INTRODUCTION TO CLINICAL PRACTICE AND CLINICAL SKILLS

MEDICAL YEAR

Point of Care Testing

This session is designed to teach you the principals of point of care testing. This is common practise in all areas of health care including primary care and hospital environments. You will be given the opportunity to use two different point of care tests with the appropriate instruction. These will be biochemical tests and will hopefully link into your biochemistry course.

Objectives

TSSBAT

- Understand the importance of following a standard operating protocol (SOP).
- Understand the requirements for quality control and user training
- Safely obtain and analyse blood glucose and urine samples and record findings.

Methods

Urine dipstick test - This will be demonstrated and then students will practice on a collected urine sample.
Blood glucose monitoring – Calibration of Glucometer and obtaining and testing blood glucose demonstration will be given by tutor. Students will practice same under supervision. Blood glucose testing will be practice on self or a consenting classmate under supervision.
Point of Care Testing (POCT)

Background
Developments in technology have resulted in production of relatively simple analytical devices and systems.
Point-of-Care testing (POCT), sometimes referred to as near-patient testing, is any test performed for a patient by a healthcare professional outside the laboratory setting (MDA, 2002).

Advantages
- Immediate results
- Small sample volume
- Wide range of tests
- Works within clinical patient flow

Disadvantages
- Expensive
- Difficult to restrict operator access – quality suffers
- Documentation inadequate
- Lack of appreciation of limitations and contraindications

POCT includes:
- Urinalysis with/without an automated reader
- Blood Ketone (b-hydroxybutyrate) Analysis
- Blood Glucose monitoring
- Drug Screening tests
- Faecal Occult Blood
- Cardiac Markers
- Blood Gas analysis (+/- Electrolytes, Ca, etc)
- Lipid Analyses
- Pregnancy tests
- Haemoglobin

Systems vary in complexity from simple disposable strips and cartridges with or without inbuilt controls, through small hand-held analysers which may have memory and communication capability to more complex analysers, such as blood gas analysers.

Analyses in clinical laboratories are performed, by highly skilled operators with high levels of scientific and technical training, to high standards of quality. POCT generally requires much less skill and training. However, it is essential that POCT is performed with comparable standards of quality and accountability.

There have been many incidences of adverse outcomes, including deaths, arising from inherent faults in devices, inappropriate use, operator error, misinterpretation, inaccurate documentation, or interferences with analyses. These have led to the development, in other countries, of guidelines and standards to prevent recurrence.

In Ireland, all point of care devices fall within the remit of the In-vitro Diagnostic Medical Devices Directive EC 98/79, which was implemented via Statutory Instrument S. I. No. 304 of 2001.
URINE MULTI DIPSTICK TEST

Urinalysis is invaluable in the diagnosis of urologic conditions such as urinary tract infection (UTI), calculi and malignancy. It also can alert the physician to the presence of systemic disease affecting the kidneys (Simmerville et al, 2005).

Assessment:

- Wash hands and introduce yourself to the patient. Gain informed consent. Explain that you would like to do a test of their urine to look for any evidence of changes in the urine that may suggest underlying health problems (e.g. sugar may suggest diabetes).
- Assess patient’s current urinary elimination pattern eg. dysuria, anuria, oliguria, polyuria, haematuria, flank pain, foul odour.
- Assess patient’s ability to provide sample independently.
- Explain to the patient how to pass a urine sample into the container. Describe the clean catch method. This requires the patient to void some urine into the toilet before collecting the sample as a “mid-stream” catch. Once the container is about half to three quarters full the rest of the urine can be voided into the toilet.

Planning:

- Equipment: Clean gloves, sterile specimen container, Urinalysis multisticks, biohazard bag, watch with second hand
- Check the expiry date on the container.
- The container should be stored on a shelf at room temperature and tightly closed.
- Do not use discoloured strips.
- Do not touch the test areas.
- The sample should be at room temperature and should not be more than 2 hours old.

Procedure:

- Put on gloves.
- Dip the test areas of the strip in urine completely, but briefly (1 second), to avoid dissolving out the reagents.
- Wipe the edge of the strip on the container as you remove it to get rid of excess fluid.
- Read the test results carefully at the time specified (30 -120 secs) in good light, with the test area held near the specimen appropriate colour chart on the bottle label.
- Do not read the strips in direct sunlight or after time specified as these will not have diagnostic significance.
- Record the results in the patient notes.

Evaluation

- Any abnormal findings should be noted, recorded and reported. (Elkin et al, 2007)
- Further investigations may be required e.g culture and sensitivity (C&S) sample if infection is suspected.
### Elements Measured in Routine Urinalysis

<table>
<thead>
<tr>
<th>Element</th>
<th>Normal Value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH value</td>
<td>4.6-8.0 (average 6.0)</td>
<td>Indicates acid base balance</td>
</tr>
<tr>
<td>Protein Level</td>
<td>Not normally present</td>
<td>Presence suggests renal disease or damage</td>
</tr>
<tr>
<td>Glucose Level</td>
<td>Not normally present</td>
<td>Elevated in diabetes</td>
</tr>
<tr>
<td>Ketones</td>
<td>Not normally present</td>
<td>Present with dehydration and starvation and poorly controlled diabetes mellitus</td>
</tr>
<tr>
<td>Blood</td>
<td>&lt;2 red blood cells</td>
<td>Elevated with kidney disease or damage, trauma and surgery</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.005-1.0030</td>
<td>Reflects urine concentration. Increased with dehydration, decreased with over hydration. Altered with kidney damage.</td>
</tr>
<tr>
<td>White Blood Cell Count</td>
<td>0-4</td>
<td>Elevated with UTI</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Not normally present</td>
<td>Presence indicates UTI</td>
</tr>
</tbody>
</table>

*Other multi-sticks also measure the following:*

<table>
<thead>
<tr>
<th>Element</th>
<th>Normal Value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukocytes</td>
<td>&lt;10, 10-20 borderline, &gt;20 Pathological</td>
<td>Bacterial: cystitis, urethritis, pyelonephritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abacterial: yeast, fungal, viral, voiding disturbances</td>
</tr>
<tr>
<td>Nitrates</td>
<td>Nil</td>
<td>Only positive in presence of infection</td>
</tr>
<tr>
<td>Bilirubin/</td>
<td></td>
<td>Excess bile is reabsorbed into the bloodstream due to liver disturbance &amp; excreted by the kidneys. Due to cirrhosis, hepatitis, obstruction, inflammation &amp; other liver damage.</td>
</tr>
<tr>
<td>Urobilinogen</td>
<td></td>
<td></td>
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</tbody>
</table>

**BLOOD GLUCOSE**

This test is performed to measure levels of blood glucose as a preliminary screen for, or to monitor diabetes. Blood Glucose is measured in mmols in Ireland but different jurisdictions may measure in Mgs. It is essential to familiarise yourself with normal ranges of measurement.

A sample reading below 2.8 mmols or above 20 mmols or a result not in keeping with the patient’s clinical picture should be verified by sending a venous specimen of blood to the laboratory for random blood glucose testing.

Blood glucose meters should **NOT** be used for patients with:
- Peripheral Circulatory Failure e.g. - Severe dehydration
  - Hyperglycaemic hyperosmolar states- with/without ketosis
- Hypotension
- Shock
- Peripheral Vascular Disease
- Severe diarrhoea and vomiting

-Patients with sustained uncontrolled diabetes.

Assessment and Planning

- **Equipment needed:** Blood Glucose monitor, test strips, control solution, logbook, lancets, gloves, cotton wool balls, biohazard bag.
- Prior to undertaking this test it is **essential** to check Operational Procedures and **Contra-indications** specific to equipment being used as these will **differ between Manufacturers**.
- Before you use your meter for the first time and every time you open a new vial of strips you need to set the meter to “match” the strips i.e calibrate.

Quality Control

Check that machine has had a Quality Control (QC) test in the past 24 hours – this will be recorded in Log Book. If unsure or if you are using a new batch of strips a **QC** must be done.

Calibration

- Turn meter on and check 3 digit code on screen matches 3 digits on test strip vial. If matching, meter is calibrated and ready to use.
- If no code appears turn off meter.
- A calibration key is found in each box of strips and is placed in the back of the meter while it is turned off.
- **EACH TIME A NEW VIAL OF STRIPS IS USED THE OLD KEY MUST BE REMOVED AND DISCARDED AND A NEW KEY USED.**
- Check expiry date on the vial of strips.
- Open test strip vial and remove a test strip. Replace vial cap tightly as damp strips may give inaccurate results.
- **Within 30 seconds,** insert test strip with silver bars facing up toward meter into test strip slot. Yellow window will also be facing upwards.
- The test strip symbol stops flashing and a blood drop appear on the display screen.
- Press and release the right arrow button once to select a Level 1 (L1) control, or twice to select a Level 2 (L2) control.
- Check the expiry date on the control solutions- these expire within 3 months of opening. If unsure when opened, discard and open and date a new set of solutions.
- Gently squeeze the bottle of control solution to form one small drop.
- Bring the drop to the edge of the strip within the curve, and allow the strip to automatically draw the solution into the yellow window until it is completely filled.
- An hourglass flashes on the display until the measurement is complete.
- If result is within the acceptable range (which is found on the side of the vial of strips), the result will alternate with “OK”.
- A QC should be done on Level 1 AND level 2 solutions.
- Record result in log book.
- Turn off meter.

**IF METER FAILS QC –OPEN NEW QC SOLUTIONS AND REPEAT PROCEDURE- IF IT FAILS AGAIN DO NOT USE METER.**

**NB DIFFERENT MANUFACTURER’S WILL HAVE DIFFERENT QUALITY CONTROL PROCEDURES SO CHECK INSTRUCTIONS.**

### Obtaining sample for Blood Glucose

**Procedure:**

- Wash hands and introduce yourself to the patient, explain the procedure and rationale.
- Gain consent and put on gloves.
- Assess planned puncture site for oedema, inflammation, open cuts or sores. Avoid areas of bruising, lesions and hand on side of mastectomy (Elkin, 2007).
- Ask patient to wash their hands and dry them thoroughly ensuring no soap is left on skin. Do not use alcohol based solutions, swabs or analgesic creams on your or the patient’s hands as these may cause inaccurate results with the equipment used.
- Turn on meter.
- Open test strip vial and remove a test strip. Replace vial cap.
- **WITHIN 30 SECONDS** insert a test strip with silver bars up toward meter, (yellow window will also be facing up), into test strip slot.
- The test strip symbol will stop flashing and a blood drop will appear on the display screen.
- Use an automatic lancet to pierce the pad of the distal phalanx, below the tip, halfway between the centre line and lateral or medial edge. Avoid index finger and thumb if possible.
- Touch the hanging droplet of blood to the curved side of the strip and keep it in place until the yellow target area is covered entirely.
- Multiple small samples can be used but total sample must be applied **WITHIN 15 seconds.**
- An hourglass symbol flashes on the screen until measurement is complete.
- Result appears on screen - mmols in Ireland.
- Apply a piece of sterile cotton wool with gentle pressure to the patient’s finger until the bleeding stops and discard this in the clinical waste.
- Dispose of the lancet in a sharps disposal bin.
• Remove gloves and dispose into biohazard waste bag.
• Dispose of cotton wool into biohazard bag once bleeding has stopped.
• Turn off meter.
• Make comfortable, reassure and thank the patient.
• Wash hands.
• Record results in patients records.

Evaluation

• Any abnormal findings should be noted, recorded and reported. (Elkin et al, 2007)
• Recheck blood glucose if result does not match clinical picture of patient.
• Further investigations may be required e.g. a sample reading below 2.8mmols or above 20 mmols or a result not in keeping with the patient’s clinical picture should be verified by sending a venous specimen of blood to the laboratory.

References


