Children's Liver Disease Foundation

fighting childhood liver disease

Jaundice Protocol

Early identification and referral of liver disease in infants

36 Great Charles Street,
Birmingham, B3 3JY

Telephone: 0121 212 3839

yellowalert.org
childliverdisease.org
info@childliverdisease.org

Registered Charity Number:
1067331 (England and Wales) SC044387 (Scotland)

The following organisations endorse the Yellow Alert campaign and are listed in alphabetical order:

BACCH British Association for Community Child Health

BAPM

BSPGHAN working for children with digestive and liver disorders
British Society of Paediatric Gastroenterology Hepatology and Nutrition

IHV Institute of Health Visiting Excellence in Practice

RCGP Royal College of General Practitioners

Royal College of Nursing

Introduction

Who is this information aimed at?

- Health visitors
- GPs
- Community midwives
- Other healthcare professionals who have contact with young babies

This protocol is one resource included within the Children's Liver Disease Foundation (CLDF) Yellow Alert Pack written to provide general guidelines on the early identification of liver disease in infants and their referral where appropriate.

Other materials include:

- Yellow Alert stool bookmark – to quickly and easily identify healthy/suspect stool colours in babies
- Jaundice in the Newborn Baby - aimed at parents of newborns to explain what jaundice is and what you should do if jaundice does not go away
- Yellow Alert poster – highlighting the Yellow Alert message and also showing the stool chart

Jaundice in infants

There are many causes of jaundice in infants:

- Physiological jaundice
- Breast milk jaundice
- Liver disease
- Haemolysis
- Infection
- Hypothyroidism

Prolonged jaundice is defined as jaundice persisting beyond two weeks of age in term babies and three weeks in pre-term babies.

The National Institute for Health and Clinical Excellence (NICE) has published clinical guidelines on neonatal jaundice which provides guidance on the recognition, assessment and treatment of neonatal jaundice in babies from birth to 28 days.

For more information go to nice.org.uk/guidance/cg98.

Biliary atresia and liver disease

The most common liver disease in newborns is biliary atresia, affecting 1 in 17,000 live births in the UK. It occurs when bile ducts form abnormally or when the bile ducts are inflamed or obstructed. This leads to a blockage of bile flow from the liver which leads to fibrosis in the liver. Children require a Kasai procedure to re-establish bile flow. The procedure is not a permanent solution in most children, however, without the procedure children will require a liver transplant by the age of two.

Many studies have shown an improved outcome in terms of clearance of jaundice and native liver survival, the earlier the Kasai portoenterostomy is performed. Urgent detection is vital in order to diagnose biliary atresia rapidly with the infant being referred to specialist care as soon as possible.

Further information on biliary atresia and other childhood liver diseases can be found at childliverdisease.org.

YELLOW ALERT

Early identification of liver disease in infants

Whilst liver disease in infants is rare, early diagnosis is vital.

The main indicators are:

- **Prolonged jaundice**
- **Abnormal stool/urine colour**

You should be aware of the importance of stool and urine colour.

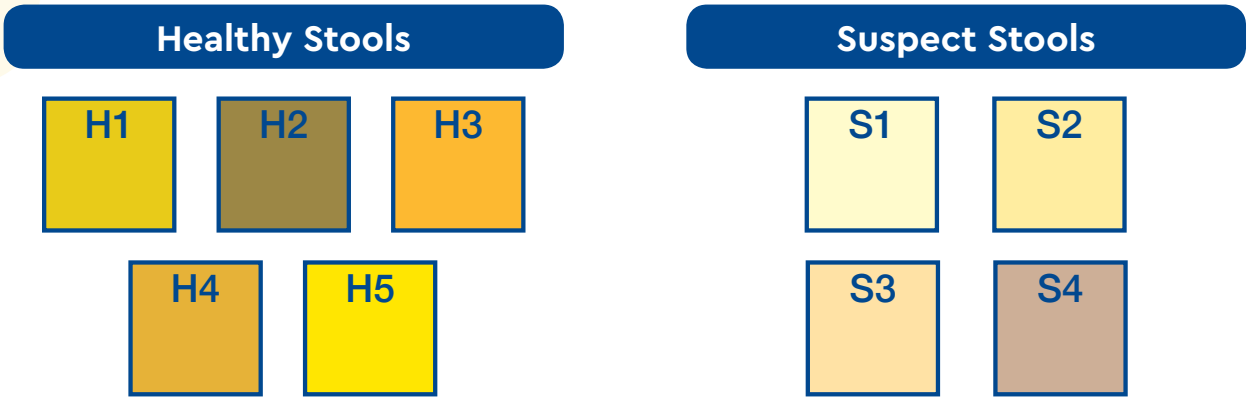
Urine:

- A baby's urine should be colourless
- Persistently yellow urine which stains the nappy may indicate liver disease

Stool:

- Stools should be green or yellow
- Persistently pale stools may indicate liver disease

The interpretation of stool colour can be subjective. The colour chart given below will help to overcome this problem.



Digital printing or photocopying of this stool chart will alter it. Use only items supplied by CLDF.

A healthy baby's stools can be any of these colours. Do not worry about green stools. Breast-fed babies often pass watery stools. A sudden change to frequent watery stools of any colour may mean the baby is unwell.

In babies with liver disease the stools may be one of these colours. Do not worry about one or two that look unusual.

All infants with pale stools or yellow urine should be referred for investigation.

All babies with prolonged jaundice should have a split bilirubin test carried out.

On the first visit midwives and/or health visitors should:

- Check all babies for jaundice by looking at the **sclera of their eyes and any yellowing of their skin**
- Record the presence of jaundice when transferring care from midwife to health visitor. State on the record that a jaundice check has been carried out
- If baby is jaundiced, check the stools and urine, no matter how mild. Urine should be colourless and stool should be pigmented yellow or green. **See stool charts**

If stools and urine in a jaundiced baby are abnormal and/or a baby with prolonged jaundice (persists two weeks after birth in term babies and three weeks after birth in a pre-term baby) is unwell or not progressing normally refer immediately to a paediatrician for further investigations

Action in the event of prolonged jaundice:

If a child has prolonged jaundice/abnormal stool or urine colour, carry out a general assessment. This includes:

- Feeding history including whether breast or bottle-fed
- Weight
- Document stool and urine colour
- Inform parents of the reason for blood tests (see below)

Request the following blood tests:

- Serum bilirubin blood test
  This test measures the total bilirubin in the blood.

- Split bilirubin test to measure conjugated bilirubin levels
  This test measures the ratio of conjugated to unconjugated bilirubin in the blood and is the key test for diagnosing liver disease. It is recommended that all babies with prolonged jaundice be given this test.

YELLOW ALERT

A baby where the conjugated bilirubin is greater than 20% (25 micromoles/litre) of the total bilirubin should be referred directly to a paediatrician for investigation.

If the conjugated bilirubin is less than 20% of the total bilirubin and the total bilirubin is less than 200 micromoles/litre, the parent(s)/guardian(s) should be reassured and weekly serum bilirubin levels checked until it is within normal laboratory ranges.

Where the total bilirubin is high (greater than 200 micromoles/litre) and the conjugated fraction is less than 20%, healthcare professionals are advised to contact a paediatrician and refer to NICE neonatal jaundice clinical guideline (CG98) as well as any local guidelines.

The following tests should also be done:

- A full blood count
- A blood group determination (mother and baby) and DAT (Coombs' test)
- A urine culture
- Ensure that routine metabolic screening (including screening for congenital hypothyroidism) has been performed.

Investigation

See algorithm on back page

The following should be referred to a paediatrician:

- A baby who is unwell and/or not progressing normally.
- A baby with abnormal colour of stools and/or urine at any age.
- A baby where the conjugated bilirubin is greater than 20% (25 micromoles/litre) of the total bilirubin.
- Any infant with prolonged jaundice that has not been investigated.

Breast-fed babies may also have liver disease; be extra careful to check stools and urine colour.

Refer to a paediatrician for the following tests:

- **Repeat Split Bilirubin Test**
- **Liver Function Tests**
  - Albumin
  - Aspartate and Alanine Transaminases (AST, ALT)
  - Alkaline Phosphatase (ALP)
  - Gamma-glutamyltransferase (GGT)
- **Coagulation Tests**
  - Prothrombin Time (PT)
  - Partial Thrombin Time (PTT)

  Coagulation may be prolonged secondary to vitamin K deficiency, particularly in breast-fed babies not given vitamin K at birth. All babies with suspected liver disease must be given vitamin K orally if the INR - (international normalized ratio) is normal, or by intravenous/intra-muscular methods if abnormal
- **Blood Glucose**

YELLOW ALERT

Referral to a specialist centre and advice

If any of the investigative tests are abnormal or liver disease is suspected, the infant may need referral to a specialist unit for further investigations or management. This may be at a regional paediatric gastroenterology unit with an interest in paediatric hepatology or a supra-regional paediatric liver unit.

There are three specialist paediatric liver centres in England, all offer medical and surgical management including transplantation. The Department of Health has designated the three specialist paediatric liver centres to carry out Kasai portoenterostomy for biliary atresia in England and Wales.

Birmingham Children's Hospital
The Liver Unit, Birmingham Children's Hospital, Steelhouse Lane, Birmingham, B4 6NH

Tel: 0121 333 9999 and ask to liaise with the on-call liver registrar
Secretarial team on 0121 333 8250 (office hours)
Nursing team on Liver Direct 0121 333 8989 or Liver.Direct@bch.nhs.uk
Web: bwc.nhs.uk/liver-unit

King's College Hospital, London
Paediatric Liver, Gastroenterology and Nutrition Centre, King's College Hospital, London, SE5 9RS

Tel: 020 3299 9000 and ask to liaise with the on-call paediatric liver registrar
Referrals: kch-tr.PaedLiverRegistrars@nhs.net
Web: kch.nhs.uk/service/a-z/paediatric-liver

Leeds General Infirmary
Children's Liver and GI Unit, Leeds General Infirmary, Great George Street, Leeds, West Yorkshire, LS1 3EX

Tel: Admin office on 0113 3925640
Clinical Nurse Specialist Team on 0113 3926151/3926138
Web: leedsth.nhs.uk/a-z-of-services/childrens-liver-unit

The supra-regional paediatric liver units above are happy to provide advice. Furthermore, the British Society for Paediatric Gastroenterology, Hepatology and Nutrition (BSPGHAN) has further advice for paediatricians on tests: bspghan.org.uk/sites/default/files/guidelines/2016_guideline_for_the_investigation_of_neonatal_conjugated_jaundice.pdf

Further resources

Further information and requests for copies of Yellow Alert campaign literature can be obtained from:

Children's Liver Disease Foundation
36 Great Charles Street
Birmingham
B3 3JY
Tel: 0121 212 3839
info@childliverdisease.org
childliverdisease.org/healthcare-professionals/yellow-alert

Parents are able to download and order **Jaundice in the Newborn Baby** which explains what jaundice is and what they should do if jaundice does not go away.

YELLOW ALERT

References

Bakshi, B., Sutcliffe, A., Akindolie, M., Vadamalayan, B., John, S., Arkley, C., Griffin, L. and Baker, A. (2012). How reliably can paediatric professionals identify pale stool from cholestatic newborns? *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 97(5), pp.F385-F387.

Cartledge, P., Kevlani, N., Shapiro, L. and McClean, P. (2010). An audit of a community protocol for identifying neonatal liver disease. *Archives of Disease in Childhood*, 97(2), pp.166-168.

Chen, S. (2006). Screening for Biliary Atresia by Infant Stool Colour Card in Taiwan. *Pediatrics*, 117(4), pp.1147-1154.

Davenport, M. (2016). Biliary atresia: From Australia to the zebrafish. *Journal of Pediatric Surgery*, 51(2), pp.200-205.

Davenport, M., De Ville de Goyet, J., Stringer, M., Mieli-Vergani, G., Kelly, D., McClean, P. and Spitz, L. (2004). Seamless management of biliary atresia in England and Wales (1999–2002). *The Lancet*, 363(9418), pp.1354-1357.

Davenport, M., Kerkar, N., Mieli-Vergani, G., Mowat, A. and Howard, E. (1997). Biliary atresia: The King's College Hospital Experience (1974–1995). *Journal of Pediatric Surgery*, 32(3), pp.479-485.

Davenport, M., Tizzard, S., Underhill, J., Mieli-Vergani, G., Portmann, B. and Hadžić, N. (2006). The biliary atresia splenic malformation syndrome: A 28-year single-center retrospective study. *The Journal of Pediatrics*, 149(3), pp.393-400.

Hadžić, N., Davenport, M., Tizzard, S., Singer, J., Howard, E. and Mieli-Vergani, G. (2003). Long-term Survival Following Kasai Portoenterostomy: Is Chronic Liver Disease Inevitable?. *Journal of Pediatric Gastroenterology and Nutrition*, 37(4), pp.430-433

Hartley, J., Davenport, M. and Kelly, D. (2009). Biliary atresia. *The Lancet*, 374(9702), pp.1704-1713.

Hinds, R., Davenport, M., Mieli-Vergani, G. and Hadžić, N. (2004). Antenatal presentation of biliary atresia. *The Journal of Pediatrics*, 144(1), pp.43-46.

Kelly, D. and Davenport, M. (2007). Current management of biliary atresia. *Archives of Disease in Childhood*, 92(12), pp.1132-1135.

McKiernan, P., Baker, A. and Kelly, D. (2000). The frequency and outcome of biliary atresia in the UK and Ireland. *The Lancet*, 355(9197), pp.25-29.

Mushtaq, I., Logan, S., Morris, M., Johnson, A., Wade, A., Kelly, D. and Clayton, P. (1999). Screening of newborn infants for cholestatic hepatobiliary disease with tandem mass spectrometry. *BMJ*, 319(7208), pp.471-477.

Powell, J., Keffler, S., Kelly, D. and Green, A. (2003). Population screening for neonatal liver disease: potential for a community-based programme. *Journal of Medical Screening*, 10(3), pp.112-116.

Verkade, H., Bezerra, J., Davenport, M., et al. (2016). Biliary atresia and other cholestatic childhood diseases: Advances and future challenges. *Journal of Hepatology*, 65(3), pp.631-642.

Livesey, E., Borja, M., Sharif, K., Alizai, N., McClean, P., Kelly, D., Hadzic, N. and Davenport, M. (2009). Epidemiology of biliary atresia in England and Wales (1999-2006). *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 94(6), pp.F451-F455.

Disclaimer

This leaflet is for information purposes only and is prepared for general application. In each individual case professional medical advice should be obtained before acting on anything contained herein as no responsibility can be accepted by the Children's Liver Disease Foundation.

Thanks

This booklet has been written, edited and reviewed with the help of staff at each of the specialist paediatric liver centres: Birmingham Children's Hospital, King's College Hospital and Leeds Children's Hospital. Thank you to all staff involved, including primary care health professionals, who have made the production of this leaflet possible.

Feedback and Information Sources

Information within this leaflet has been produced with input from the three specialist paediatric liver centres in the UK. To provide feedback on this leaflet or for more information on the content of this leaflet, including references and how it was developed, contact Children's Liver Disease Foundation: info@childliverdisease.org
No conflicts of interest were declared in the development and review of this document.

This leaflet has been reviewed in November 2018. It is due to be reviewed by November 2021.

Early identification algorithm

YELLOW ALERT

Jaundiced Baby
Term: > 2 Weeks
Pre-Term: >3 Weeks

↓

Carry out General Assessment
- Feeding History
- Baby's Weight
- Document Stool and Urine Colour

Baby Well

↓

Inform parents of reason for blood test
- Split Bilirubin Test

↓

Conjugated Bilirubin
> 20% (25 micromoles/l) of Total Bilirubin

↓

Refer to Paediatrician for:
- Repeat Split Bilirubin
- Liver Function Tests
- Blood Glucose
- Coagulation

Conjugated Bilirubin
< 20% (25 micromoles/l) of Total Bilirubin and Total Bilirubin < 200 micromoles/l

↓

Reassure parents and review serum bilirubin weekly until it is within normal laboratory ranges

Baby Unwell

↓

Refer to Paediatrician

Conjugated Bilirubin
< 20% (25 micromoles/l) of Total Bilirubin and Total Bilirubin > 200 micromoles/l

↓

Refer to Paediatrician

Children's Liver Disease Foundation
fighting childhood liver disease

36 Great Charles Street,
Birmingham, B3 3JY

Telephone: 0121 212 3839

yellowalert.org
childliverdisease.org
info@childliverdisease.org

Registered Charity Number: 1067331 (England and Wales) SC044387 (Scotland)