INTEGRATED PLAN FOR DETECTION & MANAGEMENT OF NEONATAL JAUNDICE
(2nd REVISION)
INTEGRATED PLAN FOR DETECTION & MANAGEMENT OF NEONATAL JAUNDICE

DIVISION OF FAMILY HEALTH DEVELOPMENT
MINISTRY OF HEALTH MALAYSIA
2017 (2nd Revision)
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MEMBERS OF THE TECHNICAL WORKING GROUP

ACKNOWLEDGEMENTS
Jaundice is one of the most common conditions that occur in newborns. There are many factors causing jaundice in newborns, both physiological and pathological. If not treated early, complications associated with jaundice can cause permanent neurological damage and lead to conditions such as cerebral palsy, deafness and intellectual impairment.

Thus, Ministry of Health has since the 1980’s, taken various measures to address the issue of jaundice in newborns. Emphasis on early detection and integrated management has always been the main focus. In an effort to further improve management of jaundice, severe neonatal jaundice was taken up as a Quality Assurance Indicator in 1993.

Guidelines have been developed to assist health care professionals in primary care and hospitals in the management of jaundice and to ensure continuity of care of our newborns. Management guidelines have been reviewed periodically to ensure that the management being practiced are effective and in line with current practices.

This current guideline has been reviewed in line with the 2015 Ministry of Health’s Clinical Practice Guideline: Management of Neonatal Jaundice (second edition) and is meant for use as reference by staff from both hospital and health clinics.

I would like to congratulate the Child Health Sector from the Family Health Development Division for their hard work and commitment in ensuring this guideline is produced. My appreciation also to all who were involved in the development of this updated guideline.

Datuk Dr Noor Hisham Abdullah
Director General of Health Malaysia
Jaundice is one of the most common conditions requiring medical attention in newborns. Jaundice is a treatable condition and should not be allowed to cause morbidity and mortality if addressed in its early stages. In most babies, jaundice reflects a normal transitional phenomenon, however, in some babies the serum bilirubin level may rise excessively, which can be a cause for concern as it can result in death and lifelong neurologic sequelae in babies who survive. For these reasons, the presence of neonatal jaundice frequently results in diagnostic evaluation.

It is essential that a newborn’s jaundice be monitored closely by health care professionals as most healthy newborns require only a brief hospital stay. Health education of the population at risk, especially pregnant women, and early referral at primary health care level will reduce the burden of severe neonatal jaundice.

Previous efforts by the Ministry of Health have addressed the issue of jaundice with a special focus on G6PD deficiency. Many factors continue to cause the persistence of severe neonatal jaundice and in addition there are continuing difference between hospital and health in policy and communication. This is a combined document relating to neonatal jaundice that will be used by both hospital and health. Recommendations from this document call for closer vigilance of newborn for early detection of jaundice and effective treatment towards the prevention of kernicterus.

DR. SAFURAH BINTI JAAFAR
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Division of Family Health Development
Ministry of Health Malaysia
1. INTRODUCTION

What is neonatal jaundice (Hyperbilirubinaemia)?
About 75% of normal newborns become clinically jaundiced sometime during the first week of life. Jaundice is apparent clinically, when the level of bilirubin in the serum rises above 85μmol/L (5mg/dL).

Physiological jaundice
Physiological jaundice occurs as a result of excessive bilirubin formation and because the neonatal liver cannot clear bilirubin rapidly enough from the blood. In normal term babies, this unconjugated (indirect) hyperbilirubinaemia usually appears between 24-72 hours of age, reaches a maximum on the 4th-5th day and becomes undetectable after 14 days.

Pathological jaundice
Jaundice is considered pathological if its appearance, duration, or pattern varies significantly from that of physiological jaundice.
Features of pathological jaundice include:
- Clinical jaundice appearing in the first 24 hours of age
- Rapid rise in the level of total bilirubin by:
  - more than 103 μmol/L/24 hours (6 mg/dL/24 hours) which is indicated for phototherapy
  - more than 8.5 μmol/L/hour (0.5 mg/dL/hour) which is indicated for exchange transfusion
- Conjugated (Direct) hyperbilirubinaemia more than 34 μmol/L (2.0 mg/dL) or more than 15% of total bilirubin.

Prolonged neonatal jaundice
Prolonged neonatal jaundice refers to jaundice persisting beyond the 14 days of life in the term baby or 21 days of life in the preterm baby. Its causes include late onset breast milk jaundice, urinary tract infection, congenital hypothyroidism, biliary atresia and other uncommon conditions. Please refer to chapter 5 ‘Special areas/issues – Prolonged Neonatal Jaundice’

Causes of neonatal jaundice
- Physiological jaundice
- Haemolysis due to ABO or Rh isoimmunisation, G6PD deficiency, microspherocytosis, drugs
- Cephalhaematoma, Subaponeurotic haemorrhage
- Polycythaemia
- Infection e.g. sepsis, meningitis, urinary tract infection and intra-uterine infection
- Breastfeeding and breastmilk jaundice
- Gastrointestinal tract obstruction: increase in enterohepatic circulation

Risk factors for severe jaundice
- Prematurity (< 37 completed weeks)
- Low birth weight (< 2.5kg)
- Sepsis
- Baby of diabetic mother
- Onset of jaundice before 24 hours of life
- A sibling with severe neonatal jaundice or exchange transfusion
- Inadequate breastfeeding/dehydration (as shown by ≥10% weight loss)
- Mothers with blood group O/ Rhesus negative
- G6PD deficiency
- Asphyxia
- Rapid rise of total serum bilirubin
- Cephalhaematoma or bruises
Complications of severe jaundice
Although most newborns with jaundice are otherwise healthy, they need to be monitored because bilirubin is potentially toxic to the central nervous system. Sufficiently elevated levels of bilirubin can lead to acute bilirubin encephalopathy and subsequently kernicterus. Kernicterus is associated with a high mortality, and survivors usually suffer sequelae like athetoid cerebral palsy, intellectual disability and high frequency hearing loss. The factors influencing bilirubin toxicity in the brain cells of the neonate are complex and incompletely understood. There is no specific level of total serum bilirubin above which kernicterus can be predicted to happen.

Measures to prevent severe neonatal jaundice
1. These are some measures to prevent severe NNJ that can be taken during the antenatal and postnatal visits:
   ● Health education to parents on NNJ: prevention, detection and treatment
   ● Identification of risk factors for severe NNJ
   ● Early detection of NNJ
   ● Early referral for further assessment or treatment

2. Breastfeeding should be encouraged. Inadequate breastfeeding in the first week may aggravate jaundice. Supportive measures should be present to promote successful breastfeeding. Supplementation may be needed temporarily to ensure adequate hydration, especially if there is more than 10% weight loss from birth weight. Supplementing with water or dextrose water does not lower bilirubin level in healthy, jaundiced and breast-feeding babies.

3. All babies should be screened for G6PD deficiency. Ideally G6PD status should be known before discharge. If G6PD deficient/intermediate, it is recommended that the babies are observed for at least 4-5 days. If they are discharged earlier, they should be followed-up closely.

4. Babies of mothers with blood group “O” and with a sibling who had severe neonatal jaundice should be observed for at least the first 24 hours of life.

5. Predischarge screening in hospital using TcB may be considered.

Please refer to Chapter 5 ‘Special areas/ issues – Transcutaneous Bilirubinometer and Predischarge Screening’
2. SCREENING AND DETECTION OF NEONATAL JAUNDICE

Neonatal jaundice screening and parental education begins from the antenatal period and extends into the early neonatal period.

Antenatal care

1. Education on neonatal jaundice should be provided for the expectant mother and a pamphlet should be given to her. 
   Please see Appendix 7.1 for Health education for parents – Jaundice in babies

2. All mothers should have blood taken for ABO and Rhesus group. Anti D Immunoglobulin (‘RhoGAM’) should be given by 28 weeks of gestation to all rh-negative mothers. 
   Please refer to Chapter 5 on ‘Special areas/ issues – Rhesus and ABO Incompatibility’

3. Identify other risk factors for significant jaundice e.g. family history of severe neonatal jaundice, exchange transfusion and haemolytic diseases.

Intrapartum care

1. Take cord blood for G6PD screening.

2. Attempts must be made to obtain G6PD results before the baby is discharged from hospital or as soon as possible in home deliveries.

3. G6PD results must be informed to parents and also be documented in the Home-based Child Health book and the G6PD register book.

4. If result shows G6PD deficiency/ Intermediate, the baby is to remain or be admitted to hospital for observation and monitoring for at least 4-5 days. 
   Please refer to Chapter 5 on ‘Special areas/ issues – G6PD deficiency’

5. When the mother is Rh-negative, a direct Coombs’test, ABO blood type, Rh(D) type, bilirubin level and haemoglobin level (full blood count) from the baby’s (cord) blood are required.

Postnatal care

1. Education on neonatal jaundice should be reinforced in the postnatal period.

2. Nursing personnel should actively look for signs of jaundice during routine care of the mother and baby.

3. Support the mother to breastfeed the baby adequately (especially preterm babies) to minimize the severity of neonatal jaundice. The adequacy of breastfeeding, weight and hydration status of all babies should be assessed during the first week of life. Babies with weight loss more than 7% of birth weight should be assessed for adequacy of breastfeeding and closely monitored for jaundice. 
   Please refer to Chapter 5 ‘ Special areas/ issues - Breastfeeding and jaundice’.

4. All babies should be examined for jaundice before discharge. If jaundice is noted, transcutaneous bilirubin or serum bilirubin should be done before they leave the ward and managed appropriately. Special attention should be given to babies with risk factors.
If jaundice is not detected on discharge, the mother should be given written instructions (Please see Appendix 7.1 for Health education for parents – Jaundice in babies) to inform the local health staff to review the baby the following day.

Home visit during the postnatal period

1. Home visit should be for all newborns on day 1, 2, 3, 4, 5, 6, 8, 10, 15, and 20. Special attention for jaundice must be taken for the first five days of life.

2. If the jaundice is detected but not indicated for admission or phototherapy, daily visits should be conducted to monitor the severity of jaundice. Transcutaneous bilirubinometer, if available, could be used to measure the level of bilirubin.

3. For the baby with jaundice, sunlight exposure is not recommended as there is a risk of dehydration and sunburn.

Clinical detection of jaundice

Neonatal jaundice first becomes visible on the face and forehead then gradually extends to the trunk and extremities. Jaundice can be detected by blanching the skin with finger pressure. The health care provider should examine the baby under good lighting for presence and severity of jaundice.

The severity of the jaundice is determined clinically by the area of skin involved (see Table 1 and Figure 1).

Table 1: Clinical assessment of neonatal jaundice (Kramer’s rule)

<table>
<thead>
<tr>
<th>Area of the Body</th>
<th>Range of serum bilirubin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>µmol/L</td>
</tr>
<tr>
<td>Head &amp; neck</td>
<td>68-133</td>
</tr>
<tr>
<td>Over upper trunk above umbilicus</td>
<td>85-204</td>
</tr>
<tr>
<td>Lower trunk &amp; thighs (below umbilicus)</td>
<td>136-272</td>
</tr>
<tr>
<td>Arms &amp; lower legs</td>
<td>187-306</td>
</tr>
<tr>
<td>Palms &amp; soles</td>
<td>&gt;306</td>
</tr>
</tbody>
</table>

Note: This may be difficult in dark skinned infants

Visual inspection of the baby, including Kramer’s rule, can only be used as a guide to the level of jaundice. There is a wide inter-observer error in the clinical estimation of the level of jaundice. If jaundice is detected clinically, total serum bilirubin (TSB) should be measured. Transcutaneous bilirubinometer (TcB) may be used to screen for jaundice, however if the levels exceed 200 umol/L (12 mg/dL), TSB should be measured.

Please refer to Chapter 5 on ‘Special areas/ issues – Transcutaneous Bilinometer and Predischarge Screening& Appendix 7.2 for the technique of capillary blood sampling for bilirubin testing.
3. CRITERIA FOR ADMISSION FOR NEONATAL JAUNDICE

Babies with the following criteria should be referred and considered for admission:

1. Onset of jaundice within 24 hours.

2. Baby who require phototherapy based on Table 2 & Table 3.

3. Clinical jaundice below umbilicus.

4. Jaundice up to the level of the sole of the feet –likely to need exchange transfusion.

5. Rapid rise of serum bilirubin:
   - more than 103 μmol/L/day (> 6mg/dL/day) - indication for phototherapy
   - more than 8.5 μmol/L/hour (> 0.5mg/dL/hour) - indication for exchange transfusion

6. All G6PD deficient/ intermediate babies with or without jaundice (to keep for at least 5 days)

7. Other haemolytic disorders eg. ABO incompatibility and Rh isoimmunisation.

8. Clinical symptoms / signs suggestive of sepsis.

Table 2: Guidelines for phototherapy in babies ≥38 weeks’ gestation

<table>
<thead>
<tr>
<th>Hours of Life</th>
<th>Total Serum Bilirubin levels μmol/L (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthy babies with no risk factors</td>
</tr>
<tr>
<td>&lt;24</td>
<td>Babies jaundiced at &lt;24 hours of life are considered not healthy &amp; require admission</td>
</tr>
<tr>
<td>24</td>
<td>9 (154)</td>
</tr>
<tr>
<td>48</td>
<td>12 (205)</td>
</tr>
<tr>
<td>72</td>
<td>15 (257)</td>
</tr>
<tr>
<td>96</td>
<td>17 (291)</td>
</tr>
<tr>
<td>&gt;5 days</td>
<td>18 (308)</td>
</tr>
</tbody>
</table>
Integrated Plan For Detection & Management of Neonatal Jaundice

Table 3: Guidelines for phototherapy in babies > 35 weeks’– 37 weeks + 6 days’ gestation

<table>
<thead>
<tr>
<th>Hours of Life</th>
<th>Total Serum Bilirubin levels µmol/L (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthy babies with no risk factors</td>
</tr>
<tr>
<td>&lt;24</td>
<td>Babies jaundiced at &lt;24 hours of life are considered not healthy &amp; require admission</td>
</tr>
<tr>
<td>24</td>
<td>7 (120)</td>
</tr>
<tr>
<td>48</td>
<td>10 (171)</td>
</tr>
<tr>
<td>72</td>
<td>12 (205)</td>
</tr>
<tr>
<td>96</td>
<td>14 (239)</td>
</tr>
<tr>
<td>&gt;5 days</td>
<td>15 (257)</td>
</tr>
</tbody>
</table>

*Risk factors are isoimmune haemolytic disease, G6PD deficiency, asphyxia, sepsis and low birth weight (<2.5kg)

Special Circumstances That May Require Admission:

Jaundice in a baby with logistic problems eg. remoteness / social reasons

Babies with logistic problems eg. remoteness / social reasons referred from the health centres for jaundice (even if mild), should be considered for admission, as it may have been difficult for health staff to persuade parents to come to hospital.

However, in cases where mothers are able to care for their babies and serum bilirubin can be measured, patients with mild jaundice can be allowed to go home and followed up by the local clinic.

Detection and management of NNJ at the postnatal ward in hospitals with and without specialists

Please refer to the flow diagrams in the Appendix 7.7 and 7.8 that outline care at these two locations.
4. MANAGEMENET OF BABIES ADMITTED FOR NEONATAL JAUNDICE

A. ASSESSMENT OF BABIES WITH NEONATAL JAUNDICE

**History**
- Day of onset of jaundice
- Previous siblings with hemolysis, G6PD deficiency, severe neonatal jaundice or exchange transfusion
- Mother’s blood group
- Gestation: the incidence of hyperbilirubinaemia increases with prematurity
- Symptoms of sepsis, apnoea, difficulty in feeding, feed intolerance and temperature instability
- Adequacy of breastfeeding

**Physical examination**
- General condition, gestation, current weight and percentage of weight loss**, signs of sepsis or focal infection, hydration status
- Pallor, plethora, cephalhaematoma, subaponeurotic haemorrhage, bruises
- Signs of intrauterine infection e.g. petechiae, hepatosplenomegaly
- Cephalo-caudal progression of severity of jaundice. Please refer to Table 1.
- In term babies with severe jaundice, look for signs of acute bilirubin encephalopathy e.g. lethargy, hypotonia, seizure, opisthotonus, high pitch cry. Please refer to Appendix 7.10: BIND score

**Percentage of weight loss (% weight loss) can be calculated by using this formula:**

\[
\text{birth weight} - \text{current weight} \times 100\%
\text{birth weight}
\]

**Laboratory investigations**
- The two most important investigations in the approach of NNJ are:
  a) Total serum bilirubin
  b) G6PD status
- There is no clinical benefit in conducting a full laboratory evaluation to identify causes of severe neonatal jaundice except in:
  a) Early onset neonatal jaundice (<24 hours)
  b) Rapid rise of TSB (> 8.5μmol/L/h or > 0.5mg/dL/h)
- The full laboratory investigations include the following:
  a) Mother’s and baby’s blood groups
  b) Direct Coomb’s test
  c) Full blood count +/- peripheral blood picture
  d) Reticulocyte count
  e) Septic workup (if infection is suspected)
B. TREATMENT OF NEONATAL JAUNDICE

Sunlight exposure is not recommended as there is a risk of dehydration and sunburn.

Phototherapy

- Phototherapy is the mainstay of treatment. It should be started when TSB reaches the phototherapy levels for neonatal jaundice. Please refer to Table 4

- Effective phototherapy consists of:
  a) Phototherapy in the blue light range (wavelengths of about 400-500nm)
  b) A minimum irradiance of 15uW/cm2/nm for conventional phototherapy
  c) A minimum irradiance of 30 uW/cm2/nm for intensive phototherapy.
  d) A distance of light source not more than 30-50cm from top surface of the baby
  e) An adequately exposed baby

- Care of babies during phototherapy:
  a) Babies should be regularly monitored for vital signs including temperature, hydration status and urine output.
  b) Babies’ eyes should be covered to prevent retinal damage.
  c) Breastfeeding should be continued.

- Turn off photolights during feeding and blood taking.

- Discontinue phototherapy when serum bilirubin is below the conventional phototherapy level. For healthy term babies who are 96 hours of life and older, discontinue phototherapy if serum bilirubin is below 280μmol/L.

- In babies without haemolytic disease, the average bilirubin increase of rebound jaundice after phototherapy is less than 17 μmol/L (1 mg/dL). Discharge from hospital need not be delayed in order to observe the baby for rebound jaundice but parental education is needed and they should be followed-up with readmission, if necessary.

- When the baby is on phototherapy, visual assessment and TcB is not reliable in monitoring the bilirubin levels. Serum bilirubin levels should be measured to guide the management.

Table 4: Guidelines for phototherapy and exchange transfusion (ET) in hospitalized babies of 35 or more weeks’ gestation

<table>
<thead>
<tr>
<th>Age</th>
<th>LOW RISK &gt;38 weeks and well</th>
<th>MEDIUM RISK &gt;38 weeks with risk factors or 35 - 37 weeks + 6 days and well</th>
<th>HIGH RISK 35 - 37 weeks + 6 days and with risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours of Life</td>
<td>Coventional Phototherapy - TSB in mg/dL (μmol/L)</td>
<td>ET - TSB in mg/dL (μmol/L)</td>
<td>Coventional Phototherapy - TSB in mg/dL (μmol/L)</td>
</tr>
<tr>
<td>&lt;24*</td>
<td>9 (154)</td>
<td>19 (325)</td>
<td>7 (120)</td>
</tr>
<tr>
<td>24</td>
<td>12 (205)</td>
<td>22 (376)</td>
<td>10 (171)</td>
</tr>
<tr>
<td>48</td>
<td>15 (257)</td>
<td>24 (410)</td>
<td>12 (205)</td>
</tr>
<tr>
<td>72</td>
<td>17 (291)</td>
<td>25 (428)</td>
<td>14 (239)</td>
</tr>
<tr>
<td>96</td>
<td>18 (308)</td>
<td>25 (428)</td>
<td>15 (257)</td>
</tr>
</tbody>
</table>

a) Start intensive phototherapy at TSB of 3 mg/dL (51 μmol/L) above the level for conventional phototherapy or when TSB increasing at >0.5 mg/dL (8.5 μmol/L) per hour.

b) Risk factors are isoimmune haemolytic disease, G6PD deficiency, asphyxia and sepsis.

c) Babies jaundiced at < 24 hours of life are not considered healthy and require further evaluation.

Follow-up
1. All babies discharged less than 48 hours after birth should as far as possible be seen by a healthcare provider in an ambulatory setting or at home within 24 hours of discharge. On discharge, the local health worker should be informed and the parents advised accordingly.

2. Babies with severe/ pathological jaundice who are discharged in the first 5 days of life, early follow-up is needed to detect rebound jaundice.

3. Babies with acute bilirubin encephalopathy should have long-term follow-up to monitor for neurodevelopment sequelae.

4. Term and late preterm babies with TSB > 20mg/dL (342umol/L) and those who require exchange transfusion should have Auditory Brainstem Response (ABR) testing done, preferably before discharge or within the first month of life. They should continue the Audiology follow-up until 3 years old, to monitor for any development/ progression of hearing impairment.

5. Healthy term and late preterm babies with non-haemolytic hyperbilirubinemia, normal hearing assessment, and TSB < 25mg/dL (428umol/L) may be followed-up at the primary care level.

Exchange Transfusion
• ET is indicated when the TSB is above the recommended levels. Please refer to Table 4

• ET procedure should follow a standardised protocol and supervised by experienced personnel. Babies undergoing ET should be closely monitored.

Intravenous Immunoglobulin
• High dose intravenous immunoglobulin (IVIG) (0.5 to 1 gm/kg single dose) has been used to reduce the need for exchange transfusions in Rh and ABO hemolytic disease, but its efficacy is inconclusive.

• If used, it should be given after ET or as early as possible when the TSB is rising despite intensive phototherapy, even if ET is not as yet indicated.
5. SPECIAL AREAS/ ISSUES

BREASTFEEDING AND JAUNDICE

Breastfeeding, because of its benefits, should be continued in the jaundiced babies. However, inadequate breastfeeding in the first week of life may aggravate jaundice. Supportive measures should be there to promote successful breastfeeding. Supplementation may be needed temporarily to ensure adequate hydration. In this instance, expressed breast milk should be given. If not available or inadequate, then only use formula milk.

Interruption of breastfeeding in healthy term newborn is discouraged and frequent breast-feeding should be continued. Supplementing with water or dextrose water does not lower bilirubin level in jaundiced, healthy, breast-feeding babies.

Table 5: Assessment of breastfeeding adequacy table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine output</td>
<td>At least 5-6 heavy wet nappies in 24 hours</td>
</tr>
<tr>
<td>Appearance and frequency of stools</td>
<td>At least 2 in 24 hours; normal appearance</td>
</tr>
<tr>
<td>Baby’s colour, alertness and tone</td>
<td>Normal skin colour, alert, good tone</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight loss not more than 10% of birth weight</td>
</tr>
<tr>
<td>Number of feeds in the last 24 hours</td>
<td>At least 8 – 12 feeds</td>
</tr>
<tr>
<td>Baby’s behavior during feeds</td>
<td>Generally calm and relaxed</td>
</tr>
<tr>
<td>Sucking pattern during feeds</td>
<td>Initial rapid sucks changing to slower sucks with pauses and soft swallowing</td>
</tr>
<tr>
<td>Length of feed</td>
<td>Feeding for 5 – 40 minutes at most feeds</td>
</tr>
<tr>
<td>End of the feed</td>
<td>Baby lets go spontaneously, or does so when breast is gently lifted</td>
</tr>
<tr>
<td>Baby’s behavior after feeds</td>
<td>Content after most feeds</td>
</tr>
</tbody>
</table>

Source: Breastfeeding assessment form, Unicef, WHO

RHESUS & ABO INCOMPATIBILITY

Maternal antenatal testing should include ABO and Rh(D) typing. Both of these are associated with severe haemolytic neonatal jaundice. The Rh-negative mother is usually given anti-D immunoglobulin (‘RhoGAM’) at 28 weeks and at any other time if there is risk of sensitisation e.g. threatened abortion, antepartum haemorrhage etc.

A Rh-negative mother should ideally deliver in hospital. When the mother is Rh-negative, a direct Coombs’ test, ABO blood type, Rh(D) type, bilirubin level and haemoglobin level (full blood count) on the baby’s (cord) blood are required. The baby should be referred to the paediatric team to decide on further management and should be discharged only if there is no risk of severe jaundice.

Babies of mothers with blood group “O” and with a sibling who had severe neonatal jaundice should be observed for at least the first 24 hours of life. If jaundiced, serum bilirubin should be performed on these babies and managed appropriately. If not jaundiced or sent home, the mother should be given written instructions to inform the local health staff to review the baby the next day. Please see Appendix 7.1 for Health education for parents – Jaundice in babies
G6PD DEFICIENCY

Magnitude of problem
Glucose-6-phosphate dehydrogenase (G6PD) deficiency is the most common human enzyme deficiency. It is an X-linked recessive condition. It affects 2.5% of newborns locally and is higher in boys (3.1%) and certain ethnic groups (Malays 2.2-3.5%, Chinese 3.1-4.5%, Dayaks 5%, Orang Asli 8-23%). The contribution of G6PD deficiency to severe NNJ and kernicterus has declined over the years but it remains an important cause of haemolytic neonatal jaundice.

G6PD deficiency screening test
The screening test for G6PD deficiency is the semi-quantitative fluorescent spot test. It has the advantage of being simple and rapid. However, this test has a false positive rate of 13.3% (sensitivity 97.9% and specificity 86.6%). See Appendix 7.4 and 7.5.

All babies must have G6PD screening done on cord blood. Ideally the G6PD status should be known before discharge. Any neonate who is discharged without the G6PD status should have the results obtained within 24 hours and if deficient/intermediate, the parents should be notified and re-admitted as soon as possible. For home and clinic deliveries the G6PD status should be traced by the health staff.

Management
All babies with G6PD deficiency/intermediate, including home deliveries, should be observed in hospital for at least 4-5 days. If jaundice is detected, treat accordingly. Term G6PD deficient babies with birth weights >2500 g may be discharged earlier on day four of life if the TSB is <160 μmol/L (9 mg/dL), and followed-up closely. Table 6 below outlines the list of drugs and foods/herbs to avoid in children with G6PD deficiency. All parents must be educated and given written guidelines on drugs and foods/herbs that should be avoided.

Table 6: Agents to be avoided in G6PD deficiency patients

<table>
<thead>
<tr>
<th>1) Food and herbs to be avoided</th>
<th>4) Drugs that can be safely given in therapeutic doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Fava Beans (Kacang Parang)</td>
<td>- Paracetamol</td>
</tr>
<tr>
<td>- Documented Chinese Herbs/medicine</td>
<td>- Ascorbic acid</td>
</tr>
<tr>
<td>o Chuen Lin</td>
<td>- Aspirin</td>
</tr>
<tr>
<td>o San Chi</td>
<td>- Chloramphenicol</td>
</tr>
<tr>
<td>o 12 herbs</td>
<td>- Chloroquine</td>
</tr>
<tr>
<td>o 13 herbs</td>
<td>- Colchicine</td>
</tr>
<tr>
<td>Other traditional herbs/medications are also not to</td>
<td>- Diphendramine</td>
</tr>
<tr>
<td>be taken unless with medical advice</td>
<td>- Isoniazide</td>
</tr>
<tr>
<td></td>
<td>- Phenacetin</td>
</tr>
<tr>
<td></td>
<td>- Phenylbutazone</td>
</tr>
<tr>
<td></td>
<td>- Phenytoin</td>
</tr>
<tr>
<td></td>
<td>- Procainamide</td>
</tr>
<tr>
<td></td>
<td>- Primaquine</td>
</tr>
<tr>
<td></td>
<td>- Sulfamethoxazole</td>
</tr>
<tr>
<td></td>
<td>- Trimethoprim</td>
</tr>
<tr>
<td></td>
<td>- Triplethramine</td>
</tr>
<tr>
<td></td>
<td>- Vitamin K</td>
</tr>
<tr>
<td></td>
<td>- Mefloquine</td>
</tr>
<tr>
<td>2) Other chemicals to be avoided</td>
<td></td>
</tr>
<tr>
<td>- Naphthalene (moth balls)</td>
<td></td>
</tr>
<tr>
<td>- Mosquito coils and insect repellents which contains</td>
<td></td>
</tr>
<tr>
<td>pyrethrum</td>
<td></td>
</tr>
<tr>
<td>3) Drugs to be avoided or contraindicated</td>
<td></td>
</tr>
<tr>
<td>- Acetanilide</td>
<td>- Nitrofurantoin</td>
</tr>
<tr>
<td>- Doxorubicin</td>
<td>- Phenozopyridine</td>
</tr>
<tr>
<td>- Furazolidene</td>
<td>- Primaquine</td>
</tr>
<tr>
<td>- Methylene Blue</td>
<td>- Sulfamethoxazole</td>
</tr>
<tr>
<td>- Nalidixic acid</td>
<td>- Bactrim</td>
</tr>
<tr>
<td>- Niridazole</td>
<td></td>
</tr>
</tbody>
</table>
Integrated Plan For Detection & Management of Neonatal Jaundice

TRANSCUTANEOUS BILIRUBINOMETRY

Transcutaneous bilirubinometer (TcB) is a hand-held device that measures the amount of bilirubin in the skin. Studies have found a good correlation between bilirubin levels measured by TcB and total serum bilirubin measurements.

However the difference between the two measurements are large at serum bilirubin levels more than 200µmol/L (12mg/dL). Thus if the TcB levels exceed 200µmol/L (12mg/dL), TSB should be measured. TcB should not be used to monitor bilirubin levels in babies on phototherapy but can be used after 24 hours of stopping phototherapy.

The two common types of TcB studied are JM103 and Bilichack. The TcB is placed on either the baby’s forehead or sternum. Measurement over the sternum is preferred because it avoids the problem of obtaining a reading when the baby wrinkles the forehead when crying and the potential risk of injuring the eye if the baby struggles.

Predischarge Screening for Jaundice

Predischarge screening for neonatal jaundice is a measure to prevent severe NNJ. It involves clinical risk factor* assessment and daily visual or TcB measurement (if available) until the baby is discharged. If jaundice is detected and TcB is not available, TSB should be measured.

If TcB is used, TSB should be done if the bilirubin level is more than 200µmol/L (12mg/dL). The TSB or TcB value is referenced against the AAP hour-specific bilirubin risk-zone nomogram (see Figure 2). Based on the risk-zone, the potential for the baby to develop severe NNJ can be predicted and treatment initiated appropriately.

*Risk factors include
1. Isoimmune (ABO or Rhesus) haemolytic disease, G6PD deficiency or other haemolytic diseases
2. Exclusive breastfeeding, if nursing is not going well, and/or weight loss is >8 - 10%
3. Previous sibling with jaundice
4. Cephalhaematoma or significant bruising
5. East Asian race

![Figure 2: Nomogram for Designation of Risk at ≥36 Weeks’ Gestational Age with Birth Weight ≥2000 g or ≥35 Weeks’ Gestational Age with Birth Weight ≥2500 g](image)

Parental reluctance or refusal for care
Occasionally parents of a baby with severe NNJ are reluctant for care or hospital admission. This is often a result of parents having transport problems, waiting for other relatives to arrive, preferring traditional treatment or a true reluctance to come for hospital care.

If parents refuse or are reluctant to bring the baby with severe NNJ to hospital, the following actions:
1. Call the FMS/ medical & health officer (M&HO) responsible for the area.
2. The FMS/ M&HO has to advise the parents regarding the need to treat NNJ urgently.
3. If this fails, the M&HO is to call the paediatric medical officer (MO) or paediatrician responsible for the area.
4. The paediatric MO or paediatrician is to advise parents of the Child Act and get the baby to a hospital with the aid of the Welfare Department.
PROLONGED NEONATAL JAUNDICE

Definition of prolonged neonatal jaundice
Visible jaundice (SB >85 μmol/L or 5 mg/dL) that persists beyond 14 days of life in a term baby or 21 days in a preterm baby.

Causes of prolonged neonatal jaundice
It may be unconjugated or conjugated hyperbilirubinaemia. Please refer to Table 7. Conjugated hyperbilirubinaemia is defined as the direct (conjugated) fraction of bilirubin more than 34 μmol/L (2mg/dL), or more than 15% of the total bilirubin.

<table>
<thead>
<tr>
<th>Table 7 : Causes of Unconjugated and Conjugated Hyperbilirubinaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unconjugated Hyperbilirubinemia</strong></td>
</tr>
<tr>
<td>Septicaemia/ Urinary Tract Infection</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Hypothyroidism</td>
</tr>
<tr>
<td>Haemolysis</td>
</tr>
<tr>
<td>Breast milk jaundice (most common, benign condition)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*All babies with conjugated hyperbilirubinaemia must be referred to a paediatric department urgently to exclude biliary atresia.

Laboratory investigations
- **Total Serum Bilirubin with Direct/ indirect Bilirubin** remains the most important laboratory investigation for prolonged neonatal jaundice.
- TSB alone or heel prick capillary bilirubin is NOT helpful in the management of prolonged jaundice.
- Other initial tests that are simple and helpful would be:
  - FBC + reticulocyte count
  - Free T4 & TSH
  - Urine Dipstick and Microscopy
- Further lab investigations are sometimes needed when the baby is referred to the Paediatric Team.

Management
- All term babies at day 14 of life (or preterm babies at day 21 of life) MUST be visually assessed/screened for prolonged neonatal jaundice
- Once prolonged neonatal jaundice is detected, the baby must be referred to any medical officer the same day or the next working day.
  - The medical officer will then need to carry out thorough clinical assessment and send for a serum bilirubin with direct and indirect bilirubin. Thereafter, he/she will risk stratify the baby into high, moderate or low risk group and make a decision on further management or referrals. Please refer to Table 8.
### Table 8: Initial Management of Neonatal Jaundice based on Risk Groups (at the point of diagnosis in any health facility)

<table>
<thead>
<tr>
<th>Clinical Feature/ Lab Results</th>
<th>High Risk</th>
<th>Moderate Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Ill/ Septic looking • Respiratory Distress • Poor Feeding • Lethargy • Poor Perfusion</td>
<td>• Conjugated • Hyperbilirubinaemia • Severe Jaundice - TSB &gt; 300μmol/L • New Onset of Jaundice (esp after Day 7) • Pale Stool • Dark Yellow Urine (that stains the diapers) • Poor Weight Gain • Hepatosplenomegaly</td>
<td>• No features as in High or Moderate Risk category</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To also consider: • Bottle fed &gt; 50% • Jaundice &gt; 1 mth not investigated before • Other suspected medical condition • Significant family history</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>Stabilize ABC Refer to Paediatrician Immediately</td>
<td>Refer to Paediatric Team Same day or next working day</td>
<td>Could be managed and followed up at the primary care level or hospitals without specialist.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Termbabies (37 weeks): • Jaundice at Day 14: o Serum Bilirubin with Direct/ Indirect bilirubin</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• If still jaundice at day 21: o Serum bilirubin with Direct/ Indirect bilirubin, o FBC + reticulocytes o UFEME + microscopy o Free T4 TSH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Preterm babies (&gt;35 weeks to 37 weeks): To work up one week later than term babies Please refer to appendix 7.11</td>
</tr>
</tbody>
</table>

Note:
1. Well, low risk babies with normal investigations results do not need repeated heel prick capillary bilirubin. *Warning signs and RME at 1, 2 months in health clinics, looking at the same clinical features will serve as a good safety netting.
2. Refer to Paediatric Team if conjugated hyperbilirubinaemia,*warning signs, SB> 300μmol/L, abnormal lab results, jaundice more than 2 months or any features in the high or moderate risk category.
3. *Warning signs for parents to seek help (at any stage): Unwell, pale stool, dark yellow urine, new onset of jaundice, persistent jaundice > 2 months.

Please refer to:
Appendix 7.11: Flow Chart of the Management of Prolonged Neonatal Jaundice
Appendix 7.12: Initial Assessment - Clerking and Referral Sheet for Prolonged Neonatal Jaundice in Health Clinics or Hospital without Specialist
Appendix 7.13: Clerking sheet for Prolonged Neonatal Jaundice for Hospitals with Paediatricians
Appendix 7.15: Infant Stool Colour Chart
Appendix 7.16: Parental Education Pamphlet for Prolonged Jaundice
6. QUALITY ASSURANCE: SEVERE NEONATAL JAUNDICE AS QA INDICATOR

The QA indicator for severe neonatal jaundice (SNNJ) was designed in 1993 and reviewed in 2001 and 2006. Many districts have remained outliers despite efforts to reduce SNNJ. Among the factors relating to this include machine errors (wrong serum bilirubin levels), failure to detect jaundice at home visits and postnatal wards, limited home visits in some regions, failure to identify risk factors for severe NNJ before discharge from hospital and parental refusal for care.

Table 9: Numbers of babies detected to have jaundice and type of treatment provided

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual Live Birth</th>
<th>No. Detected</th>
<th>% detected</th>
<th>Phototherapy</th>
<th>Exchange Transfusion</th>
<th>No. of severe NNJ cases</th>
<th>Percentage of SNNJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>472,048</td>
<td>219,667</td>
<td>46.5</td>
<td>53,034</td>
<td>427</td>
<td>4523</td>
<td>2.1</td>
</tr>
<tr>
<td>2008</td>
<td>487,346</td>
<td>240,085</td>
<td>49.3</td>
<td>53,960</td>
<td>261</td>
<td>3862</td>
<td>1.6</td>
</tr>
<tr>
<td>2009</td>
<td>496,239</td>
<td>251,015</td>
<td>50.6</td>
<td>57,250</td>
<td>281</td>
<td>3513</td>
<td>1.4</td>
</tr>
<tr>
<td>2010</td>
<td>491,239</td>
<td>272,098</td>
<td>55.4</td>
<td>58,933</td>
<td>192</td>
<td>2777</td>
<td>1.0</td>
</tr>
<tr>
<td>2011</td>
<td>511,594</td>
<td>287,795</td>
<td>56.3</td>
<td>59,330</td>
<td>165</td>
<td>2607</td>
<td>1.0</td>
</tr>
<tr>
<td>2012</td>
<td>526,012</td>
<td>300,300</td>
<td>57.1</td>
<td>57,536</td>
<td>214</td>
<td>2718</td>
<td>1.0</td>
</tr>
<tr>
<td>2013</td>
<td>503,914</td>
<td>310,275</td>
<td>61.6</td>
<td>63,183</td>
<td>174</td>
<td>2816</td>
<td>0.9</td>
</tr>
<tr>
<td>2014</td>
<td>511,865</td>
<td>330,430</td>
<td>64.6</td>
<td>58,850</td>
<td>163</td>
<td>2739</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Definition of severe neonatal jaundice
Severe Neonatal Jaundice (SNNJ) is defined as neonate under 14 days of life with serum bilirubin levels > 340 μmol/L (> 20 mg/dL).

Rationale for selection of indicator
1) The rationale to monitor NNJ cases is to use it as a proxy in the prevention of bilirubin encephalopathy/kernicterus.
2) It also serves as an indicator for overall neonatal care and morbidity.
3) It is important that the complication of moderate to advanced acute bilirubin encephalopathy is being captured at the same time. One way is to report on the BIND score (see Table 10).

Formula for incidence rate of severe neonatal jaundice
Incidence rate of SNNJ = \( \frac{\text{Total number of severe NNJ cases} \times 10,000}{\text{Total number of estimated live births}} \)
STANDARD FOR SEVERE NEONATAL JAUNDICE RATE

Upper limit
Districts with rates exceeding 50 per 10,000 estimated live births are considered above the accepted level and have a shortfall in quality. These districts need to investigate why there are high rates of SNNJ and whether the care provided has been optimal (Figure 4).

Lower limit
Districts with rates below 15 per 10,000 estimated live births are considered far below the accepted level and have a shortfall in quality. These districts need to investigate why there was such a low detection rate of SNNJ (Figure 5).

Staff responsible for investigation of severe neonatal jaundice
Both hospital and health staff are jointly responsible for the prevention of SNNJ and hence will investigate and institute remedial measures. Regardless of whether the baby was or was not managed in the hospital the following individuals will be responsible for the investigation by the district:

1. Hospitals with specialists - the relevant paediatrician, special care nursery sister, postnatal ward sister, public health matron/sister of the district (coordinator).

2. Hospitals without specialists - the relevant senior medical officer of the paediatric unit/family medicine specialist, hospital sister, public health matron/sister of the district (coordinator).

Data on severe NNJ should be analysed and presented twice yearly at the state perinatal mortality meetings.

Monitoring of babies with Acute Bilirubin Encephalopathy (ABE)
ABE signifies the presence of changes in the mental (behavioural) status and muscle tone during the neonatal period when the baby is having severe NNJ.

These include drowsiness, poor feeding and hypotonia followed by hypertonia affecting extensor muscles in particular, resulting in retrocollis and opisthotonos. A BIND score could be used to assess for ABE in term babies who are admitted for severe NNJ. Moderate to advanced ABE signifies the potential of neurodevelopmental sequelae and needs long term follow-up and hearing assessment. Please Refer to Appendix 7.10

Table 10: BIND Scoring

<table>
<thead>
<tr>
<th>Acute Bilirubin Encephalopathy Severity</th>
<th>Total BIND score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild ABE</td>
<td>1-3</td>
</tr>
<tr>
<td>Moderate ABE</td>
<td>4-6</td>
</tr>
<tr>
<td>Advanced ABE</td>
<td>7-9</td>
</tr>
</tbody>
</table>
Steps in investigation of SNNJ
Figure 5 shows the process of investigation and flow of information and data. An investigation should be conducted if there is a shortfall in quality.

Figure 3: Flow of data collection for NNJ

1. Monitoring of all newborns for NNJ
2. Newborn identified to have NNJ
3. Use the NNJ form to monitor, manage & notify (MMN form in 2 copies)
4. On going NNJ management at home, clinic, hospital. Data to be updated at all levels
5. Final outcome

- Mild-Moderate NNJ
  1. One copy of MMN form to be sent to health matron/sister of the district
  2. One copy of MMN form to be kept with the child health card

- Severe NNJ
Figure 4: Investigation for districts that exceed the upper limit of SNNJ rates (>50 per 10,000 estimated live births)

- Determine status by comparing with National Standard at the end of the cycle (6 monthly)
- Any shortfall in QA
  - Yes: Review and verify data for any error
  - No: Continue QA Investigation
- Error in data
  - Yes: Make correction
  - No: Continue QA Investigation
- Any shortfall in QA
  - Yes: End
  - No: Medical Audit of SNNJ cases from the MMN form compared with model of good care
- Was each step taken appropriately, timely & adequately
  - Yes: Investigation ends
  - No: Identify problem in each area of case
- How often did the same problem occur
- Review 30 sample of NNJ using MMN forms
  - Did not occur: Remedial measures for isolated case
  - Occurred in sample problems identified: Why do these problems occur

- Observe and interview staff
- Study of available infrastructure
- Interview sample of mothers/community
- Study/review environment/logistics

- Training
- Improve supervisory procedures
- Revise organizational process
- Review clinical procedures
- Health education
- Community mobilisation
Figure 5: Investigation for districts that are below the lower limit of SNNJ rates (<15 per 10,000 estimated live births)

Determine status by comparing with National Standard at the end of the cycle (6 monthly)

- Any shortfall in QA
  - Yes: Review and verify data for any error
  - No: End

Review and verify data for any error

- Error in data
  - Yes: Make correction
    - Determine status again
  - No: Continue QA investigation

Continue QA investigation

- Any shortfall in QA
  - Yes: End
  - No: Make correction
    - Determine status again

Medical Audit of SNNJ cases from the MMN form compare with model of good care

- Was there adequate postnatal visits for all deliveries
  - Yes: Investigation ends
  - No: Identify problem in each area of case

Identify problem in each area of case

- How often did the same problem occur
  - Institute remedial action
    - Reinforce postnatal nursing program/visit

End
7. MODEL OF GOOD CARE

Antenatal care
1. Education on neonatal jaundice provided for the expectant mother (pamphlet)
2. All mothers should have blood taken for ABO and Rhesus group.
3. Identify other risk factors for significant jaundice e.g. family history of severe neonatal jaundice, exchange transfusion and haemolytic diseases.

Intrapartum care
1. Cord blood for G6PD screening. Obtain G6PD screening results before baby is discharged from hospital or as soon as possible in home deliveries.
2. If result shows G6PD deficiency/ Intermediate, the baby is to remain or be admitted to hospital for observation and monitoring for at least 4-5 days.
3. Babies of Rh-negative mother should be managed at hospital.

Postnatal care
1. Prompt notification of postnatal mother to the nearest health centre.
2. Support the mother to breastfeed the infant adequately and supplementation if needed. The adequacy of breastfeeding, weight and hydration status of all babies should be assessed during the first week of life. Babies with weight loss > 7% of birth weight should be assessed for adequacy of the breastfeeding and closely monitored for jaundice.
3. Nursing personnel should actively look for signs of jaundice during routine care of the mother and baby.
4. Identification of Risk Factors
   - Prematurity (< 37 weeks)
   - Low birth weight (< 2.5kg)
   - Sepsis
   - Baby of diabetic mother
   - Onset of jaundice before 24 hours of life
   - A sibling with severe neonatal jaundice or exchange transfusion
   - Inadequate breastfeeding/ dehydration (as shown by > 7% weight loss)
   - Mothers with blood group O / Rhesus negative
   - G6PD deficiency
   - Asphyxia
   - Rapid rise of Total Serum Bilirubin
   - High pre discharge bilirubin level
   - Cephalhaematoma or bruise

Detection of neonatal jaundice postnatally
1. Examine all babies for jaundice before discharge and TcB/ serum bilirubin measured if jaundice is detected. Special attention should be given to babies with risk factors.
2. Routine home visits as planned (Day 1, 2, 3, 4, 5, 6, 8,10, 15, and 20).
3. Refer to clinic or hospital for admission or bilirubin testing and review based on ‘Criteria of Admission’

Management
Appropriate management of NNJ in hospital.

Recording & Monitoring
1. Use the "Monitor, Manage & Notify NNJ" form. Please see next page.
2. Provide returns to health matron/ district sister.
**Integrated Plan For Detection & Management of Neonatal Jaundice**

**MONITORING, MANAGEMENT AND NOTIFICATION OF NNJ / SNNJ**

<table>
<thead>
<tr>
<th>Bulan/Tahun:</th>
<th>Klinik :</th>
<th>Hospital:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pejabat Kesihatan Daerah:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nama:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tarikh Lahir:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alamat Rumah:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarak Rumah Dari Hospital Terdekat:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kumpulan Ethnik:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melayu:</td>
<td>Rumah:</td>
<td>Primigravida:</td>
</tr>
<tr>
<td>Cina:</td>
<td>ABC:</td>
<td>2–5:</td>
</tr>
<tr>
<td>India:</td>
<td>BBA:</td>
<td>≥ 6:</td>
</tr>
<tr>
<td>Bumi Sarawak:</td>
<td>Hosp Kerajaan:</td>
<td>Tidak diketahui:</td>
</tr>
<tr>
<td>Bumi Sabah:</td>
<td>Hospital Swasta:</td>
<td></td>
</tr>
<tr>
<td>Lain-lain:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RUMUSAN KES**

(oleh Pegawai Perubatan & Kesihatan/PHN/JK):

- Pelapor:
- Kes Neonatal Jaundis:
- Kes SNNJ:
- Kes SNJ dikesan dari format QA FH2:

**PERGERAKAN KES HARI POSTNATAL**

<table>
<thead>
<tr>
<th>Jika kes adalah SNNJ nyatakan</th>
<th>Rawatan</th>
<th>Outcome*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parast SB Tertinggi(umol/l or mg/dl):</td>
<td>Fototerapi</td>
<td>Hidup:</td>
</tr>
<tr>
<td>Mengikut Borang QA FH2)</td>
<td>Fototerapi &amp; Blood Exchange</td>
<td>Mati :</td>
</tr>
<tr>
<td>BIND Score Tertinggi (0-9):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sebab Kelewatan rujukan/kemasukan ke rawatan:

1. Faktor Pesakit:
2. Faktor Perkhidmatan Kesihatan:
3. Faktor Perkhidmatan Hospital:

**MINISTRY OF HEALTH :**

MMN/NNJ 2016

**MONITORING, MANAGEMENT AND NOTIFICATION OF NNJ / SNNJ**

**MINISTRY OF HEALTH :**

MMN/NNJ 2016
GARIS PANDUAN MENGISI BORANG PENGENDALIAN KES-KES NNJ DAN SNNJ


2. Isikan dua (2) salinan.
   a. Salinan Pertama – dikepilkan di Buku Rekod Kesihatan Bayi dan Kanak-kanak 0-6 Tahun

3. Ruangan PERGERAKAN KES:
   i. Tarikh anak discaj.
   ii. Tarikh notifikasi diterima.
   iii. Tarikh lawatan postnatal pertama dan berikutnya.
   iv. Tarikh pertama jaundis dikesan.
   v. Tarikh jaundis dikesan di bawah paras umbilicus.
   vi. Tarikh TSB dijalankan dan tempat di mana ujian TSB dijalankan serta paras Serum TSB.
      (K = KK DAN JPL, H = HOSPITAL DAN A&E HOSPITAL, S = KLINIK ATAU HOSPITAL SWASTA)
   vii. Tarikh rujukan ke Hospital iaitu (HOSPITAL DAN A&E HOSPITAL) dan paras TSB semasa rujukan.
   viii. Tarikh masuk wad dan paras TSB semasa masuk wad. Sekiranya kes tidak masuk wad pada tarikh rujukan sila catatkan TM pada ruangan berkenaan.
   ix. Tarikh discaj dan paras TSB semasa discaj.

4. Salinan pertama yang telah lengkap perlu diambil semula selepas PN ke10, tetapi tentukan kes telah pulih.


Pelapor:

Disemak:
JAUNDICE IN BABIES

What is jaundice

Jaundice in newborn babies is seen as a yellowness of the skin and eyes. Up to 75% of all babies develop jaundice.

What causes jaundice?

In the human body, new blood is being made all the time and old blood is being destroyed. One of the breakdown products of blood is ‘bilirubin’. Bilirubin is normally processed in the liver and is eliminated from the body in the stool and urine. For the first few days after birth, a baby’s liver does not work as efficiently as it does later. So there tends to be a build up of bilirubin in the blood. This causes jaundice in the newborn babies.

Is jaundice harmful?

Severe jaundice can cause
• Death
• Hearing problems (deafness)
• Learning difficulties
• Intellectual disabilities
• Cerebral palsy

What are the danger signs?

Urgent treatment should be sought if jaundiced babies develop the following signs:
• Jaundice visible within 24 hours after birth
• Jaundice visible below the umbilicus
• Not active, unwell or having fever
• Not feeding well
• Fits or stiffness of the body
• Jaundice persisting beyond 14 days
• Pale coloured stools or tea coloured urine

What should the parents do if their babies develop jaundice?

• Seek early treatment at the nearest health facility
• A blood test will be taken to determine the level of bilirubin in the baby’s blood
• Do not put the baby under the sun, as it will cause sunburn and dehydration.

How can parents minimise the severity of jaundice in my baby?

• Ensure adequate breastfeeding (at least 8-12 times every 24 hours)
• Avoid taking traditional medication if breastfeeding

Contact Numbers of nearest Health Clinics / Hospitals:_________

Special Note for parents of babies born to mothers with blood group O:

1. Your baby has a higher risk of developing severe jaundice.
2. Please inform the health staff of the nearest clinic to see your baby the day after discharge to examine for jaundice.

Which babies get severe jaundice?

Babies who may be particularly prone to severe jaundice include:
• Premature babies
• Babies with infection
• Babies with G6PD deficiency
• Babies whose blood group is different from their mother’s
  o Mothers with rhesus negative
  o Mothers with blood group O
• Babies who do not receive adequate feeds
• Baby of diabetic mothers
Appendix 7.2

CAPILLARY BLOOD SAMPLING FOR BILIRUBIN TESTING

To obtain the sample:
- Ensure baby is lying in a safe and secure position
- Hold the baby’s heel
- Hold the ankle with index and middle finger
- Use other fingers to steady the baby’s leg
- Partly encircle the baby’s heel with the thumb
- Clean the proposed puncture site with warm water and gauze. Alcohol impregnated wipes should not be used.
- Allow the area to dry.
- Gently compress the heel and hold the skin under tension.
- Puncture the skin in a steady manner.
- Relax tension and wipe away initial blood flow with cotton wool or gauze.
- While maintaining grip, hold the heel so that blood is allowed to hang.
- Gently but firmly compress the baby’s heel to form a large droplet of blood. Do not squeeze.
- Hold the capillary tube (or blood bottle) to the blood droplet and touch.
- Momentarily release pressure to collect subsequent blood then reapply pressure, allowing the blood to flow.
- Continue until sufficient blood has been obtained.
- Once the sample has been obtained, apply pressure to the site with gauze and maintain pressure until bleeding has stopped.

Figure 6 : Diagram to show location where heel prick should be done
Appendix 7.3

CORD BLOOD SAMPLING & COLLECTION OF SPECIMENS FOR SCREENING G6PD DEFICIENCY

Collection
The specimen is dried blood spots on filter paper. A specific type of filter paper is used and it see section on filter paper type and it is easy to transport to the laboratory from remote areas.

Method
1. Blood can also be obtained directly from the cut end of the maternal portion of cord.
2. Sampling is carried out after the cord has been cut between the clamps or ties normally applied at delivery.
3. Blood must not be drawn from the portion of cord still attached to the baby because of the serious risk of bleeding.

After cleaning
1. Release the clamp or tie on the maternal part of the cord.
2. Using a gloved hand, gently squeeze blood along the cord to the end.
3. Drop the blood into a sterile gully pot.
4. A minimum of 1 ml of blood should be collected.
5. Use a syringe or dropper to transfer the blood onto filter paper.
6. Drop blood from the syringe or dropper directly onto the circle of filter paper, without touching the syringe or dropper to the paper.

Note:
Dropping the blood directly onto the filter paper from the end of the cord, results in poor control of the amount of blood going onto the paper (usually too much spilling over the edge of the circle). This alternative can be used if there is no other option.
GUIDELINES ON THE METHOD FOR G6PD SCREENING (BLOOD COLLECTION AND SCREENING FORM)

Blood for screening purposes should be obtained from the umbilical cord at birth. For babies not screened at birth, blood should be obtained by a heel prick as soon as possible.

1. Collection of blood for G6PD screening at birth

Before delivery
- Fill up the test request form with the name of mother, address, sex, ethnic group, telephone number, e-mail address, etc. (see below)
- Label G6PD screen filter paper strip with the registration number for cases delivered in hospital or use the Identification Card number (I/C) for cases delivered at Alternative Birthing Centers or home.

At delivery
- Completely wet one end of the filter paper strip with cord blood (minimum soak diameter 1 cm).
- Staple the other end of the filter paper strip to corresponding place on the G6PD screen form.
- Complete other relevant information required on the form.
- Put the form in the envelope and address it to the laboratory to which the form is to be sent for testing. For cases delivered in Alternative Birthing Centers or at home forms should be sent to nearby health centers with U/V box.
- Send the form by hand or post as soon as possible.

For babies who’s cord blood screening has not been done
- Blood is to be obtained by heel prick. Please refer to Appendix 7.2.
- Completely wet G6PD filter paper strip with heel blood at one end.
- Label the strip, staple it to the form, label the form, label the form and fill in the necessary particulars and send it to the laboratory as soon as possible.

2. Screening for G6PD enzyme deficiency in the laboratory
- All G6PD specimens must be treated as URGENT and processed on the day of arrival, even if there is only a single specimen to be tested.
- Record all details in the book for G6PD screening.
- Follow procedure for G6PD screening provided in the laboratory.
- Fill in the results on the G6PD form and send them back immediately.
- For guidelines on procedure for detection of G6PD enzyme deficiency by laboratory personnel, please refer to Appendix 7.5.

3. Notifications and Documentation of results - Hospital & Health
- See Appendix 7.6
GUIDELINES FOR LABORATORY PERSONNEL (U/V FLUORESCENCE SCREENING METHOD FOR G6PD DEFICIENCY)

Principle
This fairly simple and foolproof screening for G6PD deficiency is based on that of Beutler (1966). G6PD catalyses nicotinamide adenine dinucleotide phosphate (NADP) to its reduced form NADPH in erythrocytes. NADPH protects cells from oxidative damage. The conversion of NADP is the basic diagnostic testing for the deficiency. The screening method was modified by White (1972) to be used on samples collected on blotting paper or filter paper. The absence of fluorescence in U/V light would mean deficiency of the enzyme.

Reagents
All reagents can be obtained from SIGMA

1. Oxidised glutathione (GSSG) 8 mmol/L
   M.W = 612.7 (49.016 mg/10 ml buffer)

2. Nicotinamide Adenine Dinucleotide Phosphate (NADP)
   7.5 mmol/L M.W = 765.44
   Prepare fresh solution (5 7.4 05 mg/10 ml buffer)
   The solution, if stored deep frozen, remains stable for a week

3. G-6-P (Glucoase-6-Phosphate) 10 mmol/L
   M.W = 358.2 (35.82 mg/10 ml buffer)

4. Tris-HCl Buffer, 0.75 mol/L, pH = 7.8
   Tris (hydroxymethyl) aminomethane = 90.825 g/L (45.412 gm/500 ml).
   250 ml Tris + 33 ml N HCl=0.75 M Tris –HCl Buffer
   (Accuracy of buffer solution should be adjusted to the first decimal place).
   It is essential to use a PH electrode, which is suitable for Tris.
Method
1. 0.1 ml working reagent is placed in a 10 x 75 min labeled test tube.
2. Disc of 6 min punched from sample strip (using TOHO eyelet punch in similar) is placed into tube.
3. Ideally the tube should be incubated at 37 °C X 15 min. However the incubation can be done at room temperature for the same length of time.
4. Using a capillary tube, spot the test mixture on a Whatman No.1 filter paper* and allow it to dry thoroughly, preferably using a hair dryer.
5. Examine under U/V lamp for fluorescence.
   Fluorescence + + + = No G6PD deficiency
   Fluorescence Nil = G6PD deficiency

Work procedure
1. Large numbers of tests may be done at the same sitting.
2. *Use “Chromatography Paper” Whatman No.1 (7.5 cm x 100m. Basic weight 87 gm/m, thickness 0.16 mm). Medium Flow Rate.
3. The mixture of the working reagent should be prepared at district hospital and issued at weekly intervals to the peripheral clinics. This reagent should be transported in a ice-flask. In the peripheral clinics, the reagent should be stored in the freezer compartment.
4. Filter paper should be made available to the peripheral clinics.

Control
A known normal blood sample must be run as a control. Check the reagent daily before each batch of tests to make sure it is working properly.

Interpretation of results
Specimens from normal persons shows strong fluorescence. Red cells with less than 20% normal activity will show no fluorescence.
- G6PD normal - normal follow up
- G6PD Deficient - admit for observation for at least 5 days
- G6PD Intermediate

Confirmatory test:
1. Confirmatory test should be sent after 6months old for G6PD intermediate & G6PD deficient
2. Two methods for confirmatory test; semi quantitative by ELISA or quantitative by immunoassay.
3. Confirmatory test can be done at Ampang Hospital, Kuala Lumpur Hospital dan UKM Medical Centre, also known as Hospital Canselor Tuanku Muhriz.

Precautions
1. This method will miss some female heterozygotes but is reliable for detecting deficiencies among males.
2. Check the expiration dates of commercial kits.
NOTIFICATION OF G6PD DEFICIENCY SCREENING RESULTS

Hospital
The result should be made available before the baby is discharged. In a busy unit with many deliveries a day, some babies may be discharged prior to receiving the laboratory results. There must be a recall system to call back the baby urgently to be admitted to the Pediatric Unit if the result is abnormal.

If the result is normal, the mothers should be notified (Fig. 7). The ward nurse in-charge should inform the public health nurse at the clinic nearest the parents’ home. The public health nurse should endorse the G6PD results in the Home Based Child Health Card.

Health Centre
If the result is abnormal, the nurse or the relevant health staff should be informed immediately, by the Medical Laboratory Technologist, by phone or fax. The baby should be referred to the hospital for admission.

Figure 7: Flow chart on notification of G6PD deficiency screening results
STANDARD OPERATING PROCEDURE FOR DETECTION OF NEONATAL JAUNDICE IN HOSPITALS WITH SPECIALISTS

This SOP enables immediate and effective actions through cooperation between the paediatric and obstetric teams for early detection of NNJ and to avoid exchange transfusion.

**Neonate Clinically Jaundice**

**TSB stat if available**

**Within 24 hours of life (all cases are pathological)**

- Refer Paeds immediately
- While awaiting transfer to neonatal ward
  - Intensive phototherapy - irradiance at least 30
  - SB stat and trace urgently
- Document G6PD status, maternal blood group and past history of severe NNJ in referral sheet

**24-72 hours of life with risk factors:**
- G6PD deficiency
- Maternal Rh -ve
- Risk of sepsis

- Refer Paeds MO immediately
- SB stat and trace urgently
- Start phototherapy while awaiting results
- Decision on admission & care

**After 24 hours of life**

With no risk factors:
- After 72 hours of life
- BW>2.5kg
- G6PD normal
- Maternal Rh +ve

- SB and trace ASAP
- Start phototherapy while awaiting result

**SB above intensive phototherapy level**

- Refer Paeds immediately

**SB above conventional phototherapy level but below intensive level**

- Continue phototherapy
- Repeat SB next morning

**SB below conventional phototherapy level**

- Off phototherapy
- Repeat SB next morning (either in maternity ward if mother is still warded or at the nearest clinic if mother is discharge)

**NOTE:**

All mothers and babies discharged from the postnatal wards must be notified to the nearest health center via fax to facilitate home visits.

**Appendix 7.7**

<table>
<thead>
<tr>
<th>Status</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No risk factors</td>
<td>Phototherapy, G6PD normal, maternal Rh +ve</td>
</tr>
<tr>
<td>With risk factors</td>
<td>Phototherapy, G6PD deficiency, maternal Rh -ve, risk of sepsis</td>
</tr>
<tr>
<td>After 72 hours of life</td>
<td>SB stat and trace, phototherapy</td>
</tr>
<tr>
<td>Within 24 hours of life</td>
<td>Phototherapy, G6PD status, maternal blood group, past history</td>
</tr>
</tbody>
</table>

**Special Cases:**
- G6PD deficient babies - keep for 4-5 days (as per national CPG)
- Maternal Rh -ve babies - ensure cord blood FBC, SB and Coomb's taken, traced urgently. Refer Paeds

**NOTE:**

All mothers and babies discharged from the postnatal wards must be notified to the nearest health center via fax to facilitate home visits.

**Document G6PD status, maternal blood group and past history of severe NNJ in referral sheet.**
**STANDARD OPERATING PROCEDURE FOR DETECTION OF NEONATAL JAUNDICE IN HOSPITALS WITHOUT SPECIALISTS**

**Rationale:** Many attempts to reduce the incidence of Severe NNJ in the past have not brought about significant change. This SOP is to enable early detection of NNJ resulting in immediate and effective action via cooperation between hospitals without specialists with the primary care team.

**Appendix 7.8**

**Note 1:** NNJ presenting <24 hrs of life is pathological.

**Note 2:** Special cases
- G6PD deficient babies - to keep for 5 days (as per national CPG)
- Maternal Rh-ve babies - ensure cord blood FBC, SB and Coomb’s test taken, traced urgently. Refer Paediatrics.

Keep all mothers and babies routinely for 24 hours after delivery (look for jaundice at each shift).

Before discharge look for clinical signs of jaundice.

**Clinically no sign of jaundice**
- Baby with high risk factors
  - High Risk Factors: BW < 2.5kg, POG < 38 wks, Previous sibling with SNNJ or ET, Cephalohaematomata, Infant of DM, Mother Blood Group “O”, Risk of sepsis
  - Notify Health Staff
- Baby with low risk factors
  - Notify Health Staff

**Clinically jaundice present**
- Check serum Bilirubin
- If clinically jaundice present do Serum Bilirubin
- If Serum Bilirubin > intensive phototherapy level
  - Refer specialist hospital
- If Serum Bilirubin < intensive phototherapy level
  - Routine Home Visits

**SB above conventional phototherapy level**
- Admit baby
- Start phototherapy
- Do SB

**SB below conventional phototherapy level**
- Notify Health Staff
- Routine Home Visits
- If clinically jaundice present do Serum Bilirubin
- Refer specialist hospital if SB > intensive phototherapy level

**SB above intensive phototherapy level**
- Admit baby
- Start phototherapy
- Do SB

**SB below intensive phototherapy level**
- Notify Health Staff
- Routine Home Visits
- Review SB next day & closely supervised home visits

After 72 hours of life
- BW > 2.5kg
- G6PD normal
- Maternal Rh +ve
- SB and trace ASAP

Start phototherapy while awaiting result.

If SB above intensive phototherapy level
- Continue phototherapy
- Repeat SB next morning

If SB above conventional phototherapy level
- Off phototherapy
- Repeat SB next morning
  - Either in maternity ward if mother is still warded or at the nearest clinic if mother is discharged

24-72 hours of life with risk factors:
- G6PD deficiency
- Maternal Rh -ve
- Risk of sepsis

**Within 24 hours of life**
- All cases are pathological
- Refer Paeds MO immediately
- SB stat and trace urgently
- Start Phototherapy while awaiting results
- Decision on admission & care

**NB:** Special Cases:
- G6PD deficient babies - to keep for 4-5 days (as per national CPG)
- Maternal Rh -ve babies - ensure cord blood FBC, SB and Coomb’s test taken, traced urgently. Refer Paediatrics.

**NOTE:**
- All mothers and babies discharged from the postnatal wards must be notified to the nearest health center via fax to facilitate home visits.

Before discharge look for clinical signs of jaundice.

- Intensive phototherapy - irradiance at least 30
- SB stat and trace urgently
- Document G6PD status, maternal blood group and past history of severe NNJ in referral sheet.

**Neonate Clinically Jaundice**
- TSB stat if available
- After 24 hours of life

Review SB next day & closely supervised home visits
- High Risk Factors:
  - BW < 2.5kg
  - POG < 38 wks
  - Previous sibling with SNNJ or ET
  - Cephalohaematomata
  - Infant of DM
  - Mother Blood Group “O”
  - Risk of sepsis
- Admit baby
- Start phototherapy
- Do SB
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ya</th>
<th>Tidak</th>
<th>Catatan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Membuang air kecil</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Menukar lampin basah sekurang-kurangnya 5-6 kali dalam 24 jam</td>
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<tr>
<td>2. Najis</td>
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<tr>
<td>- Kelihatan normal</td>
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<tr>
<td>- Sekurang-kurangnya 2 kali dalam 24 jam</td>
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<tr>
<td>3. Keadaan Am Bayi</td>
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<tr>
<td>- Warna kulit normal</td>
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<tr>
<td>- Aktif</td>
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<td></td>
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<tr>
<td>- Tona otot normal</td>
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<tr>
<td>4. Berat bayi</td>
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<td></td>
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<tr>
<td>- Kehilangan berat badan tidak lebih dari 10% berat lahir</td>
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<tr>
<td>5. Penyusuan</td>
<td></td>
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<tr>
<td>- Sekurang-kurangnya 8-12 kali penyusuan dalam 24 jam</td>
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<tr>
<td>6. Kelakuan bayi semasa penyusuan</td>
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<td></td>
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<tr>
<td>- Tenang dan relaks</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7. Corak hisapan semasa penyusuan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Laju pada permulaannya dan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lebih perlahan kemudian, diselang dengan penelanan yang lembut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Jangkamasa penyusuan</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- Menyusu selama 5-40 minit setiap kali</td>
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<td></td>
</tr>
<tr>
<td>9. Akhir penyusuan</td>
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</tr>
<tr>
<td>- Bayi berhenti menyusu secara spontan</td>
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</tr>
<tr>
<td>10. Kelakuan bayi selepas penyusuan</td>
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<td></td>
</tr>
<tr>
<td>- Kelihatan puas dan kenyang</td>
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</tbody>
</table>
### BILIRUBIN-INDUCED NEUROLOGIC DYSFUNCTION (BIND) SCORE

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>BIND Score</th>
</tr>
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<tbody>
<tr>
<td><strong>Mental Status</strong></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>0</td>
</tr>
<tr>
<td>Sleepy but arousable; decreased feeding</td>
<td>1</td>
</tr>
<tr>
<td>Lethargy, poor suck &amp;/or irritable/jittery with strong suck</td>
<td>2</td>
</tr>
<tr>
<td>Semi-coma, apnoea, unable to feed, seizures, coma</td>
<td>3</td>
</tr>
<tr>
<td><strong>Muscle Tone</strong></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>0</td>
</tr>
<tr>
<td>Persistent mild to moderate hypotonia</td>
<td>1</td>
</tr>
<tr>
<td>Mild to moderate hypertonia alternating with hypotonia, beginning</td>
<td>2</td>
</tr>
<tr>
<td>Arching of neck &amp; trunk on stimulation</td>
<td>3</td>
</tr>
<tr>
<td>Persistent retrocollis &amp; opisthotonus - bicycling or twitching of hands &amp; feet</td>
<td></td>
</tr>
<tr>
<td><strong>Cry Pattern</strong></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>0</td>
</tr>
<tr>
<td>High pitched when aroused</td>
<td>1</td>
</tr>
<tr>
<td>Shriil, difficult to console</td>
<td>2</td>
</tr>
<tr>
<td>Inconsolable crying or cry weak or absent</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL BIND SCORE**

- **Advanced ABE** (score 7 - 9): urgent bilirubin reduction intervention is needed to prevent further brain damage & reduce the severity of sequelae
- **Moderate ABE** (score 4 - 6): urgent bilirubin reduction intervention is likely to reverse this acute damage
- **Mild ABE** (score 1 - 3): subtle signs of ABE
FLOW CHART FOR THE MANAGEMENT OF PROLONGED NEONATAL JAUNDICE IN BABIES ≥ 35 WEEKS

Clinical Jaundice (SB> 85μmol/L) at D14 for babies ≥ 37 weeks or D21 for babies 35 weeks to 37 weeks

REFER MO same day or next working (KK or Hospital)

INITIAL ASSESSMENT using ‘Clerking and Referral Sheet for Prolonged Neonatal Jaundice’

RISK STRATIFICATION

HIGH RISK ★
Lethargic/ Septic
Poor Perfusion
Respiratory Distress
Poor Feeding

STABILIZE ABC
REFER PAEDIATRICIAN IMMEDIATELY

Note:
• Conjugated Hyperbilirubinemia = Direct Bilirubin > 34μmol/L or > 15% of TSB
• * Any features in the High or Moderate Risk

MODERATE RISK ★
Conjugated Hyperbilirubinemia ★
TSB > 300 μmol/L
New Onset of Jaundice (esp after D7)
Pale Stool
Dark Yellow Urine (stains the diapers)
Pallor
Poor Weight Gain
Hepatosplenomegaly

To also consider:
Jaundiced & bottle fed > 50%
Jaundice > 1 mth not investigated before
Other suspected medical condition
Significant family history

REFER PAEDIATRIC TEAM
(To be reviewed the same day, or if child relatively well, the next working day)

LOW RISK
DO: Serum Bilirubin with Direct/indirect Bilirubin
Review results with 72 hours

Unconjugated
Hyperbilirubinemia

TCA 1 WEEK to review baby & results

No

Jaundice

DISCHARGE + Warning Signs Follow up at RME 1 & 2 months
LOOK OUT FOR Warning Signs or New Concerns ★

TCA 1-2 WEEKS to review baby & results

Abnormal Results or New Concerns ★

WARNING SIGNS for Parents (at any stage):
TCA STAT if Unwell/ Pale Stool/ Dark Yellow Urine/ New Onset of Jaundice/ Persistent Jaundice > 2 months

Normal Results & Child Well
Appendix 7.12

INITIAL ASSESSMENT – CLERKING AND REFERRAL SHEET FOR PROLONGED NEONATAL JAUNDICE IN HEALTH CLINICS/ HOSPITAL WITHOUT SPECIALIST

<table>
<thead>
<tr>
<th>To Hospital</th>
<th>Appointment</th>
<th>Spoken to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>IC</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Current age (days of life)</th>
<th>DOB/ Time of birth</th>
<th>Contact No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>Was Vitamin K given?</th>
<th>Mother’s blood group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G6PD</th>
<th>Baby’s blood group (if known)</th>
</tr>
</thead>
<tbody>
<tr>
<td>normal</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colour of stool: pale/ grey/ yellow</th>
<th>Colour of urine: clear/ light yellow/ dark yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(by inspection or history, pls state)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feeding method:</th>
<th>Onset of Jaundice (Day of life):</th>
<th>New onset of jaundice? Yes No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive BF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>percentage of bottle feed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Family history:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consanguinity</td>
</tr>
<tr>
<td>Blood disorder (e.g. thalassemia SEA ovalocytosis, hemolytic diseases, etc;)</td>
</tr>
<tr>
<td>Blood disorder (e.g congenital hypothyroidism, hyperthyroid mother on medication etc;)</td>
</tr>
<tr>
<td>Liver disease (e.g biliary atresia, liver failure, congenital hepatitis, etc;)</td>
</tr>
<tr>
<td>Kidney disease (e.g UTI, VUR, juvenile renal failure)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examination: General examination:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW: kg</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abdominal examination</th>
<th>CVS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatomegaly cm</td>
<td>Splenomegaly cm</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other systems: Respiratory:</th>
<th>CNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prolonged jaundice Warning Sign given to parent’s? Yes No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Investigation taken prior to referral (if any):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impression: High risk</td>
</tr>
<tr>
<td>(Refer STAT)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comments:</th>
<th>Name &amp; designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature &amp; official stamp:</td>
<td></td>
</tr>
</tbody>
</table>

Appendix 7.13

CLERKING SHEET FOR PROLONGED NEONATAL JAUNDICE FOR HOSPITALS WITH PAEDIATRICIANS

<table>
<thead>
<tr>
<th>Referred from</th>
<th>I/C:</th>
<th>Date:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Current Age: (days of life)</th>
<th>Date &amp; Time of Birth:</th>
<th>Gestation:</th>
<th>Contact No.:</th>
</tr>
</thead>
</table>

| Address: | | | |
|----------|| | |

<table>
<thead>
<tr>
<th>Vitamin K given?:</th>
<th>Yes</th>
<th>No</th>
<th>Mother's blood group:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(if not given please consider giving.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G6PD:</th>
<th>Normal</th>
<th>Deficient</th>
<th>Baby's blood group (if known):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Onset of jaundice:</th>
<th>days of life</th>
<th>New onset of jaundice: Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Total Bilirubin:</th>
<th>Conjugated: (%)</th>
<th>Cord TSH:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Colour of stool:</th>
<th>pale/ grey/ yellow</th>
<th>Colour of urine:</th>
<th>clear/ light yellow/ dark yellow</th>
</tr>
</thead>
</table>

*If there is pale/ grey stool or persistently dark yellow urine, or conjugated > 34μmol/L and > 15%, please observe colour of stool for 3 days & take necessary investigation as in Appendix A - Conjugated Hyperbilirubinemia Checklist.*

**Feeding method:**
- Exclusive BF
- Bottle feeding:
  - Mixed feeding: percentage of bottle feed __% |

*If predominantly (> 50%) bottle fed, suggest to do SB with differential, LFT, FBC, FBP, Free T4/TSH, Uric C&ES.*

**Family history:**
- Consanguinity
- Blood disorder (e.g. thalassemia, SEA ovalocytosis, hemolytic diseases, etc.)
- Thyroid disease (e.g. congenital hypothyroidism, hyperthyroid mother on medication etc.)
- Liver disease (e.g. biliary atresia, liver failure, congenital hepatitis, etc.)
- Kidney disease (e.g. UTI, VUR, juvenile renal failure)

**Please consider**
- FBC & FBP
- TFT
- LFT
- Urine C&ES, UFESE, RP

**Examination:**
- General examination
- Jaundice:
  - BW: ____ kg  CW: ____ kg
    - If CW < BW or not thriving, suggest to do SB with differential, TFT, Uric C&ES, & consider admission
  - Pallor:
    - Clinically pale coombs, FBC, FBP & blood

**Abdominal examination:**
- Hepatomegaly ____ cm  Splenomegaly ____ cm
  - If there is hepatomegaly and splenomegaly suggest to do LFT, coombs test, FBC, FBP, uric C&ES, TORCHES & Metabolic screening

**Other systems:**
- Respiratory:
- CVS:
- CNS:

**Prolonged jaundice Warning Signs given to parent’s?**
- Yes

---

## Appendix A: Workup for Conjugated Hyperbilirubinaemia
(mainly for biliary atresia and neonatal hepatitis)

<table>
<thead>
<tr>
<th>Areas</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOR ALL BABIES</td>
<td>SB with direct/ indirect’ FBC = reticulocyte counts Free T4 &amp; TSH, urine Dipstick and Microscopy</td>
</tr>
<tr>
<td>PLUS</td>
<td></td>
</tr>
<tr>
<td>Biochemistry</td>
<td>Liver function test, SB with direct/ indirect, Gamma GT, CaPo4, Lipid profile, coagulation profile, blood sugar</td>
</tr>
<tr>
<td>Microbiology</td>
<td>VDRL, Blood C + S, Urine dipstick + microscopy, Urine culture</td>
</tr>
<tr>
<td>Virology</td>
<td>TORCHES, Hep B/C, Urine for CMV</td>
</tr>
<tr>
<td>Metabolic</td>
<td>GAL-1-PUT, Alpha-1-antitrypsin, Plasma amino acids, Urine for reducing sugars, Urine amino acids, Urine organic acids, IRT/ sweat test</td>
</tr>
<tr>
<td>Endocrine</td>
<td>Thyroid function test, Cortisol, Short synacthen test</td>
</tr>
<tr>
<td>Radiology</td>
<td>Ultrasound HBS, CXR/ spine x-ray for butterfly veterbrae, HIDA scan, ECHO if murmur</td>
</tr>
<tr>
<td>Histology</td>
<td>Liver biopsy</td>
</tr>
<tr>
<td>Others</td>
<td>Ophthalmology for embryotoxon/ chorioretinitis/ septooptic dysplasia Stool color observation for 3 days</td>
</tr>
</tbody>
</table>
INFANT STOOL COLOUR CHART

Adapted from 'Early Identification and Referral of Liver Disease in Infants', Children's Liver Disease Foundation, UK (www.childliverdisease.org)

Healthy Stools

Suspect Stools

Digital printing or photocopying of this stool chart will alter them. Use only items supplied by CLDF.
Integrated Plan For Detection & Management of Neonatal Jaundice

Appendix 7.16

PARENTAL EDUCATION LEAFLET ON PROLONGED NEONATAL JAUNDICE

KEKUNINGAN BAYI BERPANJANGAN

(masih lebih umur 2 minggu)
Pastikanlah bukan MASALAH HATI YANG SERIUS!

(Masalah hati ‘Biliary Atresia’ boleh diaurat dengan pembesaran sebelum umur 2 bulan)
Berjumpalah dengan doktor SEGERA

Untuk perenakan darah kencing dan kewatan susu

Prolonged jaundice in babies

 (> 2 weeks old)

It could be serious liver disorder!

(Liver disorder ‘Biliary Atresia’ could achieve good survival rates with definitive operation done before the age of 2 months old)

Bring your baby to the nearest clinic IMMEDIATELY

For detailed examination/ blood/urine test

Warning signs for liver disorder:

Persistent jaundice
Pale Stool
Dark Urine
Poor weight gain

PROLONGED JAUNDICE

KEKUNINGAN BAYI BERPANJANGAN

(มีอาการเหลืองที่ยาวนาน)

It can be a serious liver disease!

(Liver disorder ‘Biliary Atresia’ can achieve good survival rates with definitive operation done before the age of 2 months old)

Bring your baby to the nearest clinic IMMEDIATELY

For detailed examination/ blood/urine test

Warning signs for liver disorder:

Persistent jaundice
Pale Stool
Dark Urine
Poor weight gain

PROLONGED JAUNDICE
9. REFERENCES

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26. Schroeder AR et al. Diagnostic Accuracy of the Urinalysis for Urinary Tract Infection in Infants <3 Months of Age. PEDIATRICS Volume 135, number 6, June 2015
35. Fuziah Md Zain. Congenital hypothyroidism. MJPCH 2010 (Dec); Vol. 16; Supplementary 1.
ABBREVIATIONS

ABO  Blood Group A, B, O
ABE  Acute bilirubin encephalopathy
BIND Bilirubin Induced Neurologic Dysfunction
BW   Birth weight
C&S  Culture & sensitivity
CPG  Clinical Practice Guidelines
ET   Exchange transfusion
FBC  Full Blood Count
G6PD Glucose-6-Phosphate dehydrogenase
IDM  Infant of Diabetic Mother
IVIG Intravenous Immunoglobulins
LB   Live birth
MOH  Ministry of Health
MO   Medical officer
NIA  National Indicator Approach
NNJ  Neonatal jaundice
QA   Quality Assurance
POG  Period of gestation
PNNJ Prolonged neonatal jaundice
Rh   Rhesus
SB   Serum bilirubin
SNNJ Severe neonatal jaundice
SOP  Standard Operating Procedure
TcB  Transcutaneous bilirubinometry
TORCHES Toxoplasmosis, Rubella, Cytomegalovirus, Herpes simplex, Syphilis
TSB  Total serum bilirubin
VDRL Venereal Disease Research Laboratory test
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