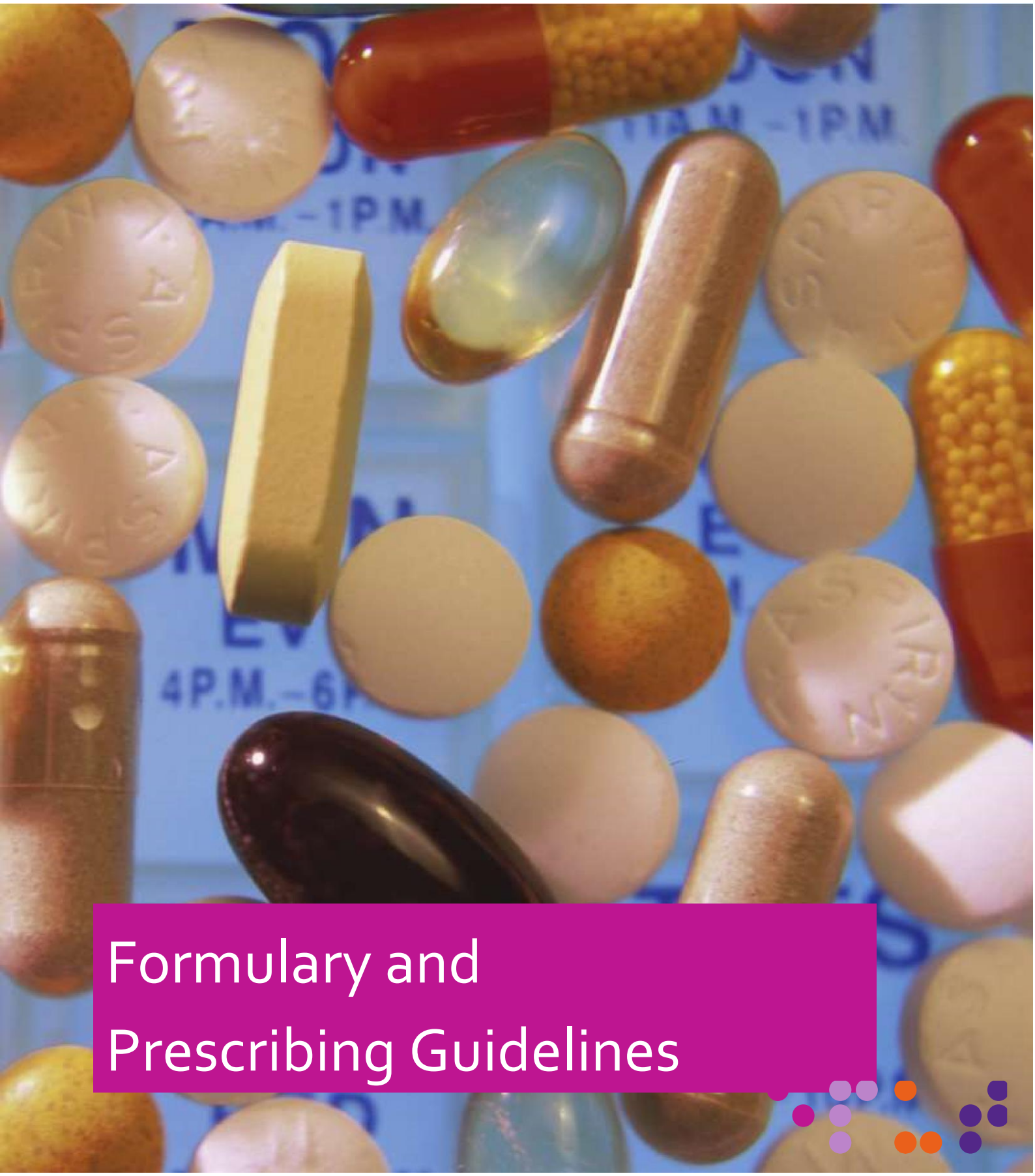
Essex Partnership University
NHS Foundation Trust

SECTION 19: TREATMENT OF HYPOGLYCAEMIA, HYPERGLYCAEMIA AND INSULIN SUBSTITUTION



Formulary and Prescribing Guidelines

19.1 Treatment of Hypoglycaemia in adults with blood glucose less than 4mmol/L[1,2,3]

Hypoglycaemia is defined as blood glucose of less than 4 mmol/L (if symptomatic but blood glucose is above 4mmol/L then give a small carbohydrate snack for symptom relief). If hypoglycaemia is suspected, check glucose levels before proceeding with treatment. **Patients with hypoglycaemia should not be left alone until blood glucose reading is above 4mmol/L**

MILD	MODERATE	SEVERE
Patient conscious, orientated and able to swallow	**Patient conscious but confused / disorientated or aggressive and able to swallow**	**Patient unconscious, fitting, or very aggressive or nil-by-mouth (NBM)**
Check ABCDE	Check ABCDE	Check ABCDE
Give 15-20g of quick acting carbohydrate - 4-5 x GlucoTabs (4g glucose per tablet) - 1 bottle of Glucojuice 1.5- 2 x Glucogel tubes (10g glucose per tube)	If capable and cooperative, treat as for mild.	Call for emergency medical assistance
Test blood glucose level after 10-15 minutes. If still less than 4mmol/L, repeat up to 3 times. If still no improvement after 45 minutes or 3 cycles of treatment, call doctor and consider 1mg IM Glucagon injection	If not capable and cooperative but able to swallow, give 1.5-2 tubes of Glucogel (or place inside cheeks and rub cheeks from outside mouth) Test blood glucose after 10-15 minutes. If still less than 4mmol/L, repeat above up to 3 times or if ineffective call doctor and use 1mg IM Glucagon injection	Give 1mg IM Glucagon * Recheck glucose after 10 minutes and if still less than 4.0mmol/L, repeat treatment as above
Blood glucose level should now be above 4mmol/L. Give 20g of long acting carbohydrate e.g. 2 biscuits or a slice of bread or next meal if due. If IM glucagon has been used, give 40g of long acting carbohydrate in order to replenish glycogen stores. **For patients with enteral feeding tube give 20g quick acting carbohydrate via enteral tube e.g. 50-70mL Ensure Plus juice or Fortijuce.**		Recheck glucose level after 10-15 minutes, it should now be above 4mmol/L. Follow up treatment as described on the left.

Do not omit subsequent doses of insulin. Continue regular capillary blood glucose monitoring for another 24- 48 hours and give hypoglycaemia[2] education or refer to specialist to review insulin and/or oral hypoglycaemic doses.

Airways **B**reathing **C**irculation **D**isability **E**xposure

*Glucagon may take up to 15 minutes to work and may be ineffective in treating hypoglycaemia in undernourished patients, in severe liver disease, sulfonylurea induced hypoglycaemia and in repeated hypoglycaemia.

A prescription is not required in order to administer glucagon in an emergency (Glucagon is subject to Schedule 19 regulation 238 of the Human Medicines Regulations 2012 (amended 2016)[4]. However it is good practice for a prescription to be written in advance should the need arise.

When administering oral glucose, give one preparation only e.g. Glucotabs or Glucojuice, not both.

If patients choose to use Lucozade® as their quick acting carbohydrate, ensure an adequate amount is consumed. From April 2017, the glucose content reduced from 17g in 100ml to 8.9g in 100ml. Therefore 15g of carbohydrate requires 170ml of Lucozade®[5].

For further guidance on the management of hypoglycaemia, please see CG27 Drug allergy and medical emergency clinical guideline.

19.2 Signs and symptoms of hypoglycaemia[3]

- Trembling
- Palpitations
- Sweating
- Anxiety
- Tingling
- Nausea
- Difficulty concentrating
- Confusion
- Weakness, tiredness
- Drowsiness, dizziness
- Vision changes
- Difficulty speaking

19.3 Treatment of Hyperglycaemia in adults with blood glucose more than 12mmol/L[6]

Patients should be prescribed a corrective dose of RAPID Acting insulin (Trurapi) on the PRN section of the drug chart, up to every 4 hours if needed, "As per Trurapi protocol" based on the table below. Doses should be calculated based on TOTAL DAILY DOSE of insulin. If insulin dose is unknown or they are not prescribed insulin, use patient's weight.

For frail patients consider using "LESS than 50 units of insulin a day" column

Blood glucose (mmol/L)	Patient is on LESS than 50 units of insulin a day (or weight less than 50kg)*	Patient is on 50-100 units of insulin a day (or weight is 50-100kg)*	Patient is on OVER 100 units of insulin a day (or weight is over 100kg)*
12-14.9	1 unit	1 unit	2 units
15.0-16.9	2 units	2 units	3 units
17.0-18.9	2 units	3 units	4 units
19.0-20.9	3 units	3 units	5 units
21.0-22.9	3 units	4 units	6 units
23.0-24.9	4 units	5 units	7 units
25.0-26.9	4 units	5 units	8 units
27.0 and above	5 units	6 units	9 units

If blood glucose 13mmol/l or above, check for ketones.

If blood ketones = 1.6mmol/l or more OR urine ketones ++/+++

Seek medical attention immediately!

Keep client hydrated **Encourage at least 100mls of sugar free fluids per hour.**

When might you not give a correction dose? (if unsure, always seek advice)

-If high blood glucose reading is taken within 2 hours after food

-Insulin has been given in the last 4 hours

Considerations-If the patient is regularly needing correction doses, seek advice from diabetes team. Basal insulin may be needed.

19.4 Signs and symptoms of hyperglycaemia[7]

When blood sugar levels are slightly elevated than normal, patients will not usually exhibit any symptoms. As blood sugar levels rise, symptoms may include:

- Passing more urine than normal, especially at night
- Being very thirsty
- Tiredness and lethargy
- Thrush or other recurring bladder and skin infections
- Headaches
- Blurred vision
- Weight loss
- Feeling sick.

Note symptoms of DKA – nausea, vomiting, acetone “Peardrop” smell breath) Kussmaul breathing (rapid deep breaths)- if your patient is exhibiting this encourage fluids, check blood sugar and blood ketones, call 999 and inform the doctor

DKA can be fatal and needs medical treatment - IV insulin and fluids

19.5 Insulin Substitution policy

This part of the guideline is to be used for the following situations:

- When a patient's usual insulin is unavailable, to prescribe a safe alternative for the doses needed until their usual insulin can be supplied.
- Calculating Insulin initiation doses for patients if not- able to confirm out of hours.

(Duration times approximate)

Patient's usual Insulin			Substitute Insulin
Quick Acting (QA) Insulins:			
Trurapi / Novorapid **Humalog** **Apidra**	Onset time 10-15 mins	Duration 4 hours	<u>Quick acting substitute insulin</u> **Trurapi** Reduce usual dose by 20%
Fiasp **Lyumjev**	Onset time 5 minutes		
Mealtime insulins – give prior to meal according to onset time			
Short Acting Insulins:			
Actrapid **Humulin S** **Insuman Rapid**	Onset time 30 minutes	Duration of all Up to 8 hours	**Substitute Insulin** **Trurapi** Reduce usual dose by 20%
Mealtime insulins – give prior to meal according to onset time			

Long Acting Insulins (Background Insulin- BI):

Lantus

Semglee

Abasaglar

Levemir

Toujeo

Onset time of all

1.5- 2 .0 hours

Duration

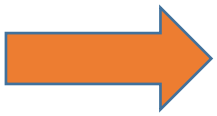
Up to

24 hours

Tresiba

Duration up to 42 hours

These are back ground insulins so not meal time dependant



Substitute Insulin

Semglee

Reduce usual dose by 20%

Intermediate –acting Insulins

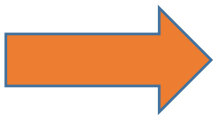
Humulin I

Insulatard

Onset time 1.5-2.0 hours

Duration

18-22 hours



Substitute Insulin

Humulin I

Reduce usual dose by 20%

Biphasic /Mixed Insulins

Novomix 30

Humalog Mix 25

Humalog Mix 50

Onset time

10-15 minutes

Duration

Up to 24 hours

Humulin M3

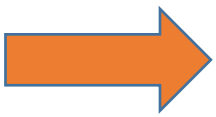
Insuman Comb 50

Onset time

Up to 30 minutes

Duration 14-24 hours

Duration 12-16 hours



Substitute Insulin

Humulin M3

Reduce usual dose by 20%

19.5.1 Animal to Human Insulin Substitution

In the unlikely event that a patient is taking animal insulin, use human insulin equivalent but reduced by 30%

e.g.

Hypurin porcine 30/70 Mix → Humalog Mix 25 and reduce dose by 30%

Hypurin porcine neutral → Trurapi and reduce by 30%

Hypurin porcine isophane → Humulin I and reduce by 30%

19.5.1 Calculating Insulin doses if these are unknown

Total daily dose of Insulin = Weight of client x 0.25
e.g. 80kg client would be 80kg x 0.25 = 20 units (total in a day)

- **For patients on Basal-Bolus insulin regime (Basal insulin and Quick Acting insulin with meals)**

These patients require half their total daily dose of insulin to be the background insulin and half their total daily dose to be quick acting insulin to be administered with meals.

The background insulin can be administered once a day if Semglee/Lantus/ Toujeo/ Tresiba etc or twice a day if Levemir (note if levemir half of the daily background insulin dose should be given at bedtime and half of the daily background insulin dose should be given with breakfast).

TDD = Half TDD is the BI + Half TDD is the QA for meals
Background insulin split = 1/2 overnight bedtime dose + 1/2 daytime breakfast time dose
Quick acting mealtime dose = Quick acting total ÷ by 3 for each of 3 meals to be administered 15 minutes before the meals (i.e. a 1/3 for each meal)

Worked example for our 80kg patient= ~20 units TDD of insulin. 10 units of background insulin and 10 units of total quick acting insulin, which would be split into 3 units with each meal.

- **For patients on mixed insulin**

Total daily dose of mixed insulin = weight of client X 0.25
Dose split = 1/3 mixed insulin with evening meal
2/3 mixed insulin with breakfast

Worked example for our 80kg patient= ~20 units of total daily dose of insulin. 12 units of mixed insulin with breakfast and 6 units of mixed insulin with evening meal.

- **For patients on background Insulin**

Total daily dose of background insulin = weight of client x 0.25
Worked example for our 80kg patient= 20 units of background insulin

Table to illustrate worked example based on weight:

Weight of client (kg)	**Total daily dose of insulin required (units)**	**Insulin regimen**				
		Basal Bolus		Mixed insulin		Background insulin
		Background insulin	Quick-acting insulin	Breakfast dose	Dinner dose	
50	13	7 units daily	2 units with each meal	8 units	4 units	13 units daily
60	15	8 units daily	2 units with each meal	10 units	5 units	15 units daily
70	18	9 units daily	3 units with each meal	12 units	6 units	18 units daily
80	20	10 units daily	3 units with each meal	13 units	7 units	20 units daily
90	23	11 units daily	4 units with each meal	15 units	8 units	23 units daily
100	25	13 units daily	4 units with each meal	16 units	8 units	25 units daily

Reminder: Capillary blood glucose monitoring should be carried out before each meal and before bedtime for patients on insulin.

References

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