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[UCL Home](#) » [Centre for Anaesthesia Critical Care & Pain Medicine](#) » [students](#)

students



Medical Students

Dear UCL Students, welcome to this part of the site. You're **always welcome** in theatres at **any** of the sites. If you'd like to come outside of your conventional times just email us!

Introduction

We provide Teaching for medical students in anaesthesia, resuscitation, critical care, pain and perioperative medicine,

Teaching files to download

Welcome all students! Please feel free to use these files. Do contact [Dr Rob Stephens](#) if you have any suggestions

PROCEDURES

How to do: **Blood Transfusion**

How to insert an **Arterial Line**

How to insert a **Central Line**

How to insert a **Chest Drain**

How to look after an **Epidural** on the Ward

How to insert an **Emergency Airway**

How to Manage **Airway Obstruction**

OTHER TOPICS

Basics of anaesthesia: [handout](#)

Introduction to **Anaesthesia**

Introduction to **Postoperative Complications**

Introduction to **Preassessment**

How to prescribe **Perioperative Analgesia**

Introduction to **Pain Pathways** and Mechanisms

How to prescribe **Perioperative Analgesia for Children**

How to prescribe **Fluid Therapy**

NICE ward- based **fluid guidelines** 2013

Basics of **Intensive Care**

How to use **Inotropes** and vasopressors

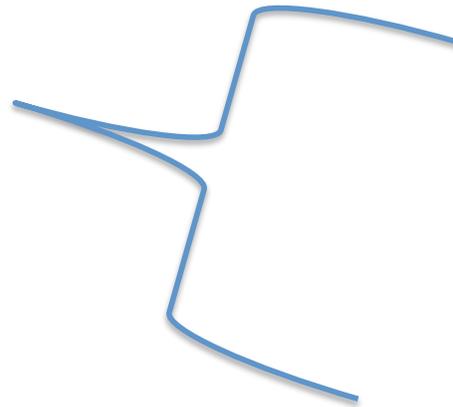
Introduction to **Trauma** Care

Introduction to **Pain Pathways**

How to Recognise **Critical Illness**

Oxygen delivery and consumption (more advanced)

History
Examination
Investigation
Management



Side Effects

CVS
RS
GI
GU
NS
Other

Danger

DR

Response?

A

AIRWAY

B

BREATHING

C

CIRCULATION

D

DISABILITY

E

EXPOSURE

Contents

Physiology – relevant only!

Anaesthesia

Analgesia Other-Ladder –Regional

Preop assessment and drugs

IV fluids

Blood + Products

ABG

Risk

Airway

Critical Care, iSBARd

Other stuff if we have time

Physiology

- Cardiac Output = $SV \times Hr$
- Mean Arterial Pressure = $CO \times SVR$
- O_2 delivery = $CO \times O_2$ content (= $Hb \times SaO_2$)

Hypoxaemia = low O_2 in blood

Deadspace = ventilation with no gas exchange
= ventilation with no perfusion
eg PE, Hemorrhage

Shunt = perfusion with no ventilation
eg Pneumonia, collapsed lung

Anaesthesia Basics

- Triad of Anaesthesia
 - **Hypnosis**
 - Analgesia
 - +/-Neuromuscular paralysis

Anaesthesia- Hypnosis

Hypnosis= reducing consciousness

$$\text{MAP} = \text{CO} \times \text{SVR}$$

Either I/v or volatile

- I/V Thiopentone Propofol

- CVS RS NS Depressants

- Volatiles- gasses- Sevoflurane, Isoflurane

- Breathe in, then out

- CVS RS NS Depressants

- I/V Ketamine

- Different side effects

Anaesthesia depresses function



Anaesthesia

- Triad of Anaesthesia
 - Hypnosis
 - **Analgesia**
 - +/-Neuromuscular paralysis



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 - [Course booklet to Introduction to Anaesthesia Course -](#)
- Please contact [robcmstephens\[at\]goolemail.com](mailto:robcmstephens[at]goolemail.com) to obtain the password to this FY-1 stage document. The MBBS year 4 booklet is higher up the page

Anaesthesia: Analgesia

- Psychology
- Physical
- Systemic – ‘ladder’ plus adjuvants (extras)
 - Simple – Paracetamol
 - NSAID
 - Opioids = any drug acting on opioid receptors
 - Gabapentin, Amitriptyline, Nitrous oxide etc
- Local/regional – Na⁺ channel Lignocaine, Bupivacaine

Anaesthesia: Analgesia

- **Psychology** eg explain, kindness, **Physical** cold compress, #
- **Systemic – ‘ladder’ plus adjuvants (extras)**
 - Simple – Paracetamol
 - NSAID – oral, I/v Side effects
 - Opioids = any drug acting on opioid receptors
 - Weak Opioid Dihydrocodeine
 - Strong Opioid Morphine, Fentanyl, Oxycodone
 - What route? Side effects
 - Gabapentin, Amitriptyline, Nitrous oxide etc
- **Local/regional – Spinal, Epidural**

Anaesthesia: Analgesia

- **Psychology** eg explain, kindness, **Physical** cold compress, #
- **Systemic – ‘ladder’ plus adjuvants (extras)**
 - Simple – Paracetamol 1g iv oral
 - NSAID – oral, i/v Side effects CVS RS GI GU
 - Opioids
 - Weak Opioid Dihydrocodeine 30mg tds
 - Strong Opioid Morphine, Fentanyl, Oxycodone
 - What route? Side effects
 - Gabapentin, Amitriptyline, Nitrous oxide etc
- **Local/regional – Spinal, Epidural**

Anaesthesia: Analgesia Ladder

Simple =

- Paracetamol 1g iv or oral
- **Never more than 4x day**
- **Never nearer than 4 hours**
- Codydramol Cocodamol have Paracetamol in

Anaesthesia: Analgesia Ladder

Non Steroidal Anti- Inflammatory Drugs

- Cyclo-oxygenase 1 + 2 'COX'
- Ibuprofen 200-400mg 3x-4x
- s/e **CVS** **RS** **GI** **GU** NS
- Caution
 - Increasing age
 - Worsening eGFR
 - Never give- renal transplant/ 1 kidney
 - give short course eg 5-7 days then reassess

Anaesthesia: Analgesia Ladder

Weak Opioids

- Opioid receptors μ , δ , κ Mu Kappa Lambda
- Dihydrocodine 30mg 3x-4x Oral
- Regularly or as needed
- s/e **CVS** **RS** **GI** **GU** **NS**
- Caution
 - Increasing age
 - Worsening eGFR
 - Resp disease

Anaesthesia: Analgesia Ladder

Strong Opioids

- **Morphine** fast or slow release Oral, IV as PCA
- **Fentanyl** IV as PCA
- **Oxycodone** fast or slow release Oral, IV as PCA
- s/e

Anaesthesia: Analgesia Ladder

Strong Opioids

- **Morphine** fast release Oral 'Oromorph' 5-15mg
- Morphine slow release 'MST' Oral
- Morphine IV as PCA
- **Fentanyl** IV as PCA, patch etc
- **Oxycodone** as PCA or Oral (slow and fast release)
- s/e **CVS** **RS** **GI** **GU** **NS**
- Caution
 - Increasing age
 - Worsening eGFR use Oxycodone
 - Give with laxative, Oxygen, PRN antiemetic, PRN Naloxone

Anaesthesia: Analgesia Ladder

Strong Opioids

Controlled drugs

On ward- Never give IV apart from PCA

Low  eGFR consider Oxycodone

Give

- Regular laxative, Oxygen,
- PRN antiemetic, PRN Naloxone

Morphine IV 3x strong as oral

You're asked to see a patient in pain

- Psychology, systemic, ?local, regional
- Assess the patient.. “out of 10 how bad is..”
- Where is the pain ? ‘expected’? acute vs chronic
- Systemic – ‘ladder’ plus adjvants
 - Simple –Paracetamol oral or IV regular
 - NSAID – oral regular
 - Opioids – Oral Dihydrocoedine regular
 - Opioids - ‘Oral Quick relaease morphine 3hrly’
 - Opioids - Oral – Long acting morphine ‘MST’ BD
 - Opioids - IV- PCA Morphine Fentanyl
 - Opioids - Oxycodone less renal elimination
 - Gabapentin, Amitriptyline, Nitrous oxide etc

SBA

A 55 year old woman has 7/10 hip pain 5 hours following an elective total right hip arthroplasty (joint replacement). She has been prescribed paracetamol 1g four times a day and ibuprofen 400mg three times a day but is still in pain.

Which of the following options would be most appropriate?

- A. Adding co-codamol 30mg/500mg four times a day orally with lactulose 10 ml twice a day orally.
- B. Adding codeine sulphate 30mg once daily orally and as required oral morphine
- C. Increasing analgesia to paracetamol 1g six times daily and dihydrocodeine 30mg three times daily .
- D. Prescribing her Fentanyl 20 micrograms intravenously up to 100 micrograms with lactulose 10 ml twice a day orally.
- E. Regular dihydrocodeine 30mg three times daily orally with lactulose 10 ml twice a day orally and as required oral morphine.

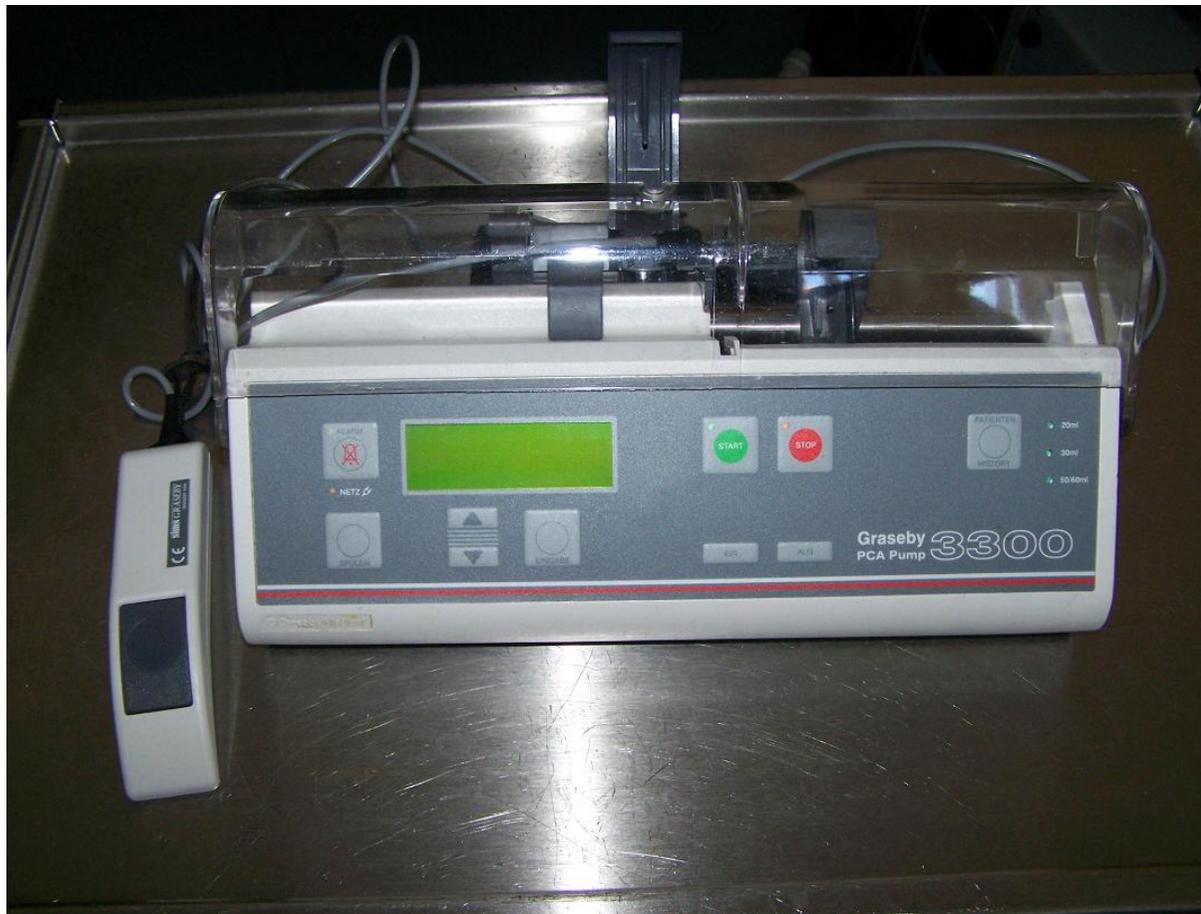
Analgesia

- Psychology, systemic, local, regional
- Postop pain – depends on expected needs
Bigger surgery, more pain
- ?Intraop local /block/epidural + systemic
- Everyone gets Paracetamol regularly 1G QDS
- ?add NSAID regularly eg Ibuprofen 200mg-400mg TDS
- ?add Dihydrocodine regular 30mg TDS
- ?need stronger – oral PRN Oral Morphine
- ? need stronger – PCA i/v + call for help

OSCE

Analgesia- PCA

Patient Controlled Analgesia



Morphine IV

1mg/ml

1mg bolus

No background

5 min lockout

Oxygen

Nursing Obs

Naloxone

Laxative & anti emetic

Allergies, sensitivities and adverse drug reactions

Patient details/addressograph

No known allergies Not possible to ascertain Initials & date *[Signature]*

Medicine/substance	Reaction and severity	Name and date

Weight (kg) NHS / Hospital number *1234567*

Surname *STEPHENS*

First name *Robert*

Height (cm)

Date of birth *28.2.1969*

Surface Area (m²)

Regular prescriptions	Date	8	12	18	22	TTAs continue	Duration	Dr sign	Date	
PATIENT CONTROLLED ANALGESIA (Adults) Morphine sulphate 100 mg in 100 mL sodium chloride 0.9% Concentration 1mg / mL Bolus dose <i>1</i> Continuous Infusion <i>0</i> /hr Dose duration STAT . Lockout <i>5</i> minutes Signature <i>[Signature]</i> Bleep <i>1234</i> Pharmacy Oxygen must be prescribed on page 2						Y				
	Drug Naloxone To be given if respiratory rate ≤ 6/ min Also URGENTLY contact oncall anaesthetist Route IV Dose 100-400 micrograms slowly Signature <i>[Signature]</i> OR if IV access not available Route IM Dose 400 micrograms Bleep <i>1234</i> Date started <i>12.2</i>						Y			
							Y			
							Y			
Additional instructions						Y				
Drug						Y				
New this admission (circle): Yes / No						Y				
Dose	Route	Frequency	Start date	Stop date		Y				
Signature	Bleep no.	Pharmacy				Y				
Additional instructions						Y				
Drug						Y				
New this admission (circle): Yes / No						Y				
Dose	Route	Frequency	Start date	Stop date		Y				
Signature	Bleep no.	Pharmacy				Y				
Additional instructions						Y				
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New this admission (circle): Yes / No						Y				
Dose	Route	Frequency	Start date	Stop date		Y				
Signature	Bleep no.	Pharmacy				Y				
Additional instructions						Y				

Anaesthesia

- Triad of Anaesthesia
 - Hypnosis
 - Analgesia
 - **+/-Neuromuscular paralysis**

Anaesthesia: Neuromuscular

To allow intubation and easy ventilation

No movement for surgery

- NMJ Nicotinic Cholinergic antagonists
 - Non-competitive/depolarising
 - = Suxamethonium = 2 acetylcholine molecules
 - Competitive/non- depolarising
 - = Others – Atracurium, Rocuronium, Vecuronium..
- Reversal- inhibit the enzyme that breaks down Ach (Cholinesterase) with Neostigmine
 - used in Myasthenia Gravis

Anaesthesia: 3 classical phases

- Preoperative – v important
- **Induction**- going to sleep
 - Dangerous
 - Mostly Analgesia, Iv hypnosis, paralysis
 - O₂, Air, ABCD
- **Maintenance** –during surgery
- **Emergence** – once surgery has ended
- Postoperative, recovery, home

SBA

SBA: Preoperative

A 73 year old woman with stable mild chronic obstructive pulmonary disease, hypertension and mild renal impairment is to undergo scheduled laparotomy. Which preoperative measures are most appropriate?

- A. ECHO cardiogram
- B. abdominal XR
- C. prophylactic β blockers
- D. Full blood count, Urea and Electrolytes
- E. Chest X-ray

Preoperative: Assess

CVS History Examination Investigation Management

SOBOE < 2 flights stairs? = Heart Failure

Can't assess exercise tolerance?

FBC, Group & Save, U & E, other preop bloods

ECG if over 55 or for major surgery

ASA risk score 1-5 and others

Many other issues....

risk vs benefit of surgery vs other options

?postpone elective surgery to 'optimise' ?

Preoperative Fasting

- Food, milk, 6 hours
- Clear fluids 2 hours
- Ok to take sip of water with drugs

Preoperative: Drugs

Don't stop CVS drugs except ACE

ie continue B Blockers, Ca⁺⁺ antagonists, Nitrates etc

Don't stop Asprin/Clopidogril with Coronary Stents

Carry on analgesia + most other drugs

Type 2 DM: no food, reduce hypoglycaemics (complex)

Type 1 DM: no food, alter insulin (complex)

'NBM' –sips of water ok for drugs until surgery

Surgical Safety Checklist 'Time out'



Patient Safety
A World Alliance for Safer Health Care

Before induction of anaesthesia

(with at least nurse and anaesthetist)

Has the patient confirmed his/her identity, site, procedure, and consent?

Yes

Is the site marked?

Yes

Not applicable

Is the anaesthesia machine and medication check complete?

Yes

Is the pulse oximeter on the patient and functioning?

Yes

Does the patient have a:

Known allergy?

No

Yes

Difficult airway or aspiration risk?

No

Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?

No

Yes, and two IVs/central access and fluids planned

Before skin incision

(with nurse, anaesthetist and surgeon)

Confirm all team members have introduced themselves by name and role.

Confirm the patient's name, procedure, and where the incision will be made.

Has antibiotic prophylaxis been given within the last 60 minutes?

Yes

Not applicable

Anticipated Critical Events

To Surgeon:

What are the critical or non-routine steps?

How long will the case take?

What is the anticipated blood loss?

To Anaesthetist:

Are there any patient-specific concerns?

To Nursing Team:

Has sterility (including indicator results) been confirmed?

Are there equipment issues or any concerns?

Is essential imaging displayed?

Yes

Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:

The name of the procedure

Completion of instrument, sponge and needle counts

Specimen labelling (read specimen labels aloud, including patient name)

Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:

What are the key concerns for recovery and management of this patient?



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SBA

SBA Fluids

You're called about Mr N, 72, who has had a revision hip replacement today, including a 2 unit transfusion. His urine output has been 15ml, then 20ml, 15ml, 10 ml and 0ml per hr. Mr N weighs 72 kg, has hypertension and type 2 diabetes and can eat and drinking normally. You decide to.....

- A) Assess him and suggest he tries to drink some oral saline or Hartmann's.
- B) Check the patency of the urinary catheter with a 'bladder washout' and check bloods looking for markers of hypoperfusion
- C) Give a unit of blood as he's probably lost blood during surgery.
- D) Give some diuretics (eg Bumetanide) as with the fluid's he's likely to be 'overloaded'
- E) Assess the patient, ask for a bladder washout and give a fluid challenge with 500ml Hartmann's solution.

Fluid Therapy

- Everyone gets confused!
- Think about why you're called to see patient
- Hx, Exam, Ix, Management vs DR ABCD
- Ward Guidelines- NICE vs others
- How can you monitor fluid status?
- Colloids / Crystalloids / Blood products
- Colloids vs Crystalloids – no real evidence

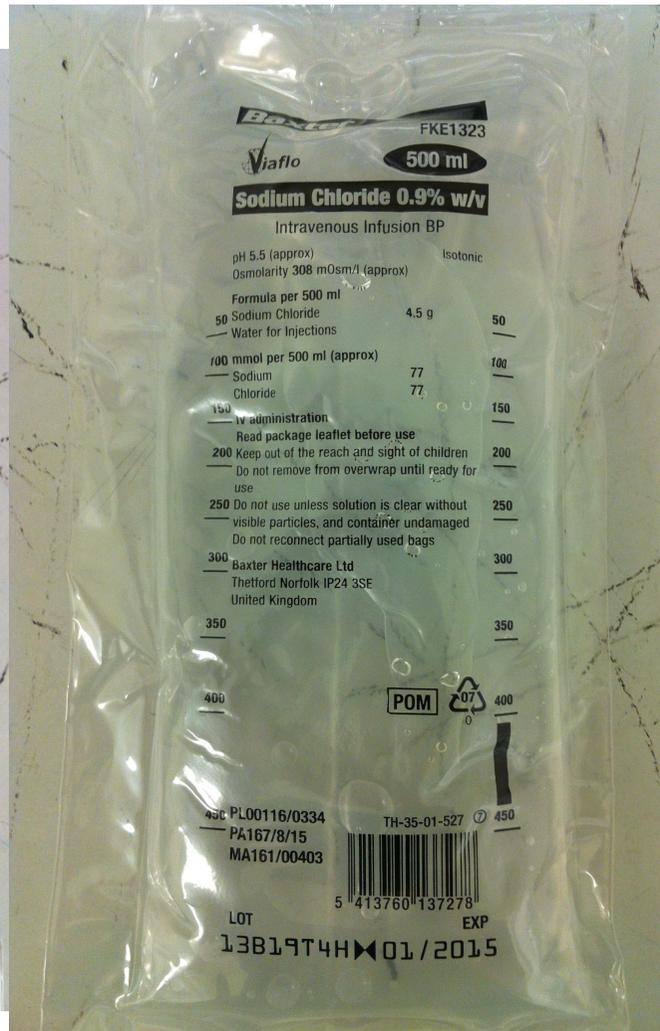
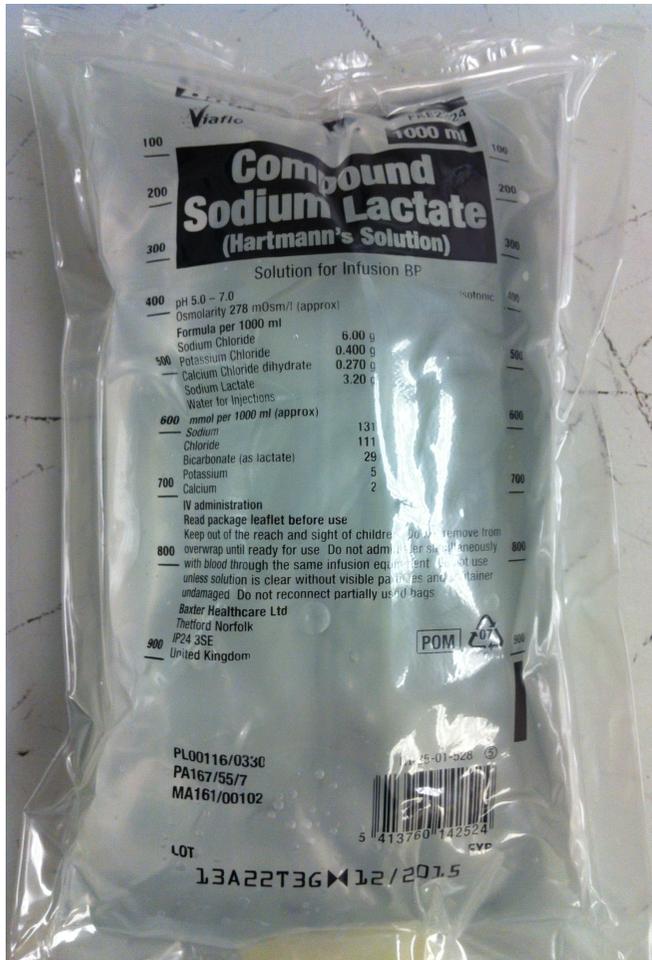
mmol/L	Na ⁺	K ⁺	Ca ⁺⁺	Cl ⁻	Lactate ⁻	Glucose
Hartmanns'	131	5	2	111	29	
Saline	150			150		
Glucose 5%						50g/L

Fluid: Crystalloids / Colloids

CSL = Hartmann's

Saline 0.9%

Gelofusin / Geloplamsa
Ignore for Finals



Algorithms for IV fluid therapy in adults

Algorithm 1: Assessment

Using an ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach, assess whether the patient is hypovolaemic and needs fluid resuscitation. Assess volume status taking into account clinical examination, trends and context. Indicators that a patient may need fluid resuscitation include: systolic BP <100mmHg; heart rate >90bpm; capillary refill >2s or peripheries cold to touch; respiratory rate >20 breaths per min; NEWS ≥5; 45° passive leg raising suggests fluid responsiveness.

Yes

Algorithm 2: Fluid Resuscitation

Initiate treatment

- Identify cause of deficit and respond.
- Give a fluid bolus of 500 ml of crystalloid (containing sodium in the range of 130–154 mmol/l) over 15 minutes.

Reassess the patient using the ABCDE approach. Does the patient still need fluid resuscitation? Seek expert help if unsure

Yes

No

Does the patient have signs of shock?

Yes

No

>2000 ml given?

No

Give a further fluid bolus of 250–500 ml of crystalloid

Seek expert help

Assess the patient's likely fluid and electrolyte needs

- History: previous limited intake, thirst, abnormal losses, comorbidities.
- Clinical examination: pulse, BP, capillary refill, JVP, oedema (peripheral/pulmonary), postural hypotension.
- Clinical monitoring: NEWS, fluid balance charts, weight.
- Laboratory assessments: FBC, urea, creatinine and electrolytes.

Can the patient meet their fluid and/or electrolyte needs orally or enterally?

Yes

Ensure nutrition and fluid needs are met. Also see [Nutrition support in adults](#) (NICE clinical guideline 32).

No

Does the patient have complex fluid or electrolyte replacement or abnormal distribution issues? Look for existing deficits or excesses, ongoing abnormal losses, abnormal distribution or other complex issues.

Yes

Algorithm 4: Replacement and Redistribution

Existing fluid or electrolyte deficits or excesses

- Check for:
- dehydration
 - fluid overload
 - hyperkalaemia/hypokalaemia

Estimate deficits or excesses.

Ongoing abnormal fluid or electrolyte losses

- Check ongoing losses and estimate amounts. Check for:
- vomiting and NG tube loss
 - biliary drainage loss
 - high/low volume ileal stoma loss
 - diarrhoea/excess colostomy loss
 - ongoing blood loss, e.g. melaena
 - sweating/fever/dehydration
 - pancreatic/jejunal fistula/stoma loss
 - urinary loss, e.g. post AKI polyuria.

Redistribution and other complex issues

- Check for:
- gross oedema
 - severe sepsis
 - hyponatraemia/hyponatraemia
 - renal, liver and/or cardiac impairment
 - post-operative fluid retention and redistribution
 - malnourished and refeeding issues
- Seek expert help if necessary and estimate requirements.

Prescribe by adding to or subtracting from routine maintenance, adjusting for all other sources of fluid and electrolytes (oral, enteral and drug prescriptions)

Monitor and reassess fluid and biochemical status by clinical and laboratory monitoring

Algorithm 3: Routine Maintenance

Give maintenance IV fluids

- Normal daily fluid and electrolyte requirements:
- 25–30 ml/kg/d water
 - 1 mmol/kg/day sodium, potassium, chloride
 - 50–100 g/day glucose (e.g. glucose 5% contains 5 g/100ml).

Reassess and monitor the patient. Stop IV fluids when no longer needed. Nasogastric fluids or enteral feeding are preferable when maintenance needs are more than 3 days.

>90bpm; capillary refill >2s or peripheries cold to touch; re

Yes

Algorithm 2: Fluid Resuscitation

Initiate treatment

- Identify cause of deficit and respond.
- Give a fluid bolus of 500 ml of crystalloid (containing sodium in the range of 130–154 mmol/l) over 15 minutes.

Reassess the patient using the ABCDE approach
Does the patient still need fluid resuscitation? Seek expert help if unsure

Yes

No

Does the patient have signs of shock?

No

Assess the patient's likely

- History: previous limited
- Clinical examination: p
- Clinical monitoring: NE
- Laboratory assessment

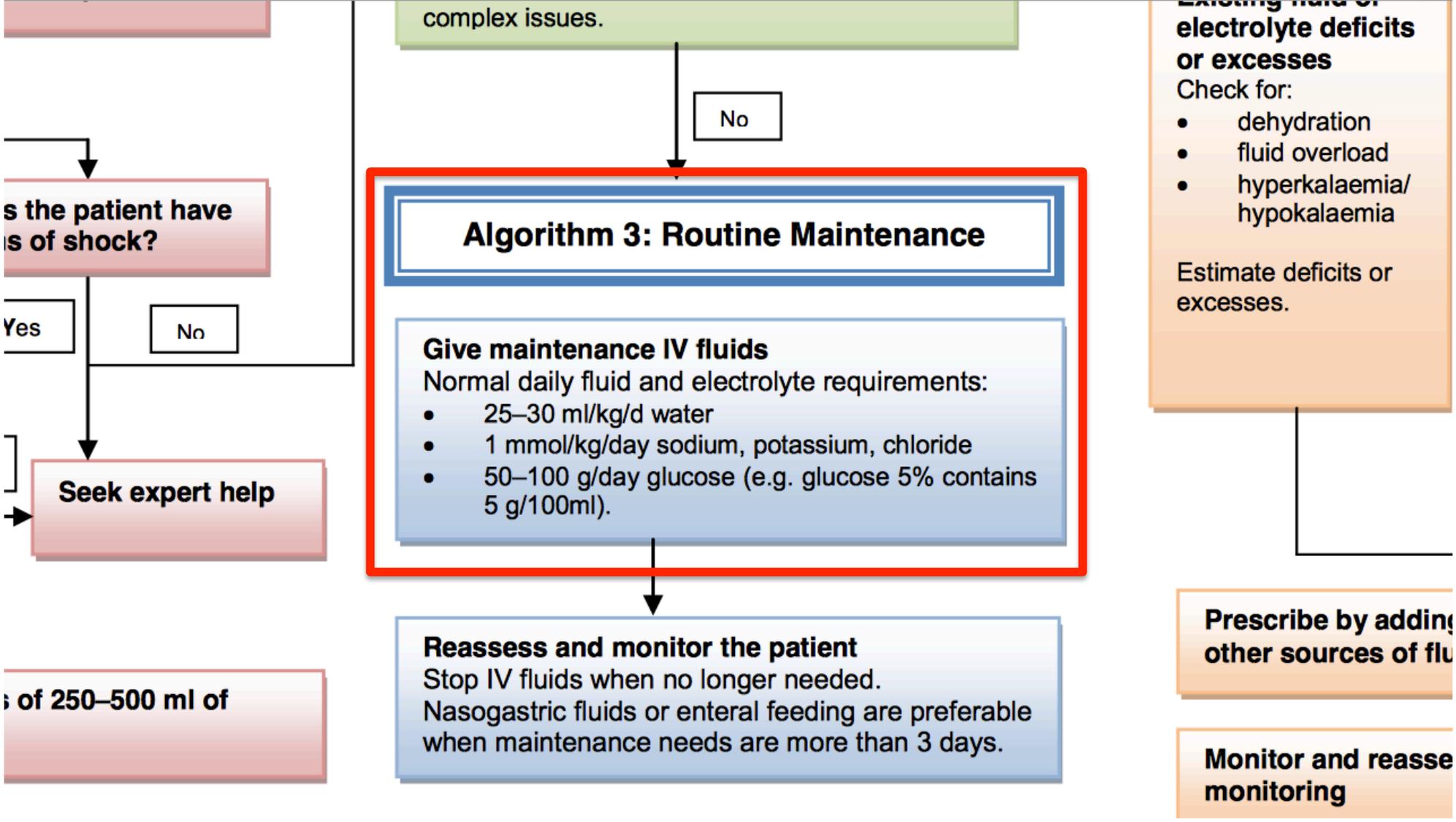
Can the patient meet their

No

Does the patient have con
electrolyte replacement o
distribution issues?
Look for existing deficits or e
abnormal losses, abnormal d
complex issues.

No

Algorithm 3: Routi



NICE 2013- ward fluid

- Assess - usual ways
- Resuscitate – Hartmann's/ ~~Saline~~ 500ml 15minutes x 4
- Routine Maintenance
 - Oral ideally, if needed i/v
 - Glucose 50-100g /day
 - 25-30ml / kg / day
 - Na K Cl 1mmol/kg/day
- (Replace + Redistribution)

Until the problem you've been called about is sorted

OSCE & SBA

- OSCE- write a fluid prescription for
 - Resuscitation
 - Maintenance
- SBA ..
 - The following is the best...fluid prescription for a 100kg person who needs IV fluid replacement. ..

Fluid Therapy

- Crystalloid – Saline / Glucose / Hartmann's
 - Saline – NaCl acidosis, renal dysfunction NaCl 150mmol
 - 5% Glucose = water no electrolytes, hypo Na+, 50g Glucose/L
 - 4% Glucose + 1/5 saline = 'Dextrose saline' 40g Glucose/L, NaCl 30mmol
 - Hartmann's less Na K+, Ca+ less Cl, has lactate, no acidosis
- Colloids- ignore/ don't mention
 - smaller volumes / artificial- allergy
 - Gelatin in saline/Hartmann's-like
 - 'Gelofusin'- saline 'geloplasma' – Hartmann's

Fluid Therapy

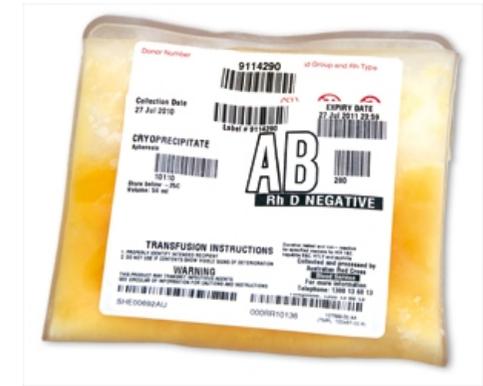
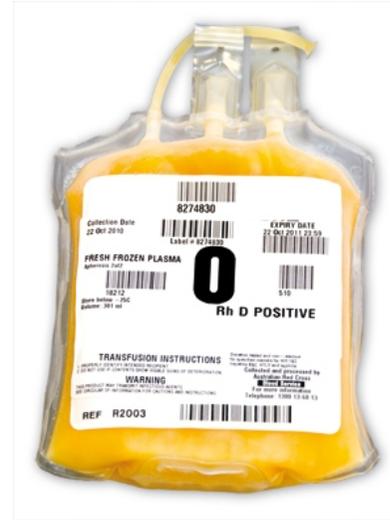
- Resuscitate – Hartmann's/ Saline 500ml 15minutes x 4
- Routine Maintenance
 - Oral ideally, if needed i/v
 - Glucose 50-100g /day
 - 25-30ml / kg / day
 - Na K Cl 1mmol/kg/day
- Saline – Na⁺ 150mmol/L – too much
- Hartmann's- Na⁺ 131 – too much
- 4% Glucose 'Dextro-saline' 1/5 Na⁺ 30mmol

Fluid Therapy

- Routine Maintenance
 - Glucose 50-100g /day
 - 25-30ml / kg / day
 - Na K Cl 1mmol/kg/day
- 4% Glucose 'Dextro-saline' 1/5 Na⁺ 30mmol
- 100 kg..2.5-3L...100mmol Na K Cl 50-100 glucose
- 3 x Dextro-saline
 - 3L, 90mmol Na& Cl 120 glucose 20,40,40 K mmol

OR

- 2L 5% Glucose & 20 K+CL- 100g glucose 40 K+CL- mmol
- 500ml Na⁺Cl⁻ & 20 K+CL- 75 NaCl, 20 K+



'Blood'
Packed Red Cells

Platelets

'Cryoprecipitate'
Fibrinogen

Haemoglobin
O₂ carriage

Low Plt number
Abnormal Plt Fn

FFP
Fresh Frozen Plasma
Clotting Factors

Fibrinogen

Blood

Group save
X Match

Packed Red Cells Transfusion

- Immune /Infection Under/Overload Chronic (Fe)

PRC Massive transfusion

- Blood = cold, ↑K, ↓Ca, Coagulopathy
- Given with FFP and Platelets
- Cryoprecipitate if Fibrinogen low

Usually aim for 70-80g/L..

80-90g/L in CVS/RS disease

Higher c100g/L if about to have surgery

OSCE

'talk to this patient about blood transfusion'

- Hello I'm....
- Can I just check I've got the correct patient...
- I've been asked to talk to you about....
- Is there anything you're specially worries about?
- Go through
 - benefits
 - risks
 - any alternatives ?
 - caveats
- Would you like to ask anything else

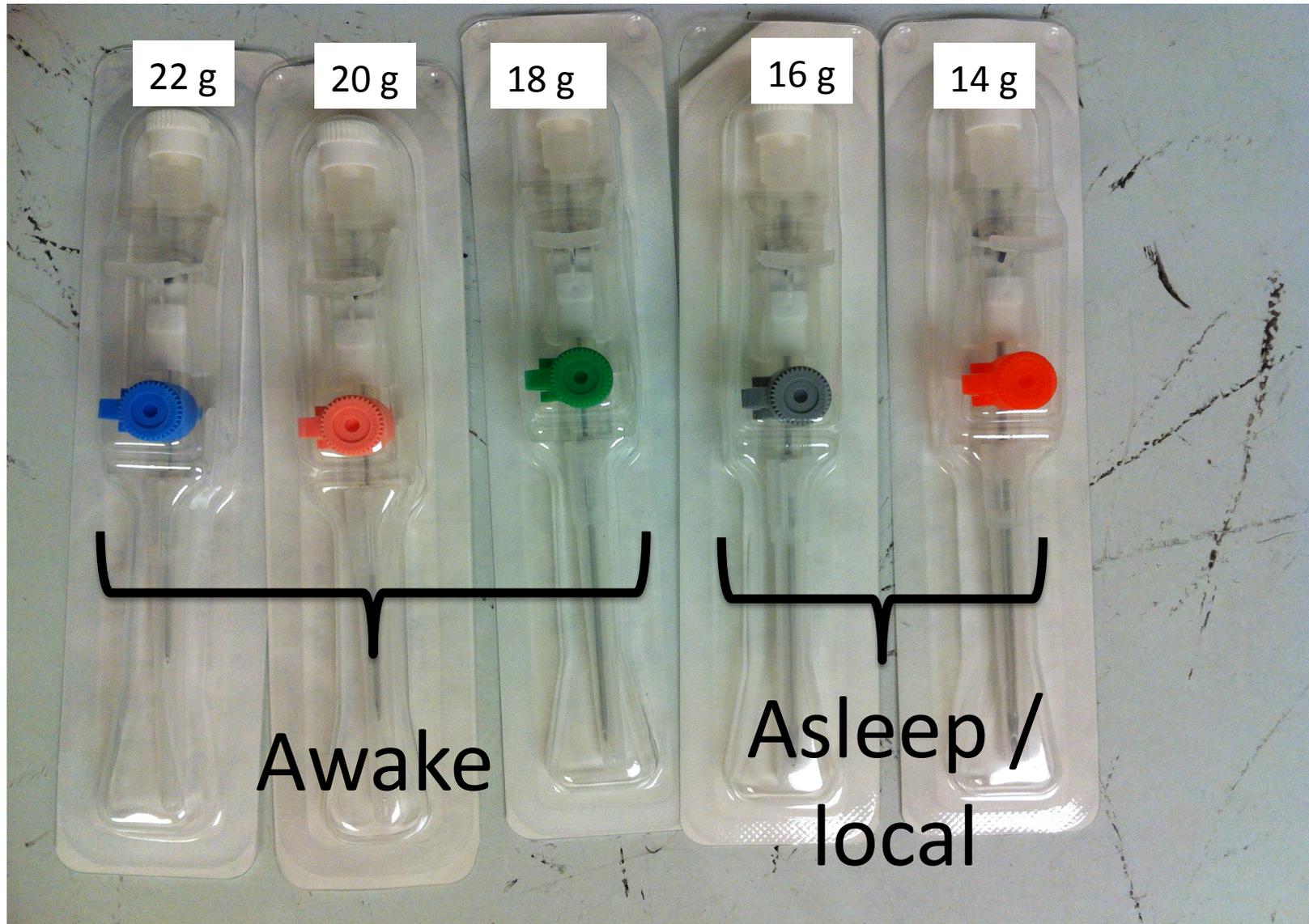
Oxygen to cells to work
Less tired
Heart has to work less hard

No blood, cell saver, erthropoetin

Only use if really need

Fluid

- Intravenous Cannulae / 'Venflons'



Bloods Day 1 Post Op

You're with a 65 woman who has had a laparoscopic hysterectomy yesterday. She looks ok to you from the end of the bed. On a postop ward round you're handed some bloods by a medical student.

The medical student asks you what you think of the bloods and what would you do about them.

You know it's very important to look cool in these sort of situations, but you're not sure what to do!

They look ok but....

Bloods Day 1 Post Op

Test	Result	Normal Range
Hb	110	115 – 155 g/L
WCC	13	3 - 10 x 10 ⁹ /L
Plt	250	150 – 400 x 10 ⁹ /L
Na	135	135 – 145 mmol/L
K	4.2	3.5 – 5.0 mmol/L
Ur	5.1	1.7 – 8.3 mmol/L
Cr	65	49 – 92 umol/L
eGFR	88	> 90
CRP	35	0 – 5 mg/L
Alb	36	35-55

Arterial blood gas

- Essentially like venous – apart from Oxygen.
- pH $p\text{CO}_2$ $s\text{BEx}$ ($s\text{HCO}_3$)
- Oxygen- what's the FiO_2
- Other stuff the hospital has bought
 - Eg Na, K, lactate, CO, Hb, MetHb
- New way of thinking- 'Stewart' (gold medal)

4 pathologies

There are 4 pathologies of Acid base balance

- Respiratory Acidosis
 Alkalosis
- Metabolic Acidosis
 Alkalosis

4 pathologies

- There are 4 pathologies of Acid-Base balance
- They can be
 - **Acute** = sudden, new, hours
 - **Chronic** = longer term, persistent, days
- The body **compensates** to limit pH changes
 - Respiratory compensation **immediate**
 - Metabolic compensation **12+ hours**

RADIOMETER ABL90 SERIES

Pt details

ABL90 UCLH T 5N0018
 PATIENT REPORT Syringe - S 65uL Sample # 1987

Identifications

Patient ID
 Patient first name
 Patient last name
 Department (Pat.) 3
 FO₂(I) %
 Sample type Arterial
 Operator Bethan Archer

Blood gas values

↓ pH	7.212	[7.350 - 7.450]
↑ pCO ₂	9.79 kPa	[4.67 - 6.00]
pO ₂	12.4 kPa	[10.7 - 13.3]
Hct _C	45.4 %	

Oximetry values

ctHb	148 g/L	[115 - 174]
sO ₂	95.3 %	[75.0 - 99.0]
↓ FO ₂ Hb	93.3 %	[95.0 - 99.0]
FCO ₂ Hb	1.7 %	[0.5 - 2.5]
FHHb	4.6 %	[1.0 - 5.0]
FMetHb	0.4 %	[0.4 - 1.5]



cCa ²⁺	1.17 mmol/L	[1.12 - 1.32]
cCl ⁻	104 mmol/L	[98 - 107]

Metabolite values

↑ cGlu	6.8 mmol/L	[3.3 - 6.1]
cLac	0.7 mmol/L	[0.4 - 2.2]

Oxygen status

ctO ₂ C	19.5 Vol%	
p50 _C	4.38 kPa	

Acid-base status

cBase(Ecf) _C	1.6 mmol/L	
cHCO ₃ ⁻ (P.st) _C	23.9 mmol/L	

Notes

↑ Value(s) above reference range
 ↓ Value(s) below reference range
 c Calculated value(s)
 0293: Oxi compensated for HbF

Telephone N

H
 J Registrar South
 07939 135 452
 J Registrar North
 07984 183 141
 I Bed Co-ordinator
 07736 330 331
 CU Bed Co-ordinat
 07908 617 681
 ite Pain Nurse
 Bleep 2257
 NN
 ext 84706 / 83123
 J ext 83574 / 8457
 ite Pain Nurse
 Bleep 8248
 rt Hospital
 North ext 63170 / 71
 South (HDU) ext 631

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FMetHb	0.4	%	[0.4 - 1.5]

Electrolyte values

cK ⁺	4.2	mmol/L	[3.5 - 4.5]
cNa ⁺	139	mmol/L	[135 - 148]
cCa ²⁺	1.17	mmol/L	[1.12 - 1.32]
cCl ⁻	104	mmol/L	[98 - 107]

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te Pain Nurse
Bleep 8248
st Hospital

pH
pCO₂
HCO₃ or BEx

Metabolic Acidosis
Partial Respiratory
Compensation

FO ₂ (I)	21.0 %		
Sample type	Arterial		
Blood Gas Values			
pH	7.25		Low
pCO ₂	3.6	kPa	low
pO ₂	29.6	kPa	
Temperature Corrected Values			
pH(T)	7.380		
pCO ₂ (T)	6.35	kPa	
pO ₂ (T)	29.6	kPa	
Acid Base Status			
cBase(Ecf) _c	-10	mmol/L	Low
cHCO ₃ ⁻ (P,st) _c	15	mmol/L	Low
Oxygen Status			
ctO _{2c}	13.7	Vol%	
p50 _e	3.48	kPa	
Oximetry Values			
ctHb	100	g/L	
FO ₂ Hb	99.7	%	
FO ₂ Hb	3.3	%	
FMetHb	1.8	%	
Electrolyte Values			
cK ⁺	3.5	mmol/L	
cCl ⁻	100	mmol/L	
cNa ⁺	137	mmol/L	
Metabolite Values			
cGlu	5.1	mmol/L	
cLac	1.3	mmol/L	

Let's think about
this stuff later

Arterial blood gas

- Essentially like venous – apart from Oxygen.
- pH pCO₂ sBEx (sHCO₃)
- Oxygen- what's the FiO₂
- Other stuff the hospital has bought
 - Eg Na, K, lactate, CO, Hb, MetHb
- New way of thinking- 'Stewart' (gold medal)

Risk

- Risk of procedure ...use 'SORT Surgery' website
- Risk of alternative procedures
- Risk of doing nothing
- Legal stuff.. 'Montgomery vs Lanarkshire



ASA-PS scoring

American Society of Anesthesiology

- Grade 1: A normal healthy patient
- Grade 2: A patient with mild systemic disease
- Grade 3: A patient with severe systemic disease
- Grade 4: A patient with severe systemic disease that is a constant threat to life
- Grade 5: A moribund patient who is not expected to survive without the operation.
- Grade 6: A brainstem dead patient awaiting organ donation

Airway

Airways obstruct

- Under Anaesthesia
- If consciousness reduced eg alcohol, CVA
- Likely if GCS <8

Airway

0 Give Oxygen – different ways

1 Airway Manouvers – caution in head trauma

Jaw thrust / Head tilt / chin lift /

2 Airway Adjuncts

Guedel / Naso-Pharyngeal

3 Airway kit eg Laryngeal Mask Airway

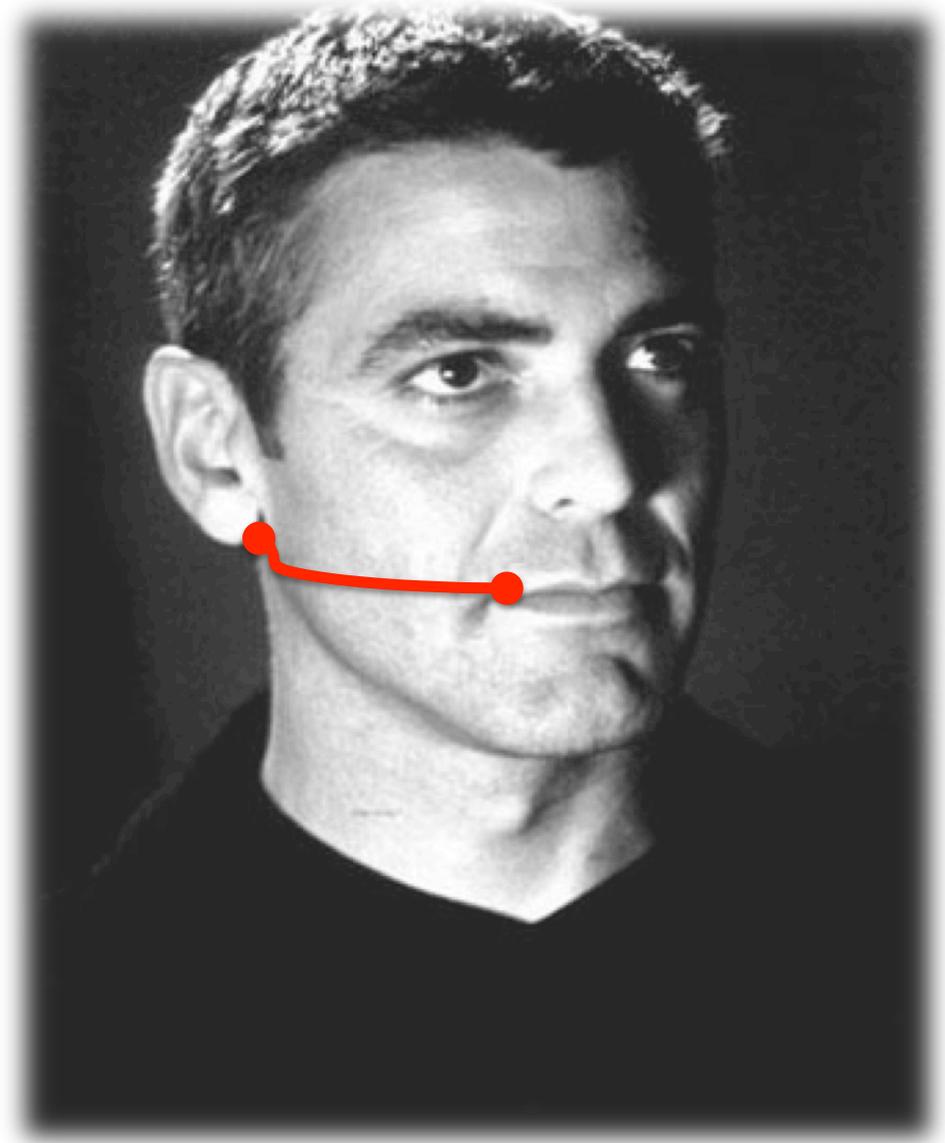
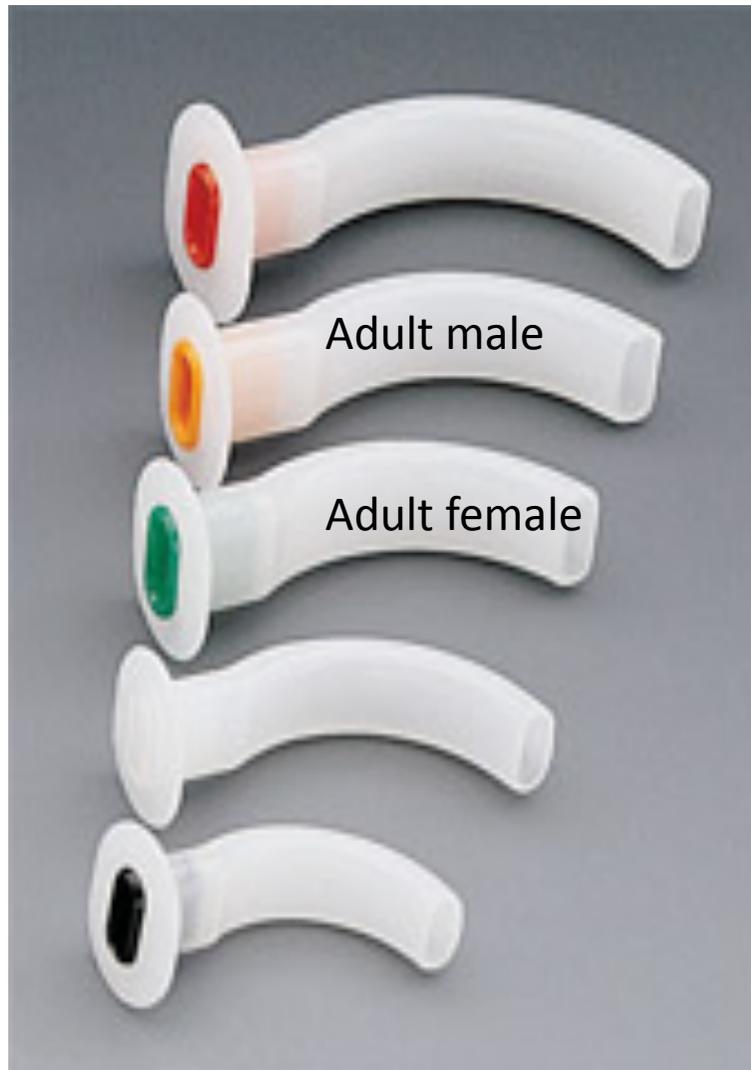
4 'Definitive' Airway

Intubate- Cuffed Oral EndoTracheal Tube / Tracheostomy

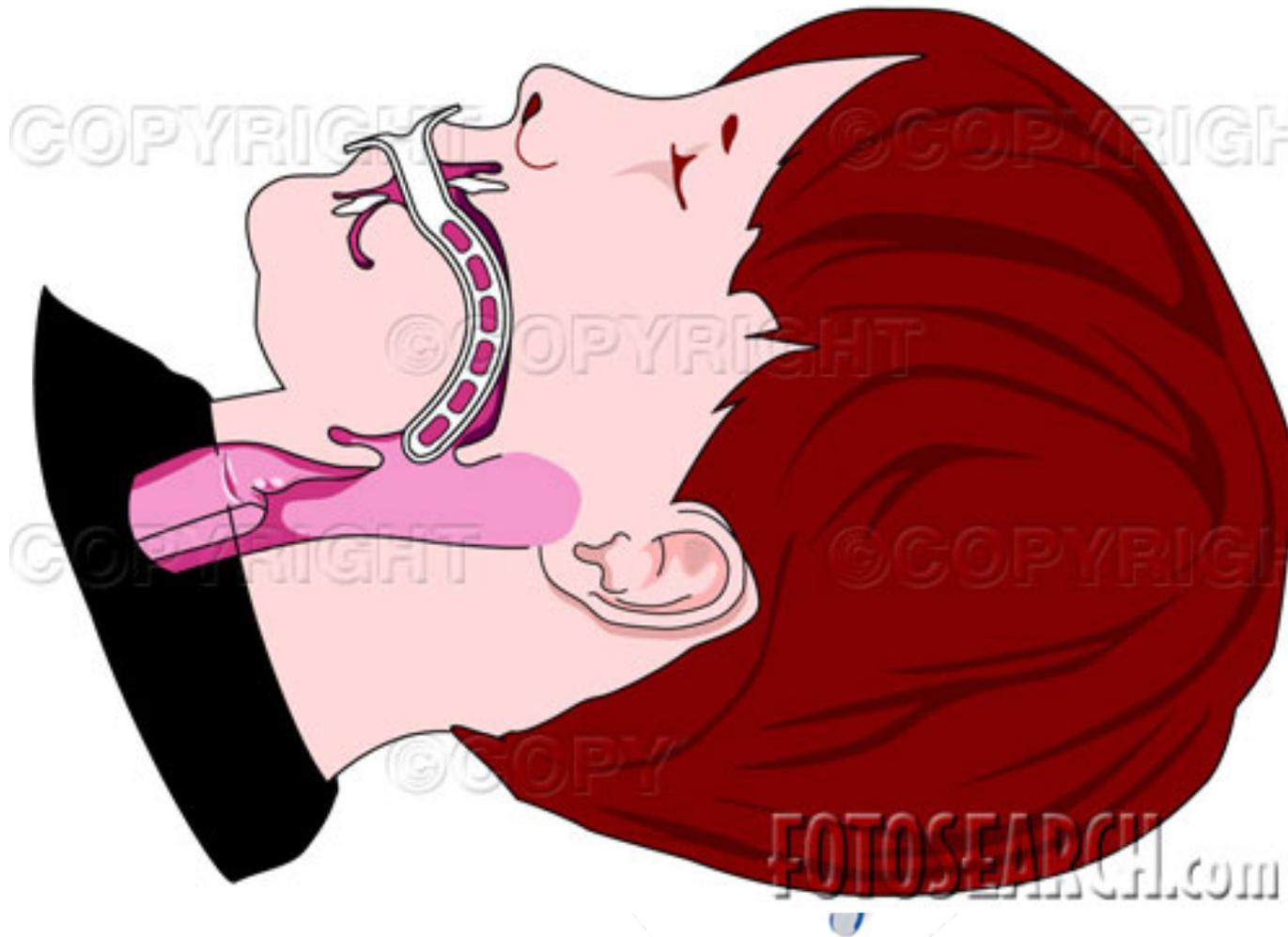
5 Surgical Airway –

Cricothyroid /Tracheostomy

Airway Use adjuncts



Airway Equipment



Airway Equipment



Equipment



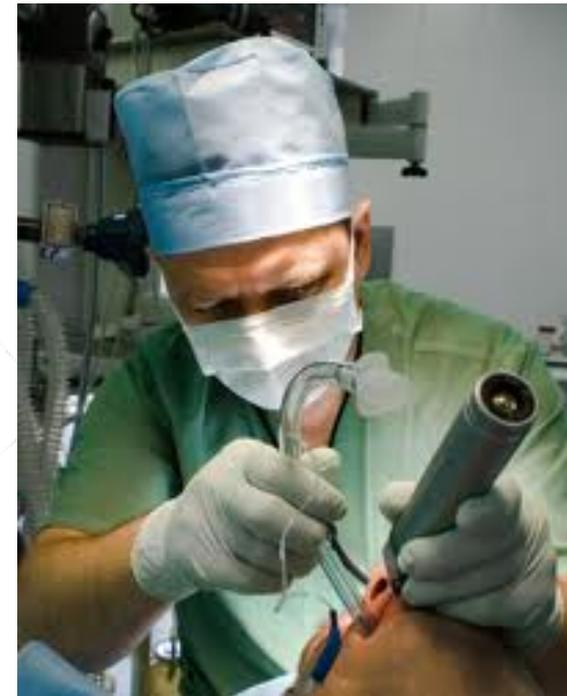
Airway Equipment

Cuffed Oral (nasal) Endotracheal Tube
'ET Tube'

Internal Diameter sized

Need to be paralyzed

Inserted under Laryngoscopy



Airway Equipment



Critical Care

More than Ward care

- More Nurses,
- More Drs,
- More Equipment & Monitors
- Treating
- Preventing Organ dysfunction

History
Examination
Investigation
Management



S

situation

Hi I'm one of the FY Drs. Is that the ICU Dr please? Can I ask you about a patient on the surgical ward?

She's on 15 L oxygen and still her oxygen saturations are still low!

B

background

She's the 36 year old lady who's just had a laparoscopic hysterectomy. I noticed her saturations were 98% on air on the preassessment chart and she's previously well.

A

assessment

Her **airway** is OK-but in terms of her **breathing** her resp rate is 27 and it looks really shallow. She's needed 15L of Oxygen to have a saturation of 94% since she's arrived in recovery. In terms of her **circulation**: Her BP is 105/74 and heart rate 98 and (**disability**) she's pretty sleepy – only responding to pain. She's certainly not ready for the ward!

R

recommendation

Could you come and see her?- she's in main surgical ward bed x.
Thank. You so much

Critical Care

- DR** & Help!- “ Can you call 222 and...”
- Reassure Patient** “ I’m Dr ...and I’m going to help sort..”
- Airway** Oxygen
- Breathing** Asses
- Circulation** Asses
- HR BP SaO₂, Capillary refill
 - IVI, Fluids, Bloods, VBGas incl Glucose
- Disability** + Drugs

Ask for History, Notes, Drug Charts

Confidentiality

?

- How can we breach it ?

Confidentiality

- Confidentiality vs need to unload after stress
- Is it OK to talk to friends / partner / parents?
- Is it OK to write on Facebook?
- Is it OK to Tweet?

- Be careful...

Confidentiality

- No features identifying a patient
- Be careful about where you work- relative could identify a patient
- No features identifying a colleague
- Be very careful
 - on social media- effectively in public domain
 - in public – lifts, on phone etc

The "never events" list 2012/13

The list of never events from Department of Health has been updated and slightly amended for 2012 - 2013. The full 'never events' list for reference is:

1. wrong site surgery
2. wrong implant/prosthesis
3. retained foreign object post-operation
4. wrongly prepared high-risk injectable medication
5. maladministration of potassium-containing solutions
6. wrong route administration of chemotherapy
7. wrong route administration of oral/enteral treatment
8. intravenous administration of epidural medication
9. maladministration of Insulin
10. overdose of midazolam during conscious sedation
11. opioid overdose of an opioid-naïve patient
12. inappropriate administration of daily oral methotrexate
13. suicide using non-collapsible rails
14. escape of a transferred prisoner
15. falls from unrestricted windows
16. entrapment in bedrails
17. transfusion of ABO-incompatible blood components
18. transplantation of ABO-incompatible organs as a result of error
19. misplaced naso- or oro-gastric tubes
20. wrong gas administered
21. failure to monitor and respond to oxygen saturation
22. air embolism
23. misidentification of patients
24. severe scalding of patients
25. maternal death due to post partum haemorrhage after elective Caesarean section.

NHS Never Events

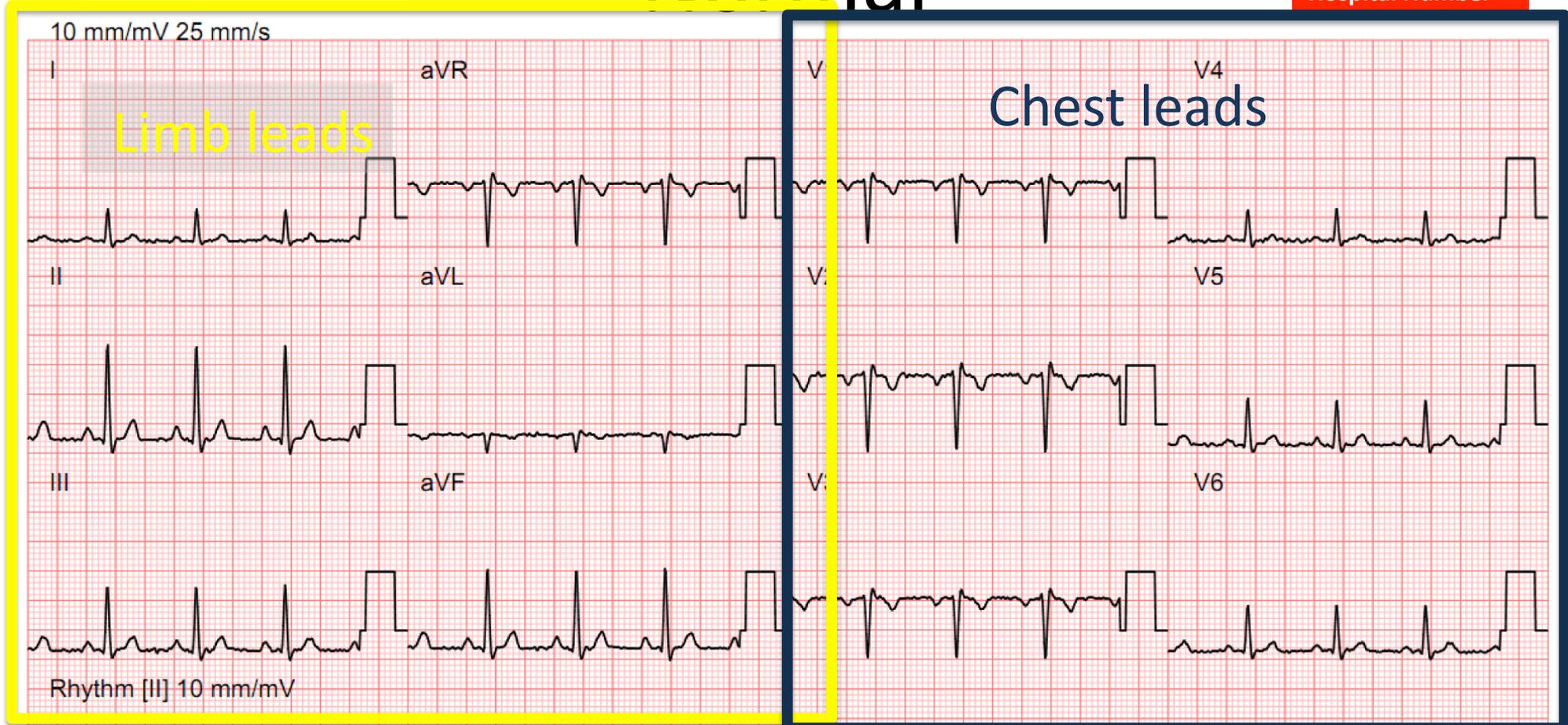
.....are serious incidents that are wholly preventable.....

...have the potential to cause serious patient harm or death.

Date taken
Clinical Info
Speed and Amplitude

First Name
Second name
Date of birth
Hospital Number

Normal



Rhythm strip

SBA

DVT Prophylaxis

You are asked to 'sort out the DVT prophylaxis' by your annoying surgical registrar. He directs you to a 67 man who is having a laparoscopic cholecystectomy at about 1300 today. The man has essential hypertension but is otherwise well. You..

- A Prescribe TED stockings and aspirin
- B Prescribe TED stockings only
- C Prescribe TED Stockings and ½ dose of low molecular weight heparin 2 hours before surgery, with the first post operative low molecular weight heparin dose 4 hours after surgery starts
- D Prescribe TED stockings and first dose 6 hours after surgery finishes of low molecular weight heparin, to carry on whilst he's an inpatient
- E Prescribe TED stockings and first dose 2 hours after surgery finishes of low molecular weight heparin, to carry on whilst he's an inpatient

DVT Prophylaxis

- Risk assess
 - Acute medical or inpatient surgery?
 - Other clotting things / risk of bleeding?
- General issues
 - Mobilise/ fluids/ pain relief
- TED
- Intermittant calf compression
- LMWH 6 hours post op, then 1800 daily

Summary

- Anaesthesia- depresses CVS RS NS & ABCD
- Analgesia –general, systemic, local/regional
- Preoperative incl WHO
- Fluids + Blood
- ABG
- Oxygen and Equipment
- Critical Care
- Welcome in theatre anytime

www.ucl.ac.uk/anaesthesia/people/stephens

Google UCL Stephens

Google UCL Anaesthesia Student