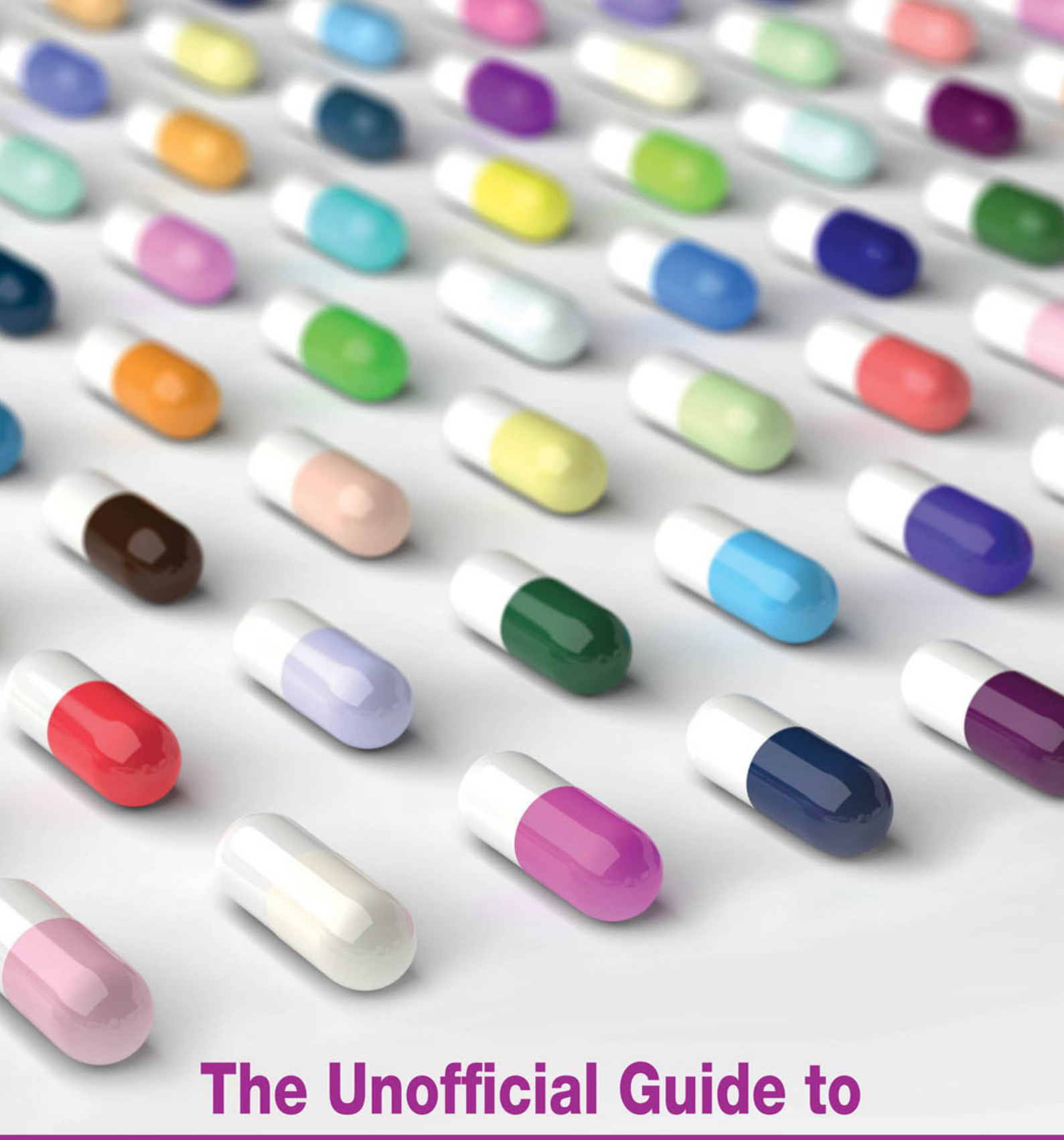

The Unofficial Guide to

Prescribing

EDITED BY
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CHURCHILL
LIVINGSTONE
ELSEVIER

The Unofficial Guide to Prescribing

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Contents

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Preface

The Unofficial Guide to Prescribing is the sequel to *The Unofficial Guide to Passing OSCEs*, which has now sold copies in over 30 countries. We have taken the same principle and applied it to prescribing.

We believe that recent graduates have a unique perspective on what works for students and so have captured their unique insight and language to make complex material more easily digestible. The textbook has been written by junior doctors, with additional reviewing by senior clinicians in the various specialties.

The book is designed to take the theoretical knowledge of medical school and apply it to real life practical situations. When a 55-year-old man with a new diagnosis of Hodgkin lymphoma is confused with a sodium of 118, what do you do? When a 17-year-old girl is unresponsive with a blood sugar of 1.8, what do you do?

Prescribing is a major challenge for students because of its volume and complexity, and the need to gather experience. It is the thing that new graduates fear the most and feel least prepared for, and it's the commonest thing new graduates do which directly affects patient safety and can produce clinical errors.

The Unofficial Guide, much like its OSCE companion, will take you through the practical steps of how you assess, investigate and manage each individual patient, with a focus on prescribing, specifically what you prescribe, and how you prescribe it; with clear examples of generic drug charts showing you how the prescriptions would look in real life.

The book is aimed not just at medical students, but also junior doctors, nursing staff, pharmacists and all those involved in prescribing and hospital care of patients. This book aims to empower you to excel at dealing with emergencies and handling complex prescribing scenarios.

We wish you all the best in any upcoming examinations and your future career. Please get in touch if you have any questions, or you want to get involved in any book writing projects. You could also join our facebook group to learn about new projects: https://www.facebook.com/TheUnofficialGuideToMedicine

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We would like to acknowledge the hard work of the authors and reviewers in the production of this book. I would also like to thank my family, particularly my father, Umer Suleman-Qureshi. He sadly passed away during the development of this book. Dad has been an inspiration in developing my career as a doctor, and I will always be grateful for his love and advice.

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How to use this book

Each scenario is broken down into the following:

- The scenario as it might present itself to you within hospital practice.
- Initial ABCDE assessment of the patient, divided into three sections: (a) how you will assess each paramater: 'airway', 'breathing', 'circulation', 'disability', 'exposure'; (b) what the assessment findings are in the particular scenario; (c) what immediate management is required.
- **Initial investigations**–what tests are needed to allow you to ascertain: (a) the diagnosis; (b) the severity of the condition; (c) any complications that have arisen. The results of any suggested tests are given.
- **Initial management**–what needs to be done to stabilize the patient, and to start treating the initial diagnosis.
- **Reassessment**–whether the treatment has been effective, or whether there is a need to escalate treatment or consider an alternative diagnosis.
- **Definitive treatment**–what needs to be done to ensure this patient is optimally managed. Other treatments outstanding, who else might need to be involved.
- **Handing over the patient**–summarizing the findings and your involvement to either the specialist, or to your colleague who is taking over responsibility for the patient.

PRESCRIBING

Throughout the text are 'Prescribe' alerts that tell you exactly what needs to be prescribed. We have emphasized drug classes rather than individual drugs, because of the variability in prescribing practice. Individual drugs are given merely as practical examples, and we have used a variety of drugs within the same broad area (e.g. dalteparin and enoxaparin for thromboprophylaxis) to illustrate different reasonable approaches to the same prescribing challenge.

This is followed by the prescription charts as they would look in these cases. The aim is to show you exactly what will need to be produced in practical prescribing, rather than just theoretically. Please note that prescription charts vary between hospitals. There may also be specialist charts available for oxygen, anticoagulants, insulin and certain IV infusions.

The blank prescription charts on the following pages can be photocopied freely for studying and exam preparations.

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

Hospital/Ward: **Consultant:**	**Name of Patient**
Weight: **Height:**	**Hospital Number:**
If re-written, date:	**D.O.B:**
DISCHARGE PRESCRIPTION **Date completed:-** **Completed by:-**	

OTHER MEDICINE CHARTS IN USE		**PREVIOUS ADVERSE REACTIONS** This section must be completed before any medicine is given		Completed by (sign & print)	Date
Date	Type of Chart	None known ☐			
		Medicine/Agent	Description of Reaction		

CODES FOR NON-ADMINISTRATION OF PRESCRIBED MEDICINE

If a dose is not administered as prescribed, initial and enter a code in the column with a circle drawn round the code according to the reason as shown below. **Inform the responsible doctor in the appropriate timescale.**

1. Patient refuses
2. Patient not present
3. Medicines not available – CHECK ORDERED
4. Asleep/drowsy
5. Administration route not available – CHECK FOR ALTERNATIVE
6. Vomiting/nausea
7. Time varied on doctor's instructions
8. Once only/as required medicine given
9. Dose withheld on doctor's instructions
10. Possible adverse reaction/side effect

ONCE-ONLY

Date	Time	Medicine (Approved Name)	Dose	Route	Prescriber – Sign + Print	Time Given	Given By

OXYGEN	Start Date	Start Time	Route Mask (%)	Route Prongs (L/min)	Prescriber – Sign + Print	Administered by	Stop Date	Stop Time

Name:

Date of Birth:

REGULAR THERAPY

PRESCRIPTION	Date → Time ↓												

Medicine (Approved Name)	
Dose	Route
Notes	Start Date
Prescriber – sign + print	

6													
8													
12													
14													
18													
22													

Medicine (Approved Name)	
Dose	Route
Notes	Start Date
Prescriber – sign + print	

6													
8													
12													
14													
18													
22													

Medicine (Approved Name)	
Dose	Route
Notes	Start Date
Prescriber – sign + print	

6													
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18													
22													

Medicine (Approved Name)	
Dose	Route
Notes	Start Date
Prescriber – sign + print	

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Medicine (Approved Name)	
Dose	Route
Notes	Start Date
Prescriber – sign + print	

6													
8													
12													
14													
18													
22													

Medicine (Approved Name)	
Dose	Route
Notes	Start Date
Prescriber – sign + print	

6													
8													
12													
14													
18													
22													

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward:	Consultant:	Name of Patient:
		Hospital Number:
Weight:	Height:	D.O.B:

Date/ Time	FLUID	VOLUME	RATE	PRESCRIBER – SIGN AND PRINT
	ADDED DRUGS	DOSE		

Name:

Date of Birth:

Date	BLOOD GLUCOSE (mmol/L)				INSULIN (units)							
	Before breakfast	Before lunch	Before dinner	Before bed	Before breakfast Type/units	Prescribed by Given by	Before lunch Type/units	Prescribed by Given by	Before evening meal Type/units	Prescribed by Given by	Before bed Type/units	Prescribed by Given by

Pharmacy Stamp ***Please don't stamp over age box***	**Age** **D.O.B.**	**Title, Forename, Surname & Address**
Number of days' treatment **N.B. Ensure dose is stated**		
Endorsements		
Signature of Prescriber	**Date**	
For Dispenser No. of Prescns. on form		
	FP10NC0105	

Name:
Date of Birth:

THERAPY REQUIRING LEVEL MONITORING

PRESCRIPTION		Date → / Time ↓	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)
Medicine (Approved Name)		6															
Dose	Route	8															
Notes	Start Date	12															
		14															
Prescriber–sign + print		18															
		22															

PRESCRIPTION		Date → / Time ↓	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)	Time Level taken	Level result	Given by (and time)
Medicine (Approved Name)		6															
Dose	Route	8															
Notes	Start Date	12															
		14															
Prescriber–sign + print		18															
		22															

List of abbreviations

ABG	arterial blood gas
ABPA	allergic bronchopulmonary aspergillosis
ACE	angiotensin converting enzyme
ACR	albumin–creatinine ratio
ACS	acute coronary syndrome
ADR	adverse drug reaction
AF	atrial fibrillation
AKI	acute kidney injury
ALP	alkaline phosphatase
ALT	alanine transaminase
AMT/AMTS	abbreviated mental test/score
AP	anterioposterior
APTT	activated partial thromboplastin time
ARB	angiotensin receptor blocker
ARDS	acute respiratory distress syndrome
AS	aortic stenosis
AST	aspartate aminotransferase
ATN	acute tubular necrosis
AVM	arterio-venous malformation
AVPU	A = Alert V = Voice P = Pain U = Unresponsive
AXR	abdominal radiograph
BBB	bundle branch block
BBB	blood–brain barrier
BD	bis die (twice daily)
BE	base excess
β-hCG	beta-human chorionic gonadotropin
BM	blood sugar
BNF	British National Formulary
BNFC	British National Formulary for Children
BP	blood pressure
BiPAP	bi-level positive airway pressure
CABG	coronary artery bypass graft
CAP	community-acquired pneumonia
CBD	common bile duct
CCF	congestive cardiac failure
CCU	coronary care unit
CF	cystic fibrosis
CHM	Commission on Human Medicines
CIWA-Ar	Clinical Institute Withdrawal Assessment for Alcohol, revised
CKD	chronic kidney disease
COPD	chronic obstructive pulmonary disease
CPAP	continuous positive airway pressure
CPR	cardiopulmonary resuscitation
CMV	cytomegalovirus
CNS	central nervous system
CR	capillary refill
CRP	C-reactive protein
CSF	cerebrospinal fluid
CT	computerized tomography
CTG	cardiotocograph
CTPA	Computed Tomographic Pulmonary Angiography
CURB 65	C = Confusion, U = Urea, R = Respiratory Rate, B = Blood Pressure, 65 = Age 65
CV	cardiovascular
CVP	central venous pressure
CVS	cardiovascular system
CXR	chest radiograph
DH	drug history
DIC	disseminated intravascular coagulation
DKA	diabetic ketoacidosis
DMARD	disease-modifying antirheumatic drug
DoTS	dose, timing and susceptibility
DVT	deep vein thrombosis
ECG	electrocardiogram
ECST	European Carotid Surgery Trial
EEG	electroencephalography
EFNS	European Federation of Neurological Societies
eGFR	estimated glomerular filtration rate
ENT	Ear, Nose and Throat
ESR	erythrocyte sedimentation rate
FBC	full blood count
FEV1	forced expiratory volume in 1 second
FFP	fresh frozen plasma
FT4	free T4
FVC	forced vital capacity
GAD	generalized anxiety disorder
GB	gall bladder disease
GCS	Glasgow coma score
GGT	Gamma-glutamyl transferase
GI	gastrointestinal
GMAWS	Glasgow Modified Alcohol Withdrawal Scale
GORD	gastroesophageal reflux disease
GPCR	G-protein-coupled receptors
G6PD	glucose-6-phosphate dehydrogenase
GRACE	Global Registry of Acute Cardiac Events

G&S	group and save
GSL	general sales list
GTCS	generalized tonic–clonic seizures
GTN	glyceryl trinitrate
GU	genitourinary
HAS	human albumin solution
HB	heart block
HCG	human chorionic gonadotrophin
HDL	high density lipoprotein
HDU	High Dependancy Unit
HELLP syndrome	H = Haemolysis, EL = elevated liver enzymes, LP = low platelets
HER2+	human epidermal growth factor receptor 2-positive
HHS	hyperosmolar hyperglycaemic state
HONK	hyperosmolar nonketotic coma
HR	heart rate
HRT	hormone replacement therapy
HS	heart sounds
HVS	high vaginal swab
Hx	history
IBD	inflammatory bowel disease
ICS	inhaled corticosteroid
IHD	ischaemic heart disease
IM	intramuscular
INH	inhaled
INR	international normalized ratio
ITP	idiopathic thrombocytopenic purpura
ITU	Intensive Therapy Unit
IV	intravenous
IVI	intravenous infusion
IVIg	intravenous immunoglogulin
JVP	jugular venous pressure
LABA	long-acting beta-agonist
LAMA	short-acting muscarinic antagonist
LCX	left circumflex artery
LDL	low density lipoprotein
LFT	liver function test
LMP	last menstrual period
LMW	low molecular weight
LMWH	low molecular weight heparin
LP	lumbar puncture
LRTI	lower respiratory tract infection
LV	left ventricular
LVF	left ventricular failure
LVH	left ventricular hypertrophy
LVSD	left ventricular systolic dysfunction
MAOIs	monoamine oxidase inhibitors
MAU	medical admissions unit
MCV	mean cell volume
MHRA	Medicines and Healthcare products Regulatory Agency
MI	myocardial infarction
MO	marginalis obtusis
MMSE	mini-mental state examination
MRI	magnetic resonance imaging
MRSA	methicillin resistant staphylococcus aureus
MST	morphine sulfate tablets
MSU	mid-stream urine
NAC	*N*-acetyl cysteine
NASCET	North American Symptomatic Carotid Endarterectomy
NBM	nil by mouth
NCA	nurse controlled analgesia
NEB	nebulized
NG	nasogastric
NJ	nasojejunal
NICE	National Institute for Health and Care Excellence
NIV	noninvasive ventilation
NP	nasopharyngeal
NPA	nasopharyngeal aspirate
NSAID	nonsteroidal anti-inflammatory drug
NSTEMI	non-ST elevation myocardial infarction
NTD	neural tube defects
NYHA	New York Heart Association
OCP	oral contraceptive pill
OD	omni die (once daily)
PA	postero-anterior
PCA	patient controlled analgesia
PCI	percutaneous coronary intervention
PCR	protein–creatinine ratio
PE	pulmonary embolism
PEF	peak expiratory flow
PMH	past medical history
PO	per oram (orally)
POM	prescription only medication
PPHN	persistent pulmonary hypertension of the newborn
PPI	proton pump inhibitor
PR	per rectum
PRN	pro re nata (when required)
PT	prothrombin time
PV	per vaginam (by vagina)
QDS	quater die sumendus (four times daily)
RCA	right coronary artery
RCC	red cell concentrate
RR	respiratory rate
RSV	respiratory syncytial virus
RUL	right upper lobe
RCX	right circumflex artery
SABA	short-acting β_2 agonist
SAMA	short-acting muscarinic antagonist
SBP	spontaneous bacterial peritonitis
SBR	serum bilirubin
SC	subcutaneous
SCBU	special care baby unit
SFH	symphysis–fundal height
SHO	Senior House Officer
SiADH	syndrome of inappropriate antidiuretic hormone
SIRS	systemic inflammatory response syndrome
SL	sublingual
SLE	Systemic lupus erythematosus
SNRI	serotonin norepinephrine reuptake inhibitor
SOB	shortness of breath
SR	sinus rhythm
SR	sustained release
SSRIs	selective-serotonin reuptake inhibitors
STAT	statim (immediately)
STEMI	ST elevation myocardial infarction
SVC	superior vena cava
SVT	supraventricular tachycardia
TA-GvHD	transfusion-associated graft vs host disease
TIA	transient ischaemic attack
TDS	ter die sumendus (three times daily)

TED	thromboembolism deterrent
TENS	transcutaneous electrical nerve stimulation
TFT	thyroid function test
THR	total hip replacement
TIA	transient ischaemic attack
TIPSS	transjugular intrahepatic portosystemic shunt
TOP	topical
TPMT	thiopurine S-methyl transferase
TPN	total parenteral nutrition
TRALI	transfusion-related acute lung injury
TSH	thyroid stimulating hormone
TTO	to take out
tx	treatment
UC	ulcerative colitis
U&E	urea and electrolyte
U/L	units per litre
USS	ultrasound
UTI	urinary tract infection
VBG	venous blood gas
VTE	venous thromboembolism
VWD	von willebrand disease
WCC	white cell count
WHO	World Health Organization

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General surgery

Anatole V Wiik

8

Station 8.1: Venous thromboembolism (VTE) prophylaxis

You are the surgical junior doctor. A 23-year-old woman (Nicole Smith 05/03/91) is brought to the emergency department with periumbilical pain that has radiated to the right iliac fossa. She also has fever. She is on the oral contraceptive pill and previously her mother had a DVT. Your registrar has reviewed the patient and has decided that this patient requires an appendicectomy tomorrow. She has normal renal function, raised CRP and raised white cell count. The registrar wants you to start regular pain killers (paracetamol and codeine), IV fluids, and IV antibiotics (cefuroxime and metronidazole). Please also perform a VTE prophylaxis assessment and prescribe the appropriate treatment.

Patient Details

Name:	Nicole Smith
DOB:	05/03/91
Hospital Number:	1208973948
Weight:	60 kg
Height:	1.6 m
Consultant:	Mr King
Hospital/Ward:	WGH Ward 3
Current Medications:	Oral contraceptive pill only
Allergies:	No known drug allergies
Admission date:	22/09/14

Stop all antiplatelets prior to procedures/operations to prevent bleeding, ideally 10 days ($t_{½}$ of platelets).

Warfarin should be stopped and covered with LMWH. If INR is significantly raised, consider reversal with Vitamin K, and take advice from haematology. Recommence all as soon as bleeding risk is minimal (which will vary depending on the procedure).

THROMBOPROPHYLAXIS

All patients admitted to hospital require a VTE prophylaxis assessment.

ASSESSMENT OF VENOUS THROMBOSIS RISK FACTORS

Surgical patients are at increased risk of VTE (venous thromboembolism) if they have one or more of the following risk factors [1]:

1. Age > 60
2. Dehydration

3. Obesity (BMI) > 30
4. Known thrombophilias
5. Critical care admission
6. Pregnancy or post-partum
7. Varicose veins with phlebitis
8. Oestrogen therapy (HRT/OCP)
9. Active cancer or chemotherapy
10. Reduced mobility
11. Personal or family history of DVT
12. Significant medical co-morbidities
13. Surgical procedures taking longer than 90 minutes in theatre
14. Acute admission with infection/inflammation/intra-abdominal condition.

GENERAL MEASURES TO REDUCE VTE RISK

1. Keep patient well hydrated
2. Encourage early mobilization
3. Aspirin or clopidogrel is not adequate VTE prophylaxis
4. Consider caval filter if prophylaxis is contraindicated (CI)
5. Utilize regional rather than general anaesthesia

VTE prophalaxis (pharmacological or mechanical) does not need to be routinely offered to all surgical patients. For example, it is not indicated in a patient undergoing a surgical procedure with local anaesthesia by local infiltration with no limitation of mobility.

However, most surgical patients at increased risk of VTE (by the above criteria) should receive mechanical VTE prophylaxis as well as pharmacological (unless contraindicated).

MECHANICAL THROMBOPROPHYLAXIS

Prescribing mechanical thromboprophylaxis

There are several types of mechanical VTE prophylaxis available. Graduated compression stockings, e.g. TED stockings, are the most common. Other possible options used less commonly are intermittent pneumatic compression (thigh or knee), and foot impulse devices.

Contraindications to mechanical VTE prophylaxis

1. Peripheral arterial disease, suspected or proven
2. Peripheral arterial bypass graft
3. Severe leg or pulmonary oedema
4. Peripheral neuropathy
5. Deformity or unusual shape to prevent correct fitting
6. Allergies to materials
7. Ulcers/wounds/cellulitis.

PHARMACOLOGICAL THROMBOPROPHALAXIS

Risk of bleeding on VTE prophylaxis

Potential contraindications to pharmacological VTE prophylaxis:

1. Active bleeding
2. On anticoagulants INR > 2
3. Significant procedure-related bleeding risk
4. Acute stroke: haemorrhagic or large infarct
5. Untreated inherited or acquired bleeding disorders (e.g. haemophilia, Von Willebrand disease)
6. Severe/acute liver disease
7. Platelets < 75 × 10^9/L or abnormal clotting screen
8. BP > 230 mmHg systolic or > 120 mmHg diastolic
9. Lumbar puncture/epidural/spinal anaesthesia in previous 4 hours or within next 12 hours
10. Heparin-induced thrombocytopenia.

Offer to patient and/or families information on:

1. Risks and possible consequence of VTE
2. Importance of VTE prophylaxis and its possible side effects
3. The correct use of VTE prophylaxis
4. How patients themselves can reduce their risk of VTE.

In those whom thromboprophylaxis is felt not indicated, this should be reassessed on a daily basis while in hospital.

PRESCRIBING PHARMACOLOGICAL THROMBOPROPHYLAXIS

The option depends on renal function.

If normal renal function, prescribe subcutaneous LMWH/factor Xa inhibitor (e.g. enoxaparin, or dalteparin, or fondaparinux).

Several possible variants occur in reduced renal function, so consult your local hospital formulary. Both the definition of reduced renal function, and the management will vary from trust to trust.

Two example protocols:

- Definition of reduced renal function: eGFR <30 mL/min
  - Action in reduced renal function: prescribe subcutaneous unfractionated heparin instead of LMWH
- Definition of reduced renal function: eGFR <20 mL/min
  - Action in reduced renal function: a standard dose of dalteparin can be prescribed, but antifactor Xa levels need to be monitored. The peak level is measured 4 hours post-dose, and trough level immediately pre-dose. This should be done every 4–5 days while on LMWH. Peaks > 0.6 and troughs > 0.3 anti-Xa units/mL indicate a need for dose reduction.

PRESCRIBE (see Figs 8.1 and 8.2)

Pharmacological VTE Prophylaxis, e.g. DALTEPARIN 5000 units SC OD

Mechanical VTE Prophylaxis, e.g. TED STOCKINGS 1 pair TOP CONT

Additional prescriptions for analgesia, infection and fluid support:

Analgesia, e.g. PARACETAMOL 1 g ORAL QDS and CODEINE PHOSPHATE 30 mg ORAL QDS

Antibiotics, e.g. CEFUROXIME 750 mg IV (over 30 mins) TDS and METRONIDAZOLE 500 mg IV (over 20–30 mins) TDS

Fluids, e.g. 0.9% SODIUM CHLORIDE 1000 mL (with 20 mmol KCl) 100 mL/h, followed by 5% GLUCOSE 1000 mL (with 20 mmol KCl) 100 mL/h, followed by 5% GLUCOSE 1000 mL (with 20 mmol KCl) 100 mL/h

NICOLE'S RISK FACTORS AND BLEEDING RISK

1. Nicole is a surgical patient
2. She is an acute admission with an inflammatory/infective/intra-abdominal condition
3. She currently is using the OCP, which promotes a prothrombotic state
4. She has a family history of DVTs, which gives her a theoretical risk of thrombosis
5. She potentially could be a critical care admission if she becomes septic
6. If she has a complicated appendicectomy and her procedure could potentially take longer than 90 minutes.

Nicole has no bleeding risk factors. Therefore, in addition to mechanical VTE prophylaxis, heparin prophylaxis is required as her VTE risk is high.

Note that the patient will need to be fasted preoperatively. Policy for this will vary between units. Once a time for surgery is settled, the patient, for instance, would not be allowed water or oral medications for 4 hours preoperatively. Therefore, oral medications would not be allowed in this time window.

ADDITIONAL VTE PROPHYLAXIS EXAMPLES: SEE PRESCRIBE BOXES IN MARGIN (DRUG CHARTS NOT SHOWN)

EXAMPLE 1 Mr Smith is a 58-year-old gentleman with pancreatic cancer, admitted for a Whipple's resection. He is known to have peripheral arterial disease, and has normal renal function.

PRESCRIBE EXAMPLE 1

Pharmacological VTE Prophylaxis, (e.g. ENOXAPARIN 40 mg OD SC), but do not give mechanical VTE prophylaxis due to peripheral artery disease

EXAMPLE 2 Mrs Mercury is a 59-year-old lady with cholecystitis secondary to gall stones. She is scheduled for an emergency cholecystectomy. She has chronic kidney disease (eGFR 20 mL/min).

PRESCRIBE EXAMPLE 2

Subcutaneous unfractionated heparin (e.g. HEPARIN 5000 units BD SC) and mechanical VTE prophylaxis (e.g. TED STOCKINGS 1 pair TOP CONT)

Name: NICOLE SMITH
Date of Birth: 5/3/1991

REGULAR THERAPY

PRESCRIPTION	Date ▶ / Time →	22/09/14
Medicine (Approved Name): PARACETAMOL Dose: 1g Route: ORAL Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	
	8	
	12	
	14	
	18	FD
	22	24 FD
Medicine (Approved Name): CODEINE PHOSPHATE Dose: 30mg Route: ORAL Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	
	8	
	12	
	14	
	18	FD
	22	24 FD
Medicine (Approved Name): CEFUROXIME Dose: 750mg Route: IV Notes: For infected appendicitis review after 48h. Over 30 mins Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	
	8	
	12	
	14	
	18	
	22	FD
Medicine (Approved Name): METRONIDAZOLE Dose: 500mg Route: IV Notes: For infected appendicitis review after 48h. Over 20-30 mins Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	
	8	
	12	
	14	
	18	
	22	FD
Medicine (Approved Name): DALTEPARIN Dose: 5000 units Route: SC Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	
	8	
	12	
	14	
	18	FD
	22	
Medicine (Approved Name): TED STOCKINGS Dose: 1 pair Route: TOP Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	
	8	
	12	
	14	
	18	FD
	22	

Figure 8.1

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: WGH WARD 3 **Consultant:** MR KING

Weight: 60 kg **Height:** 1.6 m

Name of Patient: NICOLE SMITH

Hospital Number: 1208973948

D.O.B: 05/03/91

Date/ Time	FLUID / ADDED DRUGS	VOLUME / DOSE	RATE	PRESCRIBER – SIGN AND PRINT
22/09/14 19.30	0.9% SODIUM CHLORIDE POTASSIUM CHLORIDE	1000 mL 20 mmol	100 mL/h	J. Meyer JOHN MEYER
23/09/14 05.30	5% GLUCOSE POTASSIUM CHLORIDE	1000 mL 20 mmol	100 mL/h	J. Meyer JOHN MEYER
23/09/14 15.30	5% GLUCOSE POTASSIUM CHLORIDE	1000 mL 20 mmol	100 mL/h	J. Meyer JOHN MEYER

Figure 8.2

Station 8.2: Acute pancreatitis

You are the surgical junior doctor in the emergency department. A 42-year-old obese female with a background of gallstones presents with severe epigastric pain radiating to the back. She has vomited on multiple occasions and feels that she is becoming more breathless. Please assess her and commence appropriate management.

Patient Details

Name:	Jane Smith
DOB:	05/03/72
Hospital Number:	J345789
Weight:	85 kg
Height:	1.6 m
Consultant:	Mr King
Hospital/Ward:	BFH Surgical
Current Medications:	None
Allergies:	No known drug allergies
Admission date:	22/09/14

INITIAL ASSESSMENT

AIRWAY

- Assess the patency of her airway. Does she have any vomitus obstructing her airway?

'The airway is secure and patent, as she is responding to questions.'

Continue to monitor the airway, but no intervention currently required.

BREATHING

- Assess the rate and depth of respiration. Is she using her accessory muscles for respiration? Check oxygen saturations. Auscultate her chest: does she have any degree of lung impairment, crackles or wheeze?

'RR 28/min, oxygen saturations are 92% pre-oxygen therapy. She is using her accessory muscles of respiration. She has reduced air entry and crackles are heard throughout both lung fields bilaterally with some wheeze. She is complaining that she cannot catch her breath.'

This lady is tachypnoeic and unable to maintain normal saturations. She requires high-flow oxygen on a non-rebreather mask, and optimization of pain control. Could consider NSAIDs or other opiates such as pethidine or tramadol, but trial morphine if pain is severe: a PCA may be required to control the pain.

CIRCULATION

- Assess her CRT, pulse and blood pressure. Check her mucous membranes and assess her hydration status by looking at her tongue and skin turgor

'HR 115 bpm, BP 90/60 mmHg, and CRT 3 seconds peripherally. Her hands are moist and cool with a thready pulse. Her mucous membranes are dry. Her eyes appear sunken. Her heart sounds are normal with no murmurs.'

This lady is intravascularly depleted. She needs aggressive fluid resuscitation. Two large bore IV cannulae (14 or 16 G) should be inserted (while simultaneously taking bloods) and a fluid challenge should be given (e.g. over 15 minutes). A urinary catheter should be inserted to assess end-organ perfusion.

Differential diagnosis of epigastric pain

- Inferior MI
- Peptic ulcer disease
- Perforated peptic ulcer
- Symptomatic gallstones
- Dissecting aortic aneurysm
- Small bowel obstruction
- Oesophagitis

Causes of acute pancreatitis

- Gallstones (40%)
- Alcohol (40%)
- Idiopathic (10%)
- ERCP
- Hyperlipidaemia
- Viral (mumps, coxsackie)
- Drugs (azathioprine, tamoxifen, corticosteroids, valproate, ASA)
- Autoimmune (vasculitides)

Complications of pancreatitis

- Early: shock, acute respiratory distress syndrome (ARDS), SIRS, hypocalcaemia, renal failure, hyperglycaemia, retroperitoneal haemorrhage
- Late: pseudocyst formation, pancreatic abscess formation, necrotizing pancreatitis, recurrent pancreatitis, pancreatic cancer

Management summary: acute pancreatitis

- Aggressive resuscitation
- Assessment of disease severity
- Early ITU involvement in severe pancreatitis
- Imaging to identify aetiology and severity
- Early nutritional support
- Avoid antibiotics unless disease identified
- Treatment in specific aetiology (i.e. ERCP)

DISABILITY

- Assess her GCS and her glucose levels

'She has normal neurological function with a 15/15 GCS and her last blood sugar was 10 mmol/L.'

No action currently required.

EXPOSURE

- Examine the abdomen as this is the source of the pain. Does she have any bruising around the flanks or periumbilical region? Does she have any tenderness on palpation? Are there any signs of peritonism, such as rebound, guarding or percussion-induced pain? Assess for flank tenderness. Measure temperature

'This lady does not have any ecchymosis in the flank (Grey–Turner's sign) or periumbilical (Cullen's sign) area. Her abdomen is soft, but extremely tender throughout, mainly around the epigastric region. There is voluntary guarding, but no abdominal distension, or percussion tenderness. Her bowel sounds are present and her temperature is 37.5°C.'

PRESCRIBE
(see Figs 8.3–8.5)

High-flow oxygen: 15 L/min OXYGEN via NON-REBREATHER MASK

Analgesia, e.g. MORPHINE SULFATE 5 to 10 mg IV (titrate to response)

CYCLIZINE 50 mg IV STAT (to reduce morphine-related vomiting)

Fluid bolus, e.g. 0.9% SODIUM CHLORIDE 500 mL IV (over 15 min)

INITIAL INVESTIGATIONS

- **Arterial blood gas**: A metabolic acidosis is characterized by a low pH and bicarbonate with an increasingly negative base excess and elevated lactate. She may be compensating her pH by hyperventilating; a low CO_2 would confirm this
- **Baseline bloods**: FBC, U&E, CRP, LFT, amylase, LDH, calcium, coagulation profile and blood sugar. A raised amylase, 3 times its upper limit, is highly sensitive for acute pancreatitis. Assess her LFTs, raised ALP and bilirubin may be due to a stone in her common bile duct, and this could be causing pancreatitis. A CRP is a good surrogate to assess inflammation, the greater the more aggressive the inflammatory process. A raised WCC count may indicate infection (sometimes upper abdominal pain can be caused by a lower lobe pneumonia, or abdominal sepsis) but may be raised purely due to pancreatitis. A dropping Hb may be a sign of retroperitoneal haemorrhage. Additional bloods listed are used for severity scoring
- **Imaging**: A CXR is extremely important to assess any element of ARDS. Diffuse bilateral pulmonary infiltrates are indicative of severe pancreatitis and that respiratory support may be pending. No free air under the diaphragm reduces the likelihood of perforation. An ultrasound is important; this will determine the aetiology and severity of the pancreatitis, 40% of pancreatitis is due to gallstones. The presence of stones and a dilated CBD is a good indicator of its origin. A non-dilated CBD does not exclude gallstones as the cause of pancreatitis

Table 8.1 Miss Smith's blood results, and ABG result

Parameter	Value	Normal range (Units)
WCC	**18 × 10^9/L**	**4–11 (× 10^9/L)**
Neutrophil	**12 × 10^9/L**	**2–7.5 (× 10^9/L)**
Lymphocyte	4 × 10^9/L	1.4–4 (× 10^9/L)
Platelet	300 × 10^9/L	150–400 (× 10^9/L)
Haemoglobin	135 g/L	Men: 135–177 (g/L) Women: 115–155 (g/L)
PT	12 seconds	11.5–13.5 seconds
APTT	30 seconds	26–37 seconds
CRP	**250 mg/L**	**0–5 (mg/L)**
Urea	**16.5 mmol/L**	**2.5–6.7 (mmol/L)**
Creatinine	**175 µmol/L**	**79–118 (µmol/L)**
Sodium	138 mmol/L	135–146 (mmol/L)

(Cont'd)

Table 8.1 *(Cont'd)*

Parameter	Value	Normal range (Units)
Potassium	4 mmol/L	3.5–5.0 (mmol/L)
eGFR	**36 mL/min**	**>60 (mL/min)**
Bilirubin	**50 µmol/L**	**<17 (µmol/L)**
ALT	**45 IU/L**	**<40 (IU/L)**
ALP	**200 IU/L**	**39–117 (IU/L)**
Amylase	**477 IU/L**	**25–125 (IU/L)**
LDH	460 IU/L	240–480 (IU/L)
Glucose	5.6 mmol/L	4.5–5.6 (mmol/L) (fasting)
Calcium (corrected)	2.20 mmol/L	2.20–2.67 (mmol/L)
Albumin	40 g/L	35–50 (g/L)
Lactate	3 mmol/L	0.6–2.4 (mmol/L)
pH	**7.32**	**7.35–7.45**
$PaCO_2$	**4 kPa**	**4.8–6.1 (kPa)**
HCO_3	**18 mmol/L**	**22–26 (mmol/L)**
PaO_2	**10 kPa**	**10.6–13.3 (kPa) on air**
BE	**−4 mmol/L**	**±2 (mmol/L)**

Modified glasgow score (IMRIE)

- Age > 55 years
- WCC > 15 × 10^9/L
- Blood glucose > 10 mmol/L
- AST or ALT > 200 IU/L
- LDH > 600 IU/L
- Serum urea > 16 mmol/L
- Serum Ca < 2 mmol/L
- Serum albumin < 32 g/L
- PaO_2 < 7.9 kPa on air

Score ≥ 3 is indicative of severe pancreatitis. Carries a 40% mortality. In this case, the score is 2 due to the WCC of 18 × 10^9/L and urea of 16.5 mmol/L.

'ABG shows a pH of 7.32, $PaCO_2$ 4 kPa, PaO_2 10 kPa, HCO_3 18 mmol/L, lactate 3 mmol/L and BE is −4 mmol/L. Hb 135 g/L, CRP 250 mg/L, WCC 18 × 10^9/L, amylase 477 IU/L, bilirubin 50 µmol/L, ALT 45 IU/L, ALP 200 IU/L, potassium 4 mmol/L, sodium 138 mmol/L, creatinine 175 µmol/L and urea 16.5 mmol/L (eGFR 36 mL/min). Initial Imrie score is 2 (WCC and urea). CXR shows mild bilateral pulmonary infiltrates, no free air under the diaphragm. USS shows multiple gallstones with a CBD diameter of 12 mm. The pancreas is markedly inflamed, but no obvious collections.'

PRESCRIBE (see Figs 8.3–8.5)

Proton pump inhibitor, e.g. ESOMEPRAZOLE 40 mg IV (over 10–30 mins) OD

Thromboprophylaxis, e.g. DALTEPARIN 5000 units OD SC and TED STOCKINGS TOP CONT

Regular analgesia, e.g. MORPHINE SULFATE 5 mg 4 HOURLY (titrate to response) IV (with antiemetic, e.g. CYCLIZINE 50 mg IV TDS)

INITIAL MANAGEMENT [2]

- **Get help early**: ITU team and senior surgical team members
- **Airway and breathing support**: High-flow oxygen with a non-rebreather mask, maintain oxygen saturation > 94%
- **Analgesia**: Opioids early to prevent any splinting of diaphragm due to pain. Patients generally require a PCA to control the pain; the ITU team will help you with this, but you can start with a regular oral morphine preparation
- **Fluid support**: Monitor intravascular fluid volume with serial creatinine and urine output. Patients with severe pancreatitis normally need > 5 L within the first 24 hours due to third space loss (the space between tissues where fluid does not normally collect). May require central access for blood pressure monitoring and accurate fluid balance
- **Nutrition**: Acute pancreatitis is a catabolic event and promotes nutritional deterioration. Early feeding plays an important role in accelerating recovery. Start with oral fluids and avoid fatty foods. NG/NJ feeds may be required if unable to tolerate oral feeds. TPN is used for specific indications such as a paralytic ileus
- **Supportive**: VTE prophylaxis as guided by trust guidelines, both mechanical and pharmacological
- **Gastric protection:** A lot of patients will get started on proton pump inhibitors since they present with epigastric pain initially, which could be caused by a gastric ulcer. It would be reasonable to start one in this case. However, they are not indicated routinely in pancreatitis, particularly if it is mild
- The patient should be placed nil by mouth given the severe pain and vomiting. Oral medications (plus fluid and diet) can be restarted as soon as the patient can tolerate them. This could be after as little as a day if the pancreatitis is mild, but may be several weeks.

REASSESSMENT

It is integral to continue monitoring these patients. They can deteriorate rapidly. Early and continued disease scoring (at least every 24 hours) with the modified Glasgow score (Imrie) is helpful. A score of 3 and greater signifies severe disease. The important aspects to consider early are pain control, fluid resuscitation and diagnostic/therapeutic tools to aid in diagnosing and treating the underlying condition. If no improvement, high resolution CT scan would be necessary to look for complications such as pseudocyst formation and, in the event of positive findings the case would need to be managed at a specialist pancreatic centre.

'After initial fluid resuscitation, and analgesia, Mrs Smith is more stable. Airway is patent, RR is 18/min, saturating 100% on 15 L/min oxygen. The patient is less dehydrated with HR 80 bpm, BP 110/75 mmHg and CRT < 2 seconds. Urine output is 0.4 mL/kg/h. No further vomiting. Pain is still severe, rated at 7/10 despite morphine regularly.'

Oxygen should be titrated down while maintaining saturations above 94%. The patient has responded well to a fluid bolus. However, on-going fluids will be required, as the patient is currently NBM. On top of this, the patient is in acute renal failure, is slightly tachycardic, with a poor urine output, so giving fluids at a faster rate than maintenance is required. Fluid requirement will need to be assessed frequently. Anaesthetic input is likely needed for pain review: a PCA is probably now required.

PRESCRIBE
(see Figs 8.3–8.5)

Further fluids, e.g. 0.9% SODIUM CHLORIDE 1 L with 20 mmol KCL 500 mL/h

OXYGEN, e.g. 8 L/min via MASK

STOP

Initial oxygen prescription

HANDING OVER THE PATIENT

'Miss Smith is a 42-year-old lady with acute pancreatitis. She presented with severe epigastric pain and dehydration. She has been stabilized with regular morphine sulfate and paracetamol analgesia, a 500 mL 0.9% sodium chloride bolus and oxygen therapy.

Admission ABG showed a lactic acidosis, pH of 7.32, $PaCO_2$ 4 kPa, HCO_3 18 mmol/L, lactate 3 mmol/L, BE −4 mmol/L. Amylase is 477 IU/L. There is evidence of cholestasis with a bilirubin 50 µmol/L, ALP 200 IU/L, and pre-renal renal failure with creatinine 175 µmol/L and urea 16.5 mmol/L. Glucose is normal. CXR shows mild bilateral pulmonary infiltrates, with no free air under the diaphragm.

She has had early scorings (currently Imrie 2) pancreatitis and an USS has demonstrated GB disease with a dilated CBD. Her pancreas is moderately inflamed but appears uncomplicated.

She is currently haemodynamically stable. Her urine output is approximately 0.4 mL/kg/h. Current observations, RR 18/min, oxygen saturations 95% on 8 L/min oxygen, HR 80 bpm, BP 110/75 mmHg, apyrexial, with 7/10 pain.

She has been placed nil by mouth and is on intravenous fluids. IV morphine is being used to control pain, with cyclizine as an antiemetic. An endoscopic retrograde cholangiopancreatography (ERCP) referral has been made for the gallstones.

The plan is to continue 500 mL/h of 0.9% sodium chloride for the next 4 hours, and commence discussion with anaesthetics about starting a PCA to optimize pain control. She needs to be discussed with the ITU team. She also will require a fluid review, repeat bloods and a repeat gas later this evening.'

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

Hospital/Ward: BFH SURGICAL **Consultant:** MR KING	**Name of Patient:** JANE SMITH
Weight: 85kg **Height:** 1.6m	**Hospital Number:** J345789
If re-written, date:	**D.O.B:** 05/03/1972
DISCHARGE PRESCRIPTION	
Date completed:- **Completed by:-**	

OTHER MEDICINE CHARTS IN USE		PREVIOUS ADVERSE REACTIONS This section must be completed before any medicine is given		Completed by (sign & print)	Date
Date	Type of Chart	None known ☒		J. Meyer JOHN MEYER	22/09/14
		Medicine/Agent	Description of Reaction		

CODES FOR NON-ADMINISTRATION OF PRESCRIBED MEDICINE

If a dose is not administered as prescribed, initial and enter a code in the column with a circle drawn round the code according to the reason as shown below. **Inform the responsible doctor in the appropriate timescale.**

1. Patient refuses
2. Patient not present
3. Medicines not available – CHECK ORDERED
4. Asleep/drowsy
5. Administration route not available – CHECK FOR ALTERNATIVE
6. Vomiting/nausea
7. Time varied on doctor's instructions
8. Once only/as required medicine given
9. Dose withheld on doctor's instructions
10. Possible adverse reaction/side effect

ONCE-ONLY

Date	Time	Medicine (Approved Name)	Dose	Route	Prescriber – Sign + Print	Time Given	Given By
22/09/14	19.30	MORPHINE SULFATE (titrate to response)	5 to 10 mg	IV	J. Meyer JOHN MEYER	19.30	JS (10mg)
22/09/14	19.30	CYCLIZINE	50mg	IV	J. Meyer JOHN MEYER	19.30	JS

	Start Date	Start Time	Route Mask (%)	Route Prongs (L/min)	Prescriber – Sign + Print	Administered by	Stop Date	Stop Time
OXYGEN	22/09/14	19.30	15L/min via NON-REBREATHER MASK		J. Meyer JOHN MEYER	JS	22/09/14	20.30
	22/09/14	20.30	8L/min via MASK		J. Meyer JOHN MEYER	JS		

Figure 8.3

Name: JANE SMITH
Date of Birth: 05/03/72

REGULAR THERAPY

PRESCRIPTION	Date → / Time ↓	22/09/14	23/09/14	24/09/14									
Medicine (Approved Name): ESOMEPRAZOLE Dose: 40mg; Route: IV Notes: over 10-30 mins; Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6												
	(8)		FD										
	12												
	14												
	18												
	22												
Medicine (Approved Name): MORPHINE SULFATE Dose: 5mg; Route: IV Notes: Titrate to response; Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	2		FD									
	8	6		FD									
	12	10		FD									
	(14)			FD									
	(18)			FD									
	(22)		FD	FD									
Medicine (Approved Name): TED STOCKINGS Dose: One pair; Route: TOP Notes: ; Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	(6)												
	8												
	12												
	14												
	18		FD	FD									
	22												
Medicine (Approved Name): DALTEPARIN Dose: 5000 units; Route: SC Notes: ; Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6												
	8												
	12												
	14												
	(18)		FD	FD									
	22												
Medicine (Approved Name): CYCLIZINE Dose: 50mg; Route: IV Notes: ; Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	(6)			FD									
	8												
	12												
	(14)			FD									
	18												
	(22)		FD	FD									
Medicine (Approved Name): Dose: ; Route: Notes: ; Start Date: Prescriber – sign + print:	6												
	8												
	12												
	14												
	18												
	22												

Figure 8.4

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: BFH SURGICAL **Consultant:** MR KING

Weight: 85kg **Height:** 1.6m

Name of Patient: JANE SMITH

Hospital Number: J345789

D.O.B: 05/03/72

Date/ Time	FLUID / ADDED DRUGS	VOLUME / DOSE	RATE	PRESCRIBER – SIGN AND PRINT
22/09/14 19.30	0.9% SODIUM CHLORIDE	500mL	Over 15min	J. Meyer JOHN MEYER
22/09/14 20.00	0.9% SODIUM CHLORIDE POTASSIUM CHLORIDE	1L 20mmol	500mL/h	J. Meyer JOHN MEYER

Figure 8.5

Station 8.3: Intestinal obstruction

You are the surgical junior doctor on-call clerking in the emergency department. You are asked to see a 62-year-old man who presents with colicky abdominal pain and distension associated with nausea and vomiting. On closer questioning, you realize he has not opened his bowels for the past 3 days and in the past has had an appendicectomy for a perforated appendix.

Patient Details

Name:	Julio Smith
DOB:	05/03/52
Hospital Number:	J345333
Weight:	70 kg
Height:	1.6 m
Consultant:	Mr Sing
Hospital/Ward:	GDH Surgical
Current Medications:	None
Allergies:	Penicillin (rash)
Admission date:	22/09/14

INITIAL ASSESSMENT

AIRWAY

- Assess the patency of his airway. Does he have any vomitus obstructing his airway?

'The airway is patent.'

No additional airway support is required.

BREATHING

- Assess the rate and depth of respiration. Assess his work of breathing and his oxygen saturations. Percuss the lung fields. Auscultate to assess air entry or presence of crackles

'RR 20/min, oxygen saturation 96% in room air. He has slightly reduced air entry bilaterally and minimal crackles at the base, otherwise is normal. He is complaining of worsening abdominal pain on deep inspiration.'

The patient is saturating well in air, but there is possible evidence of atelectasis, or aspiration pneumonia. Abdominal distension and pain can cause atelectasis, which will impair proper ventilation and perfusion. Prescribe analgesia, and order a CXR.

CIRCULATION

- Assess the haemodynamic stability by assessing the pulse, blood pressure with pulse pressure width, CRT, skin temperature and mucous membranes

'HR 110 bpm, BP 110/90 mmHg, CRT 3 seconds and mucous membranes are pink and dry. During the past 48 hours, he mentions that he has passed less urine and that it appears concentrated.

This man will require 2 large-bore IV cannulae (with bloods taken simultaneously) and a fluid challenge. Reassessment should occur immediately after. The best way to assess his response is by assessing his urine output and vital signs. A narrow pulse pressure is a good indicator of an intravascularly depleted patient.

DISABILITY

- Assess the patient's consciousness using the Glasgow coma scale. Is the patient confused or agitated? What's the capillary glucose reading?

'This man's GCS is E4, M6, V4 = 14/15. He seems a bit confused and his blood sugar currently is 7 mmol/L.

His confusion is probably due to his depleted intravascular volume, or due to infection, and this should be thoroughly assessed, as well as considering other potential causes of confusion, e.g. metabolic disturbances.

Differential diagnosis of causes of intestinal obstruction

- Small bowel: Adhesions/bands, hernia (inguinal, femoral, incisional), strictures, volvulus
- Large bowel: Constipation, neoplasia, volvulus, strictures
- Ileus: Metabolic disturbances

Cardinal features of intestinal obstruction

- Pain
- Vomiting
- Distension
- Constipation

These vary depending on the location and aetiology of the obstruction. The higher the more likely vomiting will occur. The lower the greater the abdominal distension.

Complications of bowel obstruction

- Visceral perforation
- Electrolyte derangement
- Acute renal failure
- Infection

Management of intestinal obstruction

- GI decompression (NG)
- Nil by mouth (NBM)
- Fluid and electrolyte restoration
- Timely treatment of obstruction

EXPOSURE

- Expose and examine this gentleman's abdomen and hernial orifices thoroughly. Complete the assessment by doing a digital rectal examination. Pay extra attention to any signs of peritonism as this may indicate a perforated viscous

'The abdomen is generally distended but particularly centrally, and he has an appendicectomy scar in the RIF. On palpation his abdomen is tender, but there is no local tenderness, guarding or rigidity. On percussion his abdomen is tympanic and his bowels sounds are hyperactive. The rectal and hernial examination was unremarkable.'

This patient has the cardinal signs of intestinal obstruction. It is important to rule out any hernias as this is a common cause of obstruction; check previous incision sites. Rigidity, guarding and absent/reduced bowel sounds are features of perforation or strangulation. These features warrant a surgical emergency.

PRESCRIBE
(see Figs 8.6–8.8)

Analgesia, e.g. MORPHINE SULFATE 5 to 10 mg (titrate to response) IV STAT

Antiemetic, e.g. CYCLIZINE 50 mg IV STAT

Fluid challenge, e.g. 500 mL 0.9% SODIUM CHLORIDE (over 15 min)

INITIAL INVESTIGATIONS

- **Bloods:** Haemoglobin, FBC, CRP, electrolytes, coagulation, amylase, LFTs, group and save. Raised WCC and CRP may indicate perforation or strangulation. A raised creatinine and urea may indicate acute renal failure due to dehydration. Electrolyte disturbances can cause a non-mechanical cause of intestinal obstruction. A raised amylase may indicate this is pancreatitis (presenting as an ileus). Abdominal pain may be due to gallstones/liver dysfunction. A group and save and coagulation screen should also be sent if you think the patient may require surgical intervention
- **ABG:** An acidosis on ABG with a raised lactate may indicate ischaemia secondary to strangulation
- **Erect CXR:** Identifies any free air under the diaphragm with intestinal perforation. Assess if there is any evidence of aspiration pneumonia such as consolidation
- **AXR:** Assessing for dilated loops of bowel. Small bowel obstruction has complete bands through the bowel wall called plica circularis (or valvulae conniventes). Large bowel dilatation is markedly larger and has haustra. Small bowel tends to be more central, whereas large bowel tends to be more peripheral. A CT scan will be able to definitely say where the obstruction might be, and might identify a secondary cause, e.g. an obstructing tumour
- **Urine dipstick:** To assess for evidence of a UTI. β-hCG if female as she may be pregnant. Urinary glucose as may be a newly diagnosed diabetic presenting with abdominal pain

'ABG is normal. WCC 8 × 10^9/L, CRP 7 mg/L, sodium 138 mmol/L, potassium 4.1 mmol/L, urea 12 mmol/L, and creatinine 130 µmol/L (eGFR 53 mL/min), other bloods normal. Erect CXR shows no free air under the diaphragm and no abnormalities in the lung zones. AXR shows multiple centrally positioned dilated bowel loops. The bowel loops appear to be of small bowel as the presence of valvulae conniventes are seen. The maximum diameter is 5 cm.'

Table 8.2 Mr Smith's blood results and ABG result

Parameter	Value	Normal range (Units)
WCC	8 × 10^9/L	4–11 (× 10^9/L)
Platelet	300 × 10^9/L	150–400 (× 10^9/L)
Haemoglobin	140 g/L	Men: 135–177 (g/L) Women: 115–155 (g/L)
PT	13 seconds	11.5–13.5 seconds
APTT	32 seconds	26–37 seconds
CRP	**7 mg/L**	**0–5 (mg/L)**
Urea	**12 mmol/L**	**2.5–6.7 (mmol/L)**
Creatinine	**130 µmol/L**	**79–118 (µmol/L)**

(Cont'd)

Table 8.2 *(Cont'd)*

Parameter	Value	Normal range (Units)
Sodium	138 mmol/L	135–146 (mmol/L)
Potassium	4.1 mmol/L	3.5–5.0 (mmol/L)
eGFR	**53 mL/min**	**>60 (mL/min)**
Bilirubin	7 μmol/L	<17 (μmol/L)
ALT	20 IU/L	<40 (IU/L)
ALP	100 IU/L	39–117 (IU/L)
Amylase	100 IU/L	25–125 (IU/L)
Calcium (corrected)	2.20 mmol/L	2.20–2.67 (mmol/L)
Albumin	40 g/L	35–50 (g/L)
pH	7.40	7.35–7.45
$PaCO_2$	5 kPa	4.8–6.1 (kPa)
HCO_3	25 mmol/L	22–26 (mmol/L)
PaO_2	12 kPa	10.6–13.3 (kPa) on air
BE	−1 mmol/L	±2 (mmol/L)

INITIAL MANAGEMENT [3]

- **Airway support:** Airway patent in this case, with no intervention required
- **Supplementary oxygen:** If saturations < 94%
- **Decompression:** This patient should be made NBM and have a large bore nasogastric (NG) tube inserted to encourage free drainage of stomach contents
- **Fluid resuscitation:** This patient requires two large bore intravenous access points and a fluid bolus due to being significantly dehydrated. His gastric/NG losses should be matched with an isotonic crystalloid. He will also require his normal maintenance fluid. As he is NBM, all fluid will be given IV. Minimum urine output should be 0.5 mL/kg/h and ideally around 1 mL/kg/h
- **Medications:** Patient will require regular analgesia and a centrally acting antiemetic (e.g. cyclizine). Medications that promote gastric emptying (e.g. domperidone) should be avoided as this may exacerbate the patient's symptoms or cause a perforation. Withold any nephrotoxic drugs if the patient is in acute renal failure
- **Proton pump inhibitors:** Practice varies on the prescription of proton pump inhibitors in small bowel obstruction. If there is obstruction, the stomach is not emptying and therefore with the stomach still producing acid, there is a risk of it building up in the stomach and ulcers developing. Also, when a patient initially presents with epigastric pain, both small bowel obstruction and gastric ulceration are possible diagnoses to think about. Therefore, it is reasonable to start a proton pump inhibitor, either IV or SL (such as lansoprazole)
- **VTE thromboprophylaxis:** Follow local thromboprophylaxis guide, the patient is at an increased risk of thromboembolic event. Measure renal function before prescribing thromboprophalaxis if there is a concern about significant renal failure.

REASSESSMENT

- After NG decompression along with a fluid bolus, the patient is reassessed

'The patient looks mildly improved. The airway is patent. RR 18/min, oxygen saturation is 97% in room air. His breathing is satisfactory and his abdomen continues to be distended. HR 70 bpm, BP 120/75 mmHg, CRT 2 seconds and urine output 1 mL/kg/h. NG has drained 1.5 L of bilious fluid. After one dose of morphine, pain is well controlled on regular paracetamol.'

The patient has responded well to a fluid bolus, but has ongoing losses with significant bilious aspirates. Another fluid bolus isn't necessary at the moment, but fluids will be needed at a rate faster than maintenance fluid to replace bilious loss and insensible losses. Fluid requirement will need to be assessed frequently.

PRESCRIBE
(see Figs 8.6–8.8)

Regular antiemetic, e.g. CYCLIZINE 50 mg IV TDS

Thromboprophylaxis, e.g. ENOXAPARIN 40 mg SC OD

TED STOCKINGS CONT TOP

Regular analgesia, e.g. MORPHINE SULFATE 5 mg (titrate to response) IV 4 hourly

PPI, e.g. ESOMEPRAZOLE 40 mg IV (over 10–30 mins) OD

Further fluids, e.g. 1 L 0.9% SODIUM CHLORIDE with 20 mmol KCl 250 mL/h

HANDING OVER THE PATIENT

'Julio Smith is a 62-year-old patient with a previous appendicectomy who has now presented with a 3-day history of signs and symptoms of bowel obstruction. On his initial assessment he was dehydrated and in pain. He has been stabilized with an NG tube and given a 500 mL fluid bolus and analgesia/antiemetics. AXR demonstrated small bowel obstruction, with no evidence of perforation. Bloods show evidence of acute renal failure with urea 12 mmol/L and creatinine 130 µmol/L. He is currently haemodynamically stable with good urine output. Oxygen saturations are 95% in room air.

Julio is currently on 250 mL/h of 0.9% sodium chloride. The patient is awaiting a CT abdomen to determine the level of the obstruction. Please do a fluid review, and re-examine the abdomen later this evening.'

Indications for operative intervention

- Visceral perforation
- Signs of peritoneal irritation
- Irreducible/strangulated hernia
- Deteriorating patient
- Failure to resolve within 48 hours

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

Hospital/Ward: GDH SURGICAL	**Consultant:** MR SING	**Name of Patient:** JULIO SMITH
Weight: 70kg	**Height:** 1.6m	**Hospital Number:** J345333
If re-written, date:		**D.O.B:** 05/03/52
DISCHARGE PRESCRIPTION **Date completed:-**	**Completed by:-**	

OTHER MEDICINE CHARTS IN USE		PREVIOUS ADVERSE REACTIONS This section must be completed before any medicine is given		Completed by (sign & print)	Date
Date	Type of Chart	None known ☐			
	None	Medicine/Agent	Description of Reaction		
22/09/14		PENICILLIN	RASH	J. Meyer JOHN MEYER	22/09/14

CODES FOR NON-ADMINISTRATION OF PRESCRIBED MEDICINE

If a dose is not administered as prescribed, initial and enter a code in the column with a circle drawn round the code according to the reason as shown below. **Inform the responsible doctor in the appropriate timescale.**

1. Patient refuses
2. Patient not present
3. Medicines not available – CHECK ORDERED
4. Asleep/drowsy
5. Administration route not available – CHECK FOR ALTERNATIVE
6. Vomiting/nausea
7. Time varied on doctor's instructions
8. Once only/as required medicine given
9. Dose withheld on doctor's instructions
10. Possible adverse reaction/side effect

ONCE-ONLY

Date	Time	Medicine (Approved Name)	Dose	Route	Prescriber – Sign + Print	Time Given	Given By
22/09/14	19.30	MORPHINE SULFATE (titrate to response)	5 to 10 mg	IV	J. Meyer JOHN MEYER	19.30	JS (5 mg)
22/09/14	19.30	CYCLIZINE	50 mg	IV	J. Meyer JOHN MEYER	19.30	JS

OXYGEN	Start Date	Start Time	Route Mask (%)	Route Prongs (L/min)	Prescriber – Sign + Print	Administered by	Stop Date	Stop Time

Figure 8.6

Name: JULIO SMITH
Date of Birth: 5/3/1952

REGULAR THERAPY

PRESCRIPTION	Date → / Time ↓	22/09/14	23/09/14									
Medicine (Approved Name): MORPHINE SULFATE Dose: 5 mg Route: IV Notes: Titrate to response Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	(2)		QW										
	8	(6)		QW										
	12	(10)		QW										
	14	(14)		QW										
	(18)			QW										
	(22)		QW	QW										
Medicine (Approved Name): ESOMEPRAZOLE Dose: 40 mg Route: IV Notes: Over 10-30 mins Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6													
	(8)			QW										
	12													
	14													
	18													
	22													
Medicine (Approved Name): ENOXAPARIN Dose: 40 mg Route: SC Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6													
	8													
	12													
	14													
	(18)		QW	QW										
	22													
Medicine (Approved Name): TED STOCKINGS Dose: One pair Route: TOP Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	(6)													
	8													
	12													
	14													
	18		QW	QW										
	22													
Medicine (Approved Name): CYCLIZINE Dose: 50 mg Route: IV Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6													
	(8)			QW										
	12													
	(14)			QW										
	18													
	22	(24)	QW	QW										
Medicine (Approved Name): Dose: Route: Notes: Start Date: Prescriber – sign + print:	6													
	8													
	12													
	14													
	18													
	22													

Figure 8.7

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: GDH SURGICAL **Consultant:** MR SING

Weight: 70 kg **Height:** 1.6 m

Name of Patient: JULIO SMITH

Hospital Number: J345333

D.O.B: 05/03/52

Date/ Time	FLUID / ADDED DRUGS	VOLUME / DOSE	RATE	PRESCRIBER – SIGN AND PRINT
22/09/14 20.00	0.9% SODIUM CHLORIDE	500 mL	Over 15 min	J. Meyer JOHN MEYER
22/09/14 20.30	0.9% SODIUM CHLORIDE POTASSIUM CHLORIDE	1 L 20 mmol	250 mL/h	J. Meyer JOHN MEYER

Figure 8.8

Station 8.4: Diabetes in the surgical patient

You are the junior doctor on a general surgical ward. Your registrar has asked you to see a patient he has reviewed in the emergency department. The patient is a 67-year-old Type 2 diabetic, normally only on metformin, who requires a below knee amputation for his infected and gangrenous right foot. Please assess the patient and instigate the appropriate management plan in preparation for theatre tomorrow.

Patient Details

Name:	Adam Smith
DOB:	05/03/47
Hospital Number:	J345400
Weight:	70 kg
Height:	1.6 m
Consultant:	Mr Wood
Hospital/Ward:	CGH Surgical
Current Medications:	Metformin 500 mg oral TDS (for diabetes)
Allergies:	No known drug allergies
Admission date:	22/09/14

AIRWAY

- Assess patency of the airway. Does he have any stridor?

'The airway is patent'.

No additional airway support is required.

BREATHING

- Assess the rate and depth of respiration. Assess his work of breathing and his oxygen saturations. Percuss the different lung zones for any abnormalities. Auscultate the lungs to assess air entry or presence of crackles

'The respiratory rate is 28/min with saturations of 96%. He is taking deep breaths, is in visible pain, with accessory muscles of breathing apparent. Despite his tachypnoea, he has good air entry with no crackles or wheeze.'

No additional breathing support is required.

CIRCULATION

- Assess the haemodynamic stability by measuring pulse, blood pressure, CRT, skin temperature and assessing the mucous membranes

'HR 110 bpm, BP 120/70 mmHg, CRT 3 seconds and mucous membranes are pink and moist. His distal peripheries are clammy and sweaty with thready pulses.'

This man will require IV access, bloods, and a fluid bolus. A reassessment should occur immediately after. A urinary catheter should be placed to monitor his urinary output.

DISABILITY

- Assess the patient's level of consciousness using the Glasgow coma scale. Is the patient confused or agitated? What's the capillary glucose reading?

'This patient's GCS is E4, M6, V4 = 14/15. He seems a bit confused and his blood sugar currently is 16 mmol/L (post-fluid challenge).

His confusion is probably due to being septic with uncontrolled hyperglycaemia. He will require a variable rate IV insulin infusion (VRIII) [4] to control the blood sugar. Note that blood sugar is often corrected just with adequate crystalloid (non-glucose) resuscitation but, in this

Diabetic complications

Microvascular disease:
- Retinopathy
- Nephropathy
- Neuropathy.

Macrovascular disease:
- Coronary heart disease
- Cerebral vascular disease
- Peripheral vascular disease.

Management summary: unwell diabetic patients

- Fluid resuscitation
- Early variable rate insulin infusion regimen and stop other hypoglycaemics
- Empirical antibiotics
- Identify focus of infection: Blood, wound, urine culture
- Monitor electrolytes and urine output
- Early diabetic team involvement
- Blood gas and urine dipstick

Diagnosis of diabetes mellitus (WHO)

- Random plasma glucose > 11.1 mmol/L
- Fasting plasma glucose
- >7 mmol/L × 2 (occasions)

Symptoms of diabetes

- Polyuria/polydipsia
- Unintentional weight loss
- Worsening blurred vision
- Recurrent infections
- Lethargy/weakness
- Sensory loss

PRESCRIBE (see Figs 8.9–8.11)

Fluid challenge, e.g. 500 mL 0.9% SODIUM CHLORIDE (over 15 min)

Table 8.3 VRIII regimen

Blood glucose (mmol/L) (target range 6–10 mmol/L)	Insulin (Actrapid®) infusion (units/h = mL/h)
>20	5
15–19.9	4
10–14.9	3
7–9.9	2
4–6.9	1
<3.9	0.5

VRIII fluids = 5% glucose/0.45% sodium chloride/0.15% potassium chloride 1000 mL 125 mL/h. 50 units of insulin (Actrapid®) is made up in 50 mL of 0.9% sodium chloride to give a concentration of 1 unit/mL of insulin. This means that 1 unit/h of insulin equates to 1 mL/h.

case, it is inadequate, and a VRIII is required anyway preoperatively. (Note VRIII was previously called a sliding scale regimen).

PRESCRIBE (see Figs 8.9–8.11)

Write on front of drug chart:

VRIII regimen is shown on Table 8.3 (note the blood glucose values, rate of insulin infusion, and co-prescribed fluids vary between hospitals: consult local guidelines).

EXPOSURE

- Examine this gentleman ensuring adequate exposure of all possible sites of infection. Examine for both macrovascular and microvascular complications of diabetes. Assess his core body temperature for pyrexia

'His right foot and distal leg is markedly erythematous, malodorous, swollen and red with exudative pyogenic material oozing from the foot. The patient has no sensations below the knee. His core temperature is 38.5°C and there are no other sites of infection.'

Commence antipyretics to reduce his temperature. Swab the wound for M/C/S and dress the wound appropriately until formal surgical intervention tomorrow.

INITIAL INVESTIGATIONS

- **Arterial blood gas:** An acute metabolic acidosis is indicated by a low pH, a normal/reduced pCO_2, and reduced bicarbonate/base excess. Tachypnoea may result in low pCO_2 (respiratory compensation for metabolic acidosis)
- **Bloods:** FBC, U&Es, CRP, blood culture, serum glucose. Look for evidence of infection, assess renal function and hydration status. Serum glucose is important to assess severity of hyperglycaemia
- **Wound swab:** Used to identify the organism and guide correct antibiotic treatment. Organism resistance is growing, especially in diabetics as they have probably had more courses of treatment and hospital admissions
- **CXR and foot/leg X-rays:** Baseline CXR should be completed to rule out any other focus of infections and identify any cardiomegaly. Limb X-rays determine the presence and extent of any osteomyelitis
- **ECG:** To assess for ischaemic heart disease. Diabetic patients can have a silent MI due to autonomic neuropathy
- **Urine dipstick:** It is important to ensure that this patient is not going into diabetic ketoacidosis. Look for ketones in the urine. Will also pick up a possible UTI

Table 8.4 Mr Smith's blood results and ABG result

Parameter	Value	Normal range (Units)
WCC	**25 × 10^9/L**	**4–11 (× 10^9/L)**
Neutrophil	**18 × 10^9/L**	**2–7.5 (× 10^9/L)**
Lymphocyte	4 × 10^9/L	1.4–4 (× 10^9/L)
Platelet	200 × 10^9/L	150–400 (× 10^9/L)
Haemoglobin	135 g/L	Men: 135–177 (g/L) Women: 115–155 (g/L)

(Cont'd)

Table 8.4 *(Cont'd)*

Parameter	Value	Normal range (Units)
CRP	**267 mg/L**	**0–5 (mg/L)**
Urea	**9.3 mmol/L**	**2.5–6.7 (mmol/L)**
Creatinine	**120 μmol/L**	**79–118 (μmol/L)**
Sodium	135 mmol/L	135–146 (mmol/L)
Potassium	4.9 mmol/L	3.5–5.0 (mmol/L)
eGFR	**54 mL/min**	**>60 (mL/min)**
Lactate	**2.8 mmol/L**	**0.6–2.4 (mmol/L)**
Glucose	**13 mmol/L**	**4.5–5.6 (mmol/L)**
pH	**7.28**	**7.35–7.45**
PaO_2	12 kPa	10.6–13.3 (kPa) on air
$PaCO_2$	**4 kPa**	**4.8–6.1 (kPa)**
HCO_3	**22 mmol/L**	**22–26 (mmol/L)**
BE	**−4 mmol/L**	**±2 (mmol/L)**

HbA1c gives you a snapshot of 'chronic' diabetic control for the past 60 days.

'Arterial blood gas shows a pH 7.28, $PaCO_2$ of 4.0 kPa, PaO_2 12 kPa, HCO_3 22 mmol/L, BE −4.0 mmol/L, lactate 2.8 mmol/L. Hb is 135 g/L, WCC 25 × 10^9/L, neutrophils 18 × 10^9/L. Na 135 mmol/L, K 4.9 mmol/L, urea 9.3 mmol/L, creatinine 120 μmol/L (eGFR = 54 mL/min). CRP is 267 mg/L. Glucose is 13 mmol/L. Wound swab/blood culture microscopy shows Gram negative rods. Leg X-rays show osteomyelitic changes to the distal tibia. ECG and CXR are normal. Urine dipstick shows no glucose and no ketones.'

INITIAL MANAGEMENT [4–5]

- Airway support: The airway is patent in this case, with no intervention required
- Supplementary oxygen: If saturations < 94%
- Fluid support: All patients require maintenance fluids while nil by mouth. Insensible losses will be increased due to being septic. Urine output should be monitored with a urinary catheter, aiming for a minimum rate of 0.5 mL/kg/h. This patient required a fluid bolus due to being dehydrated, and responded well to it
- Since this patient is getting 3 L of fluid every 24 hours through the VRIII, and has received a 500 mL bolus, if he is not clinically dehydrated anymore, maintenance fluids are accounted for, and further resuscitation fluid is not currently required. Fluid balance needs to be carefully monitored. Further crystalloid fluids at a later stage (via a second line to the insulin infusion) may be necessary. Note that with the VRIII, the fluid is generally not changed if the blood sugar drops or increases. The blood sugar is unlikely to fluctuate dramatically in this clinical situation, and it avoids unnecessarily changing between different fluid bags
- Blood glucose: All non-diet controlled diabetic patients (Type 1 or 2) requiring major surgery (unable to eat and drink for > 4 h after surgery) will need to start a VRIII preoperatively
- In this scenario, as the patient is septic with elevated blood sugar readings, a VRIII should be commenced as soon as possible. The regimen involves drawing up 50 units of human soluble insulin in 50 mL of 0.9% saline in a syringe-pump. This will give a concentration of 1 unit/mL of insulin. Repeated blood glucose levels are required to be tested hourly and rate adjusted accordingly. 5% glucose with 0.45% sodium chloride and with 0.15% potassium chloride at a rate of 125 mL/h should be used with the VRIII regimen. If the serum potassium is low use the 0.30% potassium chloride instead of 0.15% solution
- The goal is to maintain the blood glucose levels between 6 and 10 mmol/L
- All patients with Type 2 diabetes should stop their oral hypoglycaemics when on VRIII. Metformin ideally should be stopped as it may cause lactic acidosis. It should be restarted once eating and drinking safely
- If this were an elective procedure, in a well patient (with non-diet controlled diabetes), then the VRIII could be delayed. If they were on the morning list, they could fast from midnight, and could be started on a VRIII from the early morning (e.g. 06.00) of the day

of the procedure. If they are on the afternoon list (ideally this should not be the case), they could fast from the early morning, e.g. 07.00 and commence the VRIII in the late morning (e.g. 11.00)

- Patients having minor operations (able to eat within 4 hours after surgery or day cases) do not require a VRIII regimen unless stated otherwise. Patients with diabetes should omit their morning short-acting insulin, but continue with their long-acting insulin on the day of the operation. For patients having minor operations, oral hypoglycaemics such as metformin and glitazones should be continued as normal, but sulphonylureas and gliptins shouldn't be taken on the morning of the operation
- Diet controlled diabetes patients do not require any form of treatment for either minor or major surgery as they are not at significantly increased risk of glucose instability [5,6]
- **Empirical antibiotics:** Antibiotics should be commenced (as per trust guidelines) immediately once cultures are taken. These antibiotics vary from trust to trust; however, all patients should be treated as suspected MRSA positive until confirmed negative. After 48 hours, blood culture results can tailor antibiotic therapy. One option would be teicoplanin (Gram positive cover), fusidic acid (MRSA cover) and piperacillin/tazobactum (broad-spectrum antibiotic)
- **Analgesia:** Start with simple analgesia and titrate upwards as required
- **VTE prophylaxis:** Commence pharmacological prophylaxis if there are no contraindications, adjusted to renal function. Mechanical prophylaxis is contraindicated due to neuropathy and infection
- **Potassium monitoring:** This will have to be monitored closely: if it falls significantly, the fluid would need to be changed to 0.45% sodium chloride and 5% glucose with 0.3% potassium chloride.

PRESCRIBE
(see Figs 8.9–8.11)

Thromboprophylaxis, e.g. ENOXAPARIN 40 mg SC OD

Regular analgesia, e.g. PARACETAMOL 1 g ORAL QDS

Antibiotics, e.g. TEICOPLANIN 400 mg IV (over 30 mins) STAT then BD on DAY 1, OD from DAY 2 and PIPERACILLIN/TAZOBACTAM 4.5 g IV (over 30 mins) STAT the TDS and FUSIDIC ACID 750 mg ORAL STAT then TDS

REASSESSMENT

- After a fluid bolus, commencement of the VRIII, supplemental oxygen, and empirical antibiotics the patient is reassessed

'The patient looks significantly better. Airway is patent. RR 20/min, oxygen saturations are 95%, in air, with mild accessory muscle of respiration use. The chest is clear. HR 80 bpm, BP 140/80 mmHg, CRT < 1 second. Glucose is now 9 mmol/L on the VRIII.'

Note: All oral regular medications should resume as normal once the patient is able to eat and drink safely. VRIII regimens may continue for some time postoperatively due to the effects of stress hormones. Fine control can be best achieved with a variable rate intravenous insulin infusion. The decision to stop the VRIII depends on the trend of stable blood sugar control.

HANDING OVER THE PATIENT

'Mr Smith is a 67-year-old type 2 diabetic, with probable E. coli osteomyelitis/infected right foot, awaiting a below right knee amputation tomorrow. He presented with an infected foot, with associated osteomyelitis, and sepsis. Respiratory wise, he has required supplementary oxygen. In terms of circulation, he was significantly dehydrated requiring a fluid bolus. Blood sugar was high, so a VRIII regimen was also started.

Currently, he is much improved. RR 20/min, oxygen saturations are 95%, in air. He is haemodynamically stable, well hydrated, and glucose has been maintained within normal limits.

Investigations showed an initial partially compensated metabolic acidosis. His WCC was 25 × 10^9/L and neutrophils 18 × 10^9/L with a CRP of 267 mg/L. Initial microscopy demonstrates Gram negative rods, which most likely will be E. coli.

The plan is to transfer to the ward in a side room due to infection risk, NBM, continue on the VRIII regimen, and IV antibiotics. Most recent blood sugars are stable.

He will require hourly blood sugar checks and insulin adjusted accordingly. Repeat ABG should be done prior to his operation in the morning; he is already first on the list in view of his diabetes. Keep an eye on his urine output to make sure he is properly rehydrated, and please do a fluid review later this evening.'

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

Hospital/Ward: CGH SURGICAL **Consultant:** MR WOOD	**Name of Patient:** ADAM SMITH
Weight: 70 kg **Height:** 1.6 m	**Hospital Number:** J345400
If re-written, date:	**D.O.B:** 5/3/1947
DISCHARGE PRESCRIPTION **Date completed:-** **Completed by:-**	

OTHER MEDICINE CHARTS IN USE		**PREVIOUS ADVERSE REACTIONS** This section must be completed before any medicine is given		Completed by (sign & print)	Date
Date	Type of Chart	None known ☑		J. Meyer JOHN MEYER	22/09/14
		Medicine/Agent	Description of Reaction		

CODES FOR NON-ADMINISTRATION OF PRESCRIBED MEDICINE

If a dose is not administered as prescribed, initial and enter a code in the column with a circle drawn round the code according to the reason as shown below. **Inform the responsible doctor in the appropriate timescale.**

1. Patient refuses
2. Patient not present
3. Medicines not available – CHECK ORDERED
4. Asleep/drowsy
5. Administration route not available – CHECK FOR ALTERNATIVE
6. Vomiting/nausea
7. Time varied on doctor's instructions
8. Once only/as required medicine given
9. Dose withheld on doctor's instructions
10. Possible adverse reaction/side effect

ONCE-ONLY

Date	Time	Medicine (Approved Name)	Dose	Route	Prescriber – Sign + Print	Time Given	Given By
22/09/14	09.30	TEICOPLANIN (over 30 mins)	400 mg	IV	J. Meyer JOHN MEYER	09.30	JS
22/09/14	09.30	PIPERACILLIN/TAZOBACTAM (over 30 mins)	4.5 g	IV	J. Meyer JOHN MEYER	09.30	JS
22/09/14	09.30	FUSIDIC ACID	750 mg	ORAL	J. Meyer JOHN MEYER	09.30	JS
22/09/14	09.30	50 units INSULIN (ACTRAPID) IN 50 mL 0.9% SODIUM CHLORIDE	AS VARIABLE RATE INSULIN INFUSION BELOW	IV	J. Meyer JOHN MEYER	09.40	JS

BLOOD GLUCOSE (mmol/L) (target range 6–10 mmol/L)	INSULIN (ACTRAPID) INFUSION (UNITS/HOUR = mL/h)
>20	5
15–19.9	4
10–14.9	3
7–9.9	2
4–6.9	1
<3.9	0.5

Figure 8.9

Name: ADAM SMITH
Date of Birth: 5/3/1947

REGULAR THERAPY

PRESCRIPTION	Date → / Time ↓	22/09/14	23/09/14										
Medicine (Approved Name): PARACETAMOL Dose: 1 g Route: ORAL Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6		FD										
	8												
	12	FD	FD										
	14												
	18	FD	FD										
	22	FD	FD										
Medicine (Approved Name): TEICOPLANIN Dose: 400 mg Route: IV Notes: Loading dose: Day 1—400 mg bd thereafter 400 mg OD. For infected wound review in 48 h. Give over 30 mins Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6		FD										
	8												
	12												
	14												
	18	FD	X	X	X	X	X	X	X	X	X	X	X
	22												
Medicine (Approved Name): PIPERACILLIN/TAZOBACTAM Dose: 4.5 g Route: IV Notes: For infected wound. Review at 48 h. Give over 30 mins Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6		FD										
	8												
	12												
	14	FD	FD										
	18												
	22	FD	FD										
Medicine (Approved Name): FUSIDIC ACID Dose: 750 mg Route: ORAL Notes: For infected wound review in 48 h Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6		FD										
	8												
	12												
	14	FD	FD										
	18												
	22	FD	FD										
Medicine (Approved Name): ENOXAPARIN Dose: 40 mg Route: SC Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6												
	8												
	12												
	14												
	18	FD	FD										
	22												
Medicine (Approved Name): Dose: Route: Notes: Start Date: Prescriber – sign + print:	6												
	8												
	12												
	14												
	18												
	22												

Figure 8.10

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: CGH SURGICAL **Consultant:** MR WOOD

Weight: 70 kg **Height:** 1.6 m

Name of Patient: ADAM SMITH

Hospital Number: J345400

D.O.B: 5/3/1947

Date/ Time	FLUID / ADDED DRUGS	VOLUME / DOSE	RATE	PRESCRIBER – SIGN AND PRINT
22/09/14 09.30	0.9% SODIUM CHLORIDE	500 mL	Over 15 min	J. Meyer JOHN MEYER
22/09/14 11.00	5% GLUCOSE/0.45% SODIUM CHLORIDE/0.15% POTASSIUM CHLORIDE	1000 mL	125 mL/h	J. Meyer JOHN MEYER
22/09/14 19.00	5% GLUCOSE/0.45% SODIUM CHLORIDE/0.15% POTASSIUM CHLORIDE	1000 mL	125 mL/h	J. Meyer JOHN MEYER

Figure 8.11

Station 8.5: Postoperative fluid loss

You are the junior doctor on call, covering the wards. You have been asked by the surgical ward nurse to prescribe some fluids for a postoperative patient. The patient is a 62-year-old man who underwent a lobectomy of the left lung yesterday.

Patient Details

Name:	Jake Smith
DOB:	05/03/52
Hospital Number:	J345600
Weight:	75 kg
Height:	1.6 m
Consultant:	Mr Walker
Hospital/Ward:	REI Surgical
Current Medications:	Paracetamol 1 g oral QDS, ibuprofen 400 mg oral TDS, morphine sulfate IV PCA (started postoperatively for analgesia) Enoxaparin 40 mg SC OD and TED stocking one pair TOP continuous (started this admission for thromboprophylaxis) Cyclizine 50 mg oral TDS (started this admission, to reduce morphine related nausea) Esomeprazole 20 mg oral OD (started this admission to reduce ibuprofen relate gastric irritation)
Allergies:	No known drug allergies
Admission date:	22/09/14

INITIAL ASSESSMENT

AIRWAY

- Assess patency of the airway. Does he have any stridor? Is his trachea central?

'The airway is patent and his trachea is central.'

No additional airway support is required.

BREATHING

- Assess the rate and depth of respiration. Assess his work of breathing and his oxygen saturations. Percuss the different lung zones for dullness or hyper-resonance. Auscultate the lungs to assess air entry or presence of crackles. Check the chest drain is functioning normally (Is it swinging/bubbling? Does it look blocked?)

'RR 20/min, oxygen saturation at 100% with an 8 L/min oxygen face mask. There is a chest drain on the left side, which has drained 300 mL of haemoserous fluid in the last 6 hours (500 mL in 24 hours). He has reduced air entry at the base of the left lung, with dullness to percussion. He is complaining of pain on deep inspiration.'

Given the above, it is unlikely he has a pneumothorax; however, there may be a haemothorax. A CXR should be done to exclude these problems. Avoid any splinting due to pain by prescribing appropriate analgesia. Supplementary oxygen should be given to maintain oxygen saturations above 94%.

CIRCULATION

- Assess the haemodynamic stability by assessing the pulse, blood pressure with pulse pressure, CRT and mucous membranes. Check the vital signs records and assess the trends rather than isolated findings. Also note the patient's urine output and fluid input for the past 24 hours

'HR 110 bpm, BP 110/90 mmHg, CRT 3 seconds and mucous membranes are pale and dry.'

This man will require IV access, bloods, and a fluid bolus. Give the fluid bolus as 500 mL, followed by reassessment.

PRESCRIBE (see Figs 8.12–8.15)

Fluid challenge, e.g. 500 mL 0.9% SODIUM CHLORIDE (over 15 min)

OXYGEN, e.g. 8 L/min via MASK

DISABILITY

- Assess the patient's consciousness using the Glasgow coma scale. Is the patient confused or agitated? What's the capillary glucose reading?

'This man's GCS is E4, M6, V4 = 14/15. He seems a bit confused and his blood sugar currently is 7 mmol/L.'

His confusion is probably due to his depleted intravascular volume, though other causes such as infection need to be considered.

EXPOSURE

- Expose and examine this gentleman thoroughly and examine all possible sources of bleeding. Have a proper assessment of his fluid balance. Assess all drains and their respective volume over the past 24 hours. Assess his core body temperature for pyrexia as this is a cause of an increased insensible loss

'As noted before, this man has a chest drain and it has drained 500 mL of serosangineous fluid in the past 24 hours. His urine output for the day has been approximately 800 mL. His oral input has been 800 mL. His fluid balance works out to be negative 500 mL plus insensible losses. His temperature is normal.'

Surgical drains are an important component of measuring fluid balance. Do not forget to check them.

INITIAL INVESTIGATIONS

- **Bloods:** FBC, U&Es, CRP. Look for evidence of anaemia or drop in Hb. Assess renal function and hydration status. A group and save, and a coagulation screen should also be sent if you think the patient is bleeding. CRP trend may suggest possible infection
- **Arterial blood gas:** Quick investigation to assess acid–base status, arterial $PaCO_2$ and PaO_2 levels. It also gives an approximate Hb, electrolyte, lactate and glucose level
- **CXR:** Will demonstrate the presence of a haemothorax or pneumothorax. 250 mL of blood in the pleural space is required before anything is seen on a CXR. 750 mL of blood will fill half of a lung field. It appears as a diffuse opacification or white-out and loss of the costophrenic angles
- **ECG:** To look for any cardiac abnormalities

'ABG shows a pH of 7.36, $PaCO_2$ 4.9 kPa, PaO_2 12 kPa, HCO_3 23 mmol/L. Hb 93 g/L, WCC 8 × 10^9/L, CRP 7 mg/L, urea 14 mmol/L, creatinine 160 µmol/L and eGFR 41 mL/min (baseline Hb 110 g/L, baseline urea 7 mmol/L and creatinine 80 µmol/L). CXR shows a correctly placed chest drain with no haemo/pneumothorax. ECG is normal.'

Table 8.5 Mr Smith's blood results and ABG result

Parameter	Value	Normal range (Units)
WCC	8 × 10^9/L	4–11 (× 10^9/L)
Platelet	200 × 10^9/L	150–400 (× 10^9/L)
Haemoglobin	**93 g/L**	**Men: 135–177 (g/L) Women: 115–155 (g/L)**
CRP	**7 mg/L**	**0–5 (mg/L)**
Urea	**14 mmol/L**	**2.5–6.7 (mmol/L)**
Creatinine	**160 µmol/L**	**79–118 (µmol/L)**
eGFR	**41 mL/min**	**>60 (mL/min)**
Sodium	134 mmol/L	135–146 (mmol/L)
Potassium	5.2 mmol/L	3.5–5.0 (mmol/L)

(Cont'd)

Table 8.5 *(Cont'd)*

Parameter	Value	Normal range (Units)
eGFR	**41 mL/min**	**>60 (mL/min)**
pH	7.36	7.35–7.45
PaO_2	12 kPa	10.6–13.3 (kPa) on air
$PaCO_2$	4.9 kPa	4.8–6.1 (kPa)
HCO_3	23 mmol/L	22–26 (mmol/L)
BE	1 mmol/L	±2 (mmol/L)

INITIAL MANAGEMENT

- **Airway support:** Airway patent in this case, with no intervention required
- **Supplementary oxygen**: If saturations < 94%
- **Gastric protection**: A PPI is often given to ITU patients, particularly if taking ibuprofen for analgesia, to reduce risk of ulcers. The patient is already on esomeprozole
- **Analgesia**: Paracetamol, opioids and ibuprofen (with daily U&Es and gastric protection) can be used. Regular and PRN morphine sulfate can be used to ensure good control, but usually a PCA system will be needed to allow the patient to titrate morphine to pain. Speak to the anaesthetic team about increasing analgesia via a PCA, and ensure on appropriate additional medications. The patient is already on paracetamol, ibuprofen and a morphine sulfate PCA (with regular cyclizine). Ibuprofen should be stopped in this case due to worsening renal function
- **Haemoglobin level**: For proper wound healing and good respiratory and haemodynamic function. Transfusion thresholds vary between surgeons and surgical units. A threshold of 70–80 g/L for transfusion is typical. A higher haemoglobin is generally aimed for in patients with ischaemic heart disease, or peripheral vascular disease. Aiming for a haemoglobin above 90 g/L might be reasonable with a history of angina. Each unit of blood is approximately 250 mL, and raises the Hb by 10 g/L. This patient does not require a transfusion at present as the haemoglobin is 93 g/L
- **Ensure on appropriate thromboprophylaxis:** Should be on mechanical VTE prophylaxis. Consider withholding enoxaparin if signs of active bleeding. In this case, there is not strong evidence of active bleeding: only 500 mL has drained in 24 hours, there is no haemothorax on the CXR, and the fluid is haemoserous rather than frank blood
- **Ensure appropriate fluid balance:** Prescribing 100 ml/hr of fluid over 24 hours (plus a 500 mL fluid challenge) will ensure appropriate fluid balance. Maintenance fluids would need to be given, plus replenishment of the 500 mL fluid deficit (and insensible losses). This will need to be continually reassessed, and when the patient is more stable, and drinking well, they can be switched to oral fluids.

REASSESSMENT

- After a fluid bolus, and commencement of maintenance fluid, the patient is reassessed

'The patient looks significantly improved. The airway is patent. RR 18/min and, oxygen saturation is 97% on 2 L/min nasal cannula oxygen. There continue to be crackles at the base of the right lung, but air entry is fine. HR 70 bpm, BP 120/75 mmHg, CRT is 2 seconds and urine output 0.8 mL/kg/h. Patient GCS is 15/15 with a blood sugar of 6 mmol/L.'

PRESCRIBE
(see Figs 8.12–8.15)

Maintenance fluids, e.g. 500 mL 0.9% SODIUM CHLORIDE with 20 mmol KCl 100 mL/h

OXYGEN, e.g. 2 L/min via NASAL CANNULAE

STOP

Previous oxygen prescription

Ibuprofen and esomeprazole (since gastric protection no longer required)

HANDING OVER THE PATIENT

'Mr Smith is a 62-year-old patient who is 1 day postop left lung upper lobectomy (for lung cancer), with anaemia and dehydration.

On his initial assessment he was pale, dehydrated, and in significant pain. He has been stabilized with a 500 mL 0.9% sodium chloride bolus. Analgesia wise, he is on regular paracetamol, and a morphine PCA. Ibuprofen has been stopped due to worsening renal function. Postoperative CXR shows no further bleeding in the chest and no pneumothorax. Bloods showed a haemoglobin

of 93 g/L, so he hasn't been transfused. He is currently haemodynamically stable with good urine output.

The plan is to continue on maintenance IV fluids, to monitor this patient's vital signs, keeping close attention to the heart rate and blood pressure. If these worsen, repeat FBC and U&E should be sent to see if the patient is actively bleeding. The on-call surgical registrar is aware of the patient and is happy to be contacted if there are any further concerns. The anaesthetist is coming later this evening to review the morphine PCA and optimize analgesia.'

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

Hospital/Ward: REI SURGICAL	**Consultant:** MR WALKER	**Name of Patient:** JAKE SMITH
Weight: 75 kg	**Height:** 1.6 m	**Hospital Number:** J345600
If re-written, date:		**D.O.B:** 5/3/1952
DISCHARGE PRESCRIPTION **Date completed:-**	**Completed by:-**	

OTHER MEDICINE CHARTS IN USE		PREVIOUS ADVERSE REACTIONS This section must be completed before any medicine is given		Completed by (sign & print)	Date
Date	Type of Chart	None known ☑		J. Meyer JOHN MEYER	22/09/14
22/09/14	MORPHINE PCA CHART	Medicine/Agent	Description of Reaction		

CODES FOR NON-ADMINISTRATION OF PRESCRIBED MEDICINE

If a dose is not administered as prescribed, initial and enter a code in the column with a circle drawn round the code according to the reason as shown below. **Inform the responsible doctor in the appropriate timescale.**

1. Patient refuses
2. Patient not present
3. Medicines not available – CHECK ORDERED
4. Asleep/drowsy
5. Administration route not available – CHECK FOR ALTERNATIVE
6. Vomiting/nausea
7. Time varied on doctor's instructions
8. Once only/as required medicine given
9. Dose withheld on doctor's instructions
10. Possible adverse reaction/side effect

ONCE-ONLY

Date	Time	Medicine (Approved Name)	Dose	Route	Prescriber – Sign + Print	Time Given	Given By

	Start Date	Start Time	Route Mask (%)	Route Prongs (L/min)	Prescriber – Sign + Print	Administered by	Stop Date	Stop Time
OXYGEN	23/09/14	19.30	8L/min via MASK		J. Meyer JOHN MEYER	JS	23/09/14	20.30
	23/09/14	20.30		2L/min via NASAL CANNULAE	J. Meyer JOHN MEYER	JS		

Figure 8.12

Name: JAKE SMITH
Date of Birth: 5/3/1952

REGULAR THERAPY

PRESCRIPTION	Date → / Time ↓	22/09/14	23/09/14	24/09/14
Medicine (Approved Name): PARACETAMOL Dose: 1g Route: ORAL Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	FG	FG	
	8			
	12	FG	FG	
	14			
	18	FG		
	22 / 24	FG		
Medicine (Approved Name): ESOMEPRAZOLE Dose: 20 mg Route: ORAL Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6			
	8	FG	FG	
	12			
	14			
	18			
	22			
		No longer required as ibuprofen stopped 23/09/14 John Meyer JOHN MEYER		
Medicine (Approved Name): MORPHINE SULFATE PCA Dose: Route: IV Notes: See PCA chart Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	FG	FG	
	8			
	12			
	14			
	18			
	22			
Medicine (Approved Name): IBUPROFEN Dose: 400 mg Route: ORAL Notes: Daily U&Es whilst on ibuprofen Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6			
	8	FG	FG	
	12			
	14 / 16	FG		
	18			
	22 / 00	FG		
		Stopped due to worsening renal function 23/09/14 John Meyer JOHN MEYER		
Medicine (Approved Name): ENOXAPARIN Dose: 40 mg Route: SC Notes: Review 24/9/14 if still bleeding Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6			
	8			
	12			
	14		Review	
	18	FG	FG	
	22			
Medicine (Approved Name): CYCLIZINE Dose: 50 mg Route: ORAL Notes: Start Date: 22/09/14 Prescriber – sign + print: John Meyer JOHN MEYER	6	FG	FG	
	8			
	12			
	14	FG	FG	
	18			
	22	FG		

Figure 8.13

Name: JAKE SMITH
Date of Birth: 05/03/1952

REGULAR THERAPY

PRESCRIPTION

Medicine (Approved Name): TED STOCKINGS
Dose: 1 pair
Route: TOP
Notes:
Start Date: 22/09/14
Prescriber – sign + print: J. Meyer JOHN MEYER

Date → / Time ↓		22/09/14	23/09/14										
6													
8		NH	NH										
12													
14													
18													
22													

Medicine (Approved Name)
Dose
Route
Notes
Start Date
Prescriber – sign + print

6													
8													
12													
14													
18													
22													

Medicine (Approved Name)
Dose
Route
Notes
Start Date
Prescriber – sign + print

6													
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12													
14													
18													
22													

Medicine (Approved Name)
Dose
Route
Notes
Start Date
Prescriber – sign + print

6													
8													
12													
14													
18													
22													

Medicine (Approved Name)
Dose
Route
Notes
Start Date
Prescriber – sign + print

6													
8													
12													
14													
18													
22													

Medicine (Approved Name)
Dose
Route
Notes
Start Date
Prescriber – sign + print

6													
8													
12													
14													
18													
22													

Figure 8.14

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: REI SURGICAL	**Consultant:** MR WALKER
Weight: 75 kg	**Height:** 1.6 m

Name of Patient: JAKE SMITH
Hospital Number: J345600
D.O.B: 5/3/1952

Date/ Time	FLUID / ADDED DRUGS	VOLUME / DOSE	RATE	PRESCRIBER – SIGN AND PRINT
23/09/14 19.30	0.9% SODIUM CHLORIDE	500 mL	Over 15 min	J. Meyer JOHN MEYER
23/09/14 19.45	0.9% SODIUM CHLORIDE	500 mL	100 mL/h	J. Meyer JOHN MEYER
	POTASSIUM CHLORIDE	20 mmol		

Figure 8.15

REFERENCES

[1] **National Collaborating Centre for Acute Care for NICE.** Reducing the risk of venous thromboembolsim (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital, 2009 <http://www.nice.org.uk/nicemedia/pdf/CG92FullGuideline.pdf> [Last accessed 08.12.12].

[2] **Abela J.E., Carter C.F.** Acute pancreatitis–a review. Surgery 2010;28:205–11.

[3] **Stephenson J., Singh B.** Intestinal obstruction. Surgery 2011;29:33–8.

[4] **George R.R., Hormis A.P.** Perioperative management of diabetes mellitus and corticosteroid insufficiency. Surgery 2011;29:465–8.

[5] **NHS Diabetes.** Management of adults with diabetes undergoing surgery and elective procedures: improving standards, 2011 <http://www.diabetes.org.uk/Professionals/Publications-reports-and-resources/Reports-statistics-and-case-studies/Reports/Management-of-adults-with-diabetes-undergoing-surgery-and-elective-procedures-improving-standards-/> [Last accessed 27.02.13].

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