration, diabetic ketoacidosis, renal stones
 Alkalotic – vegan diet, chronic renal failure, bacterial urinary tract infections

Specific gravity

Urine specific gravity measures the concentration of molecules in urine.
 Normal range 1.003- 1.030

Lower values – urinary dilution in diabetes insipidus, renal failure, excessive fluid intake
 Higher values – urinary concentration in shock and dehydration

Potential causes of abnormal findings

Blood

Blood in the urine may be caused by
 Renal – glomerulonephritis, polycystic renal disease, renal cancer
 Extra-renal – urinary tract infection, kidney stones, hypertension, sickle cell

disease Positive results may also appear in trauma and in menstruating females

Protein

Proteinuria may be present in urinary tract infections, pre-eclampsia, intrinsic kidney dysfunction

Nitrites and Leukocytes

Present in urinary tract infection

Glucose & ketones

Diabetes, pregnancy, Cushings disease, pancreatitis, intrinsic kidney disease

Further Urine Investigation

If an abnormal result is identified further investigation may be required
The sample should be sent as soon as possible to the relevant laboratory
Otherwise store the sample in a specimen fridge overnight
Red top bottles containing the preservative boric acid are useful if no fridge is available
Label the sample bottle with the patient details and place in an appropriate sample bag
Complete the investigation form

(e.g. Microbiology form for culture and sensitivity)



You must document the procedure in the patients' medical notes. Your entry must include:

- Date and time
- Verbal consent obtained
- Type of urine sample obtained
- Any abnormalities detected
- Whether further investigations were performed such as sending a urine sample for culture and sensitivity
- Information given to patient
- Your signature and job role