HYPOTHYROIDISM

Introduction:

Congenital hypothyroidism is a disorder resulting from inadequate thyroxine production from an absent or abnormally developed thyroid gland. Thyroxine is required for normal growth and development.

Early identification of babies with congenital hypothyroidism enables timely initiation of thyroxine replacement therapy with the aim of improving neurodevelopmental outcomes. It is important to note that the screening programme will not detect secondary or tertiary hypothyroidism due to the screening method and so these infants may only present with clinical signs such as prolonged jaundice. Similarly, infants with a delayed TSH rise, thyroid binding globulin deficiency and hyperthyroxinaemia will not be detected by the screening programme.

SCREENING

- Congenital hypothyroidism (CHT) is included in routine neonatal bloodspot screening at aged 5–8 days
- In preterm babies ≤31^{+6} weeks' gestation, repeat at aged 28 days or at discharge, whichever is sooner
- Screening relies on measurement of raised bloodspot TSH

Categorisation of initial screening result

- Based on TSH result in initial screening sample or second sample for baby <32 weeks' gestation
  - <8 mU/L: negative result – CHT not suspected
  - ≥20 mU/L: positive result – CHT suspected
  - ≥8−<20 mU/L: borderline result
- Borderline result repeat sample 7−10 days after previous sample
  - <8 mU/L: negative result − CHT not suspected
  - ≥8 mU/L: positive result – CHT suspected

IMMEDIATE MANAGEMENT

Informing diagnosis

- If screening test result indicates CHT, a well-informed healthcare professional (community midwife, neonatal outreach nurse, health visitor or GP) must inform parents face-to-face
  - do not communicate an abnormal result on Friday, Saturday or just before a weekend if consultant meeting cannot be arranged within next 24 hr
  - provide parents with information leaflet **Congenital hypothyroidism is suspected** (available from: https://www.gov.uk/government/publications/congenital-hypothyroidism-cht-confirmed-description-in-brief/congenital-hypothyroidism-cht-further-information-for-families)

Consultant meeting

- Consultant to arrange to meet parents on same or next day to:
  - explain abnormal result
  - examine baby using screening laboratory proforma as an aide-mémoire
  - look for other abnormalities (10% in CHT versus 3% in baby without CHT), congenital heart disease (pulmonary stenosis, ASD and VSD) is commonest anomaly
  - commence treatment
  - stress importance of daily and life-long treatment
  - provide parent information leaflet (see **Informing diagnosis**)
- Document discussion, management plan and follow-up and send to GP and parents
- Complete and return data form to clinical biochemist at screening laboratory

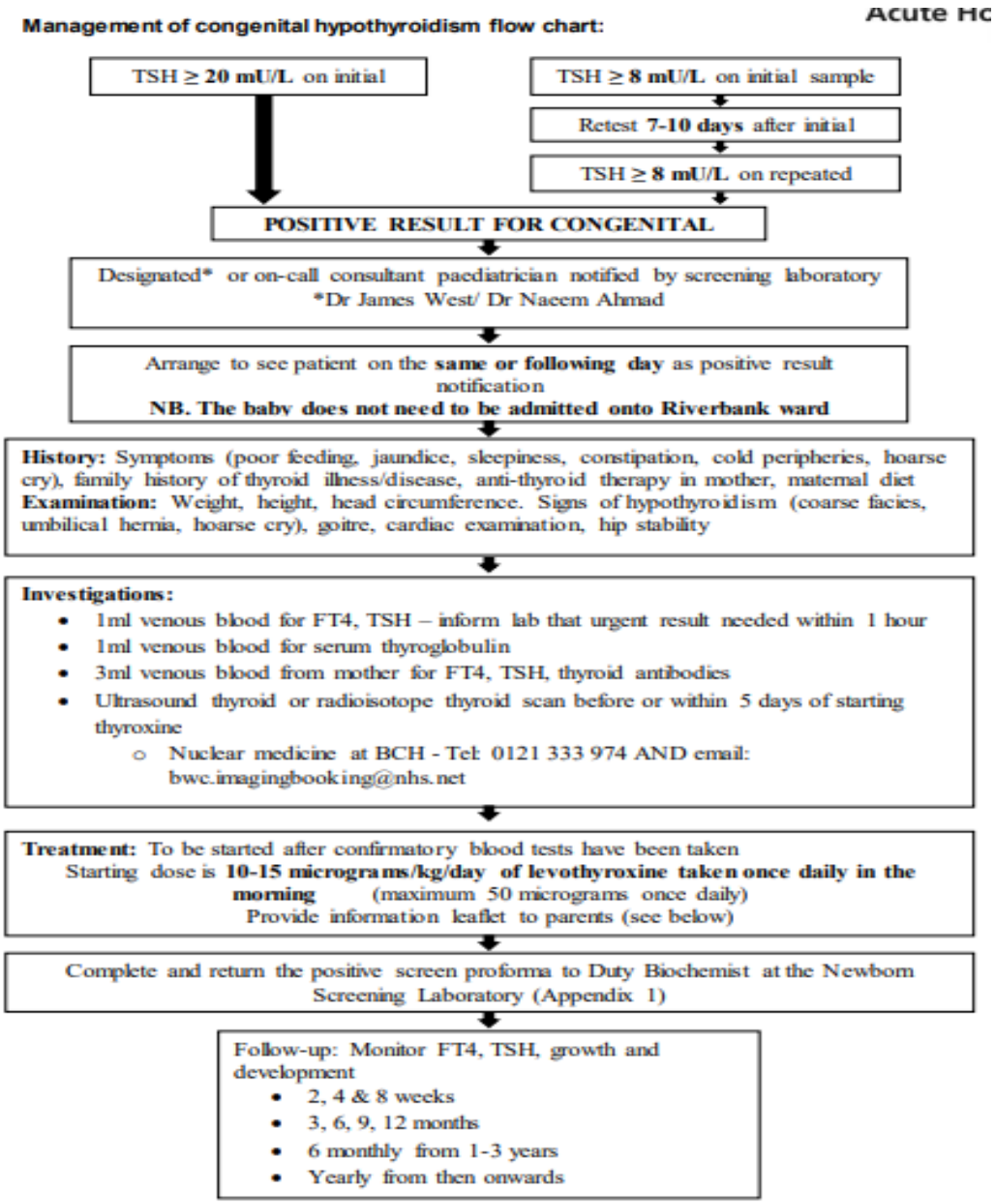
Obtain further diagnostic tests

- **Baby**
  - 1 mL venous blood in heparinised container for FT4 and TSH

- send repeat dried bloodspot card to screening laboratory
- 1 mL venous blood for serum thyroglobulin
- ultrasound or radionuclide scan of thyroid, latter preferably within 5 days of starting levothyroxine; ultrasound can be performed at any age
- **Mother**
- take 3 mL venous blood into a heparinised container for FT4, TSH and thyroid antibodies

TREATMENT

- Start treatment with levothyroxine after obtaining confirmatory blood tests. Do not wait for results unless transient hypothyroidism suspected. Treatment must start before aged 14 days. For those detected on repeat sampling, treatment should ideally commence by 21 days
- after discussion with paediatric endocrinologist, consultant may withhold treatment if transient hypothyroidism suspected
- Starting dose levothyroxine 10–15 microgram/kg/day with maximum daily dose of 50 microgram. Aim to maintain serum FT4 in upper half of normal range by 2 weeks treatment and for normalisation of TSH by 4 weeks
- Adjustment required depending on thyroid function test results – Aim to keep FT4 towards the upper limit of normal range. TSH can take weeks to normalise but FT4 settles quickly. If FT4 is satisfactory but TSH is significantly raised then consider non-compliance.
- Levothyroxine liquid is more expensive than tablets. However, when comparing liquids with crushed tablets:
- liquid preparations are licensed, crushed tablets dispersed in milk or water aren't licensed.
- liquid preparations are available in various strengths.
- dose titrations are easier with liquid preparations.
- liquid preparations are easier to administer in infants and young children.
- Therefore, levothyroxine liquid is preferred in infants and young children. However, tablets should be prescribed once on a stable dose and able to swallow whole tablets.
- Advise parents to repeat dose if baby vomits or regurgitates immediately after giving dose.
- Tablets are 25 microgram strength
- it is not necessary to divide tablets for intermediate dose; administer intermediate dose, e.g. 37.5 microgram, as 25 and 50 microgram on alternate days
- Crush required levothyroxine dose using tablet crusher (if tablet crusher not available, between 2 metal spoons) and mix with a little milk or water, using teaspoon or syringe
- do not add to bottle of formula
- suspensions not advised due to variable bioavailability
- repeat dose if baby vomits or regurgitates immediately
- Record date treatment commenced
- Provide parents with 28 day prescription for levothyroxine
- Arrange continued prescription with GP, emphasising need to avoid suspensions



FOLLOW–UP

- Arrange follow-up after commencement of hormone replacement therapy as follows:
- 2 weeks, 4 weeks, 8 weeks, 3 months, 6 months, 9 months, 1 yr, 18 months, 2 yr, 30 months, 3 yr, yearly thereafter
- At each clinic visit:
- physical examination, including height, weight and head circumference
- developmental progress
- blood sample for thyroid function test (FT4, FT3 and TSH, just before usual daily medication dose)
- request as **FT4 priority, then TSH**

Interpretation of thyroid function test results

Analyte	Age	Concentration
FT4 (pmol/L)	0–5 days	17–52
	5–14 days	12–30
	14 days–2 yr	12–25
TSH (mU/L)	0–14 days	1–10
	15 days–2 yr	3.6–8.5

Check reference ranges with your laboratory's assay

- Aim for FT4 towards upper limit of normal range
- at higher concentrations of FT4, normal concentrations of T3 (produced by peripheral conversion) are achieved
- if FT4 concentration satisfactory but with significantly raised TSH, consider non-compliance
- TSH concentration does not always normalise under 6 months and may be slightly raised up to aged 3 yr in absence of non-compliance, probably due to reset feedback mechanism
- Overtreatment may induce tachycardia, nervousness and disturbed sleep patterns, and can produce premature fusion of cranial sutures and epiphyses. If symptoms of overtreatment or very suppressed TSH, reduce dose of levothyroxine

AFTERCARE

- Reassure parents that baby will grow into healthy adult with normal intelligence
- Stress importance of regular treatment. **As half-life is long, it is not necessary to give an extra tablet next day if a day's treatment missed**

Main contacts:

- Dr James West, Consultant Paediatrician, Worcestershire Royal Hospital
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Further information can be found at:
o British Thyroid Foundation: www.btf-thyroid.org
o The Child Growth Foundation: www.childgrowthfoundation.org
o British Society for Paediatric Endocrinology and Diabetes: www.bsped.org.uk
o NHS choices: www.nhs.uk/bloodspot

NHS Worcestershire Acute Hospitals NHS Trust

PROFORMA – POSITIVE SCREEN FOR CONGENITAL HYPOTHYROIDISM

Please fill in or correct the information requested below and email the completed form to nsbg.bch@nhs.net as soon as possible following the clinic appointment.

Baby's Name:		D.O.B.		Gender :
Hospital No:		NHS No:		
Address:				
Specimen Date	Date received	Age of baby	Screening Results	
			Mean TSH:	mIU/L
			Mean TSH:	mIU/L
Birthweight: (kg)		Gestation	Ethnicity:	
Date of referral:		Referred to:		

Date of clinic:	Hospital:		Seen by:	
Plasma Thyroid Results Date:	TSH mIU/L	Free T4 pmol/L		Anti-thyroid Ab
Was the baby treated? Y/N	Date treatment started:		Starting dose:	
Did the baby have a thyroid scan? Y/N Scan result:				
Iodine exposure to baby Y/N	Consanguinity Y/N Details…			
Family history of thyroid disease? Y/N Details…				
Jaundiced? Y/N	Feeding problems? Y/N		Sleepy? Y/N	
Constipation? Y/N	Umbilical Hernia? Y/N		Goitre? Y/N	
Additional information/clinical details				
Form completed by:	Date of completion:		Tel:	