

Neonatal jaundice

Clinical Guideline Presentation



45 minutes

Towards CPD Hours

References:

Queensland Clinical Guideline: *Neonatal jaundice* is the primary reference for this package.

Recommended citation:

Queensland Clinical Guidelines. Neonatal jaundice clinical guideline education presentation E17.7-1-V2-R22. Queensland Health. 2017.

Disclaimer:

This presentation is an implementation tool and should be used in conjunction with the published guideline. This information does not supersede or replace the guideline. Consult the guideline for further information and references.

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Abbreviations

CF	Cystic fibrosis
CMV	Cytomegalovirus
DAT	Direct antiglobulin test (also known as Coombs test)
FBC	Full blood count
G6PD	Glucose-6-phosphate dehydrogenase deficiency
LFT	Liver function tests
RBC	Red blood cell
RhD	Rhesus type D
TFT	Thyroid function tests
TcB	Transcutaneous bilirubin
TSB	Total serum bilirubin
USS	Ultrasound scan

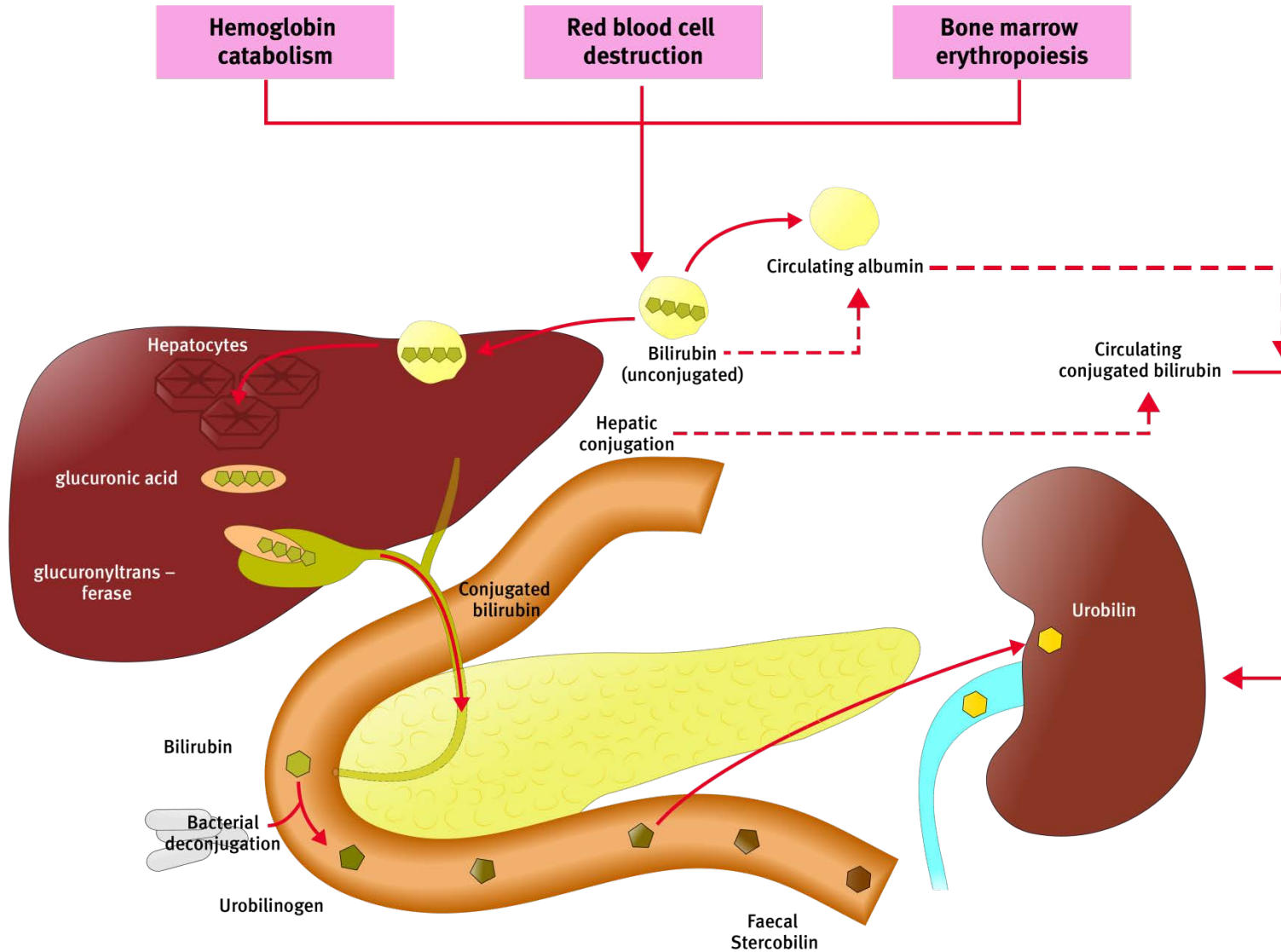
Introduction

- One of the most common conditions requiring medical attention in newborn babies
- Occurs in 60% of term and 80% of preterm babies in the first week of life
- 3.2% of all babies born in Queensland (2015) had phototherapy

Pathogenesis of hyperbilirubinaemia

- Occurs due to an imbalance between bilirubin production, conjugation and elimination
- Unconjugated bilirubin:
 - Accumulates in the blood due to red cell destruction
 - Binds to albumin and is converted to conjugated bilirubin in the liver
- Conjugated bilirubin is water soluble and eliminated in urine and stools

Bilirubin



Maternal risk factors

- ABO and RhD type
- Genetic
- Diabetes
- Previous jaundiced baby
 - Baby required phototherapy or other treatment

Neonatal risk factors

- Feeding—breast milk, delayed gut colonisation, low breast milk or formula intake
- Haematological—haemolysis, polycythaemia, haematoma
- Gastroenterological—bowel obstruction
- Infection
- Prematurity
- Male



Pathological jaundice

Early presentation (before 24 hours of age) or high peak level

- Level of free bilirubin (unbound to albumin) increases risk of developing acute and chronic encephalopathy
- Exacerbated by acidosis/hypoxia, hypothermia, hypo-albuminaemia, infection, some medications

Causes of pathological jaundice

Early presentation (before 24 hours of age) or high peak level

- Haemolysis—bruising, haemorrhage, isoimmunisation
- Decreased conjugation of bilirubin—congenital hypothyroidism
- Decreased excretion of bilirubin—biliary atresia, cystic fibrosis

Jaundice onset after 24 hours and resolving early

- Transient—resolves in first week to 10 days (term baby) or 3 weeks (preterm baby)
- Mostly benign—monitor
- Investigate and treat unwell, jaundiced baby for underlying disease

Causes of non-pathological jaundice

- Physiological due to increased volume and decreased life span of RBC
- Common in breastfeeding babies

Prolonged jaundice

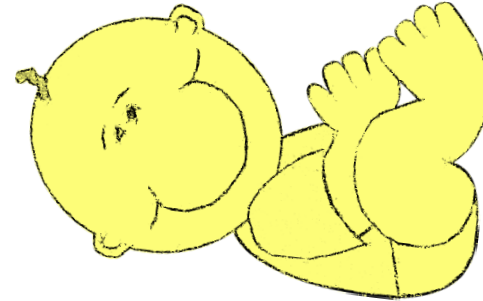
- Jaundice after day 14 in term babies and day 21 in preterm babies
- Usually harmless but may be indicative of more serious disease

Causes of prolonged jaundice

- Unconjugated—inadequate nutrition and hydration, breast milk
- Conjugated—congenital hypothyroidism
- Unconjugated and/or conjugated—haemolytic disease, G6PD

Assessment of jaundice

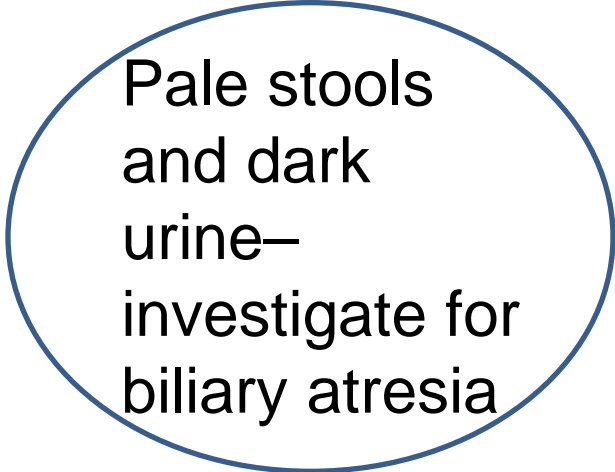
- Examine all babies for jaundice:
 - Every 8 to 12 hours in the first 72 hours of life
 - Before discharge
- Do not rely on visual examination to assess level of jaundice
 - Use TcB or measure TSB



Jaundice appears cephalocaudal and regresses in reverse order

Assessment

- Signs of lethargy
- Feeding—poor intake, breast milk
- Urine—output and colour
- Weight loss greater than 10%
- Stools—colour



Pale stools
and dark
urine—
investigate for
biliary atresia

Total Serum bilirubin (TSB)

Measure total, conjugated and unconjugated bilirubin

- Measure if jaundiced baby:
 - Less than 24 hours of age
 - Less than 35 weeks gestation
- Plot on nomogram
- Repeat TSB according to nomogram



Transcutaneous bilirubin (TcB)

- Reduces the number of invasive blood tests
- Suitable for babies:
 - Greater than 35 weeks gestational age
 - Older than 24 hours of age



Not recommended:

- During phototherapy
- After phototherapy
- After exchange transfusion
- Prolonged jaundice
- Conjugated bilirubinaemia

Initial investigations

- Check maternal antenatal screening—blood group, RhD type, red cell antibodies
- Total serum bilirubin
- FBC
- Blood group compatibility—ABO and RhD type, DAT

Additional investigations



Consider as indicated:

- Electrolytes/urea
- Infection C-reactive protein
 - Blood culture and sensitivity
 - Urine microscopy and culture
 - Congenital infections—signs suggestive of history, severe jaundice, elevated conjugated bilirubin, thrombocytopenia
- Inborn errors of metabolism—unwell with severe jaundice
- Albumin/LFT

Investigations for prolonged jaundice

Progression of early jaundice

- History, weight gain, feeding, bilirubin level (total/conjugated/unconjugated), FBC, LFT, TFT

Recurrent or new

- Urine microscopy and culture, CMV, reducing substances
- FBC and reticulocytes, consider G6PD, repeat neonatal screening test

Investigations for prolonged jaundice

Unwell baby

- Urine microscopy and culture, CMV, reducing substances, abdominal USS, sweat test and genetic markers for CF, inborn errors of metabolism (e.g. CF, hypothyroidism, galactosaemia)

Genetic

- Family history—investigate as indicated for RBC metabolism disorders, glucuronyl transferase deficiency disorders, red cell membrane disorders

Nomogram

- Hour-specific graph based on TSB
- Monitors trend of TSB or TcB
- Use nomogram appropriate for baby's age in hours, gestational age and birth weight
- Re-check TSB as per nomogram
 - Cease phototherapy when TSB greater than 50 micromol/L below phototherapy treatment line

Management–Nutrition



Breastfeeding

- Encourage 8–12 feeds/day initially
- Supplementary feed not recommended
- Offer expressed breastmilk if extra fluids required

Formula feeding

- Educate parents about adequate intake

Intravenous fluids

- Only if clinically indicated

Phototherapy lights



- Commence as indicated by nomogram
- Spectral power increases with increased skin exposure
- Irradiance maximised by minimising the distance between the baby and the light source
- Use additional light sources for intensive phototherapy

How does phototherapy work?

Causes a chemical reaction

Bilirubin in the skin absorbs light and converts bilirubin molecules to photoisomers

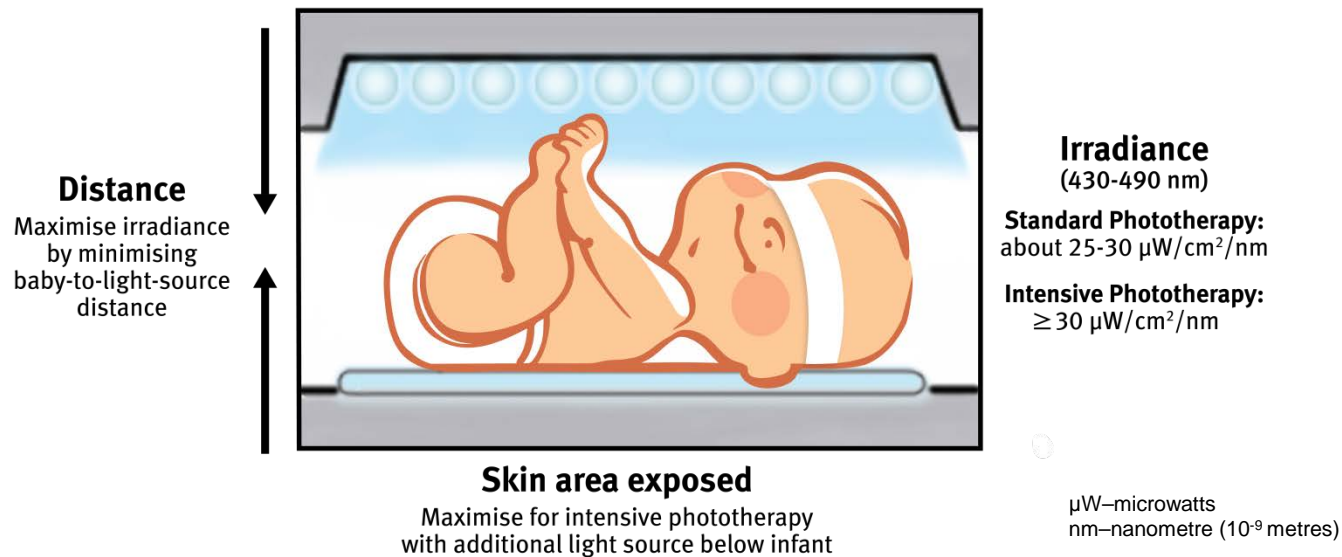
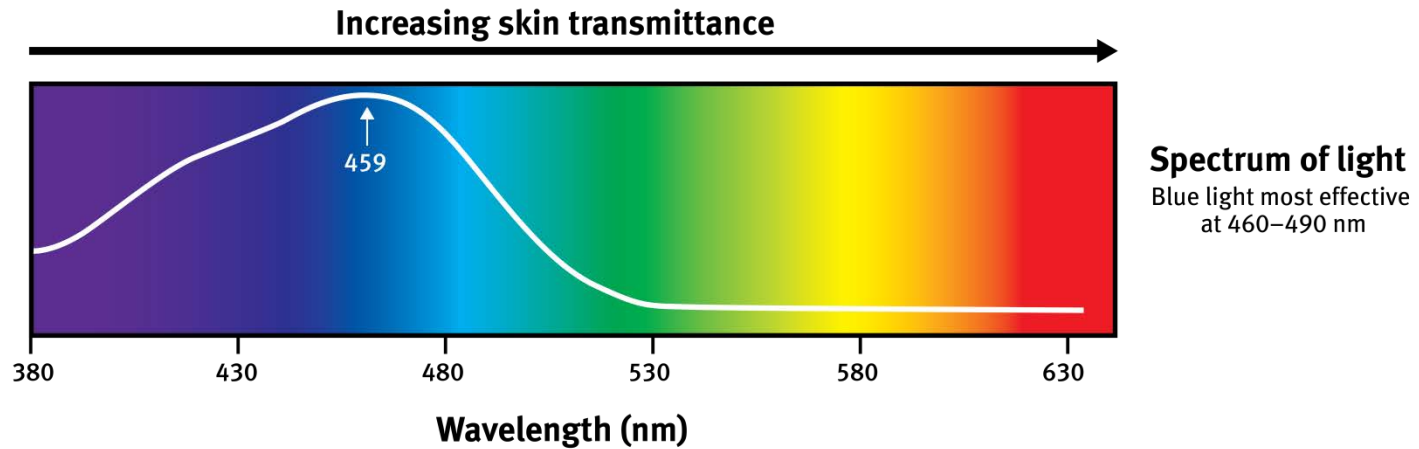


Photoisomers are excreted in bile or urine

Phototherapy

- Clinical response depends on:
 - Efficiency of the phototherapy unit
 - Rate of bilirubin production and bilirubin excretion
- Blue-green light in 460–490 nanometres emission spectrum is most effective
- Measure spectral output of light source
 - Maximise spectral power by increasing skin exposure
 - Maximise irradiance by reducing distance between baby and light source

Efficacy of phototherapy



Care during phototherapy

- Nurse baby in nappy only
- Use eye protection
- Check baby's temperature
- Interrupt phototherapy for feeding/parental attachment when bilirubin decreasing



Exchange transfusion

Medical emergency—perform in NICU

Indications

- TSB continues to rise despite phototherapy
- Baby shows signs of acute bilirubin encephalopathy

Transfusion

- O RhD negative or relevant antigen negative, CMV negative (if available), irradiated
- Double the baby's blood volume

Risks

- Fluid overload, metabolic imbalance, necrotising enterocolitis, infection, thrombocytopenia, coagulaopathy, air embolism, thrombosis, NEC

Hyperbilirubinaemia complications

- Bilirubin encephalopathy due to lipid soluble bilirubin crossing blood brain barrier
- Bilirubin induced neurological disorder (BIND)—severe and irreversible; diagnosis based clinical observation and history
- Bilirubin induced auditory toxicity due to effect on neural cells of auditory pathway

Bilirubin encephalopathy

- Complication of unconjugated hyperbilirubinaemia
- Lipid soluble and can cross the blood-brain barrier
- Results in:
 - Acute and then chronic bilirubin encephalopathy
 - Kernicterus
- Australian incidence is 9.4/100 000 live births

Discharge planning

- Identify at risk babies
 - Consider pre-discharge measurement of TcB
- Provide written and verbal information to parents
- Review:
 - Baby less than 72 hours of age at discharge within 2 days of going home
 - Jaundice increasing or presents after 10 days
 - Poor feeding or losing weight
 - Pale stools, dark urine