

Blood Results for Beginners

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Recently a medical student was showing me her work. As a routine training exercise she had undertaken a case study of a hospital patient. From the hospital IT system, she had downloaded and tabulated the blood results and had devised a colour code for those falling outside the normal range. What caught my eye was a run of three to four days of blood results, urea and creatinine, printed in red. “Oh, that’s the weekend” she sagely remarked.

introduction to NCEPOD. 2009. Adding Insult to Injury.

Introduction

aim: to provide a resource for you to interpret blood results on your patients

results often include normal reference range, or abnormal results indicated

blood is the transport system of body so blood contents reflect body activity

homeostasis: daily intake production balances loss with imbalances, “first aid” assessment of results enables timely interventions

Most things come in 3s

- usually 3 hours!
- so selected examples
- 3 main areas (haematology, LFTs, biochemistry)
 - and...

3 reasons for abnormal results

low:

- dilution
- loss
(eg gut, renal)
- failure of supply
or to produce

high:

- dehydration
(haemoconcentration)
- failure to clear
- excessive
intake/production

So, if abnormal, 3 key questions

- source/loss? (where is it from/where is it lost?)
- what is its significance (for my patient)?
- what do I do about it?

Haematology

3 types of cells:

erythrocytes (red cells)

leucocytes (white cells)

platelets

so, full blood count has 3 main parts

haemoglobin

white cell count (WCC)

platelets

haemoglobin

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

white cell count (overall)

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

white cells

2 major groups:

- granulocytes
- agranulocytes

what are the main differences?

white cells

Granulocytes:

- neutrophils
- basophils
- eosinophils

Agranulocytes

- lymphocytes (T+B cells)
- monocytes

white cell count

$\times 10^9/\text{litre}$

- neutrophils (polymorphs) 2.5-7.5
- basophils <0.2
- eosinophils 0.04-0.44

- lymphocytes (B + T cells) 1.5-4.0
- monocytes 0.2-0.8

C-reactive protein (CRP)

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

platelets

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

Liver Function Tests

Bilirubin	1-20 $\mu\text{mol/litre}$
Alkaline Phosphatase (Alk Phos)	<100 iu/litre
Alanine (Amino)Transferase (ALT)	<40 iu/litre
Aspartate Aminotransferase (AST)	<40 iu/litre
Gamma glutamyl transpeptidase (GGT)	10-48 iu/litre
Albumin	35-50 g/litre
Total protein (TP)	60-80 g/litre

bilirubin

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

transaminases (Alk Phos, ALT, AST, GGT)

- *source/loss?*
- *significance?*
- *what do I do?*

proteins (albumin, total protein)

- *normal (albumin)?*
- *source/loss?*
- *significance?*
- *what do I do?*

clotting

3 main tests:

- aPTT (intrinsic clotting)
- PT (extrinsic clotting)
- INR (combined pathways)

also d-dimers

normal

28-34 secs

10-12 secs

0.9-1.1

negative

(<250 ng/ml)

Biochemistry

many, but most important:

- sodium
- potassium

also:

- calcium - total; ionised
- magnesium
- phosphate
- creatinine

sodium

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

potassium

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

calcium

- *normal?* (total; ionised)
- *source/loss?*
- *significance?*
- *what do I do?*

magnesium

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

phosphate

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

creatinine

- *normal?*
- *source/loss?*
- *significance?*
- *what do I do?*

Patient 1

admitted to ICU post laparotomy:

Hartmann's procedure + formation of colostomy

day 1 post-op: stoma has not acted,
no bowel sounds, abdomen tense

sedated, needing noradrenaline;

urine output poor to adequate;

otherwise stable

Patient 2

Outreach, called to Clinical decisions Unit
(Medical Admissions Ward)

56 year-old, completed chemotherapy cycle one
week ago; collapsed at home, BIBA

now hypotensive (85/40; patient is normally
normotensive), tachycardia (116, regular)
tachypnoeic (36); temperature 34.3

saturations 92% on 15 litres oxygen via non-
rebreathe mask

other vital signs normal; patient is restless

Patient 3

admitted with severe community-acquired
pneumonia

intubated and ventilated; antibiotics commenced
currently stable

Patient 4

admitted to medical ward for electrolyte and
fluid management

patient has no fixed abode; signs of self-neglect

Patient 5

admitted for investigations (?Ca stomach)

vital signs normal

UTI, treated with furosemide

Conclusions

- think in threes
- abnormal levels may indicate or cause disease
- nurses usually first clinical staff to receive laboratory results; understanding main results enables earlier treatment (“first aid” identification of problems)
- interpret results in context of the patient (disease, treatment)
- interpreting results is a skill, so practice interpretation by applying to results from patients whom you have cared for

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Further Reading

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