



The Unofficial Guide to Prescribing

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The Unofficial Guide to Prescribing

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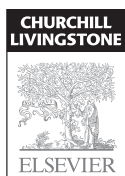
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Preface

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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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 parameter: '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 <input type="checkbox"/>			
		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 | 6. Vomiting/nausea |
| 2. Patient not present | 7. Time varied on doctor's instructions |
| 3. Medicines not available – CHECK ORDERED | 8. Once only/as required medicine given |
| 4. Asleep/drowsy | 9. Dose withheld on doctor's instructions |
| 5. Administration route not available – CHECK FOR ALTERNATIVE | 10. Possible adverse reaction/side effect |

ONCE-ONLY

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

	Start		Route		Prescriber – Sign + Print	Administered by	Stop	
	Date	Time	Mask (%)	Prongs (L/min)			Date	Time
O X Y G E N								

Name:
Date of Birth:

REGULAR THERAPY

PRESCRIPTION		Date →																	
		Time →																	
Medicine (Approved Name)		6																	
Dose		8																	
		12																	
Notes		14																	
		18																	
Prescriber – sign + print		22																	
Medicine (Approved Name)		6																	
Dose		8																	
		12																	
Notes		14																	
		18																	
Prescriber – sign + print		22																	
Medicine (Approved Name)		6																	
Dose		8																	
		12																	
Notes		14																	
		18																	
Prescriber – sign + print		22																	
Medicine (Approved Name)		6																	
Dose		8																	
		12																	
Notes		14																	
		18																	
Prescriber – sign + print		22																	
Medicine (Approved Name)		6																	
Dose		8																	
		12																	
Notes		14																	
		18																	
Prescriber – sign + print		22																	
Medicine (Approved Name)		6																	
Dose		8																	
		12																	
Notes		14																	
		18																	
Prescriber – sign + print		22																	

INTRAVENOUS FLUID PRESCRIPTION CHART									
--------------------------------------	--	--	--	--	--	--	--	--	--

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

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

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		Age		Title, Forename, Surname & Address	
		D.O.B.			
Please don't stamp over age box					
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

[illegible][illegible]

List of abbreviations

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

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

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General surgery

Anatole V Wiik

Station 8.1: Venous thromboembolism (VTE) prophylaxis

Station 8.2: Acute pancreatitis

Station 8.3: Intestinal obstruction

Station 8.4: Diabetes in the surgical patient

Station 8.5: Postoperative fluid loss

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 ($t_{1/2}$ 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 prophylaxis (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 THROMBOPROPHYLAXIS

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 < $75 \times 10^9/L$ 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.

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.

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 (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

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

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

Figure 8.1

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: <i>WGH WARD 3</i>	Consultant: <i>MR KING</i>	Name of Patient: <i>NICOLE SMITH</i>
Weight: <i>60 kg</i>	Height: <i>1.6 m</i>	Hospital Number: <i>1208973948</i> D.O.B: <i>05/03/91</i>

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

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



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)

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.

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.'

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

PRESCRIBE (see Figs 8.3–8.5)

High-flow oxygen: 15 L/min OXYGEN via NON-REBREATHING 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)

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

Parameter	Value	Normal range (Units)
WCC	$18 \times 10^9/\text{L}$	$4\text{--}11 (\times 10^9/\text{L})$
Neutrophil	$12 \times 10^9/\text{L}$	$2\text{--}7.5 (\times 10^9/\text{L})$
Lymphocyte	$4 \times 10^9/\text{L}$	$1.4\text{--}4 (\times 10^9/\text{L})$
Platelet	$300 \times 10^9/\text{L}$	$150\text{--}400 (\times 10^9/\text{L})$
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 $\mu\text{mol/L}$	79–118 ($\mu\text{mol/L}$)
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 μ mol/L	<17 (μ mol/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	\pm 2 (mmol/L)

'ABG shows a pH of 7.32, PaCO₂ 4 kPa, PaO₂ 10 kPa, HCO₃ 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 μ mol/L, ALT 45 IU/L, ALP 200 IU/L, potassium 4 mmol/L, sodium 138 mmol/L, creatinine 175 μ mol/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.'

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.

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
 - PaO₂ < 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.



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)

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 15L/min oxygen. The patient is less dehydrated with HR 80bpm, BP 110/75 mmHg and CRT < 2 seconds. Urine output is 0.4mL/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.

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, PaCO₂ 4 kPa, HCO₃ 18 mmol/L, lactate 3 mmol/L, BE -4 mmol/L. Amylase is 4771 U/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, afebrile, 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.'

PRESCRIBE
(see Figs 8.3–8.5)

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

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

STOP

Initial oxygen prescription

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

Hospital/Ward: BFH SURGICAL Consultant: MR KING Weight: 85 kg Height: 1.6 m If re-written, date: DISCHARGE PRESCRIPTION Date completed:- Completed by:-		Name of Patient: JANE SMITH Hospital Number: J345789 D.O.B: 05/03/1972	
OTHER MEDICINE CHARTS IN USE		PREVIOUS ADVERSE REACTIONS This section must be completed before any medicine is given	
Date	Type of Chart	None known <input checked="" type="checkbox"/>	Completed by (sign & print) J. Meyer JOHN MEYER
		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 | 6. Vomiting/nausea |
| 2. Patient not present | 7. Time varied on doctor's instructions |
| 3. Medicines not available – CHECK ORDERED | 8. Once only/as required medicine given |
| 4. Asleep/drowsy | 9. Dose withheld on doctor's instructions |
| 5. Administration route not available – CHECK FOR ALTERNATIVE | 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

O X Y G E N	Start		Route		Prescriber – Sign + Print	Administered by	Stop	
	Date	Time	Mask (%)	Prongs (L/min)			Date	Time
	22/09/14	19.30	15L/min via NON- REBREATHING 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 →	22/ 09/ 14	23/ 09/ 14	24/ 09/ 14														
		Time →																	
Medicine (Approved Name) ESOMEPRAZOLE		6																	
Dose 40mg	Route IV	8		FD															
Notes over 10-30 mins	Start Date 22/09/14	12																	
Prescriber – sign + print John Meyer JOHN MEYER		14																	
		18																	
		22																	
Medicine (Approved Name) MORPHINE SULFATE		6	2	FD															
Dose 5mg	Route IV	8	6	FD															
Notes Titrate to response	Start Date 22/09/14	12	10	FD															
Prescriber – sign + print John Meyer JOHN MEYER		14		FD															
		18		FD															
		22		FD	FD														
Medicine (Approved Name) TED STOCKINGS		6																	
Dose One pair	Route TOP	8																	
Notes	Start Date 22/09/14	12																	
Prescriber – sign + print John Meyer JOHN MEYER		14																	
		18		FD	FD														
		22																	
Medicine (Approved Name) DALTEPARIN		6																	
Dose 5000 units	Route SC	8																	
Notes	Start Date 22/09/14	12																	
Prescriber – sign + print John Meyer JOHN MEYER		14																	
		18		FD	FD														
		22																	
Medicine (Approved Name) CYCLIZINE		6		FD															
Dose 50mg	Route IV	8																	
Notes	Start Date 22/09/14	12																	
Prescriber – sign + print John Meyer JOHN MEYER		14		FD															
		18																	
		22		FD	FD														
Medicine (Approved Name)		6																	
Dose	Route	8																	
Notes	Start Date	12																	
Prescriber – sign + print		14																	
		18																	
		22																	

Figure 8.4

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: *BFH SURGICAL*Consultant: *MR KING*Name of Patient: *JANE SMITH*Weight: *85 kg*Height: *1.6 m*Hospital Number: *J345789*D.O.B: *05/03/72*

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

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



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



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 110bpm, BP 110/90mmHg, 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 7mmol/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.

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 viscus

'The abdomen is generally distended but particularly centrally, and he has an appendectomy 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 $8 \times 10^9/L$, CRP 7 mg/L, sodium 138 mmol/L, potassium 4.1 mmol/L, urea 12 mmol/L, and creatinine 130 $\mu\text{mol/L}$ (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	$8 \times 10^9/L$	4–11 ($\times 10^9/L$)
Platelet	$300 \times 10^9/L$	150–400 ($\times 10^9/L$)
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 $\mu\text{mol/L}$	79–118 ($\mu\text{mol/L}$)

(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. Withhold 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 thromboprophylaxis 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 70bpm, 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 μ mol/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: <i>GDH SURGICAL</i>		Consultant: <i>MR SING</i>		Name of Patient: <i>JULIO SMITH</i>	
Weight: <i>70kg</i>		Height: <i>1.6 m</i>		Hospital Number: <i>J345333</i>	
If re-written, date:				D.O.B: <i>05/03/52</i>	
DISCHARGE PRESCRIPTION		Completed by:-			
Date completed:-					

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

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

ONCE-ONLY

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

O X Y G E N	Start		Route		Prescriber – Sign + Print	Administered by	Stop	
	Date	Time	Mask (%)	Prongs (L/min)			Date	Time

Figure 8.6

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

REGULAR THERAPY

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

Figure 8.7

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: <i>GPH SURGICAL</i> Consultant: <i>MR SING</i> Weight: <i>70 kg</i> Height: <i>1.6 m</i>	Name of Patient: <i>JULIO SMITH</i> Hospital Number: <i>J345333</i> D.O.B: <i>05/03/52</i>
--	---

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

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



Diabetic complications



Microvascular disease:

- Retinopathy
- Nephropathy
- Neuropathy.

Macrovascular disease:

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

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 110bpm, BP 120/70mmHg, 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

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 VRlll 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

VRlll 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 VRlll is required anyway preoperatively. (Note VRlll was previously called a sliding scale regimen).

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	$25 \times 10^9/L$	4–11 ($\times 10^9/L$)
Neutrophil	$18 \times 10^9/L$	2–7.5 ($\times 10^9/L$)
Lymphocyte	$4 \times 10^9/L$	1.4–4 ($\times 10^9/L$)
Platelet	$200 \times 10^9/L$	150–400 ($\times 10^9/L$)
Haemoglobin	135 g/L	Men: 135–177 (g/L) Women: 115–155 (g/L)

(Cont'd)

PRESCRIBE (see Figs 8.9–8.11)

Write on front of drug chart:

VRlll 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).

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 μ mol/L	79–118 (μ mol/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	\pm 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, PaCO₂ of 4.0 kPa, PaO₂ 12 kPa, HCO₃ 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 μ mol/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 VRlll, 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 VRlll, 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 VRlll preoperatively
- In this scenario, as the patient is septic with elevated blood sugar readings, a VRlll 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 VRlll 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 VRlll. 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 VRlll could be delayed. If they were on the morning list, they could fast from midnight, and could be started on a VRlll from the early morning (e.g. 06.00) of the day

PRESCRIPTION AND ADMINISTRATION RECORD

Standard Chart

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

OTHER MEDICINE CHARTS IN USE		PREVIOUS ADVERSE REACTIONS <small>This section must be completed before any medicine is given</small>		Completed by (sign & print)	Date
Date	Type of Chart	None known <input checked="" type="checkbox"/>		<i>J. Meyer</i> <i>JOHN MEYER</i>	<i>22/09/14</i>
		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 | 6. Vomiting/nausea |
| 2. Patient not present | 7. Time varied on doctor's instructions |
| 3. Medicines not available – CHECK ORDERED | 8. Once only/as required medicine given |
| 4. Asleep/drowsy | 9. Dose withheld on doctor's instructions |
| 5. Administration route not available – CHECK FOR ALTERNATIVE | 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	<i>J. Meyer</i> JOHN MEYER	09.30	JS
22/09/14	09.30	PIPERACILLIN/TAZOBACTAM (over 30 mins)	4.5 g	IV	<i>J. Meyer</i> JOHN MEYER	09.30	JS
22/09/14	09.30	FUSIDIC ACID	750 mg	ORAL	<i>J. Meyer</i> 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	<i>J. Meyer</i> 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 →	22/ 09/ 14	23/ 09/ 14															
		Time →																	
Medicine (Approved Name) PARACETAMOL		6		FD															
Dose 1g		8																	
Route ORAL		12		FD	FD														
Notes		14																	
Start Date 22/09/14		18		FD	FD														
Prescriber – sign + print John Meyer JOHN MEYER		22		FD	FD														
Medicine (Approved Name) TEICOPLANIN		6		FD															
Dose 400 mg		8																	
Route IV		12																	
Notes Loading dose: Day 1—400 mg bd thereafter 400 mg OD. For infected wound review in 48 h. Give over 30 mins		14																	
Start Date 22/09/14		18		FD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Prescriber – sign + print John Meyer JOHN MEYER		22																	
Medicine (Approved Name) PIPERACILLIN/TAZOBACTAM		6		FD															
Dose 4.5 g		8																	
Route IV		12																	
Notes For infected wound. Review at 48 h. Give over 30 mins		14		FD	FD														
Start Date 22/09/14		18																	
Prescriber – sign + print John Meyer JOHN MEYER		22		FD	FD														
Medicine (Approved Name) FUSIDIC ACID		6		FD															
Dose 750 mg		8																	
Route ORAL		12																	
Notes For infected wound review in 48 h		14		FD	FD														
Start Date 22/09/14		18																	
Prescriber – sign + print John Meyer JOHN MEYER		22		FD	FD														
Medicine (Approved Name) ENOXAPARIN		6																	
Dose 40 mg		8																	
Route SC		12																	
Notes		14																	
Start Date 22/09/14		18		FD	FD														
Prescriber – sign + print John Meyer JOHN MEYER		22																	
Medicine (Approved Name)		6																	
Dose		8																	
Route		12																	
Notes		14																	
Start Date		18																	
Prescriber – sign + print		22																	

Figure 8.10

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: *CGH SURGICAL*Consultant: *MR WOOD*Name of Patient: *ADAM SMITH*Weight: *70 kg*Height: *1.6 m*Hospital Number: *J345400*D.O.B: *5/3/1947*

Date/ Time	FLUID	VOLUME	RATE	PRESCRIBER – SIGN AND PRINT
	ADDED DRUGS	DOSE		
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 8L/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 110bpm, BP 110/90mmHg, 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.

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 serosanguineous 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.'

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 PaCO₂ and PaO₂ 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, PaCO₂ 4.9 kPa, PaO₂ 12 kPa, HCO₃ 23 mmol/L. Hb 93 g/L, WCC 8 × 10⁹/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)

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

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



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 esomeprazole
- **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 2L/min nasal cannula oxygen. There continue to be crackles at the base of the right lung, but air entry is fine. HR 70bpm, BP 120/75mmHg, CRT is 2 seconds and urine output 0.8mL/kg/h. Patient GCS is 15/15 with a blood sugar of 6mmol/L.'

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

PRESCRIBE (see Figs 8.12–8.15)

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

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

STOP

Previous oxygen prescription

Ibuprofen and esomeprazole (since gastric protection no longer required)

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 Weight: 75 kg Height: 1.6 m If re-written, date: DISCHARGE PRESCRIPTION Date completed:- Completed by:-		Name of Patient: JAKE SMITH Hospital Number: J345600 D.O.B: 5/3/1952			
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 <input checked="" type="checkbox"/>		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 | 6. Vomiting/nausea |
| 2. Patient not present | 7. Time varied on doctor's instructions |
| 3. Medicines not available – CHECK ORDERED | 8. Once only/as required medicine given |
| 4. Asleep/drowsy | 9. Dose withheld on doctor's instructions |
| 5. Administration route not available – CHECK FOR ALTERNATIVE | 10. Possible adverse reaction/side effect |

ONCE-ONLY

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

O X Y G E N	Start		Route		Prescriber – Sign + Print	Administered by	Stop	
	Date	Time	Mask (%)	Prongs (L/min)			Date	Time
	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 →	22/ 09/ 14	23/ 09/ 14	24/ 09/ 14										
		Time →													
Medicine (Approved Name) PARACETAMOL		6	FG	FG											
Dose 1g		8													
Route ORAL		12	FG	FG											
Notes		14													
Start Date 22/09/14		18	FG												
Prescriber – sign + print John Meyer JOHN MEYER		22	24	FG											
Medicine (Approved Name) ESOMEPRAZOLE		6													
Dose 20 mg		8	FG	FG											
Route ORAL		12													
Notes		14													
Start Date 22/09/14		18													
Prescriber – sign + print John Meyer JOHN MEYER		22													
Medicine (Approved Name) MORPHINE SULFATE PCA		6	FG	FG											
Dose		8													
Route IV		12													
Notes: See PCA chart		14													
Start Date 22/09/14		18													
Prescriber – sign + print John Meyer JOHN MEYER		22													
Medicine (Approved Name) IBUPROFEN		6													
Dose 400 mg		8	FG	FG											
Route ORAL		12													
Notes Daily U&Es whilst on ibuprofen		14	16	FG											
Start Date 22/09/14		18													
Prescriber – sign + print John Meyer JOHN MEYER		22	00	FG											
Medicine (Approved Name) ENOXAPARIN		6													
Dose 40 mg		8													
Route SC		12													
Notes Review 24/9/14 if still bleeding		14													
Start Date 22/09/14		18	FG	FG											
Prescriber – sign + print John Meyer JOHN MEYER		22													
Medicine (Approved Name) CYCLIZINE		6	FG	FG											
Dose 50 mg		8													
Route ORAL		12													
Notes		14	FG	FG											
Start Date 22/09/14		18													
Prescriber – sign + print John Meyer JOHN MEYER		22	FG												

No longer required as ibuprofen stopped
23/09/14 John Meyer JOHN MEYER

Stopped due to worsening renal function
23/09/14 John Meyer JOHN MEYER

Review

Figure 8.13

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

REGULAR THERAPY

PRESCRIPTION		Date → 22/ Time → 09/ 14	23/ 09/ 14															
Medicine (Approved Name) <i>TED STOCKINGS</i>		6 8 12 14 18 22																
Dose <i>1 pair</i>	Route <i>TOP</i>																	
Notes	Start Date <i>22/09/14</i>																	
Prescriber – sign + print <i>J. Meyer JOHN MEYER</i>																		
Medicine (Approved Name)		6 8 12 14 18 22																
Dose	Route																	
Notes	Start Date																	
Prescriber – sign + print																		
Medicine (Approved Name)		6 8 12 14 18 22																
Dose	Route																	
Notes	Start Date																	
Prescriber – sign + print																		
Medicine (Approved Name)		6 8 12 14 18 22																
Dose	Route																	
Notes	Start Date																	
Prescriber – sign + print																		
Medicine (Approved Name)		6 8 12 14 18 22																
Dose	Route																	
Notes	Start Date																	
Prescriber – sign + print																		

Figure 8.14

INTRAVENOUS FLUID PRESCRIPTION CHART

Hospital/Ward: REI SURGICAL **Consultant:** MR WALKER

Name of Patient: JAKE SMITH

Weight: 75 kg

Height: 1.6 m

Hospital Number: J345600

D.O.B: 5/3/1952

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

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