Work up-Laboratory medicine

Dr. Rodney Martinez
Why do we use additional tests?

- Clinical history
- Physical examination
- Complementary exams (Work Up)
  - Laboratory medicine
  - Imaging
Before asking for auxiliary test...

Ask yourself

1. Will the investigation alter patient management? I.e. is the expected outcome clinically relevant? **Do you need it?**

2. Investigating too often or repeating investigations before there has been an adequate lapse of time to allow resolution or to allow treatment to take effect. **Do I need it now?**

3. Would an investigation that does not use ionising radiation be more appropriate, e.g. USS/MRI?

4. Failure to provide accurate clinical information and questions that you are hoping will be answered by the investigation may result in an unsatisfactory outcome. Have I explained the problem?

5. Would another technique be more appropriate? The advances in radiology mean that discussion with a radiologist may be helpful in determining the best possible test.

6. Overinvestigating: are you taking comfort in too many tests or providing reassurance to the patient in this way?
Factors affecting measurable variables

- Age.
- Sex.
- Ethnicity.
- Altitude.
- Build.
- Physiological conditions (e.g. at rest, after exercise, standing, lying).
- Sampling methods (e.g. with or without using tourniquet).
- Storage and age of sample.
- Container used, e.g. for blood sample, as well as anticoagulant.
- Method of analysis
Sensitivity & specificity

- **Sensitivity** % of patients with the disease and in whom the test is positive

- **Specificity** % of people without the disease in whom the test is negative
Full blood count (FBC)

- **Sample:** peripheral blood EDTA; the sample should be analysed in the laboratory within 4h, if possible.
- **Main parameters measured**
  1. Hb concentration.
  2. Red cell count (RCC).
  3. MCV.
  4. MCH.
  5. MCHC.
  6. Haematocrit (Hct) or PCV.
  7. Red cell distribution width (RDW).
  8. White cell count.
  9. WBC differential.
  10. Platelet count
A complete blood count is a common blood test that's done for a variety of reasons:

- **To review your overall health.** Your doctor may recommend a complete blood count as part of a routine medical examination to monitor your general health and to screen for a variety of disorders, such as anemia or leukemia.
- **To diagnose a medical condition.** Your doctor may suggest a complete blood count if you're experiencing weakness, fatigue, fever, inflammation, bruising or bleeding. A complete blood count may help diagnose the cause of these signs and symptoms. If your doctor suspects you have an infection, the test can also help confirm that diagnosis.
- **To monitor a medical condition.** If you've been diagnosed with a blood disorder that affects blood cell counts, your doctor may use complete blood counts to monitor your condition.
- **To monitor medical treatment.** A complete blood count may be used to monitor your health if you're taking medications that may affect blood cell count.
Endocrine Lab work

- Fasting plasma glucose
- A1C
- GH
- LH
- TSH
- T3 & T4
- Norepinephrine and epinephrine
- Cortisol testing
Immunology

• The detection or quantification of autoantibodies, typically IgG antibodies.
• The measurement of complement components.
• The detection of changes in concentration of non-specific inflammatory markers.
Rheumatology

• Rheumatoid factor
• Antinuclear antibody (ANA)
• Anticentromere antibodies
• Anti-DNA
Infectious & tropical diseases

- Serology
- Microscopy
- Presence of toxins
- Antigen detection
- Molecular assays
- Culture
Cardiology

- Cardiac enzymes
  - LDH
  - CK
  - TROPONIN
  - OTHERS
Gastroenterology

- Bilirubin
- Aminotransferases
- Globulins
- Faecal occult blood
- Tumor markers
Respiratory medicine

- Spirometry
- Arterial blood gases
- Diagnostic pleural aspiration
Neurology

• Lumbar puncture (LP)

• A lumbar puncture can help diagnose serious infections, such as meningitis; other disorders of the central nervous system, such as Guillain-Barre syndrome and multiple sclerosis; or cancers of the brain or spinal cord. Sometimes doctors use lumbar puncture to inject anesthetic medications or chemotherapy drugs into the cerebrospinal fluid.
Renal medicine

- Serum creatinine
- Serum urea
- 24hrs creatinine clearance
- Anion gap
- Urine culture
- Urine microscopy
Urine dipstick testing

- Depending on the type of dipstick used, urine can be tested for:
  - pH.
  - Specific gravity.
  - Haemoglobin.
  - Leucocyte esterases and nitrites.
  - Glucose.
  - Ketones.
  - Protein.
  - Urobilinogen.
Poisoning & overdose

- Amphetamines & derivatives (MDMA (ecstasy), MDEA (eve), MDA (adam))
- Anticonvulsants
- Benzodiazepines
- Carbon monoxide
- Cocaine
- Cyanide
- Digoxin
Work up-Imaging

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Chest x-ray: useful landmarks

- Chest X-rays produce images of your heart, lungs, blood vessels, airways, and the bones of your chest and spine. Chest X-rays can also reveal fluid in or around your lungs or air surrounding a lung.
Why is it done?

- **The condition of your lungs.** Chest X-rays can detect cancer, infection or air collecting in the space around a lung (pneumothorax). They can also show chronic lung conditions, such as emphysema or cystic fibrosis, as well as complications related to these conditions.

- **Heart-related lung problems.** Chest X-rays can show changes or problems in your lungs that stem from heart problems. For instance, fluid in your lungs (pulmonary edema) can be a result of congestive heart failure.

- **The size and outline of your heart.** Changes in the size and shape of your heart may indicate heart failure, fluid around the heart (pericardial effusion) or heart valve problems.

- **Blood vessels.** Because the outlines of the large vessels near your heart — the aorta and pulmonary arteries and veins — are visible on X-rays, they may reveal aortic aneurysms, other blood vessel problems or congenital heart disease.
• **Calcium deposits.** Chest X-rays can detect the presence of calcium in your heart or blood vessels. Its presence may indicate damage to your heart valves, coronary arteries, heart muscle or the protective sac that surrounds the heart. Calcium deposits in your lungs are most often from an old, resolved infection.

• **Fractures.** Rib or spine fractures or other problems with bone may be seen on a chest X-ray.

• **Postoperative changes.** Chest X-rays are useful for monitoring your recovery after you've had surgery in your chest, such as on your heart, lungs or esophagus. Your doctor can look at any lines or tubes that were placed during surgery to check for air leaks and areas of fluid or air buildup.

• **A pacemaker, defibrillator or catheter.** Pacemakers and defibrillators have wires (leads) attached to your heart to make sure your heart rate and rhythm are normal. Catheters are small tubes used to deliver medications or for dialysis. A chest X-ray usually is taken after placement of such medical devices to make sure everything is positioned correctly.
Abdominal x-ray: useful landmarks

• Digestive tract problems. Barium, a contrast medium delivered in a drink or an enema, can help reveal problems in your digestive system.

• Swallowed items. If your child has swallowed something like a key or a coin, an X-ray can show the location of that object.
Barium studies

• Common disorders and patterns:
  – Luminal narrowing
  – Megaesophagus
  – Megacolon
  – Diverticulae
  – Ulcerations
  – Filling defects
Cholangiography

- ERCP (endoscopic retrograde cholangiopancreatography)
- Intravenous cholangiography
- PTC (percutaneous transhepatic cholangiography)

Dye is injected through a catheter into the pancreatic or biliary ducts.
Cholangiography is the imaging of the bile duct (also known as the biliary tree) by x-rays

- **Percutaneous transhepatic cholangiography (PTC):** Examination of liver and bile ducts by x-rays. This is accomplished by the insertion of a thin needle into the liver carrying a contrast medium to help to see blockage in liver and bile ducts.

- **Endoscopic retrograde cholangiopancreatography (ERCP).** Although this is a form of imaging, it is both diagnostic and therapeutic, and is often classified with surgeries rather than with imaging.
Breast imaging

• Mammography

• A mammogram is an X-ray image of your breast used to screen for breast cancer. Mammograms play a key role in early breast cancer detection and help decrease breast cancer deaths.
• **Screening mammography.** Screening mammography is used to detect breast changes in women who have no signs or symptoms or observable breast abnormalities. The goal is to detect cancer before clinical signs are noticeable.

• **Diagnostic mammography.** Diagnostic mammography is used to investigate suspicious breast changes, such as a breast lump, breast pain, an unusual skin appearance, nipple thickening or nipple discharge. It's also used to evaluate abnormal findings on a screening mammogram. A diagnostic mammogram includes additional mammogram images.
Ultrasound

- Diagnostic ultrasound, also called sonography or diagnostic medical sonography, is an imaging method that uses high-frequency sound waves to produce images of structures within your body. The images can provide valuable information for diagnosing and treating a variety of diseases and conditions.
Ultrasound is used for a variety of reasons, including:

- View the uterus and ovaries of a pregnant woman and assess her fetus
- Diagnose gallbladder disease
- Evaluate flow in blood vessels
- Guide a needle for biopsy or tumor treatment
- Evaluate a breast lump
- Check a thyroid gland
- Diagnose some cancers
- Reveal genital and prostate abnormalities
Computed tomography (CT)

- A computerized tomography (CT) scan combines a series of X-ray images taken from different angles and uses computer processing to create cross-sectional images, or slices, of the bones, blood vessels and soft tissues inside your body. CT scan images provide more detailed information than plain X-rays do.
Why is done?

• Diagnose muscle and bone disorders, such as bone tumors and fractures
• Pinpoint the location of a tumor, infection or blood clot
• Guide procedures such as surgery, biopsy and radiation therapy
• Detect and monitor diseases and conditions such as cancer, heart disease, lung nodules and liver masses
• Monitor the effectiveness of certain treatments, such as cancer treatment
• Detect internal injuries and internal bleeding
Magnetic resonance imaging (MRI)

- Magnetic resonance imaging (MRI) is a technique that uses a magnetic field and radio waves to create detailed images of the organs and tissues within your body.
- MRI is a noninvasive way for your doctor to examine your organs, tissues and skeletal system. It produces high-resolution images that help diagnose a variety of problems.
Vascular intervention

• Angiography

• A coronary angiogram is a procedure that uses X-ray imaging to see your heart's blood vessels. Coronary angiograms are part of a general group of procedures known as heart (cardiac) catheterization.

• Heart catheterization procedures can both diagnose and treat heart and blood vessel conditions. A coronary angiogram, which can help diagnose heart conditions, is the most common type of heart catheterization procedure.
Interventional radiology

- Percutaneous biopsy
- Percutaneous drainage
- Drainage