Ulster University

School of Nursing

Pre-Registration Nursing Education

BSc (Hons) Nursing
ADULT & MENTAL HEALTH FIELDS

RETURN TO PRACTICE NURSING
NUMERACY WORKBOOK

Introduction

This workbook is designed to update your knowledge and understanding in relation to the importance of numeracy in nursing. As a previous registrant you know the importance of the need to be competent in basic and more complex numeracy skills. This workbook is designed to give you some focus and practice in these skills during practice learning. It is set out in two main parts:

Part 1 – Basic Calculations and SI Units

Part 2 – Using numbers in Everyday Nursing Practice

All entries into this workbook must be verified by a registrant. You should aim to undertake the tasks in this workbook in practice so that a registrant can verify you can independently complete them.

Part 1 – Basic Calculations and SI Units

Basic Calculations

Without using a calculator work through the following:

Addition

(a) 47 + 53 = _____

(b) 241 + 21 + 137 = _____

(c) 145 + 573 + 37 = _____

(d) 49 + 388 + 133 = _____

(e) 613 + 13 + 252 = _____

Subtraction

(a) 17 – 13 = _____

(b) 47 – 33 = _____

(c) 246 – 137 = _____

(d) 2571 – 1684 = _____

(e) 3322 – 1782 = _____

Multiplication

(a) 8 x 8 = _____

(b) 6 x 3 = _____

(c) 15 x 6 = _____

(d) 115 x 25 = _____

(e) 245 x 100 = _____

Division

(a) 10 / 5 = _____

(b) 504 / 9 = _____

(c) 105 / 5 = _____

(d) 125 / 25 = _____

(e) 812 / 14 = _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

SI Units

The SI unit system was adopted by the UK health care system in the 1970s and is loosely based on the metric system which we are all familiar with.

Physical quantity	SI Unit	Symbol of SI Unit
Length	Metre	m
Mass	Kilogram	kg
Volume	Litre	l
Amount of substance	Mole	mol
Temperature	Celsius	°C

Equivalences	
1 kilogram (kg)	1000 grams (g)
1 gram (g)	1000 milligrams (mg)
1 milligram (mg)	1000 micrograms (ug) written in full = microgram
1 microgram (ug)	1000 nanograms (ng) written in full = nanogram
1 litre (l)	1000 millilitres (ml)
1 millilitre (ml)	1000 microlitres (nl) written in full - microlitres

- To change from **small** units to **larger** units, you need to divide by moving the decimal point the required number of places to the **left**

- To change from **larger** units to **smaller** units, you need to multiply by moving the decimal point the required number of places to the **right**

International Units (IU)

Some drugs are measured in units; some examples are insulin and heparin. The exact size or mass of a unit is unique to each drug, so a unit of insulin will be different than a unit of heparin.

Insulin

Insulin comes in measurements of U-100 strength. The U stands for the number of units per ml. So U-100 means that there are 100 units in each ml. When calculating and preparing a dose of insulin a specific syringe is required. The syringe is marked in units rather than mls to allow you to be exact in your measurement of the dose.

Other drugs
Other drugs measured in units include heparin, epinephrine and norepinephrine. These can be administered in ordinary syringes that are marked in mls, so you need to be careful to calculate the dose correctly.

Change the following from litres to millilitres or millilitres to litres:

(a) 1.5 litres = _____

(b) 2 litres = _____

(c) 250mL = _____

(d) 1452 mL = _____

(e) 3.56 litres = _____

Change the following to grams:

(a) 2mg = _____

(b) 1000mg = _____

(c) 2.5 kg = _____

(d) 5mg = _____

(e) 1000 micrograms = _____

1. James is prescribed 20 units of insulin U-100. Mark on the diagram how much you would draw up.

2. Susan is prescribed 50 units of insulin U-100. Mark on the diagram how much you would draw up. If you had to calculate the volume of this dose, how many mls would it be? *Please note you may not have to do this particular calculation as part of administration in practice, it is important you do understand the volumes involved.*

3. Tom is prescribed 35 units of insulin U-100. Mark on the diagram how much you would draw up.

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

4. Edward is prescribed 25 units of insulin U-100. Mark on the diagram how much you would draw up. If you had to calculate the volume of this dose, how many mls would it be? *Please note you may not have to do this particular calculation as part of administration in practice, it is important you do understand the volumes involved.*

5. A heparin drip is prescribed for Seamus. It consists of 25 000 units in 500mls of 0.45% normal saline. The heparin vials from which you have to obtain your dose contain 5 000 units per ml. How many mls of heparin would you add to the IV fluids? Mark on the diagram below.

6. Elizabeth is prescribed a bolus dose of 3 000 units of heparin. The heparin vial that is available contains 1 000 units/ml. How many mls would you administer? Mark on the diagram below.

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

Body weight calculations

Many drugs for children and some intravenous drugs for adults are prescribed in milligrams per kilogram of body weight. This means it is important to get an up-to-date body weight for the person you are preparing to administer such drugs for to avoid under or over dosing them. In general, the metric system should be used, but you will sometimes find yourself with a person's weight measured in stones and pounds. In this situation you need to be able to convert stones and pounds to the metric equivalent of kilograms.

1. Sarah weighs 60kilograms. She is prescribed a drug dose of 2mg per kg of body weight. How many mgs should she receive?

   _____

2. Tom weighs 25kgs. He is prescribed a drug dose of 5mg per kg of body weight. How many mgs should he receive?

   _____

3. Elizabeth weighs 9 stone and 2 pounds. She is prescribed a drug dose of 3 mgs per kg of body weight. How many mgs should she receive?

   _____

4. Sam weights 14 stones. He is prescribed a drug dose of 2mgs per kg of body weight.

   How many mgs should he receive? _____

   Sam is 5 feet 10 inches tall. Calculate his BMI. _____

5. Susan weights 55kgs. She is prescribed a drug dose of 2mgs per kg of body weight.

   How many mgs should she receive? _____

   The drug is supplied in a preparation of 2mgs in 0.5mls. What volume would be administered to her? _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

Body Mass Index

Calculate the BMI (use the formula in your notes) for the following people and place them in appropriate nutritional status category. Please note you will need to convert the units of measurement into the correct form first:

Mr Tom Smith

- Weight - 82kgs
- Height - 1.8m

BMI = _____

Mrs Rita McCullough

- Weight – 65kgs
- Height – 1.5m

BMI = _____

Ms Taylor Wright

- Weight – 55kgs
- Height – 1.6m

BMI = _____

Mr Seamus Grant

- Weight – 13 stones
- Height – 5 feet 11 inches

BMI = _____

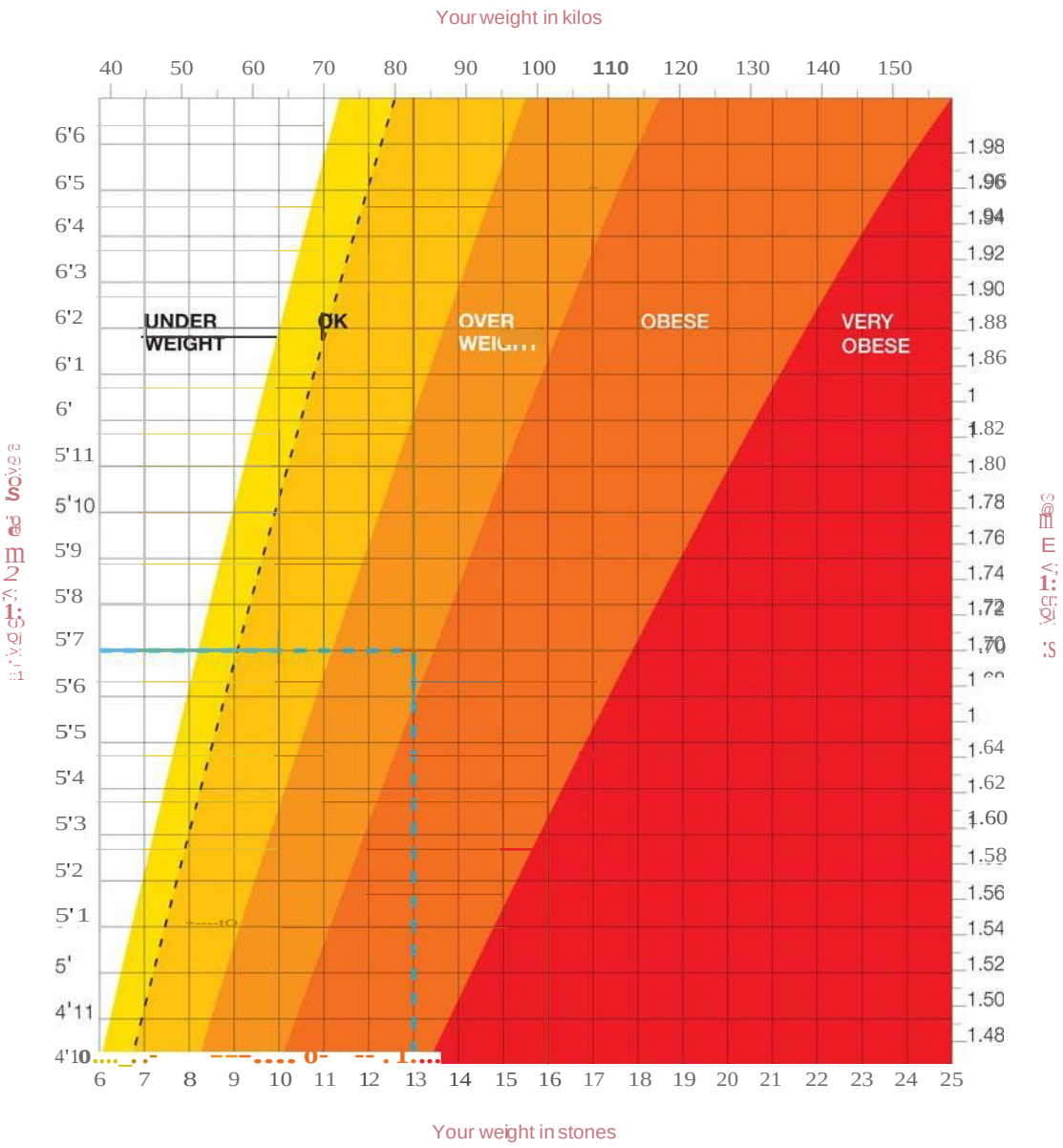
Mrs Mary McManus

- Weight – 12 stones
- Height – 5 feet 2 inches

BMI = _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	


Your weight in kilos
40 50 60 70 80 90 100 110 120 130 140 150
6'6 6'5 6'4 6'3 6'2 6'1 6' 5'11 5'10 5'9 5'8 5'7 5'6 5'5 5'4 5'3 5'2 5'1 5' 4'11 4'10
1.98 1.96 1.94 1.92 1.90 1.88 1.86 1 1.82 1.80 1.78 1.76 1.74 1.72 1.70 1 1.64 1.62 1.60 1.58 1.56 1.54 1.52 1.50 1.48
UNDER WEIGHT
OK
OVER WEIGHT
OBESE
VERY OBESE
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Your weight in stones

Part 2 – Using numbers in Everyday Nursing Practice

You will be using numbers every day in practice from observing and recording temperature, blood pressure, pulse and respirations to calculating body mass index and balancing a person's fluid intake and output.

Recording temperature, blood pressure, pulse and respirations

Using the information in the following case study, complete the physiological early warning score forms provided on the next page.

Mrs Harriett James is a sixty four year old lady admitted to the ward for elective surgery to remove her gall bladder. Preoperatively she was alert and her vital signs were:

- Temperature – 36.8
- Blood pressure – 120/66
- Pulse – 88bpm
- Respirations – 14rpm
- Oxygen saturation – 96% **NEWS** : _____

Her surgery was routine and successful and she was transferred to the recovery unit where she was responsive to voice and her observations were:

- Temperature – 35.6
- Blood pressure – 106/52
- Pulse – 105bpm
- Respirations – 10rpm
- Oxygen saturation – 92% **NEWS** : _____

On return to the ward, she begins to complain of severe pain in her upper right abdomen. Still alert, her vital signs are:

- Temperature – 36.8
- Blood pressure – 180/85
- Pulse – 112bpm
- Respirations – 18rpm
- Oxygen saturation – 90% **NEWS** : _____

After a couple of hours, she becomes noticeably pale. Her pain seems to have settled, however on recording her routine observations you notice that she seems sleepy, responsive only to the discomfort she feels when you check her wound dressing:

- Temperature – 36.2
- Blood pressure – 82/44
- Pulse – 130bpm
- Respirations – 12rpm
- Oxygen saturation – 88% **NEWS** : _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
The student has plotted the vital signs correctly on the NEWS chart				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

Using the information in the following care study, complete the early warning score forms provided on the next page:

Mr Eddie Doherty is a 72 year old man admitted to the medical ward from the emergency department complaining of shortness of breath. On admission to the ward he was alert and receiving oxygen therapy at 12 litres through nasal cannula. His vital signs were:

- Temperature - 37.6
- Blood pressure – 180/90
- Pulse – 105bpm
- Respirations – 28rpm
- Oxygen saturation – 96%

On review by the medical team, he is commenced on humidified oxygen at 40%. After 30 minutes, his vital signs are:

- Temperature - 38.6
- Blood pressure – 150/80
- Pulse – 108bpm
- Respirations – 18 per minute
- Oxygen saturation – 98%

A fan is placed by his bed and he settles and appears to fall asleep. You have difficulty wakening him an hour later when you approach to do your routine observations. You have to call his name loudly several times. He complains of chest pain when taking a deep breath. He says it is 8 out of 10 on a scale of 0-10, 10 being the worst pain he can imagine. Reassessment of his vital signs shows:

- Temperature - 38.9
- Blood pressure – 96/40
- Pulse – 125bpm
- Respirations – 28 per minute
- Oxygen saturation – 90%

What action would you take now?

1. _____
2. _____
3. _____
4. _____
5. _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
The student has plotted the vital signs correctly on the NEWS chart				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

Use addressograph-otherwise write in capitals

Surname: _____

First names: _____

Consultant: _____ Ward: _____

Hospital no: _____

DOB:

Check identity

NEWS Chart

NEWS KEY (0 1 2 3)		NAME:	D.O.B.	ADMISSION DATE:	
	DATE				DATE
	TIME				TIME
RESP. RATE	≥25		3		≥25
	21-24		2		21-24
	12-20				12-20
	9-11		1		9-11
	≤8		3		≤8
Sp0₂	≥96				≥96
	94-95		1		94-95
	92-93		2		92-93
	≤91		3		≤91
Inspired 0₂% or L/min.	%		2		%
TEMP.	≥39°		2		≥39°
	38°		1		38°
	37°				37°
	36°		1		36°
	≤35°		3		≤35°
NEW SCORE uses Systolic BP BLOOD PRESSURE	230		3		230
	220				220
	210				210
	200				200
	190				190
	180				180
	170				170
	160				160
	150				150
	140				140
	130				130
	120				120
	110		1		110
	100		2		100
	90		3		90
	80				80
	70				70
	60				60
	50				50
HEART RATE	>140		3		>140
	130				130
	120		2		120
	110				110
	100		1		100
	90				90
	80				80
	70				70
	60				60
	50		1		50
	40				40
	30		3		30
Level of Consciousness	Alert				Alert
	V / P / U		3		V / P / U
TOTAL NEW SCORE					TOTAL NEW SCORE
Escalation Plan Y / n/a					Escal. Plan
Time for Next Observations					Observations.
Additional Parameters					
	Pain Score				Pain Score
	Initials				Initials

Staff should use their clinical judgement and seek advice if they have concerns about the patient regardless of the score.

NEW Score	Frequency of Monitoring	Clinical Response
0	Minimum 12 hourly	• Continue routine NEWS monitoring with every set of observations
Total: 1-4	Minimum 4-6 hourly	• Registered nurse assesses the patient • If score 4 or concerned inform the nurse- in –charge. The nurse - in-charge decides if increased frequency of monitoring and/or escalation of clinical care is required
Total: 5 or 6 or 3 in one single parameter	Increased frequency to minimum of 1 hourly	• Inform nurse in charge. • Registered nurse to urgently inform medical team caring for the patient (within 15 mins) **From 7pm – 7 am through H@N coordinator.** • Urgent assessment by clinician (within 30 mins) • If clinician is FY1, must discuss with and request review if appropriate with next in line of seniority (FY2, SHO, Reg, within 30 mins) • Nurse will ensure patient is seen and assessed at intervals between the hourly monitoring • Verify BP and Pulse manually and record
Total: 7 or more	Continuous monitoring of vital signs and recorded on NEWS chart every 15 mins	• Registered nurse/nurse in charge will **immediately** (within 5 mins) inform the medical team caring for the patient – this should be at the least Registrar level, experienced Trust/Staff grade, ST3 or above. • Emergency assessment by Medical Team and if required by Anaesthetist (± ICU Team) if appropriate. • Consider transfer to critical care facility, ie ICU/HDU if appropriate. • Verify BP and Pulse manually and record

The Nurse in charge can contact relevant Consultant following discussion with junior medical staff if they continue to have clinical concerns.

ACTIONS				
DATE	TIME 24HR	NEWS SCORE	ACTION TAKEN	SIGNATURE

USE SBARS COMMUNICATION

Example Situation	Background	Assessment	Recommendation
I am……	Give Patient history	Recent patient observations - NEWS	Describe the actions you have taken
I am calling about……	Reason for admission	Recent blood results	State how quickly you need patient to be seen
The patient isin Ward……		Clinical signs - ABCDE	What else do you need to do
I am concerned about ……		I think the problem is	Confirm & record agreed action and when patient will be assessed?

Fluid Intake and Output Balance

Using the details from the following case studies, fill out and calculate the daily balance for each on the fluid balance chart provided.

Fluid Intake and Output Balance

Using the details from the following care studies, fill out and calculate the daily balance for each on the fluid balance chart provided. You will need to define the amount in mls used to record as a cup, or glass etc. check with your mentor to find out the standard measures used in practice where you are learning.

Reworded Case Study 1

Record Mr Smith's fluid intake and output on a fluid balance chart and evaluate it.

- Mr Smith has breakfast at 8am with a half glass of water with his medication.
- He has a cup of tea at 9am
- He passed 300mls urine at 09.30am
- At mid-day, he has a bowl of soup, a pot of ice cream and 2/3 of a glass of milk.
- He passes 200mls of urine at 1pm and another 100mls of urine at 2pm
- He takes another half glass of water at 3pm
- He passes 250mls of urine at 5pm
- At 6pm he has another cup of tea with his evening meal
- At 8pm he vomited 150mls of fluid
- He has also been on intravenous fluids all day (Normal Saline), at the rate of 125mls an hour. The first bag of fluid (1 litre) was started at 8am, and he continued on these until the second bag was started at 4pm.
- He had one Fortisip at 10pm before going to sleep
- As a result of his blood results that day, the medical staff prescribed another bag of IV fluids (normal Saline with 20mmols of Potassium added), which was commenced at 7am at the rate of 125mls an hour.
- He passes 150 mls of urine at 2am and another 350mls at 6am.

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

Case Study 2

Mrs Esther McKinney has just returned from theatre at 12 midday following gynaecological surgery. She has been fasting from midnight. She passed 300mls of urine prior to going to theatre. She has a urinary catheter insitu following surgery. Her abdominal wound is stapled and covered by a dry dressing. A wound drain has been inserted and is attached to a drainage bag.

Her operation notes show that during theatre she lost 1800 mls of blood. She received 5 units of packed red cells containing 200ml, 190ml, 205ml, 208ml, 195ml. She was infused with 500mls of fresh frozen plasma and 200mls of platelets. During surgery, which commenced at 09.00 she received 100mls per hour of Hartmann's solution. This is still in progress. Her urinary output during theatre totalled 200mls and is to be recorded hourly for the first 4 hours post-surgery.

Use the following fluid balance chart to record these details ready for you to continue to monitor her fluid balance for the remainder of the day on the ward.

- 10mgs of Morphine sulphate 1mg per ml is administered as prescribed at 12.30 following her complaints of severe pain.
- At 13:00 her urinary output is 75mls
- At 14.00 you notice that 200mls of blood stained fluid has collected from her wound drain, there is 60mls of urine in her catheter drainage system.
- At 15.00 her blood pressure falls and she is prescribed 500mls of Volplex over 30 minutes. Her urinary output is 40mls. There doesn't appear to be any more drainage from her would drain.
- At 16.00 her urinary output is 50mls. There is 100mls of blood stained fluid in her wound drain.
- She receives 100ml of metronidazole (an antibiotic) in a IV infusion as prescribed at 18.00.
- At 19.00 the doctor prescribes 500ml of IV fluids (0.9% NaCl) at 75mls per hour.
- At 20.00 her urinary output is 230mls. She complains of feeling nauseous and vomits 100mls of bilious fluid. She is prescribed an antiemetic (anti sickness and nausea drug) with good effect.
- At 22.00 her urinary output is 150mls and there is 75mls of draining in the wound drainage bag.
- Her pain relief is effective as prescribed and she settles comfortably. At 02.00 her urinary output is 200mls and there is 40mls of drainage from her wound.
- At 06.00 she wakens and is able to tolerate 100 mls of water orally. Her urinary output is 150mls and there is no new drainage from her wound.

Calculate the total fluid intake, output and balance for this 24 hour period and record on the chart on the next page.

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

Daily Fluid Balance & Prescription Chart

Special Instructions:

For Hourly, Cumulative fluid recording today — Yes ☐

Hospital _____

Ward _____

Date _____

Use addressograph-otherwise write in capitals

Surname: _____

First names: _____

Consultant: _____ Ward _____

Hospital no: _____ DOB: _____

Health and Care no: _____

Check identity

Adult

From their 16th birthday

FLUID INPUT (ml)

	ORAL FLUID				INTRAVENOUS FLUID & MEDICINES* *Include volume of infused medicines									
	ORAL		ENTERAL		Site		Site		Site		Site			
	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Hourly Amount in	Grand Total in
08.00														
09.00														
10.00														
11.00														
12.00														
13.00														
14.00														
15.00														
16.00														
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23.00														
24.00														
01.00														
02.00														
03.00														
04.00														
05.00														
06.00														
07.00														

FLUID OUTPUT (ml)

URINE		BOWEL		GASTRIC							
Amount	Total	Amount	Total	Amount	Total	Amount	Total	Amount	Total	Hourly Amount out	Grand Total out

Comment		Initials
Overall Balance		

LPC 12/12/014

INTAKE	Day	Night	Total
Oral			
Enteral			
Intravenous**			
Grand Total IN			

** Include daily cannulae flush volumes

—

OUTPUT	Day	Night	Total
Urine			
Bowel			
Gastric			
Other			
Grand Total OUT			

=

24 hour Fluid Balance (ml)

Balance

ADULT

Use addressograph-otherwise write in capitals

Surname: _____

First names: _____

Consultant: _____ Ward _____

Hospital no: _____ DOB: _____

Health and Care no: _____

Check identity

Recent Weight _____ kg

Estimated ☐

Weighed ☐ __/__/__

Yesterday's Date	Grand total in	Grand total out	Balance

Solution	Composition of common intravenous solutions (mmol/L)				
	[Na^+]	[Cl^-]	[Glucose]	[Lactate]	[K^+]
5% Dextrose	0	0	278	-	-
0.45% Sodium Chloride	77	77	0	-	-
0.45% Sodium Chloride + 5% Glucose (Dextrose)	77	77	278	-	-
0.9% Sodium Chloride	154	154	0	-	-
Hartmann's solution - Compound Sodium Lactate	131	111	0	29	5
Plasma substitutes: gelatins, etherified starches	140 - 154	118 - 154	0	0 - 30	0 - 5
Plasma	135 - 145	95 - 108	3.5 - 7.0	0.4 - 2.2	3.5 - 5.0

FLUID PRESCRIPTION ADVICE FOR ADULTS

Fluid therapy should involve the consideration of:-

- Fluid bolus for hypovolaemic shock
- Correction of any obvious fluid deficit
- Maintenance requirements (which varies with clinical state)
- Ongoing losses (e.g. vomiting, drainage, insensible, diarrhoea)
- Whenever possible, the oral or enteral route should be used for giving fluids.
- **Monitor** - include clinical assessments & glucose and U&E at least 24 hourly.
- Daily insensible loss = 500 - 800 ml.

Types of Fluid

Sodium chloride 0.9% provides the most important extracellular ions. It is indicated when a fluid bolus is needed for shock and in sodium depletion. The administration of large volumes may give rise to sodium accumulation, oedema, and hyperchloraemic acidosis. Compound sodium lactate (Hartmann's solution) can be used instead of isotonic sodium chloride solution during or after surgery, or in the initial management of the injured or wounded; it may reduce the risk of hyperchloraemic acidosis. 5% glucose (dextrose) is an important source of free water for maintenance, but should be used with caution as excessive amounts may cause dangerous hyponatraemia, especially in the elderly.

Maintenance IV fluids replace the normal fluid content of oral food intake, insensible & urinary output and are prescribed to provide optimal hydration in patients unable to fully use the oral or enteral route. Maintenance fluids should take into account the volume of fluid to deliver IV medications (antibiotics, analgesics). The total (oral, IV drugs and prescribed fluids) volume prescribed in healthy adults (without excess fluid losses) should be of the order of 30 ml/kg/day up to a maximum of 2L fluid (females) and 2.5L (males). Patients with persistent oliguria, acute kidney injury, chronic kidney disease, obesity and cardiac or liver failure may have lower daily maintenance fluid requirements and require careful and regular assessment to avoid fluid overload. In these patient groups formulae-based equations should be used with caution to avoid prescription of excess fluid volumes. Patients with symptoms and signs of fluid overload (cumulatively positive fluid balance, increasing body weight, oedema) may need restriction of the total volume of fluids prescribed.

Sodium requirement - 1 to 2 mmol/kg/day, so it is rarely necessary to give more than 1 litre of sodium chloride 0.9% or Hartmann's solution per day for maintenance IV fluids. Antibiotic and analgesic infusions may already provide some of this.
Potassium requirement - 1 mmol/kg/day, adjusted according to the serum potassium.
Phosphate, Magnesium - monitor & correct.

Ongoing losses - prescribed fluid should reflect the electrolyte composition of the fluid being lost.
Gastric losses - replace volume for volume with sodium chloride 0.9% with added potassium as required.
Lower Gastrointestinal losses - replace with Hartmann's solution or, if extra potassium is needed, sodium chloride 0.9% with added potassium.

Senior input should always be sought e.g. complex ongoing fluid losses or when the balance between fluid overload and deficit is unclear and especially when patients have diminished organ reserves.

mls	hrs	ml/hr
500	4	125
500	6	83
1000	4	250
1000	6	167
1000	8	125
1000	12	83
1000	24	42
2000	24	83

Indications - all that apply: Fluid Bolus, Maintenance, Deficit, On-going losses, Drug Prescription

* Medicines must be recorded in Drug Kardex

** Model name, Serial number.

	Date	Time	Volume	Infusion Fluid/Type	Additives *	Rate ml/hour Range	Prescriber's Signature	Administered By	Checked By	Batch/Lot No. & Expiry Date	Pump Details **	Start Time	Finish Time	Volume given
				A										
				B										
				C										
				D										
				E										
				F										
				G										
				H										
				I										
				J										
				K										
				L										
				M										
				N										
				O										
				P										

Daily Fluid Balance & Prescription Chart

Special Instructions:

For Hourly, Cumulative fluid recording today Yes ☐

Hospital _____

Ward _____

Date _____

Use addressograph-otherwise write in capitals

Surname: _____

First names: _____

Consultant: _____ Ward _____

Hospital no: _____ DOB: _____

Health and Care no: _____

Check identity

Adult

From their 16th birthday

FLUID INPUT (ml)

	ORAL FLUID				INTRAVENOUS FLUID & MEDICINES* *Include volume of infused medicines									
	ORAL		ENTERAL		Site		Site		Site		Site			
	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Hourly Amount in	Grand Total in
08.00														
09.00														
10.00														
11.00														
12.00														
13.00														
14.00														
15.00														
16.00														
17.00														
18.00														
19.00														
20.00														
21.00														
22.00														
23.00														
24.00														
01.00														
02.00														
03.00														
04.00														
05.00														
06.00														
07.00														

FLUID OUTPUT (ml)

URINE		BOWEL		GASTRIC							
Amount	Total	Amount	Total	Amount	Total	Amount	Total	Amount	Total	Hourly Amount out	Grand Total out

Comment		Initials
Overall Balance		

LPC 12/12/014

INTAKE	Day	Night	Total
Oral			
Enteral			
Intravenous**			
Grand Total IN			

—

OUTPUT	Day	Night	Total
Urine			
Bowel			
Gastric			
Other			
Grand Total OUT			

=

24 hour Fluid Balance (ml)

Balance

** Include daily cannulae flush volumes

ADULT

Use addressograph-otherwise write in capitals

Surname: _____

First names: _____

Consultant: _____ Ward _____

Hospital no: _____ DOB: _____

Health and Care no: _____

Check identity

Recent Weight _____ kg

Estimated ☐

Weighed ☐ __/__/__

Yesterday's Date	Grand total in	Grand total out	Balance

Solution	Composition of common intravenous solutions (mmol/L)				
	[Na^+]	[Cl^-]	[Glucose]	[Lactate]	[K^+]
5% Dextrose	0	0	278	-	-
0.45% Sodium Chloride	77	77	0	-	-
0.45% Sodium Chloride + 5% Glucose (Dextrose)	77	77	278	-	-
0.9% Sodium Chloride	154	154	0	-	-
Hartmann's solution - Compound Sodium Lactate	131	111	0	29	5
Plasma substitutes: gelatins, etherified starches	140 - 154	118 - 154	0	0 - 30	0 - 5
Plasma	135 - 145	95 - 108	3.5 - 7.0	0.4 - 2.2	3.5 - 5.0

FLUID PRESCRIPTION ADVICE FOR ADULTS

Fluid therapy should involve the consideration of:-

- Fluid bolus for hypovolaemic shock
- Correction of any obvious fluid deficit
- Maintenance requirements (which varies with clinical state)
- Ongoing losses (e.g. vomiting, drainage, insensible, diarrhoea)
- Whenever possible, the oral or enteral route should be used for giving fluids.
- **Monitor** - include clinical assessments & glucose and U&E at least 24 hourly.
- Daily insensible loss = 500 - 800 ml.

Types of Fluid

Sodium chloride 0.9% provides the most important extracellular ions. It is indicated when a fluid bolus is needed for shock and in sodium depletion. The administration of large volumes may give rise to sodium accumulation, oedema, and hyperchloraemic acidosis. Compound sodium lactate (Hartmann's solution) can be used instead of isotonic sodium chloride solution during or after surgery, or in the initial management of the injured or wounded; it may reduce the risk of hyperchloraemic acidosis. 5% glucose (dextrose) is an important source of free water for maintenance, but should be used with caution as excessive amounts may cause dangerous hyponatraemia, especially in the elderly.

Maintenance IV fluids replace the normal fluid content of oral food intake, insensible & urinary output and are prescribed to provide optimal hydration in patients unable to fully use the oral or enteral route. Maintenance fluids should take into account the volume of fluid to deliver IV medications (antibiotics, analgesics). The total (oral, IV drugs and prescribed fluids) volume prescribed in healthy adults (without excess fluid losses) should be of the order of 30 ml/kg/day up to a maximum of 2L fluid (females) and 2.5L (males). Patients with persistent oliguria, acute kidney injury, chronic kidney disease, obesity and cardiac or liver failure may have lower daily maintenance fluid requirements and require careful and regular assessment to avoid fluid overload. In these patient groups formulae-based equations should be used with caution to avoid prescription of excess fluid volumes. Patients with symptoms and signs of fluid overload (cumulatively positive fluid balance, increasing body weight, oedema) may need restriction of the total volume of fluids prescribed.

Sodium requirement - 1 to 2 mmol/kg/day, so it is rarely necessary to give more than 1 litre of sodium chloride 0.9% or Hartmann's solution per day for maintenance IV fluids. Antibiotic and analgesic infusions may already provide some of this.
Potassium requirement - 1 mmol/kg/day, adjusted according to the serum potassium.
Phosphate, Magnesium - monitor & correct.

Ongoing losses - prescribed fluid should reflect the electrolyte composition of the fluid being lost.
Gastric losses - replace volume for volume with sodium chloride 0.9% with added potassium as required.
Lower Gastrointestinal losses - replace with Hartmann's solution or, if extra potassium is needed, sodium chloride 0.9% with added potassium.

Senior input should always be sought e.g. complex ongoing fluid losses or when the balance between fluid overload and deficit is unclear and especially when patients have diminished organ reserves.

mls	hrs	ml/hr
500	4	125
500	6	83
1000	4	250
1000	6	167
1000	8	125
1000	12	83
1000	24	42
2000	24	83

Indications - all that apply: Fluid Bolus, Maintenance, Deficit, On-going losses, Drug Prescription

* Medicines must be recorded in Drug Kardex

** Model name, Serial number.

	Date	Time	Volume	Infusion Fluid/Type	Additives *	Rate ml/hour Range	Prescriber's Signature	Administered By	Checked By	Batch/Lot No. & Expiry Date	Pump Details **	Start Time	Finish Time	Volume given
				A										
				B										
				C										
				D										
				E										
				F										
				G										
				H										
				I										
				J										
				K										
				L										
				M										
				N										
				O										
				P										

There are other ways in which numbers are used to contribute to the assessment of a person's needs. Many assessment tools are based on numerical data that generates a score that can be used to judge risk or need. Some examples include pressure area risk assessment, fall risk assessment, moving and handling assessments, nutritional assessment, deep vein thrombosis risk assessments.

During your periods of practice learning, complete these assessment tools using those specific to the ward you are working on and insert them here into this workbook.

Ensure these are signed by a registrant to verify their authenticity.

Name of Tool	Date Completed Correctly	Registrant's Verification Signature

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

One of the most important ways in which you will have to use your calculation skills in your practice is when you are preparing and administering medicines. You have been introduced to the basic theory behind drug calculations year 1. This will be built on as you progress into year 2, but as you will be involved with administering medication to people during your practice learning, it is important that you are competent in calculating the correct volumes and dosages. The important information that you need for getting to grips with dose calculations are:

- The type of formulations containing the drug – eg tablets, capsules or suspensions (volumes of fluid)
- The amount of the drug contained in each tablet, capsule or volume of fluid etc
- The prescribed amount required for the dose to be given to the person

Work out the answers to the following scenarios and record your answer in the space provided:

Tablets, Capsules and Liquid medication

1 Mr McKenna is prescribed 1g of paracetamol orally. Paracetamol 500mg tablets are available on the medicine trolley. How many tablets should be given to the person?

Answer: _____

2 Co-amoxiclan (an antibiotic) is available in a liquid form of 625mg in 5mls. How many mls would you give if a person was prescribed 625mg?

Answer: _____

3 Mrs James is prescribed Prednisolone 40mgs daily. Each tablet contains 5mgs. How many tablets does she need to take to meet the prescribed dose?

Answer: _____

4 Sonya Rainey has been prescribed one litre of intravenous fluids to run over 12 hours. How many mls per hour does the pump need to be set to deliver to meet this?

Answer: _____

5 Robert Galbraith is prescribed 20mgs of Cipramil oral drops. These drops come as a preparation of 40mgs per 1ml. How much would you give to him?

Answer: _____

6 Diclofenac Sodium 50mgs (an analgesic) is prescribed ‘prn’ (this means as the person requires it for pain relief). The guidance leaflet and BNF state that person should have no more that 150mgs in 24 hours. What time interval should pass between doses to make sure that the person does not get too much of the medication?

Answer: _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	

7 Ms Shirley Williams is prescribed amoxicillin 500mgs. A liquid suspension is available containing 250mgs in 5mls. What volume would you administer?

Answer: _____

8 Furosemide oral solution is available as 20mgs in 5mls. Sanjeev Patel is prescribed 60mgs once a day. How much will you give him?

Answer: _____

9 One litre of intravenous fluids is prescribed to run over 8 hours. How many mls per hour should the person receive?

Answer: _____

10 A person you are caring for has been prescribed 2g of an antibiotic. The tablets available contain 500mgs. How many tablets do you administer?

Answer: _____

Injections

1. You have to prepare an injection of pethidine for Mrs Smith. The pethidine injection solution contains 100mg in a 2ml vial. Mrs Smith is prescribed 75mg. How much do you draw up?

   Answer: _____

2. A doctor orders heparin 9,000 iu to be given subcutaneously twice daily to one of the people in your care. The ward stock only consists of 10,000 iu per ml. How many ml of heparin would you give?

   Answer: _____

3. Mrs Black requires 80mg of cortisone. The stock ampoule is 100mg in 5ml. How much volume is required?

   Answer: _____

4. You have a vial of gentamycin for injection containing 80mg in 2ml. How much do you need to administer 240mg?

   Answer: _____

5. Mr McFarland is prescribed 20mg of haloperidol by intramuscular injection and 50mg in 1ml of liquid for injection is available. How many mls will you administer?

   Answer: _____

Registrant Verification

Registrant, please verify that					
The student has undertaken these calculations independently				Yes ☐	No ☐
I (Registrant) have checked the answers and confirm they are correct				Yes ☐	No ☐
Registrant Name (Print)		Registrant Signature		Date	