

PHOTOTHERAPY WITH BILICOCOON™ BAG SYSTEM - NETS

PRACTICE GUIDELINE®

DOCUMENT SUMMARY/KEY POINTS

- The BiliCocoon™ Phototherapy System is for the treatment of unconjugated hyperbilirubinemia; in the population of neonates and infants under 6 kg.(3)
- Light Box and Pad are paired in order to emit light with a peak between 430 and 490 nm and a spectral irradiance of $35 \mu\text{W}\cdot\text{cm}^{-2}\cdot\text{nm}^{-1}$ ($\pm 15\%$).(3)
- The BiliCocoon™ bag is a single use item (3)
- Used over the patient's entire body except for genitals, head and eyes – eye protection must be worn
- Not to be used on damaged skin, in babies less than 2500g or in conjunction with photosensitising drugs or agents (3)
- The BiliCocoon™ can be used in babies less than 2.5 kg at the NETS consultant's discretion.

Disclaimer

This document is available on-line as a stimulus for interchange of knowledge and ideas in the field of Neonatal and Paediatric Retrieval. It is provided "as-is" and without support or warranty of any kind. Many of our guidelines may not be appropriate for use in retrieval settings other than NETS NSW, especially in non-Australian environments.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st December 2020	Review Period: 3 years
Team Leader:	Retrieval Nurse	Area/Dept: NETS

CHANGE SUMMARY

- This is a new practice guideline
- **12/01/2022** – Minor review. Additional section – “Checks which need to be completed before loading/ unloading and flying in rotary wing and fix wing”, see Pg 8.

READ ACKNOWLEDGEMENT

- All NETS clinical staff are to read and acknowledge they understand the contents of this guideline.

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Rationale

Phototherapy is the primary treatment for unconjugated hyperbilirubinemia in neonates. Level and rate of rise of serum bilirubin, gestational age, birth weight, postnatal age and the underlying cause of hyperbilirubinemia are all taken into consideration when determining the need for phototherapy (1).

Hyperbilirubinaemia, if left unchecked, can lead to acute bilirubin encephalopathy (ABE), with a risk of serious long term sequelae including choreoathetoid cerebral palsy and hearing impairment. It is critical that phototherapy be initiated in a timely manner and continue with minimal interruption in newborns with hyperbilirubinaemia above treatment threshold. Phototherapy should be continued wherever possible during retrieval - using the BiliCocoon™ - particularly in the setting of severe hyperbilirubinaemia and/or planned exchange transfusion.

Patients are particularly at risk if they are unwell with concomitant acidosis, hypoalbuminaemia or a requirement for mechanical ventilation. Unconjugated or water-soluble bilirubin is carried in the bloodstream attached to albumin. This renders it safe from crossing irreversibly into the basal ganglia, the major site of ABE-related neurological injury. In the setting of acidosis, albumin will preferentially carry hydrogen ions, leaving the bilirubin free to cross into the basal ganglia. Treating hyperbilirubinaemia with phototherapy decreases this risk and the amount of free bilirubin available.

Equipment Required

- Any 2012 series neonatal system
- BiliCocoon™ Phototherapy System light box module
- BiliCocoon™ pads (inside green Phototherapy carry bag)
- Single use BiliCocoon™ bag pad cover (inside green Phototherapy carry bag)
- Protective eye mask (from referring hospital or from inside green Phototherapy carry bag)
- 2 x eye protective glasses for staff (inside green Phototherapy carry bag)

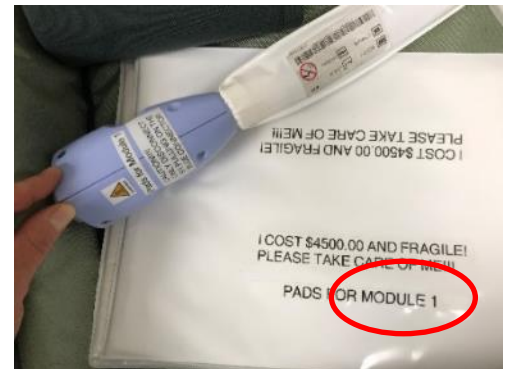
NOTE: ENSURE the Phototherapy system light box module number matches green Phototherapy carry bag number and BiliCocoon™ pads (Picture 1,2,3)



Picture 1



Picture 2



Picture 3

Phototherapy carry bag cannot be bent or squashed during transport

- **Do not interchange BiliCocoon™ pad cable** as each pad cable has a code, which corresponds with the code on the phototherapy light box. (Picture 4)
- NETS has each light box module, pad cable and bag labelled with matching numbers. The number on the bottom of the light box can't be seen when box is secured in bracket (3)
- It is preferable to set up the system prior to departure and pre-warm the pads inside neonatal crib, especially for small babies – see set up instructions below. The cold pads can cause conductive heat loss and can result in hypothermia of the neonate.
- Set NETS crib temperature according to NETS policies. However, lower or higher temperature settings may be required to maintain a physiological temperature in the neonate during the use of the BiliCocoon™ bag system.
- Take Phototherapy carry bag, even if Phototherapy system has been set up at base
- Phototherapy carry bag can be secured in the ambulance with a seat belt by feeding seat belt through carry bag handles.

Procedure – Setup

- Remove the system storage compartment net and leave in the compartment before mounting the BiliCocoon™ light box module. Secured onto the 2012 series neonatal via the three captive threaded knobs. (Picture 5)



Picture 5

- All three knobs need to be tightly secured (Picture 6)



Picture 6

- Connect the power cable to the back of the system (Picture 7)
- Rain cover and net can remain in place.



Picture 7

- Take BiliCocoon™ pads out of the Phototherapy carry bag and place them securely onto a flat surface (into crib or onto patients bed) (picture 8a and 8b)



Picture 8a



Picture 8b

NOTE: Do not bend or kink the pads – they should always be kept in a flat position. Do not twist pad cable as this can result in the damage of the cables inside the cord.

- Plug in BiliCocoon™ pad cable - it is magnetically attached, therefore **no force is required**
- Connect or disconnect the BiliCocoon™ pad cable **only by holding and pulling the light blue part** of the cable – **do not pull on the white part** of pad cable (Picture 9)



Picture 9

- Secure BiliCocoon™ pad cable to the system with the yellow secure clip attached to the 2012 series neonatal system (Pictures 10 and 11)



Picture 10



Picture 11

- Ensure the pads are **clean and dry** before use
- Pads **cannot be used without the BiliCocoon™ bag**
- BiliCocoon™ pads need to be wiped down after each use
- Take one BiliCocoon™ bag from Phototherapy carry bag
→ this is a single use item.

BiliCocoon™ bags should not come in contact with cleaning substances (3)

- Fold BiliCocoon™ bag, so printed site is on top (Picture 12)



Picture 12

- First, insert BiliCocoon™ pad **with manufacturing** label attached into **bottom part** of bag (Picture 13)



Picture 13

- Then, insert BiliCocoon™ pad **without manufacturing** label into **top part** of bag (Picture 14)

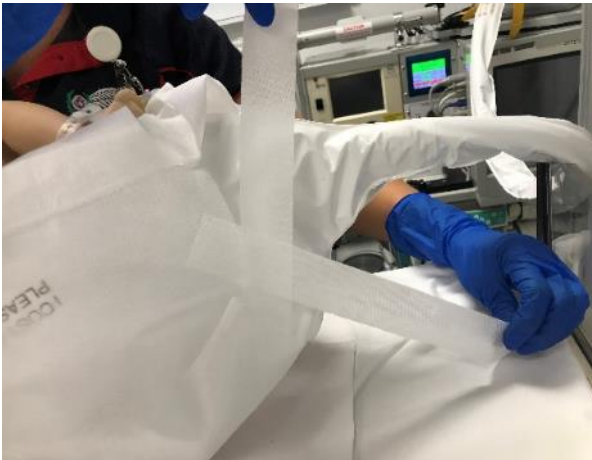
Warning: Placing the pads incorrectly could lead to airway obstruction of the neonate (3)

- Phototherapy lights on pads should face each other (Picture 14)



Picture 14

- **Cross over the two under straps nearest to the pad cable** up and around the bottom side of pads onto the printed side of the BiliCocoon™ bag (Pictures 15 and 16)



Picture 15



Picture 16

Checks which need to be completed before loading/ unloading and flying in rotary wing and fix wing.

- Ensure all three captive threaded knobs of phototherapy module are tightened and secured to Neonatal system.
- Ensure Billicocoon™ pad cable is secured with yellow secure clip.
- Phototherapy carry bag needs to be secured in stowage compartment in Fixed Wing and IAM (Integrated Aeromedical Module) Rotary Wing.
- In Rotary wing the neonatal unit can only be installed in the single Neonatal Unit configuration.

At referring hospital:

- Ensure the prepared pads are pre-warmed in the neonatal crib with the crib temperature set to maximum. Allow a minimum of 20 to 30 minutes prior to placing baby on pads. Pads can be cold and could result in conductive heat loss, especially in small babies (Picture 17)



Picture 17

- On arrival to referring hospital, position the 2012 series neonatal system next to the baby ensuring the head of the NETS crib is in alignment with the baby's head. BiliCocoon™ cable will otherwise not reach. (Picture 18)
- Ensure the 2012 series neonatal system is connected to mains power and the switch at the back of the system is turned on to power.

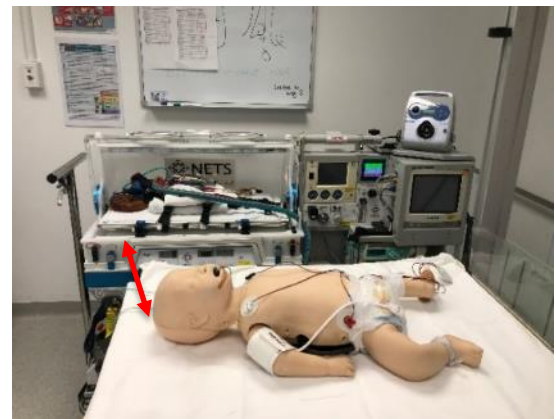


Figure 18

• Prepare neonate:

- Attach NETS monitoring
- **Neonate needs to wear a nappy** – pads should not get extensively wet (3)
- Efforts should be made to ensure that the amount of skin covered by the nappy is kept to the minimum required to avoid soiling of the BiliCocoon™ pads
- All other clothing should be removed
- Ensure eye cover protection is available or already in place
- Connect all infusions

- Open BiliCocoon™ bag, expose site with infant fastening straps (Picture 19)



Picture 19

- Place baby on top of BiliCocoon™ bag, onto site of infant fastening straps (Picture 20)
 - Babies shoulder should be in line with the top edge of the BiliCocoon™ bag
 - Head and neck should not be covered by the BiliCocoon™ bag



Picture 20

- Roll up middle part of BiliCocoon™ infant fastening system strap to ensure only nappy area is covered by straps (Picture 21)



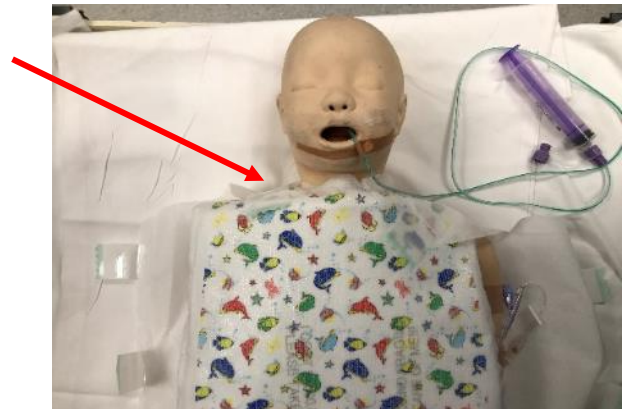
Picture 21

- Secure the infant fastening straps on top of nappy –secures like a nappy (Picture 22)
- In smaller babies the middle strap of the infant fastening strap system needs to be rolled up enough so the baby doesn't slide under the BiliCocoon™ bag.



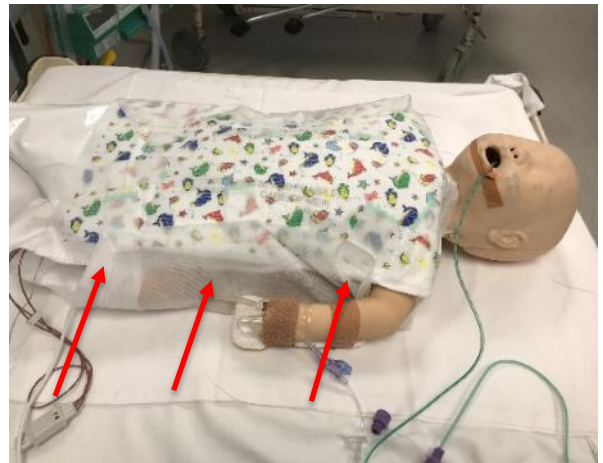
Picture 22

- Fold over the BiliCocoon™ bag, without covering face or neck.
- Fasten both Velcro straps over shoulders. (Picture 23)



Picture 23

- Fasten all three Velcro straps on both sides of the BiliCocoon™ bag (Picture 24)
- Feed arms or legs through gaps between Velcro straps if required (for visualisation and monitoring of limbs and IV lines)



Picture 24

- Protect the Infant's eyes with suitable eye protection (3) (Picture 25)



Picture 25

- Start Phototherapy by turning the on/off switch on the Phototherapy light box "ON" (Picture 26 - 27).
- Numbers displayed represent therapy length time in hours : minutes.
- Adjust therapy length time by pressing the + or – button directly after switching device on (within 5 seconds).
- Alternatively, press the x button to reset the time to 00:00 and then adjust the time to desired length with the + and – button.
- Therapy commences within 5 Seconds of switching the device on. Settings cannot be changed afterwards. Switch box off and on again to change settings.



Picture 26



Picture 27

- Clear inside of crib of N2012 series neonatal system, leaving the neonatal harness and gel mount. Open and lengthen all neonatal harness straps.
- Transfer baby into neonatal crib once stabilized. Phototherapy can be commenced prior to transfer into neonatal crib if required.



Picture 28

- Fasten neonatal harness over BiliCocoon™ bag. Green leg strap can be secured on the right or left side of the cable. (Picture 29)



Picture 29

- Ensure BiliCocoon™ is closed around the baby as much as possible. There should be minimal phototherapy light exposure to the surrounding environment (Picture 30)



Picture 30

At receiving destination:

- On arrival to receiving hospital, position the 2012 series neonatal system next to the neonatal bed ensuring the head of the NETS crib is in alignment with the head of the neonatal bed.
- Switch off phototherapy by pressing the on/off button
- Baby can be moved to neonatal crib with the BiliCocoon™ in place – ensure cable reaches. **Do not disconnect cable from phototherapy box.**
- **Alternatively**, BiliCocoon™ can be opened up in the NETS crib and baby moved to receiving bed without BiliCocoon™.
- Leave pads cable attached and secured to the phototherapy lightbox for safe transport back to base
- Store pads in NETS crib for safe transport back to base
- **If tasked to another job**, wait for 5 Minutes after switching Phototherapy light off, clean pads with cleaning wipes, ensure pads are dry and store pads back in green Phototherapy transport carry bag for transport (see “Cleaning Procedures” below for more information).

Commencing Treatment and Troubleshooting



- Turn on the light box → **1**
- Set the session time by using the + and – button → **3**
- Time will be displayed in hours and minutes → **2**
- Therapy will commence within 5 seconds
- The blue feature light should be on continuously – flashing light indicates a connection problem between the pad and the light box → **5**
- To set the session time to zero press the RESET button within 5 seconds from the time of switching the light box ON → **4**

- When the session starts all controls become inactive. To reactivate them switch the machine off and on again. (3)
- Overheating indicator → **6**:
 - Continuous light:
 - Fan failure
 - session has stopped
 - Switch off light box and back on again, switch off for 15 Minutes if unsuccessful
 - take device out of service, if problem unresolved
 - Contact technical support (3)
 - Flashing light:
 - Overheating
 - Session has stopped
 - Check air inlets and remove anything obstructing them
 - Switch off light box and back on again, switch off for 15 Minutes if unsuccessful
 - Verify that ambient temperature < 35 degrees, move to environment below 35 degrees and switch light box off for 20 Minutes
 - take device out of service, if problem unresolved
 - Contact technical support (3)
- LED failure indicator → **7**:
 - one or more LEDs have failed
 - session has stopped and can't be restarted
 - contact technical support (3)

Important safety points:

- **Avoid looking into phototherapy light** from pads or at the connection port when disconnected. Staff to wear eye protection if needed. (3)
- Don't use BiliCocoon™ pads and light box if they are cracked or damaged
- **Never bend** BiliCocoon™ pads – pads need to be stored flat
- **Do not touch the magnetic connection part** of the pad cable and light box **after use** – surface can be hot and there is a **risk of burning** (3)

Patient monitoring during phototherapy treatment:

- Bilirubin level should be regular checked (4 – 6 hourly) during therapy. Phototherapy lights need to be switched off during the collection of blood sample when testing bilirubin levels (1,2)
- Temperature of the neonate need to be monitored during phototherapy treatment continuously with a skin temperature probe. Phototherapy treatment can increase the baby's temperature. (1,2,3).
- Phototherapy can affect the neonate's fluid balance and can increase the insensible fluid losses. Monitor fluid balance and adjust fluid maintenance as needed (1,2)
- Babies with Umbilical lines insitu need to have the umbilical site and limb perfusion assessed every 15 minutes – see Umbilical line insertion – NETS Procedure for complications (4)
- Phototherapy light and the BiliCocoon™ bag can make clinical assessment of the baby more difficult. Switch off Phototherapy temporary and open up BiliCocoon™ bag to assess baby if needed. SpO2 monitoring probe needs to be covered with Coban™ to ensure reliable readings. (3)

Cleaning Procedure

- Wait at least 5 minutes after use before cleaning the BiliCocoon™ pads and light box. Magnetic part of blue connection will be very hot after use of Phototherapy light.
- Unplug the light box power, disconnect the pads and cable from the light box.
- Wipe down BiliCocoon™ pads and light box with wipes according to NETS cleaning guideline
- Ensure equipment is dry before use again
- Store Bilicocoon™ pads in the Phototherapy carry bag with blue connector piece placed in the pouch for protection – don't bend the cable



Documentation

- Document phototherapy start and end time on the “comments” column of the NETS observation chart, as well as any significant interruptions to treatment (e.g. prolonged time with phototherapy off due to need to stabilise patient en route)
- Document recent bilirubin level prior to commencement of therapy, including time of sample
- Document commencement of therapy and device used in NETS nursing documentation

Reference

1. James NGK, Fraser A, Halliday R, Spence K, Kerslake G. JAUNDICE IN NEONATAL CARE - GCNC - CHW PRACTICE GUIDELINE ©. SCHN; 2017. p. 1–18.
2. Luciano R, Mancini G, Cota F, Vento G. New high intensity fibreoptic phototherapy devices in healthy newborns: a single pad wrapped around the neonate body in comparison with double pad device. Italian Journal of Pediatrics; 2019. 45: 68
3. NEOMEDLIGHT. BilliCocoon TM System Phototherapy User Manual. France: NEOMEDLIGHT; 2017. p. 1–61.
4. NETS. Umbilical lines insertion - NETS Procedure. SCHN; 2015. p1-10.

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