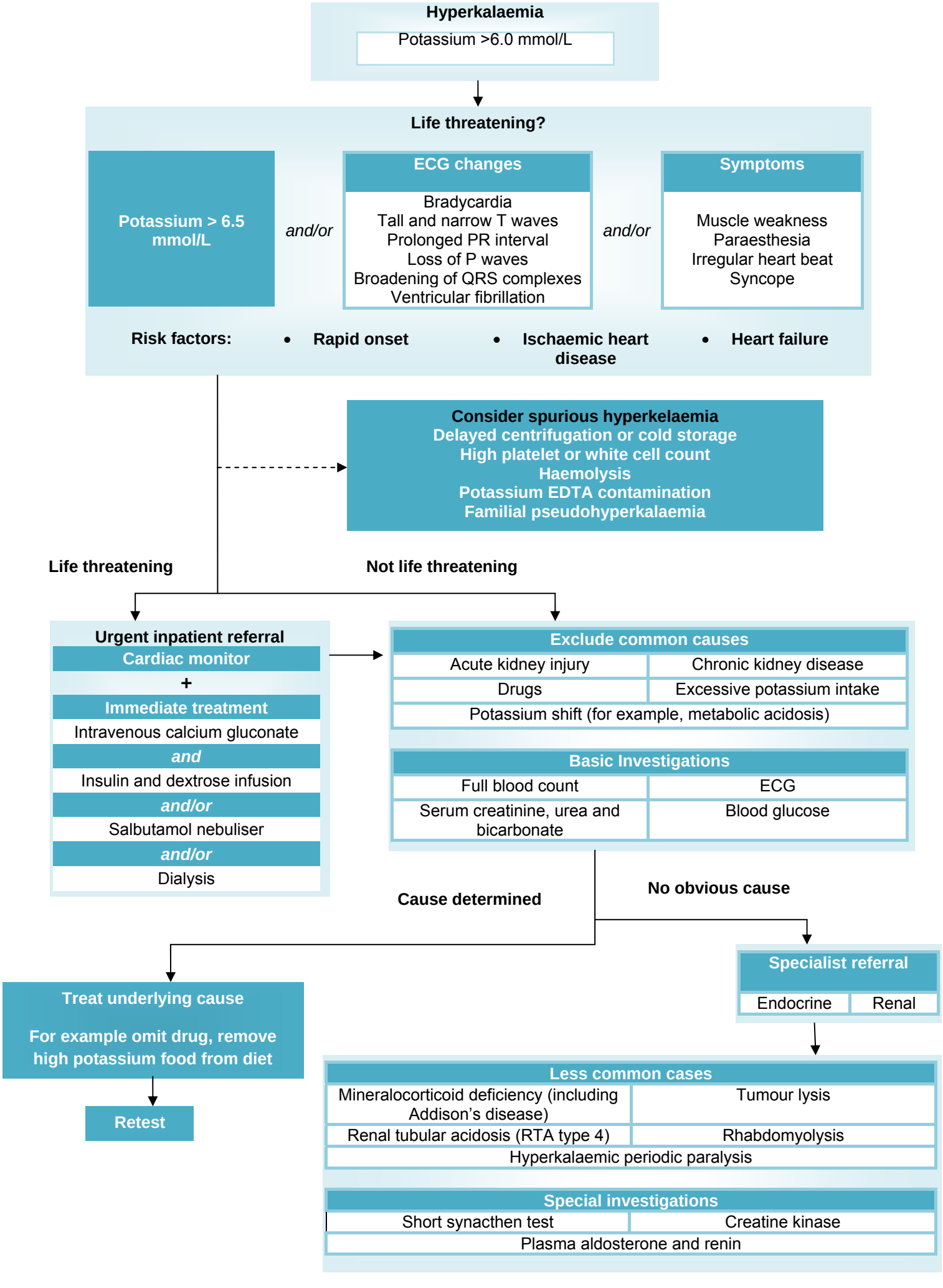
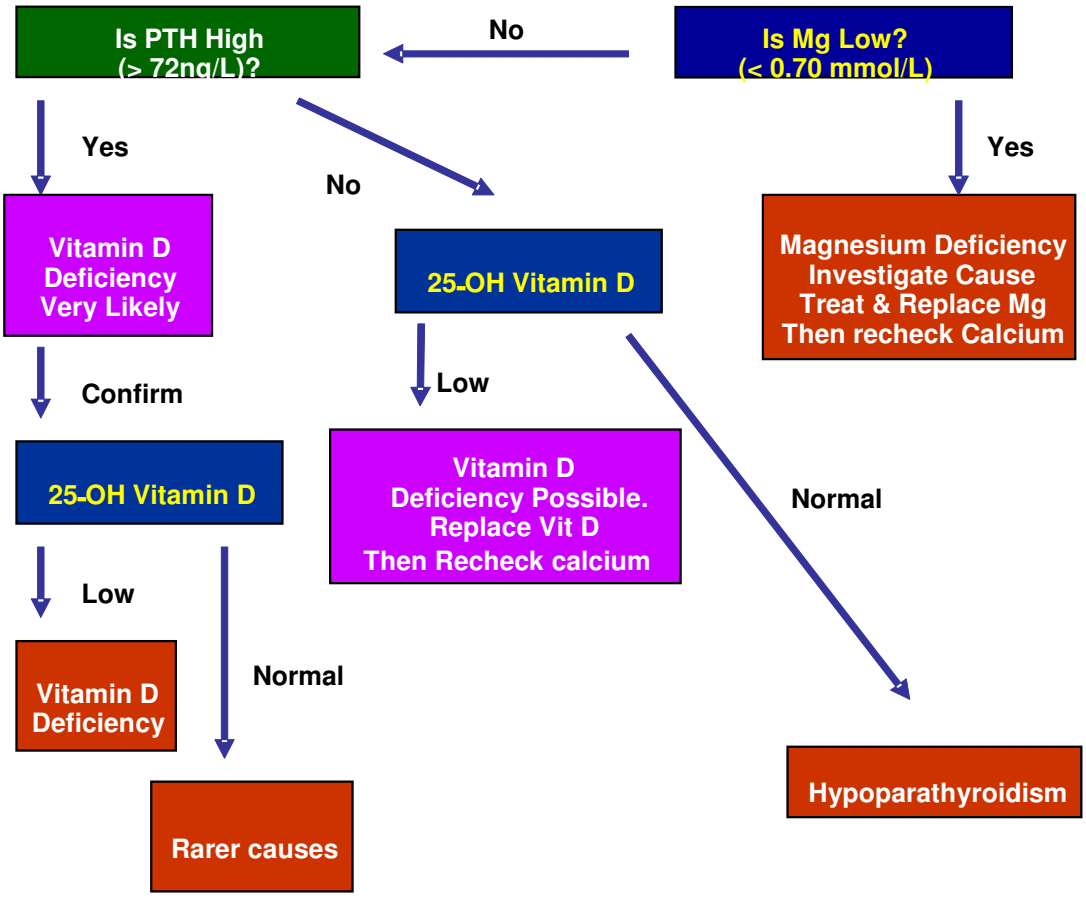
Appendix 1. Hyperkalaemia [1]



Investigating New Hypocalcaemia Summary

Adjusted Calcium < 2.20 mmol/L

Laboratory measures (usually within 24 hours):	
Creatinine	If eGFR < 60 follow renal guidelines
Phosphate	Low value suggest vitamin D deficiency
ALP	High value suggests vitamin D deficiency
Magnesium	See below
PTH	See below



Hypoparathyroidism is not common and can arise from autoimmune disease, infiltration, post-surgery and congenital causes. All newly diagnosed hypoparathyroidism should be referred to a Consultant Endocrinologist for full assessment and management plan.

APPENDIX 3 a
(ULN = Upper Limit of Normal)

Investigation of an isolated rise in Bilirubin 1

Isolated increase in Bilirubin >25
(>1.5xULN)

Repeat test after 12hr fast
And check conjugated / unconjugated split
FBC and Film

Post fasting
if significant increase in Bilirubin
(up to 70umol/l)
predominantly unconjugated Diagnosis is Gilberts Syndrome - reassurance and no further Ix needed

Post fasting
if no increase in Bilirubin
But predominantly unconjugated consider haemolysis or haematoma breakdown
Check FBC, blood Film
Reticulocytes and LDH

Post fasting
if no increase in Bilirubin
but predominantly conjugated
Look for other evidence of compensated chronic liver disease

If positive for haemolysis
refer to haematology

Check for potential Drug induced Liver Injury
If minor rise < 2xULN (34) recheck all LFT's in 3months
If significant rise >2xULN recheck 1 month

* Bilirubin Rising

Bilirubin falling
Repeat in 3 months
then 6 months

Bilirubin normal
No further
action

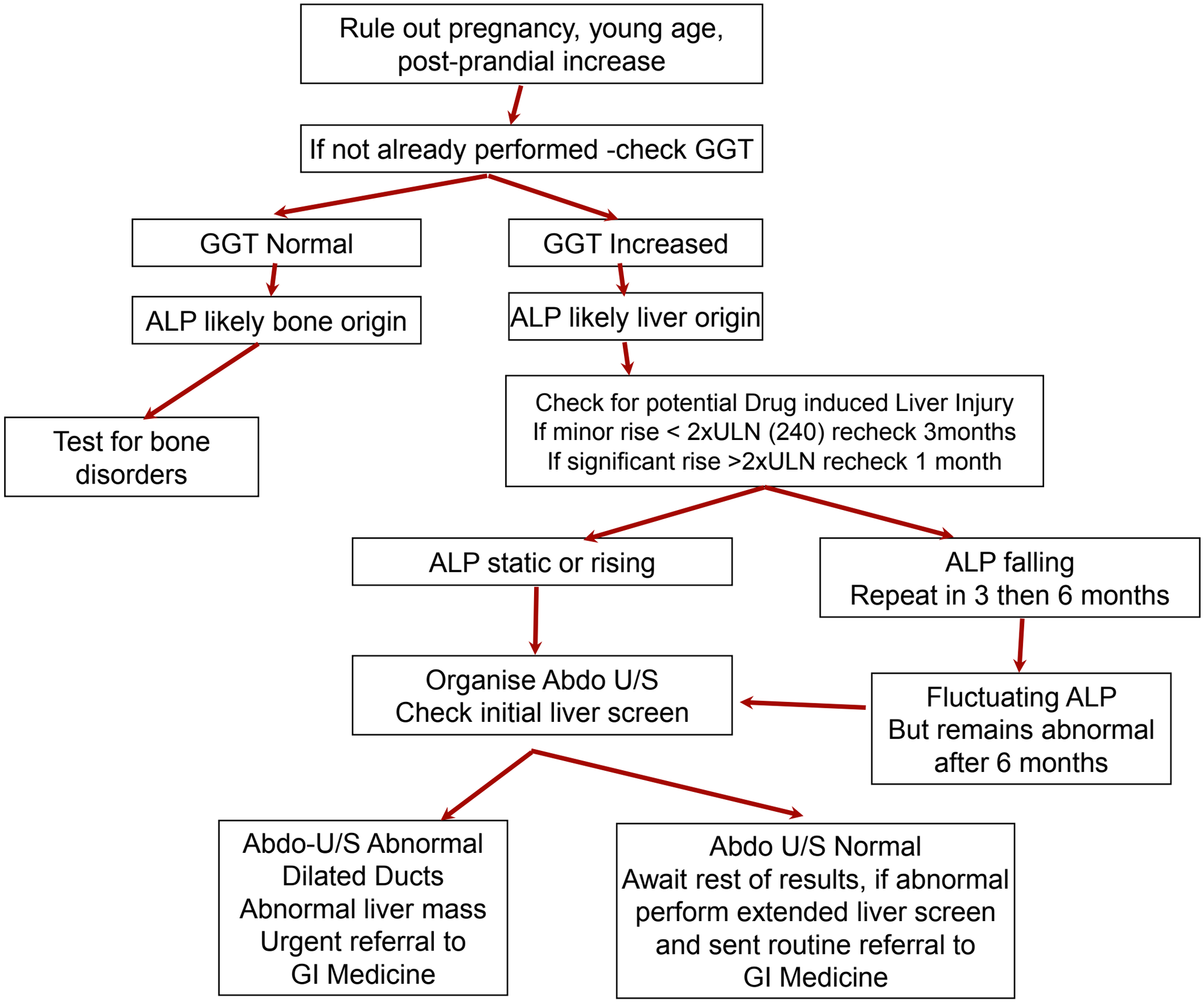
Organise Abdo U/S
Check initial Liver screen

Abdo-U/S Abnormal
Dilated Ducts
Abnormal liver mass
Urgent referral to
GI Medicine

Abdo U/S Normal
Await rest of results
And routine referral to
GI Medicine

APPENDIX 3 b
(ULN = Upper Limit of Normal)

Investigation of Isolated Raised Alkaline Phosphatase 2



APPENDIX 3 c
(ULN = upper limit of normal)

Investigation of Isolated Raised Transaminases 3

Isolated increase in AST/ALT

Advise stop alcohol
Check for and stop any recently initiated hepatotoxic drugs
Advise **stop all** over the counter herbal /alternative products
If BMI > 25 or recent increase in wt - advise loss of 2-5kg
Discuss if high risk - current / previous drug misuse /partner of drug misuser / from high prevalence area - check BBV
If <2xULN (<80) - recheck in 6 months
If >2xULN (>80) - recheck in 3 months
If >3xULN (>120) - recheck in 1month

If persisting degree of abnormality or rising values at repeat testing
Reinforce above advice

If falling values at repeat test
Repeat in 6 -12 months

Abdo U/S - Abnormal
Dilated Ducts
Abnormal liver mass
Urgent referral to
GI Medicine

Organise Abdo U/S
Examine for signs of liver disease
Check Initial Liver screen

Abdo U/S normal or abnormal texture
Initial liver screen positive
Send off extended liver screen as appropriate to clarify abnormality
And routine referral to
GI Medicine

Abdo U/S Normal or fatty liver only
Initial liver screen negative - Reinforce advice re **stopping** alcohol / Drug / herbal meds, losing wt
If <2xULN (<80) - recheck in 6 months
If >2xULN (>80) - recheck in 3 months
If >3xULN (>120) - recheck in 1month
if still abnormal - and full compliance with advice above
Consider routine referral to GI Medicine
See Triage pathway 6

Abdo U/S abnormal texture
Initial liver screen negative
Send off extended liver screen as appropriate
And routine referral to
GI Medicine

APPENDIX 3 d

Investigation of cluster of Abnormal LFT's 4

Predominantly Hepatocellular picture
Predominant increase in AST/ALT
With raised GGT and +/- minor rise in Bil and ALP

Predominantly Cholestatic picture
Predominant increase in Alkaline Phosphatase with elevated GGT +/- bilirubin and +/- minor rise in AST/ALT

ULN = upper limit of normal

Advise stop alcohol
Check for and stop any recently initiated hepatotoxic drugs
Advise **stop all** over the counter herbal /alternative products
Discuss if high risk - current / previous drug misuse /partner of drug misuser /from area high prevalence -check for BBV
Examine for signs of liver disease
If most deranged test <2xULN - recheck in 3 months
>2xULN - recheck in 2 months
>3xULN - recheck in 1month

If pain +/- increased Bilirubin
Urgent referral to
GI Medicine via the Fast Track Jaundice Service
For raid access to U/S and ERCP /MRCP

If persisting degree of abnormality or rising values
Request abdo ultrasound and initial liver screen
If rapidly deteriorating tests discuss with GI on Call

If falling values at repeat test
Repeat in 3 - 6 months

Abdo U/S - Abnormal
Dilated Ducts
Abnormal liver mass
Urgent referral to
GI Medicine

Abdo U/S normal or abnormal texture
Initial liver screen positive
Send off extended liver screen as appropriate to clarify abnormality
And routine referral to
GI Medicine

Abdo U/S Normal or fatty liver only
Initial liver screen negative - Reinforce advice re **stopping** alcohol / Drug / herbal meds, losing wt
If most deranged test <2xULN - recheck in 6 months
If >2xULN - recheck in 3 months
If >3xULN - recheck in 1month
if still abnormal - and full compliance with advice above
Consider routine referral to GI Medicine
See Triage pathway 6

Abdo U/S abnormal texture
Initial liver screen negative
Send off extended liver screen as appropriate
And routine referral to
GI Medicine

Initial ‘liver screen’

should include
Hepatitis Screen (hepatitis B surface antigen, hepatitis C antibody), HIV
liver autoantibody screen (anti-mitochondrial antibody, anti-smooth muscle antibody), anti-nuclear antibody (ANF), serum immunoglobulins,
serum ferritin, Thyroid function tests (TFT’s),
full clotting scren.
Also request Abdomineal U/S

Extended ‘liver screen’

should includeTissue Transglutanimase (TTG) for coeliac disease
Anti-Neutrophil Cytotoxic Antibody (ANCA)
ceruloplasmin, *
α1 antitrypsin level *
Alpha Fetoprotein

- if HBV sAg positive - labs should check other HBV markers and Hep B DNA load
- If Ferritin raised above ULN range check Serum Iron / Total Iron Binding Capacity (Fe/TIBC) = transferrin Sat% If Transferrin Sat% above 55% male or 50% female - check HFE (haemochromatosis) gene assay
- If Ceruloplasmin below 0.15g/l - on referal Hepatology will organise 24hr urinary copper excretion and ophthalmology review for Kayser Fleischer rings

Appendix 4. Investigation of low magnesium (Derbyshire Mg, emedicine)

[Editor's note: although there is no case on hypomagnesaemia in this module, the expert reviewer of this module receives frequent requests for advice on correcting low magnesium, so a brief summary is provided here.]

This condition can present with other biochemical abnormalities, as mentioned already in the Information Section. Magnesium is crucial in the renal re-absorption of potassium and calcium. Therefore, in some cases of hypocalcaemia and hypokalaemia, it is essential to replace magnesium to enable the correction of the other abnormalities.

As in other parts of this module, the degree of hypomagnesaemia can be important:

- magnesium 0.5 – 0.7mmol/L = not a medical emergency
- magnesium 0.3 – 0.5 mmol/L = possible medical emergency
- magnesium less than 0.3 = likely medical emergency.

Abnormal magnesium levels can result in disturbances in nearly every organ system, and can be fatal (ventricular arrhythmia or coronary artery vasospasm leading to sudden death).

Causes

Hypomagnesaemia is more common than people think, with probably 90% of cases not identified clinically. It is present in 25% of poorly controlled diabetics, 80% of alcoholics, and 90% of haematological malignancies. The commonest causes are GI and renal abnormalities.

Renal causes include:

- Drugs
    - proton pump Inhibitors (common cause)
    - diuretics
    - cytotoxic drugs
    - aminoglycosides
    - immunosuppressants
    - theophylline
- Osmotic diuresis (poorly controlled diabetes).

GI causes include:

- Reduced intake – i.e. dietary deficiency (rare, but occurs in alcoholics)
- Reduced absorption - coeliac disease, chronic diarrhoea, laxative abuse, fistulas, short bowel syndrome.

Treatment

Treat the causes above (e.g. stop the relevant drugs), and replace magnesium, which may need to be IV in severe cases. Intramuscular magnesium injections are very painful and are not recommended. Oral administration requires up to 50 mmol/L day. Suggested initial treatment is Maalox 10-20 ml qds (10ml Maalox = 6.8mmol Mg), rechecking magnesium 1-2 weekly initially depending on clinical context – this may take 6-8 weeks. Long term maintenance replacement may be needed if a reversible cause is not found and removed.

Although dietary causes are rare, the foods which are high in magnesium include

- green vegetables such as spinach (magnesium is contained in the chlorophyll molecule)
- some legumes (beans and peas)
- nuts and seeds
- whole, unrefined grains.

Magnesium glycerophosphate (1 tablet = 4mmol Mg, 1-2 tablets three to four times daily (12-32 mmol/day) is an unlicensed medication, available on a named patient basis, for cases of Maalox intolerance. Patients with renal Impairment should be treated with caution - obtain renal advice before commencing treatment if your patient has CKD stage 3 to 5.