

Barnsley BEST Meeting

19 July 2017

Dr Anne Straffen
Consultant Chemical Pathologist
(Embelished by Dr. Sabiha Atcha !)

Hyponatraemia *

60 yr old male

Na	128 mmol/L	(133 – 146)
K	3.9 mmol/L	(3.5 – 5.3)
Urea	4.1 mmol/L	(2.5 – 7.8)
Creatinine	79 umol/L	(f: 51 – 96) (m: 66 – 118)

What do I do? *

Assess full U&Es profile – clues
 severity
 chronicity

Drug history

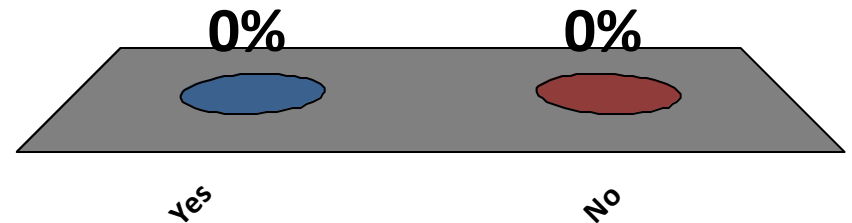
Patient review – hydration status

Investigations **glc, triglycerides, protein**
 repeat with plasma osmolality
 urine Na and osmolality
 TFTs, LFTs ??cortisol

Do you regularly request
urine /plasma osmolality
and urine electrolytes?

A. Yes

B. No



ICE urine/plasma osmolality

Mr Mickey Mouse

Hospital Number: ICE151418

Sex: Male

29 May 1989

NHS Number: No NHS Number



1 Disney Land Street, Barnsley

Telephone No:

[View Details](#)

Microbiology (WP)

Radiology: General

Radiology: Specials

Urea and Electrolytes

Glucose (Fasting) - GP

Glucose (Random) - GP

HbA1c

Serum Osmolality

Total Cholesterol

Lipid Profile (Fasting)

Lipid Profile (Random)

Liver Function Tests

LFT

Bone Profile

LDH

Glucose Tolerance Test (GTT)

Amylase

Calcium Profile

Magnesium

Zinc

Troponin-I

BNP

Creatinine Kinase (CK)

Uric Acid

C Reactive Protein (CRP)

B12 and Serum Folate

Ferritin

Beta HCG (BHCG - Pregnancy)

Iron Profile

Vitamin D

FBC

ESR

Reticulocytes

Glandular Fever Screen

Malaria Screen

Coagulation Screen

INR

INR - GP Contracted

D DIMER

PTT Ratio

↓ **Most recent requests made for this patient:**

To view all requests for this patient

To view records of the tests on this panel only made for this patient

Requested	Investigations	Priority	Loc	Order
06 Jun 2017 09:07:06	Urea and Electrolytes, Glucose (Random) - GP, HbA1c	Normal	C85006	C850
23 May 2017 11:59:15	Urea and Electrolytes, Glucose (Fasting) - GP	Normal	C85006	C850

Blood Sciences

Microbiology (WP)

Radiology: General

Radiology

Routine Blood

Endocrinology

Markers /
Drugs

Immunology

More
Haem/Coag

Urines / Faeces

GP Protocols

WR Protocols

Search

Set as
Default
Panel

Universal Container

- Urine pH
- Urinary Drug Screen
- Urine Amylase
- Urine Osmolality
- Urine LFT
- Random Urine Protein
- Random Urine U/E & Osmolality
- Microalbumin (DM)
- Albumin/Creatinine ratio (Non DM)
- Cal Creat Ratio
- Protein Creatinine Ratio
- Porphobilinogen
- Pregnancy Test

24 Hour Urines

- 24Hr Urine Protein
- 24Hr Urine Uric Acid
- 24 Hr Urine Calcium
- 24Hr Urine U/E & Osmolality
- Urinary Free Cortisol
- 24 Hr Urine Oxalate
- 24 Hr Urine Copper
- Creatinine Clearance

Faeces

- Pancreatic
- Faecal Cal

Urines - Acidified Container Required

- SHIAA Screen (24 Hour Collection)
- Catecholamines - (24 Hour Collection)
- Overnight Metanephrines/Catecholamines 1

↓ **Most recent requests made for this patient:**

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Search

Set as
Default
Panel

Search:

for

- Tests
- Test Collections

Name:

osmol

Search in:

- this panel only
- all tests/collections

Search type:

- descriptions
- codes
- descriptions & codes

Search for text:

- Anywhere in name
- From the start of

- Serum Osmolality
- 24Hr Urine U/E & Osmolality
- Random Urine U/E & Osmolality
- Urine Osmolality

Most recent requests made for this patient:

To view records of the tests on

Requested	Investigations
06 Jun 2017 09:07:06	Urea and Electrolytes, Glucose (Random) - GP, HbA1c
23 May 2017 11:29:16	Urea and Electrolytes, Glucose (Fasting) - GP
23 May 2017 11:28:24	Urea and Electrolytes, Glucose (Fasting) - GP

Online Test Request

Patient Name: **Mr Mickey Mouse**Hospital Number: **ICE151418**Sex: **Male**Date of Birth: **29 May 1989**NHS Number: **No NHS Number**Address: **1 Disney Land Street, Barnsley**

Telephone No:

[View Details](#)Woodland
Drive
Medical
Centre
User:4071292

Powered by ICE

▼ Services

Blood Sciences

Microbiology (WP)

Radiology: General

Radiology: Specials

Routine Blood

Endocrinology

Markers /
Drugs

Immunology

More
Haem/Coag

Urines / Faeces

GP Protocols

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Search

Set as
Default
Panel

KEY

 Urea and Electrolytes **Glucose (Fasting) - GP** **Glucose (Random) - GP** **HbA1c** → ↵ **Serum Osmolality** **Total Cholesterol** **Lipid Profile (Fasting)** **Lipid Profile (Random)****Liver Function Tests** **LFT** **Bone Profile** **LDH** **Glucose Tolerance Test (GTT)** **Amylase** **Calcium Profile** **Magnesium** **Zinc** **Troponin-I** **BNP** **Creatinine Kinase (CK)** **Uric Acid** **C Reactive Protein (CRP)** **B12 and Serum Folate** **Ferritin** **Beta HCG (BHCG - Pregnancy)** **Iron Profile** **Vitamin D** **FBC** **ESR** **Reticulocytes** **Glandular Fever Screen** **Malaria Screen** **Coagulation Screen** **INR** **INR - GP Contracted** **D DIMER** **PTT Ratio**↓ **Most recent requests made for this patient:**To view all requests for this patient, [click here](#).To view records of the tests on this panel only made for this patient, [click here](#).

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Special support by body system

Find a resource




Brain and mental health



Ophthalmology and ENT



Respiratory and Smoking



Cardiovascular and Lipids



Endocrine and Diabetes



Gastroenterology



Renal, Urology and Mens Health



Women's and Sexual Health



Paediatrics



Dermatology, MSK and Rheumatology



Cancer, Palliative Care, Pain and Older People



Laboratory investigations and Infections

ical support by body system

Find a resource










 in and mental health	 Ophthalmology and ENT	 Respiratory and Smoking	 Cardiovascular and Lipids
 ocrine and Diabetes	 Gastroenterology	 Renal, Urology and Mens Health	 Women's and Sexual Health
 Paediatrics	 Dermatology, MSK and Rheumatology	 Cancer, Palliative Care, Pain and Older People	 Laboratory investigations and Infections
General	Haematology	Biochemistry	Microbiology

ical support by type


Find a resource

Clinical support by body system

 Anatomy	 Diagnostic tools	 Local pathways and guidelines
 National guidelines and pathways	 Medicines information	 Referral criteria and investigation forms
 Services	 Patient information sheets	 Useful websites and e-Learning

Clinical support by type

Body system

[Sheffield Hyponatraemia in Adults](#)



[Sheffield Isolated Raised Alkaline Phosphatase in Adults](#)



[Sheffield Isolated raised ALT guidelines](#)



[Sheffield lipid guidelines](#)



[Vitamin D Guidelines](#) 



Sheffield Hyponatraemia in Adults



Laboratory investigations and Infections

On this page

- [1. Top](#)
- [2. Key documents](#)

This useful guideline/pathway/top tips has been taken from the Sheffield GP website "S

Barnsley CCG takes no responsibility regarding the content within these references.

Telephone numbers for laboratories or specific services will be different for Barnsley.

Key documents

- [Sheffield Hyponatraemia in Adults](#)

Do you want to add this to your CPD record?

NEW HYPONATRAEMIA (Na < 133 mmol/L)

- Na < 115 mmol/L
- Neurological symptoms
- Severe hypovolaemia
- Patient unwell

Immediate admission to hospital recommended

Occurs in hyperproteinaemia (e.g. myeloma) and hypertriglyceridaemia. All sodiums < 120 & all samples with total protein > 90 will be checked for pseudohyponatraemia by the lab.

False: Pseudohyponatraemia

True

Repeat measurement to confirm result and establish if changing.
Na 115-125; repeat in 1-2 days. **Na 126-132**; repeat within 1 week.

- Request serum osmolality if not already done.
- Consider admission to hospital if rapidly falling (>10 mmol/L over days)

- Box 2. Some drug causes (list not exhaustive)**
- Diuretics
 - SSRIs
 - Antipsychotics
 - NSAIDs
 - Carbamazepine
 - PPIs
 - Desmopressin
 - Sulphonylureas
 - Tricyclics
 - Opiates
 - Theophylline
 - ACE inhibitors
 - Amiodarone

- Box 1. Some causes of hypo-osmolar hyponatraemia**
- Drugs (see Box 2)
 - GI loss
 - Skin loss (e.g. burns)
 - Renal failure (chronic)
 - Nephrotic syndrome
 - CCF
 - Cirrhosis
 - SIADH (see Box 3)
 - Hypothyroidism (rare)
 - Adrenal insufficiency

Osmolality high >295

Check plasma glucose* if not already done

Osmolality normal 275-295

Check serum protein & triglycerides and plasma glucose* if not already done

Osmolality low <275
See Box 1

* Hyperglycaemia causes hyponatraemia with normal or high serum osmolality.

- Review patient's symptoms and look for cause (see Box 1 & 2).
- Stop any drugs which may be contributing (if safe to do so).
- Check renal, adrenal & thyroid function (see Box 1).
- Consider seeking specialist advice if sodium < 120.

- Box 3. Some causes of SIADH**
- Malignancy** - mainly small cell lung cancer, also some GI and genitourinary.
 - Respiratory** - pneumonia, PE, abscess, TB & CF.
 - Cerebral** - CVA, trauma, tumour & infection.

?SIADH:
 If no apparent cause (see Box 1 and 2) send paired serum and spot urine for osmolality and sodium.

Box 2. Some drug causes (list not exhaustive)

- Diuretics
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Osmolality normal
275-295

Check serum protein & triglycerides and plasma glucose* if not already done

Osmolality low
<275
See Box 1

- Review patient's symptoms and look for cause (see Box 1 & 2).
- Stop any drugs which may be

* Hyperglycaemia causes

Box 1. Some causes of hypo-osmolar hyponatraemia

- Drugs (see Box 2)
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pseudohyponatraemia by the lab.

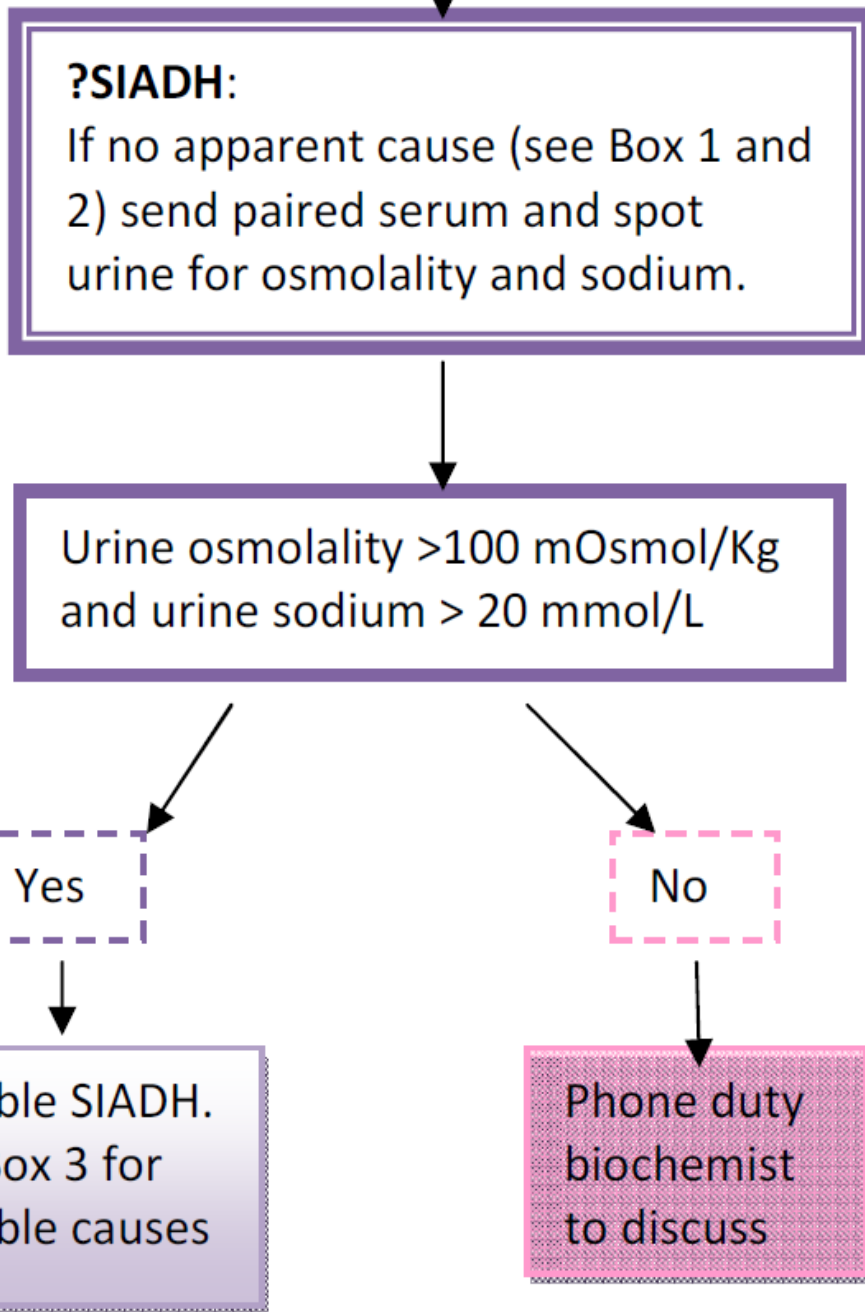
natraemia

Immediate admission to hospital recommended

Some causes of SIADH
Primary - mainly small cell
cancer, also some GI and
renal.
Secondary – pneumonia, PE,
TB & CF.
Other – CVA, trauma,
& infection.
See Box 2.
Postoperative pain, nausea,
intermittent porphyria.

[Hyponatraemia](#)

Care and Laboratory
Investigations 2010.



If you want to
at any stage,
biochemist
contacted
switchboard

Hyponatraemia – lessons I learnt

1. Repeat
2. ensure glc, TG, protein “normal-ish”
3. Check TFT , LFT
3. Check plasma and urine osmolality and urine electrolytes
4. Refer to Sheffield guidelines -BEST website...

Basic common causes – I learnt

- Think diabetes !

- Fluid overload



Fig. 1. Patient with relatively high serum albumin level of 28 g/l but marked edema and nephrotic-range proteinuria (3.3 g/d).

- If Dehydrated – diuretics / D+V



- If Normal hydration – Drugs / SIADH

Case 1

- Mrs.BP 53
- Na 127 (133-146)
- K 4.1
- Urea 4.1
- Cr 59

- What next ?
- Glc/TG/ proteins/TFT/LFT – normal

- Drugs
- Propranolol
- Cetrizine
- Beconase
- Lactulose
- Tegretol
- Lansoprazole

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- Beconase
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- **Tegretol**
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pseudohyponatraemia by the lab.

natraemia

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Neoplasia - mainly small cell cancer, also some GI and urinary.

Infective – pneumonia, PE, meningitis, TB & CF.

Drugs – CVA, trauma, surgery & infection.

Postoperative – see Box 2.

Other – postop pain, nausea, acute intermittent porphyria.

[Hyponatraemia](#)

Primary Care and Laboratory Investigations 2010.

?SIADH:

If no apparent cause (see Box 1 and 2) send paired serum and spot urine for osmolality and sodium.

Urine osmolality >100 mOsmol/Kg
and urine sodium > 20 mmol/L

Yes

Possible SIADH.
See Box 3 for possible causes

No

Phone duty biochemist to discuss

If you want at any stage biochemist contacted switchboard

Osmolality urine/plasma

- Sodium 130 (133-146)
- Serum osmolality 274 (275- 295)
- Urine Osmolality 413 (50-1200)
- Urine sodium 83

Case 2

- 65 yr old male
- Na 126
- K 3.5
- Urea 2.2
- Cr 91
- Glc
- TG
- TSH /LFT

- Serum osmolality
<275
- Urine osmolality
>100
- Urine sodium
<20

?????

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[Hyponatraemia](#)

Emergency Care and Laboratory Investigations 2010.

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Case 3

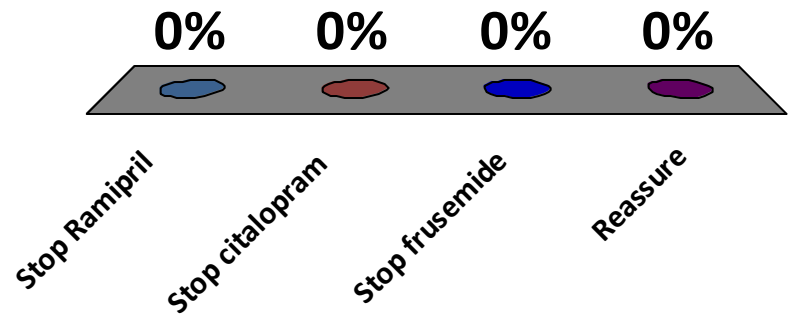
- Mrs S 82 A+E
- Found on floor by son , lacerated forehead , stitched
- Discharged after 10 hours obs
- PMH - HT ,IHD depression

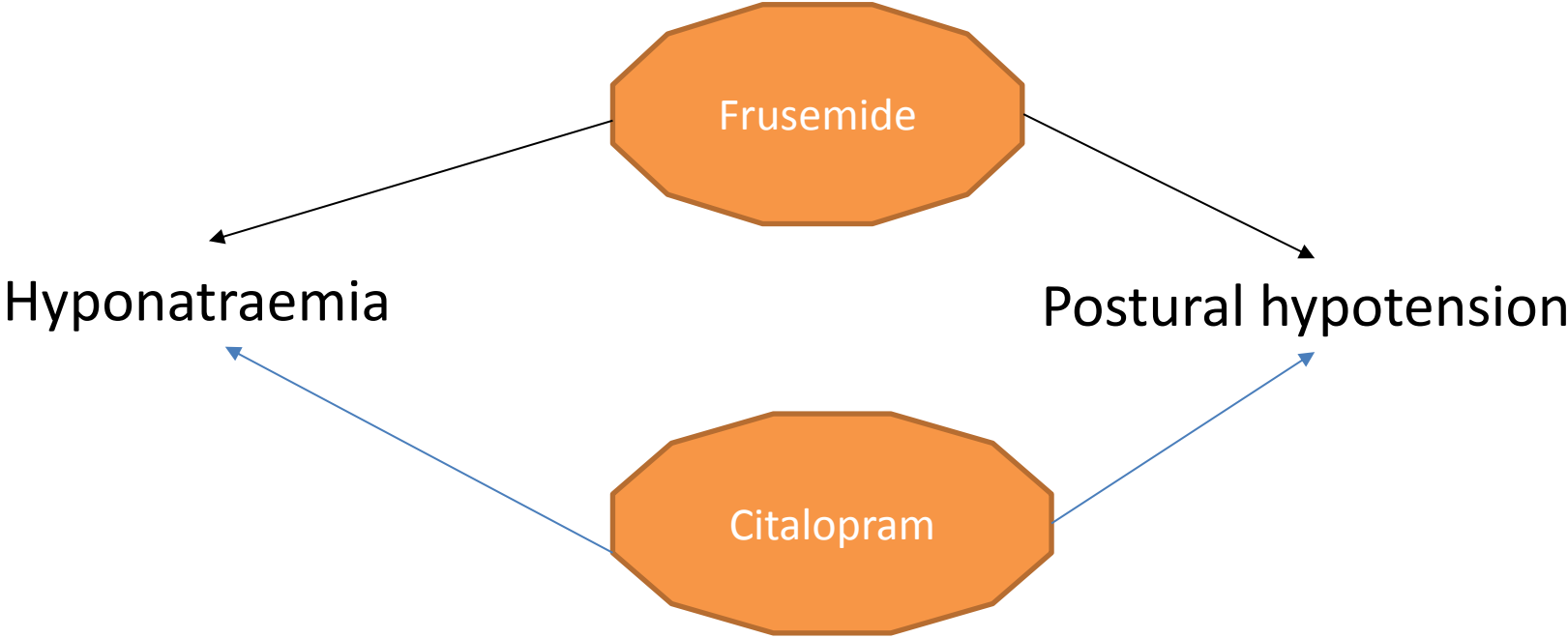
- GP to follow

- Aspirin 75 mg
- Ramipril 5 mg
- Atorvastatin 40 mg
- Amlodipine 10 mg
- Frusemide 40 mg
- Citalopram 20 mg
- Bp 110/60
- No odema
- JVP normal
- Chest clear
- **Na 132**

What will you do next ?

- A. Stop Ramipril
- B. Stop citalopram
- C. Stop frusemide
- D. Reassure





Case 4

- Mr.KH – 56
- Na 123
- K 4.7
- Cr 112
- Urea 12

- Depression – mirtazapine
- NIDDM- on everything
- Cardiomyopathy – cardiac pacemaker
- Frusemide, candesartan, spironolactone

- Sodium 123
- Serum osmolality 297
- Urine osmolality 335
- Urine sodium 28

- HbA1C – 150 !!!!!
- TG 7.32 !!!!

Box 2. Some drug causes (list not exhaustive)

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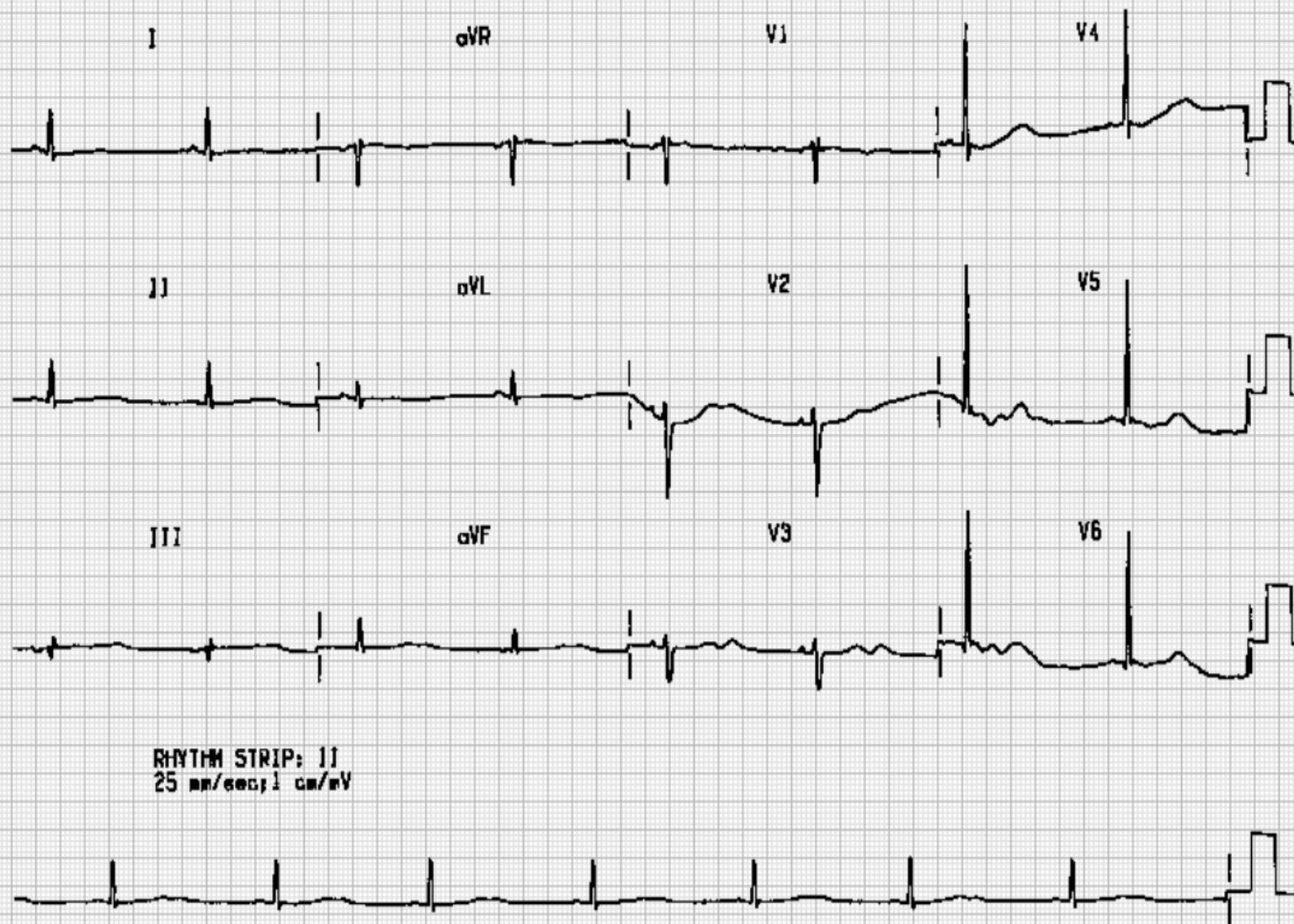
If low sodium

- Check glc
- And TG s first !!!!



Clue 1

A 22 year old lady with prolonged vomiting.



Hypokalaemia *

67 year old male

Na	141 mmol/L	(133 – 146)
K	2.8 mmol/L	(3.5 – 5.3)
Urea	6.6 mmol/L	(2.8 – 7.8)
Creatinine	52 umol/L	(66 – 118)

What do I do? *

Looking for source of loss

Extra-renal:

D&V

XS sweating

Purgative abuse

Fistulae/stomas

Renal:

Diuretics

Mineralocorticoid XS-
Conns

Cushing's

Liquorice/carbenoxolone

What do I do? *

Looking for source of loss

Extra-renal:

D&V



XS sweating

Purgative abuse



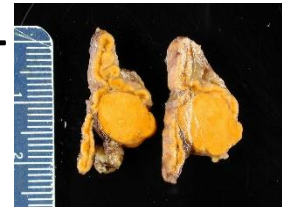
Fistulae/stomas

Renal:

Diuretics



Mineralocorticoid XS-
Conns



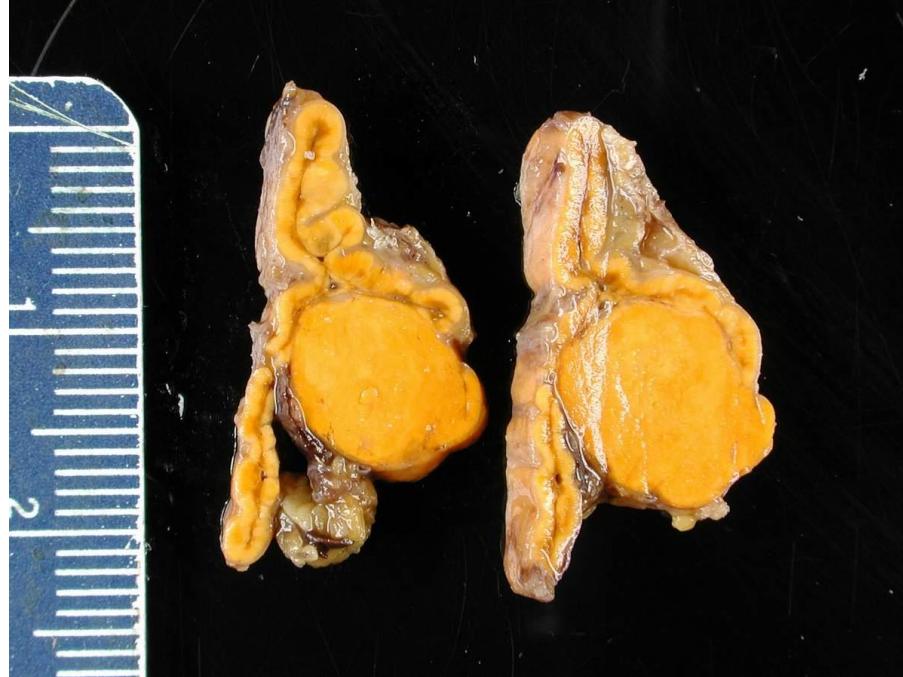
Cushing's

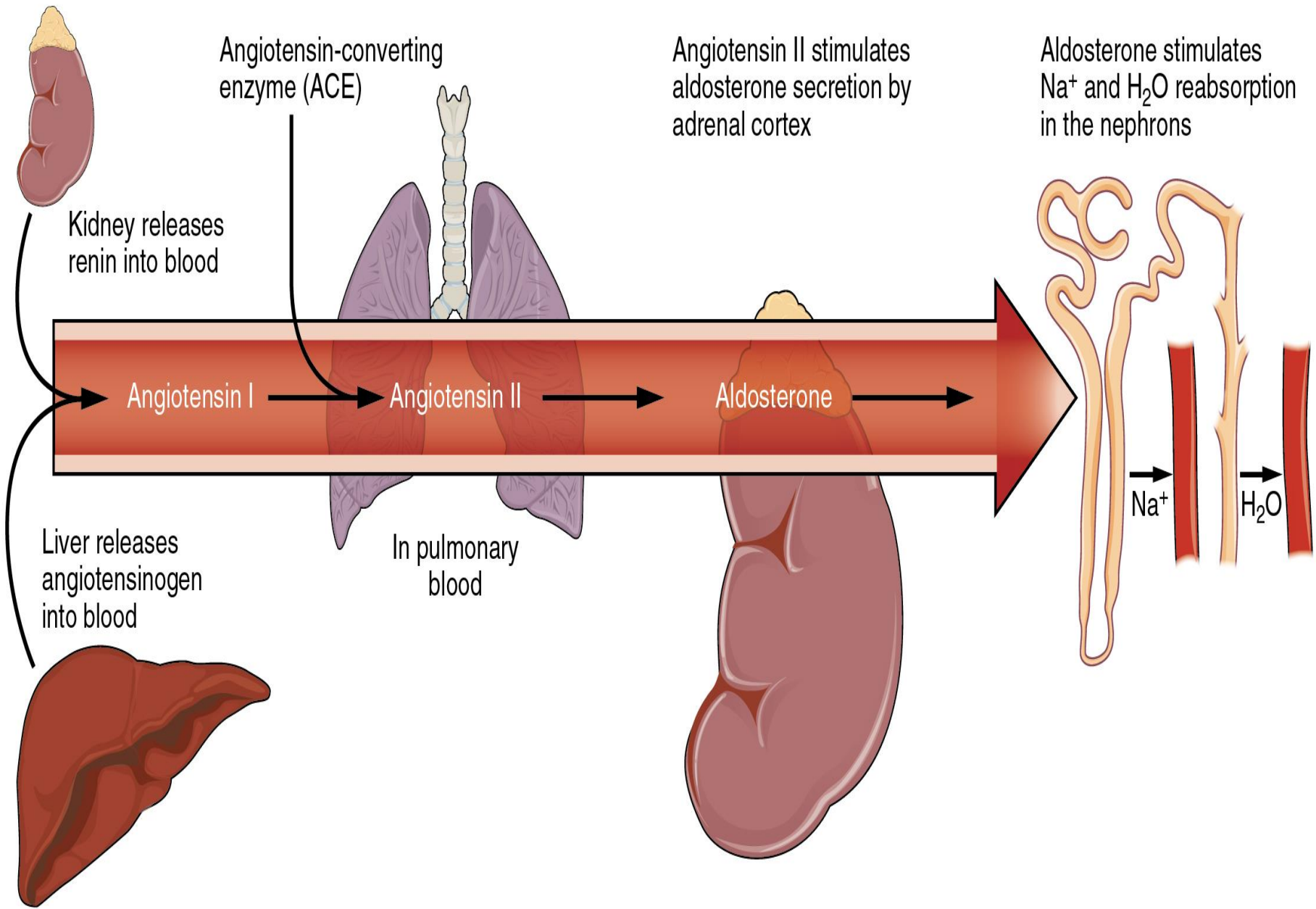


Liquorice/carbenoxolone



Case :45yr old gardener
fatigue, headache muscle weakness,
BP 180/110
Na 138 K **3.1** urea 6.9 Cr 112





What I learnt....

- Low potassium is easier than low Na
- Think – where is K^+ being lost from ?
 - Renal / non renal
 - Diuretics/ laxatives
- Be wary of young drug resistant hypertensives with low potassium
- Enjoy liquorice to a limit !!!





Hypocalcaemia*

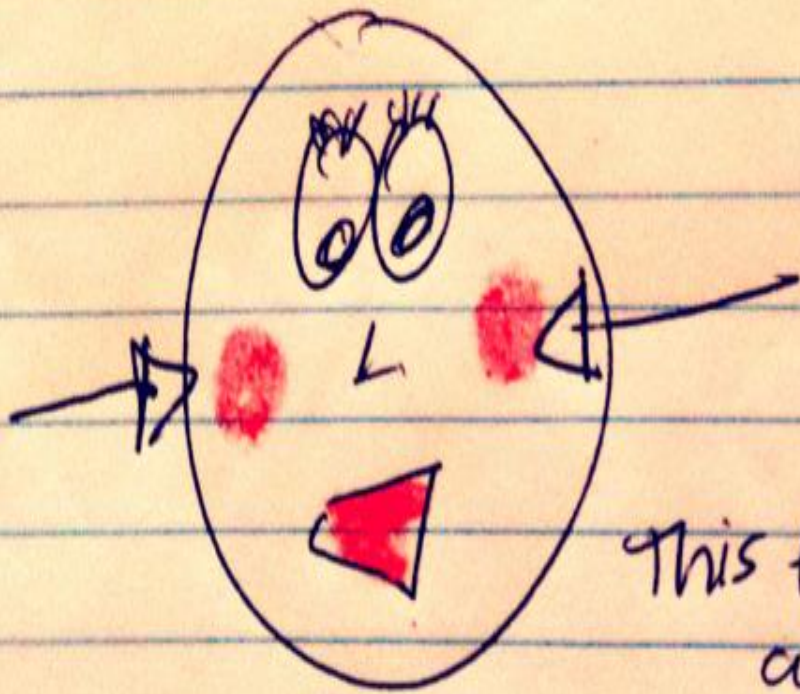
Calcium (2.1-2.6)

- 56 yr old lady
- **Ca 1.97**
- PO₄ 1.6 (0.8- 1.5)
- Alb 44
- Corrected calcium 1.89

What's this sign?

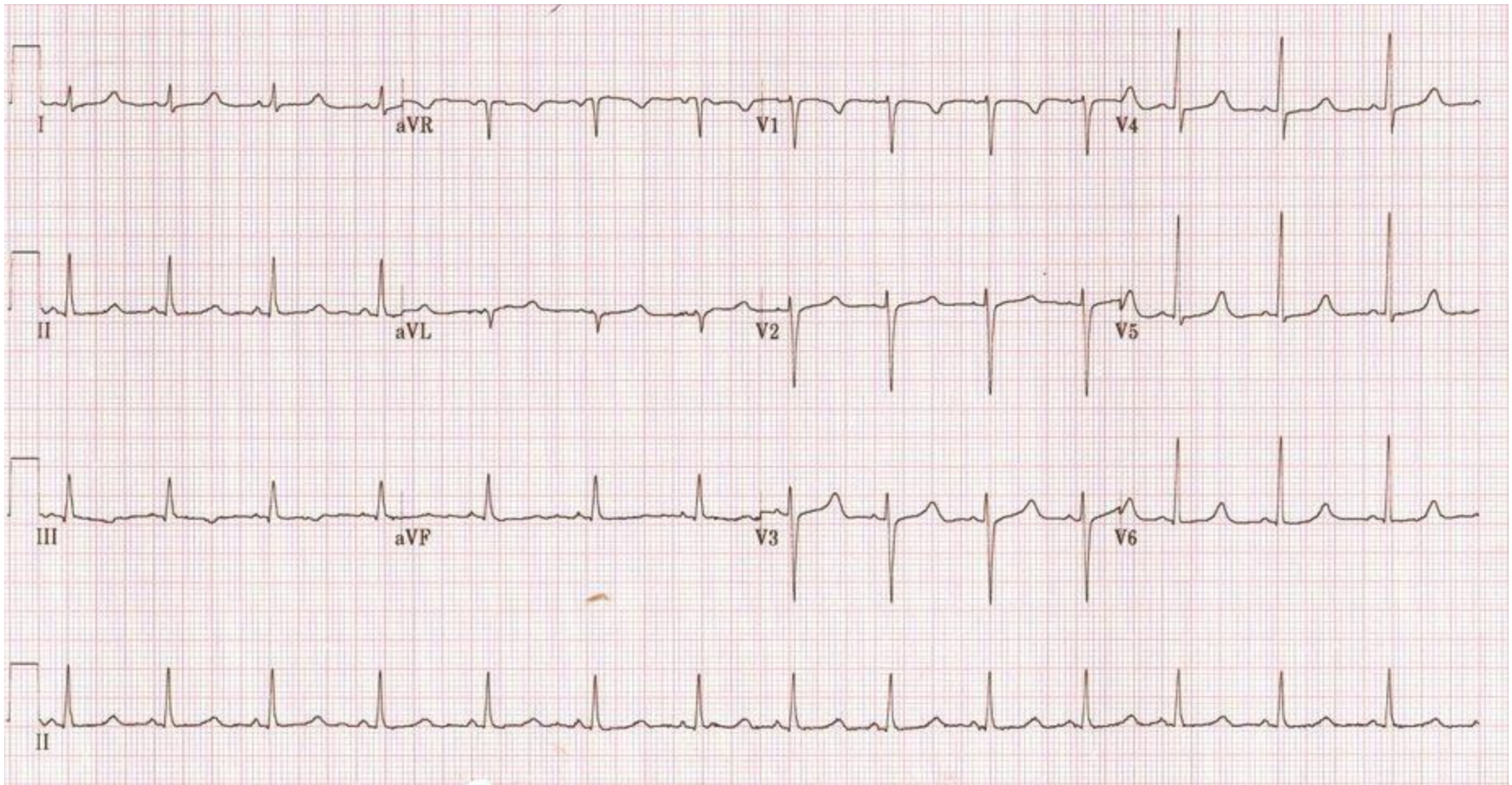


When you see Chvostek -
Think Cheek.



Tap side
of neck gently
and observe for
facial twitching.

This tests for Hypocalcemia
and tetany.



What other blood tests needed?

- Mg
- vitD
- PTH

NEW ADULT HYPOCALCAEMIA ADJUSTED CALCIUM < 2.20 mmol/L

BOX 2 SOME CAUSES (List Not Exhaustive)

- Hypomagnesaemia
- Vitamin D deficiency (e.g. lack of sunlight; dietary; malabsorption; CKD; liver disease; anticonvulsants)
- Drugs (see BOX 3)
- Hungry bone syndrome
- High phosphate intake
- Acute pancreatitis
- Early rhabdomyolysis
- Hypoparathyroidism
- Pseudohypoparathyroidism

BOX 3 SOME DRUG CAUSES (List Not Exhaustive)

- Long term PPI (causing hypomagnesaemia)
- Furosemide/loop diuretics
- Anticonvulsants (eg phenytoin, carbamazepine, valproate)
- Bisphosphonates, calcitonin.
- Cinacalcet

1.8 - 2.19 mmol/L
and asymptomatic

Repeat measurement to confirm result* and consider cause (BOX 2 & 3). If **cause unknown** consider requesting:

- Bone profile
- Magnesium
- U&E, LFT
- Vitamin D (check not requested in last 4 months)
- PTH

< 1.8 mmol/L
and/or symptomatic
(BOX 1)

Adjusted Ca < 1.8 mmol/L will be phoned to GP surgery or collaborative and a serum Mg added.

MEDICAL EMERGENCY

If acutely unwell/symptomatic:
Admit to A&E immediately.

If not acutely unwell: repeat Adj. Ca measurement urgently* if inconsistent with a previous calcium result within last 3 months.
Otherwise, seek urgent specialist advice and consider admitting to A&E.

BOX 1 HYPOCALCAEMIA SOME SIGNS & SYMPTOMS

Signs

- Positive Trousseau's and Chvostek's sign
- ECG changes (prolonged QT interval) and arrhythmia

Symptoms

- Peri-oral and/or digital paraesthesia
- Tetany, carpopedal spasm and muscle cramps
- Laryngospasm
- Seizure

Low Magnesium
Prolonged hypomagnesaemia can cause hypocalcaemia. Look for cause of hypomagnesaemia. Correction of magnesium is necessary for correction of calcium.

Low Vitamin D
See metabolic bone guidelines on optimising adult vitamin D levels (<http://tinyurl.com/sth-mb-gl>)

Normal Mg, Vitamin D,
U&E, LFT

PTH Raised
Consider:

1. Borderline Vitamin D deficiency
2. Drugs e.g. bisphosphonates

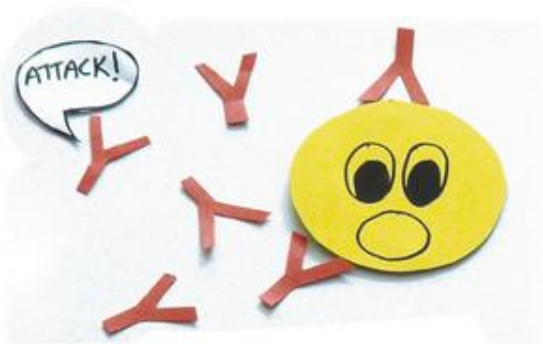
PTH Low or Normal
Consider:

1. Drugs e.g. cinacalcet
2. Hungry Bone Syndrome
3. Hypoparathyroidism (rare)

* Within 5 days is

Hypo-parathyroidism *

PRIMARY CAUSES OF HYPOPARATHYROIDISM



AUTOIMMUNE
DESTRUCTION



ABSENT
PARATHYROID GLANDS

SECONDARY CAUSES OF HYPOPARATHYROIDISM



RADIATION OR
SURGERY DAMAGE



LOW
MAGNESIUM LEVELS

What I learnt – low Calcium

- Long QT/ Trousseau/ Chovtek's sign
- Vit D, Mg, PTH
- Ca <1.8 admit

- Low Mg
 - PPI
 - Diuretics
 - bisphosphonates

62 housewife, fell, wrist fracture summary discharge:-

U+E normal, Ca 1.8, LFT normal ALP normal, PO4 normal

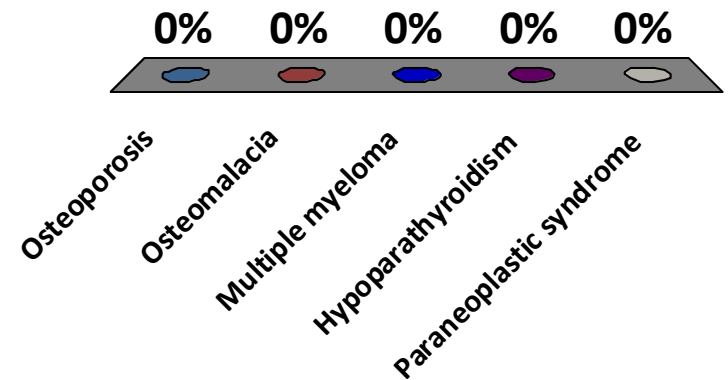
A. Osteoporosis

✓ B. Osteomalacia

C. Multiple myeloma

D. Hypo-parathyroidism

E. Paraneoplastic syndrome



Thyroid-case 1

40 year old female

Health check

No medications

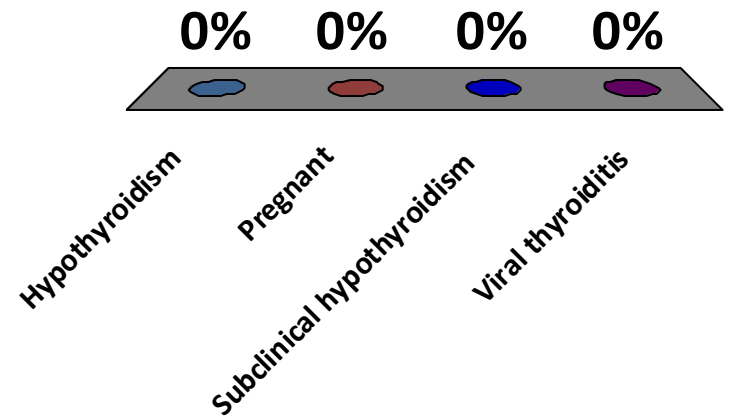
TSH	6.25 mIU/L	(0.38 – 5.50)
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Free T4	12.8 pmol/L	(10.0 – 18.7)
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Thoughts?

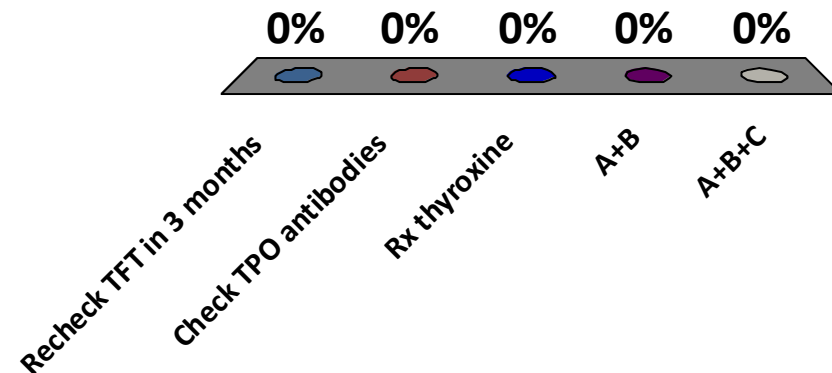
TSH 6.25 (0.38-5.5) free T4 normal

- A. Hypothyroidism
- B. Pregnant
- ✓ C. Subclinical hypothyroidism
- D. Viral thyroiditis



Subclinical hypothyroidism

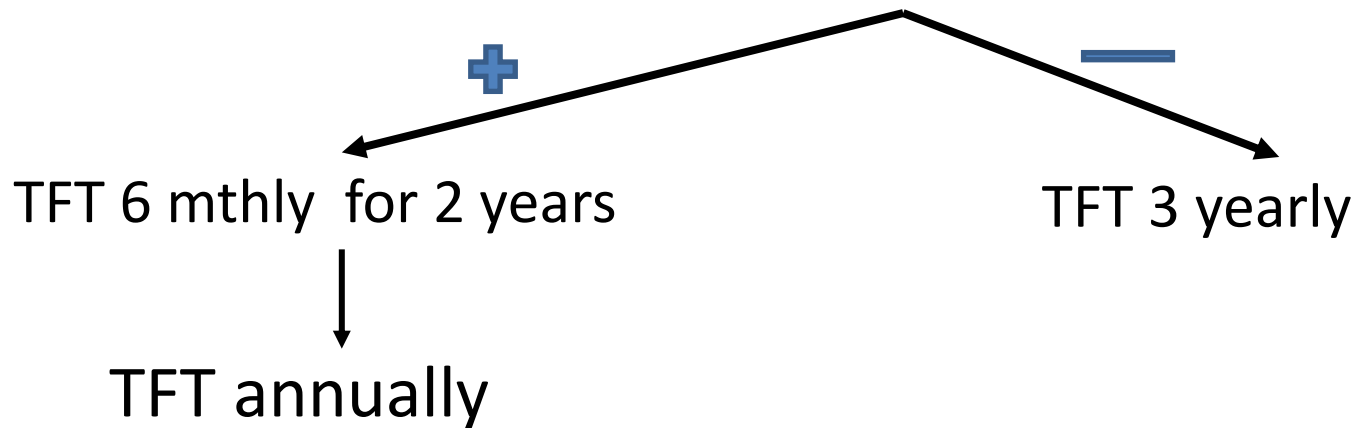
- A. Recheck TFT in 3 months
- B. Check TPO antibodies
- C. Rx thyroxine
- D. A+B
- E. A+B+C



Subclinical hypothyroidism

No Treatment

Thyroid peroxidase (TPO) antibodies



If symptomatic- Trial of Rx

Thyroid- case 2

40 year old nurse

Meds review

On Thyroxine 75 mcg

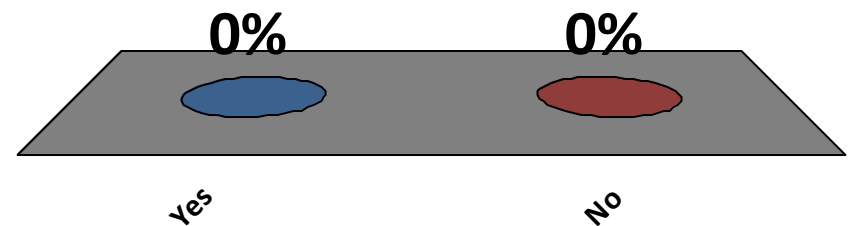
TSH	6.25 mIU/L	(0.38 – 5.50)
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Free T4	12.8 pmol/L	(10.0 – 18.7)
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Thyroxine 75 mcg...TSH high , T4 normal
will you increase her thyroxine dose to
100 mcg ?

A. Yes

B. No



Thyroid – case 3

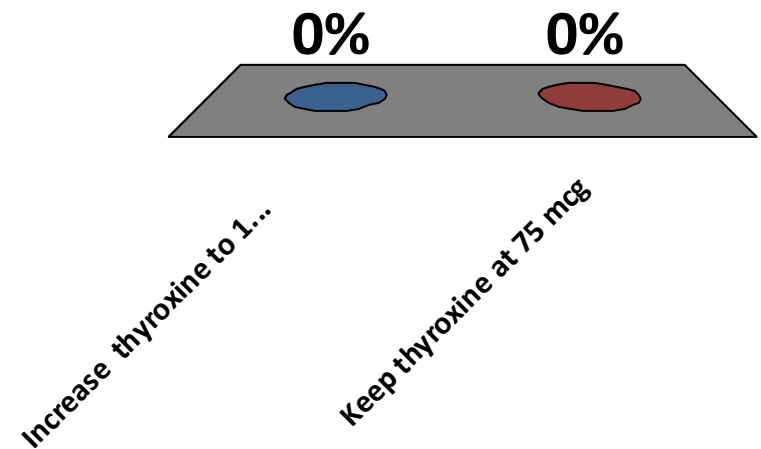
- Mrs LO 28 yr old, on thyroxine 75 mcg
- Med rev – tired , cold

- TSH 5.3 (0.38- 5.5)
- T4 12.8 (10.0- 18.7)

28 yr old, on thyroxine 75 mcg
tired , cold

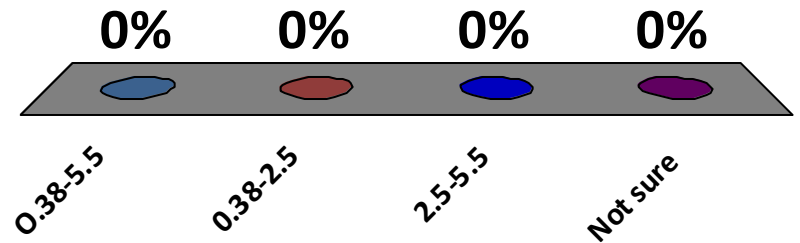
TSH 5.3 (0.38- 5.5) T4 12.8 (10.0- 18.7)

- A. Increase thyroxine to 100mcg
- B. Keep thyroxine at 75 mcg



Hypothyroidism- target TSH normal range (0.38-5.5)

- A. 0.38-5.5
- ✓ B. 0.38-2.5
- C. 2.5-5.5
- D. Not sure



Target TSH on thyroxine replacement

- **0.38-2.5**
- 0.38-5.5 if....
- Depends on symptoms!

Thankyou

