Joint Trust Guideline for 72 hour fast for Investigation of Spontaneous Hypoglycaemia

Document Control:

For Use In:	Endocrinology Wards & Clinical Investigation Unit		
Search Keywords	72 hour fast, hypoglycaemia, blood glucose meter, lab glucose, insulin, c-peptide		
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Document Owner:	Endocrinology		
Approved By:	Clinical Guidelines Assessment Panel (CGAP)		
Ratified By:	Clinical Standards Group and Effectiveness Sub-Board		
Approval Date:	NNUH: 30th August 2023 QEHKL: 16th October 2023 JPUH: 2nd November 2023	**Date to be reviewed by:** This document remains current after this date but will be under review	30th August 2026
Implementation Date:	2nd November 2023		
Reference Number:	1460		

Version History:

Version	Date	Author	Reason/Change
V3	June 2023	Endocrine Specialist Nurse	To improve the diagrams/ document transferred to new Trust Procedural document template

Previous Titles for this Document:

Previous Title/Amalgamated Titles	Date Revised
72 Hour Fast for Investigation of Spontaneous Hypoglycaemia in Adults	Not applicable

Distribution Control

Printed copies of this document should be considered out of date. The most up to date version is available from the Trust Intranet.

Consultation

The following were consulted during the development of this document:

- Endocrine Specialist Nurses
- Consultant Endocrinologists
- Clinical Biochemists
- Clinical Governance Meeting of the Directorate of Endocrinology

Monitoring and Review of Procedural Document

The document owner is responsible for monitoring and reviewing the effectiveness of this Procedural Document. This review is continuous however as a minimum will be achieved at the point this procedural document requires a review e.g. changes in legislation, findings from incidents or document expiry.

Relationship of this document to other procedural documents

This document is a clinical guideline applicable to Norfolk and Norwich University Hospitals NHS Foundation Trust: James Paget University Hospital NHS Trust; Queen Elizabeth Hospital King's Lynn NHS Foundation Trust; please refer to local Trust's procedural documents for further guidance.

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1. Introduction

1.1. Rationale

The 72-hour fast

- It is a gold standard test for investigating fasting spontaneous hypoglycaemia
- Is used to elicit evidence of spontaneous hypoglycaemia (i.e., plasma glucose < 2.2 mmol/L (lab glucose) and
- to establish an underlying cause of hypoglycaemia - such as insulinoma by measurement of insulin and c-peptide during hypoglycaemia.
- Most patients with insulinoma hypoglycaemia (lab glucose <2.2mmol/L) (Hamdy et al 2019).
- By 24 hrs, 66% insulinomas develop hypoglycaemia and by 48 hrs, >95% insulinomas can be diagnosed. After 72 hrs fast plus exercise, if no hypoglycaemia, insulinoma is very unlikely, (Hammersmith Hospital 2005).

Hirshberg *et al*. showed that 43% of patients undergoing a supervised fast will become hypoglycaemic and symptomatic in 12 h, 67% within 24 h, 95% within 48 hrs and 100% within 72 h.

1.2. Objective

To enable patients to have a 72-hour fast test performed safely and efficiently by an Endocrine Specialist Nurse, Registered Nurses and medical staff on Mattishall ward.

1.3. Scope

1.3.1. Broad recommendations

- The test should be carried out by blood and urine sampling, in hospital, and under strict supervision.
- Consider and exclude where possible other causes of hypoglycaemia such as:
    - Reactive hypoglycaemia
    - Addison's disease
    - Hypopituitarism
    - Severe liver disease
    - Malignancy e.g., Sarcoma
    - Exogenous insulin or oral hypoglycaemic agents
- The test will be performed only on patients referred by an Endocrine Consultant or Endocrine Specialist Trainees. **Referrals from other sources would not be accepted.**

1.3.2. Patient Exclusions

The test will not be carried out in:

- Children aged less than 16 (refer to Paediatricians)
- Pregnant women
- End stage disease: this should be pre-determined by the referring Consultant

If in doubt about the safety of performing this test on a patient the Endocrine Specialist Nurse or other registered nurse should discuss concerns with the referring doctor or the Specialist Registrar.

1.4. Glossary

The following terms and abbreviations have been used within this document:

Term	Definition
IV	Intravenous
CBG	Capillary Blood Glucose
POC	Point of Care
CIU	Clinical Investigations Unit

2. Responsibilities

- Consultant for Endocrinology – Support in producing the document and lead for the Endocrine business meeting.
- Lead for Clinical Governance in Endocrine & Diabetes – For approval at speciality level.
- Clinical Director for Endocrine & Diabetes – for overall approval
- Senior Endocrine Specialist nurse – author of document and distribution once fully approved.

3. Processes to be followed

3.1. Preparation (see Care Plan – Appendix 1)

a. To allow administration of intravenous glucose during severe hypoglycaemia, **insertion of an IV cannula** at the start of the fast is advised. If it is deemed likely that venous access will be difficult, discuss this with the senior clinician involved in organising the fast if alternative sampling (e.g., midline is necessary). A plan should be made to ensure the samples can be obtained, including out of hours when the endocrine team may not be present.

b. Patient is given **nothing to eat or drink except water** from start of 72h fast and this time is recorded.

c. **Non-essential medication should be suspended** for the duration of the test. The decision of what medication can be safely suspended should be made in advance of the admission by the referring clinician. All other medication should be given as prescribed with water.

d. The patient should be moderately active and not confined to bed; however, they **should not leave the ward area** unsupervised.

e. **On the specific 72 hours fast care plan (**Appendix 2), record CBG, lab glucoses (plasma glucose) and patients' symptoms.

f. The Endocrine Specialist Nurse will **organise some laboratory request forms and bottles for blood samples to be collected**, in advance of the test starting. These will be available for use by the nurse or doctor attending to the patient.

3.1.1. Sampling Procedure

The aim is to achieve the plasma glucose is <2.2mmols/L with symptomatic hypoglycaemia. Do not reverse the fast with a carbohydrate meal, oral glucose, or intravenous glucose until you are sure that the glucose is low enough, confirmed by, laboratory glucose and blood has been taken into a green lithium heparin tube.

- **2 hourly CBG is taken using POC** blood glucose meter throughout the test.
- **Venous sampling every 6 hourly throughout the fast for plasma glucose (grey tube) and insulin/c-peptide** (dark Green top- lithum heparin) (Appendix 1) as per flow chart (page 2):
- If the lab glucose is **above 2.5 mmol/L**, continue CBG sampling every 2 hours, continue 6 hourly venous sampling.
- If the lab glucose is **between 2.2-2.5mmol/L**, or the patient has symptoms of hypoglycaemia:
    1. Take venous sample urgently. This should be sent to the laboratory in person for urgent plasma glucose, insulin, and c-peptide.
    2. Increase the frequency of CBG sampling every 10-15 minutes.
    3. **Only if the laboratory glucose is confirmed as below 2.2 mmol/L can the fast be terminated, and the specimen processed for insulin and C peptide measurement.** (Please use Green biochem request form) Exception- see "stopping the fast" for neuroglycopenic symptoms
    4. POC ketone testing should also be performed. A yellow tube should also be taken the sample for insulin antibodies if ab glucose confirmed below 2.2 mmol/L. If the patient has a confirmed laboratory blood glucose of <2.2mmol/L a urine sample should be sent to biochemistry for a subsequent sulphonylurea screen. A separate WebICE request should be made for this.

3.1.2. Stopping the Fast

Fasting should be stopped in any of the following situations

- If biochemistry confirms a ***laboratory blood glucose < 2.2 mmol/L,*** then the fast can be stopped and the patient fed. However, before this**; please ensure that blood ketones have been tested, and that a spare sample in lithium heparin and a yellow topped tube has been taken.**
- However, if the patient has neuroglycopenic symptoms (confusion, epileptic seizure), fasting should be terminated immediately with appropriate treatment for hypoglycaemia

- If 72 hours have elapsed and the patient has not become hypoglycaemic or symptomatic the fast can be terminated.

3.1.3. At the End of the Fast

- Collect venous samples for plasma glucose, insulin, c-peptide
- After these samples have been taken, proceed to a Glucagon test only if requested by the referring clinician. Administer IV glucagon 1.0mg and measure plasma glucose in a grey tube at, 10, 20 and 30 minutes (see Mayo paper).
- The patient can then be given fruit juice, a carbohydrate meal, oral glucose, or intravenous glucose as appropriate

3.2. Venous Sampling for Glucose, Insulin, and C Peptide

1. When a sample is due to be taken, ask a member of staff from the ward to collect a sample storage pot from the pathology hatch. This should contain ice.
2. Once the sample has been collected, place the blood tubes and request form in a plastic bag and put this into the sample storage pot, along with the ice.
3. Do not place the samples or the storage pot containing the ice into the pod system, Deliver to the pathology hatch in person.
4. Ensure the samples are handed in person to a member of staff. Ask for samples to be processed urgently; if reception staff was unable to help, ask to speak to Medical Laboratory Scientific Officer (MLSO) or if out of hours, please contact duty biochemist via switchboard.
5. Tell them these are the urgent samples for insulin and c-peptide, which require immediate centrifuging and freezing.

Decreasing lab glucose but not reaching <2.2mmol/L

If glucose falls but has not reached <2.2 mmol/L, increase frequency of a standard blood glucose meter measurements and frequency of venous glucose sampling. This may be as often as every 10-15 minutes.

3.3. Dealing with Symptomatic Hypoglycaemia

Always make sure that the blood samples have been collected, bedside ketones tested, and hypoglycaemia <2.2mmol/l documented by the laboratory before ending the fast. Once the blood has been taken, follow the trust standard hypo protocol as below:
http://nnvmwebapps01/TrustDocs/Doc.aspx?id=1337

3.3.1. Mild hypoglycaemia – patient conscious and able to swallow

If the patient is able to eat and drink, give them fruit juice and food (15-20g oral carbohydrate) and repeat the test at 10 minutes. This can be repeated up to three times if necessary.

3.3.2. Moderate hypoglycaemia – patient conscious but confused or aggressive

If the patient is unable to cooperate as above but can still swallow, or if the patient has not responded to oral carbohydrates give 1.5-2 tubes of Glucogel® and recheck after 10 minutes. This can be repeated three times. If the patient is improving, follow with oral carbohydrates as above. If the blood glucose is still low or the patient remains unwell, consider giving IV dextrose as per the 'severe' guidance below.

3.3.3. Severe – patient unconscious / fitting / very aggressive or not responded to oral treatment

Check ABC and fast bleep a doctor.
If the patient has not responded to Glucogel® or is too unwell to take this, give 200mL of 10% glucose or 100ml of 20% dextrose over 15 minutes. Use an infusion pump if available, but if not, start the infusion anyway to avoid delay. Measure the blood glucose level after 10 minutes and repeat the treatment if the level remains <4.0mmol/L.

3.3.4. Post Hypoglycaemia

If hypoglycaemia is achieved a sample of urine for measurement of sulphonylurea should be obtained as soon as possible in a plain universal container sent with a WebICE request to Pathology.

The patient must be reviewed by a senior clinician from the Endocrine Team. All patients with documented hypoglycaemia will need to remain in hospital for further investigations and management.

4. Training & Competencies

The nurse performing this test must have an experience of taking blood sampling, recognising and treating hypoglycaemia.

5. References

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6. Monitoring Compliance

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring
Patient exclusion criteria met, and samples obtained according to this schedule	Retrospective review of patient's notes	Lead Clinician from the Endocrinology team	Endocrine Clinical Governance Meeting	Yearly and ad hoc if any adverse incidence occurs
Incidents	Datix and discussed at monthly Clinical Governance Meeting	Endocrine Specialist nurse or delegated person	Endocrine & Diabetes Governance	Yearly and ad hoc if any adverse incidence occurs

The audit results are to be discussed at relevant governance meetings to review the results and recommendations for further action. Then sent to Clinical Standards Group and Effectiveness Sub-Board who will ensure that the actions and recommendations are suitable and sufficient.

7. Appendices

7.1. Appendix 1 - 72-hour Fast Care Plan Pages 1 - 4

This patient is undergoing a "72 hour fast". He/She is not permitted to eat during the test and is only allowed to drink water nothing else.
Ensure the cannula is patent, 10% glucose and glucagon for IV use, and fruit juice are available on the ward throughout this period.
Patients must be reviewed on a regular basis to check for subtle signs of hypoglycaemia and MUST not be allowed to leave the ward during the fast unaccompanied

Starting	Date : *(dd/mm/yyyy)*	Time: *(24hr clock)*
Finishing	Date: *(dd/mm/yyyy)*	Time: *(24hr clock)*

- Test 2 hourly capillary blood glucose using a standard blood glucose meter and document overleaf.
- Take 6 hourly, routine venous blood samples in a grey top fluoride oxalate bottle for glucose & a green top lithium heparin bottle to biochemistry with a pre-prepared (by specialist nurses) green biochemistry request form. Check blood ketones at baseline, twice daily at 08.00 and 17.00 and at the end of the fast.
- If capillary glucose is <2.5 mmol/L at any time then take***** samples as above to biochemistry urgently. **NB These samples must have a green biochemistry request form completed by the person taking the blood sample so that the glucose can be requested urgently. Remember to add insulin and c-peptide to the request form. NB: The CIU team will always leave pre-prepared forms by the patient's bedside which just need the time and date adding.**

*****Do not pod samples to the path lab; these must be hand delivered and handed to a person not left on the counter. If out of hours, ring the bell for on call biochemist. If they do not come to hatch bleep them using the number on the board for urgent blood gases.

72-hour Fast Care Plan Page 2

The fast must **NOT** be terminated UNLESS the patient has one or more of the following:

- Laboratory glucose (**not just Capillary glucose**) below <2.2 mmol/l
- Seizure / impaired consciousness
- Focal Neurology

If clinical biochemistry confirms glucose of <**2.2 mmol/l** then take venous blood into a grey, green and yellow topped tube, and stop the fast by giving fruit juice, a carbohydrate meal, Glucogel® or iv glucose (100ml/hour 10% glucose in most patients, or 150ml 10% glucose over 10-15 minutes in unstable patients). If an infusion pump is available use this, but if not readily available the infusion should not be delayed. Repeat capillary blood glucose measurement 10 minutes later. See trust guideline on management of hypoglycaemia for further details. Once the blood has been taken, follow the trust standard hypo protocol as below: *Trustdocs ID 1337*

If the patient has a confirmed laboratory blood glucose of <2.2mmol/L a urine sample should be sent to biochemistry for a subsequent sulphonylurea screen. A separate WebICE request should be made for this. POC ketone testing should also be performed. A yellow tube sample should also be taken for insulin antibodies if lab glucose confirmed below 2.2 mmol/L.

Dropping glucose but not down to venous glucose of <2.2mmol/L?

- If glucose starts to drop but has not reached <2.2 mmol/L, increase frequency of capillary blood glucose meter and venous glucose. It can be as often as every 10 - 15 minutes to catch the glucose as soon as the patient becomes hypoglycaemic.
- If any stage, you are uncertain as to the correct count of action then contact the following:
    - during day time:
    - out of hours:

72-hour Fast Care Plan Page 3

Date	Time	Capillary Glucose	Blood sample taken				Symptoms
			Glucose	Insulin	c-peptide	Ketones	

AT THE END OF 72 HOUR FAST, if no hypoglycaemia

1. Consider exercising the patient up and down the stairs (accompanied)

1. Take blood sample for plasma glucose, insulin profile and send to pathology with WebICE request form. Bedside ketone testing should be performed either by the Endocrine Specialist Nurse or one of the junior doctors working for the endocrine team.

2. Glucagon stimulation test may then be performed if requested by an endocrinologist as follows:

   - Give 1 mg glucagons intravenously
   - Take blood sample for glucose after 5, 10, 20 and 30 min post glucagon (labelled, timed, correct tube)
   - Give patient fruit juice, followed by a meal

Blood sample	Glucose	Insulin	β OH butyrate (blood ketone)
0 min			
Give glucagon 1 mg intravenously			
5 min			
10 min			
0 min			
30 min			

8. Equality Impact Assessment (EIA)

Type of function or policy	Existing

Division	Medical	**Department**	Endocrinology
Name of person completing form	Neetha Joseph	**Date**	23/06/23

Equality Area	**Potential Negative Impact**	**Impact Positive Impact**	**Which groups are affected**	**Full Impact Assessment Required YES/NO**
Race	No	No	None	No
Pregnancy & Maternity	Yes, many hormone levels change during pregnancy it is the referring clinician's responsibility to only refer patients for tests where pregnancy will not affect the results	No	All pregnant women	No
Disability	No	No	None	No
Religion and beliefs	No	No	None	No
Sex	No	No	None	No
Gender reassignment	Yes, but only for baseline levels of sex hormones not for the actual tests	No	Male to female and female to male	No
Sexual Orientation	No	No	None	No
Age	This document is for adults (over 16) only	No	None	No
Marriage & Civil Partnership	No	No	None	No

EDS2 – How does this change impact the Equality and Diversity Strategic plan (contact HR or see EDS2 plan)?	

- **A full assessment will only be required if: The impact is potentially discriminatory under the general equality duty**
- **Any groups of patients/staff/visitors or communities could be potentially disadvantaged by the policy or function/service**
- **The policy or function/service is assessed to be of high significance**

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

The review of the existing policy re-affirms the rights of all groups and clarifies the individual, managerial and organisational responsibilities in line with statutory and best practice guidance.