LRI Children's Hospital

Children requiring long term non-invasive ventilation on a medical children's ward

Staff relevant to:	Nursing and Medical Staff within the Children's Hospital
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Written by:	Clare Suart, Helen Hickey, Kay Calvert
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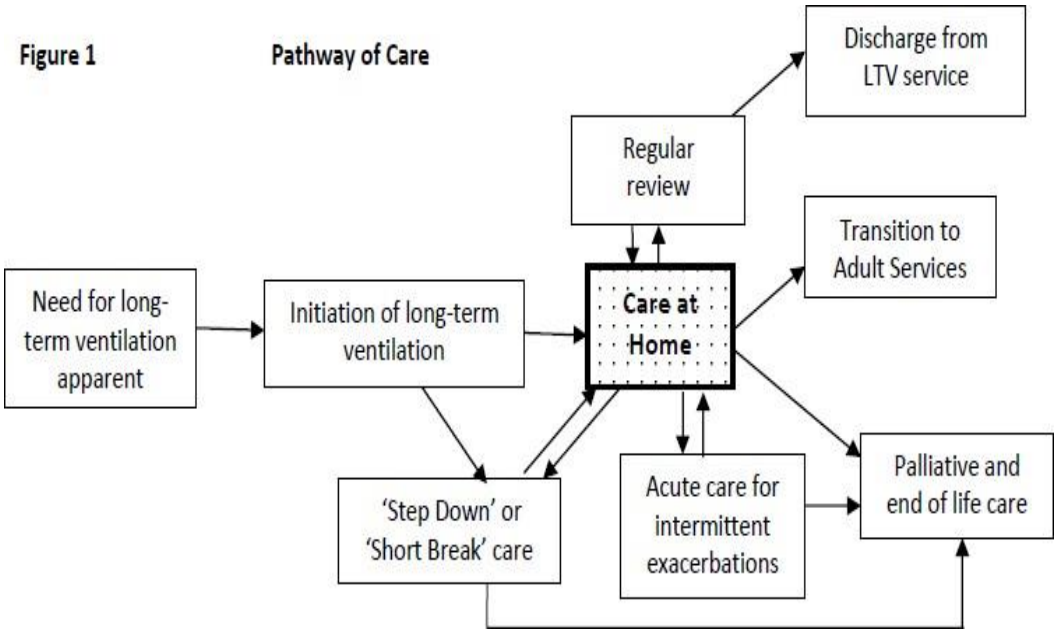
1. Introduction and who this standard operating procedure (SOP) applies to

The number of children requiring long term ventilation to maintain respiratory health has increased exponentially in the past 20 years [1,2]. As per the NCEPOD report many children are not failure to wean from ventilation but are elective /semi elective initiation of NIV.

"Long term ventilation (LTV) refers to various types of respiratory support provided every day for a period of at least three months. Ventilation is delivered either via a tracheostomy tube (invasive) or via a face mask, non-invasive. The aim of LTV is to improve survival and quality of life in people with conditions that have led to respiratory failure.

Guidelines and pathways for initiation of ventilation have been identified as important in the safe transition of these children from the intensive care unit/ high dependency unit setting to home [2]. This Standard Operating Procedure and pathway is to provide a framework for caring for children who require LTV outside of a high dependency setting and complement the process (figure 1[2]) that is already at UHL for managing this cohort of patients.

Figure 1 Pathway of Care



This SOP applies to patients on respiratory support who are under the care of the LTV team who can be considered for step down from a high dependency environment or direct admission to a children's ward.

This SOP applies to children on non-invasive ventilation only and not for tracheostomy ventilated children.

This SOP applies to children with high (Level 1) and some children with severe (Level 2) levels of need, but not suitable for children with priority (level 3) level of need (table 1[2])

Table 1: Levels of need of children initiated on L T V .

High (Level 1)	Child is able to breathe unaided during the day but needs to go onto a ventilator for supportive ventilation. The ventilation can be discontinued for up to 24 hours without clinical harm
Severe (Level 2)	Child requires ventilation at night for very poor respiratory function; has respiratory drive and would survive accidental disconnection, but would be unwell and may require hospital support
Priority (Level 3)	Child has no respiratory drive at all and is dependent on ventilation at all times Child has no respiratory drive when asleep or unconscious who require ventilation and one–to–one support while asleep, and disconnection would be fatal

Overarching document:
Initiation of Long Term Non-Invasive Ventilation UHL Children's Medical Guideline

Related Documents: Safe Staffing for Nursing and Midwifery UHL Policy

2. Standards and Procedures

Ward Staffing Requirement

Nurse staffing for BABIES AND CYP needing LTV will be influenced by a number of factors, including patient diagnosis and complexity, severity of presenting illness, age, PEWS and ward layout.

The care of the BABIES AND CYP requiring LTV is described by the Children's and young person safer nursing care tool decision matrix (appendix 2) as a level 2. This requires review of safecare, every shift, to ensure the correct hours available to care for BABIES AND CYP with LTV.

The care of LTV patients can be supported by Health Care Support Worker (HCSW) or Nursing Associate (NA) with appropriate competencies and supervision from a registered nurse.

If there is not the correct hours this needs to be escalated following the **Safe Staffing for Nursing and Midwifery UHL Policy**

Suitability for step down to a ward environment:

Decision regarding suitability for step down on NIV should be taken by BABIES AND CYP Lead Respiratory Consultant (or delegate in their absence) after clear discussion between the team, accepting ward and the child's family. This needs documentation in the clinical notes.

Key requirements as agreed with lead consultant:

- Named LTV consultant
- Sufficient Respiratory drive
- Babies and BABIES AND CYP on portable ventilator suitable for home use
- Stable blood gases
- Recent oxycapnography / oximetry, if required
- NIV pathway initiated and all interagency referrals commenced by the LTV team.
- Discharge checklist from Ward 12 HDU completed (appendix 2).
- Patients/carers counselled regarding step down and changes in expectations.

Suitability for direct admission to a ward environment

- Respiratory or other acute illness not needing HDU
- Sufficient respiratory drive
- Overnight assessment of ventilation
- Refinement of ventilation settings for stable patients (NOT acute deterioration)
- Agreement by respiratory consultant of the week or paediatrician consultant

out of hours

Management in a ward environment

Children will remain under the care of the LTV / Respiratory team up until & after discharge.

They will be seen daily by the paediatric/respiratory team, as appropriate, on the relevant ward and as part of the respiratory ward round.

Oversight of patient and discussion on the Respiratory Grand Round MDT.

Any changes/concerns in the child's condition needs to be escalated in the usual way; the nurse caring for the child should make medical staff aware of any concerns or changes in the child's condition, this needs to be communicated with the LTV / Respiratory and/or ITU team as required.

Documentation

1. Ventilation prescription to be checked on handover and signed by nurses from both shifts
2. Observations to be clearly documented when completed
    a. PEWS completed via Nervecentre
    b. LTV observations completed as advised by LTV team. If admitted OOH then 2 hourly LTV observations until further discussion.
    c. Documentation of time-off LTV
3. Nervecentre risk assessments completed in line with trust policy and best practice. Best Shot twice daily and aSSKINg to be completed daily due to risk of pressure damage from equipment.
4. Discharge pathway from LTV.

3. Education and Training

The care of children requiring LTV needs additional skill.

As a minimum there will be at least one registered member of staff, who has completed the LTV skill and competency booklet (appendix 1), working in the clinical area per shift.

Health care support workers can be used to complement the registered nursing staff if trained and assessed as competent.

4. Monitoring Compliance

Monitoring of admission

Collecting of data to ensure the care of LTV patients remains appropriate for the base wards.

The LTV team to collect data regarding:

1. Admission to base ward
2. Length of stay
3. Reason for admission
4. Datix in relation to LTV admission

The ward to collect FFT feedback and report trends for celebration or improvement to LTV team.

5. Supporting References

1. Wallis C, et al. Children on long-term ventilatory support: 10 years of progress. Arch Dis Child 2011; 96: 998-1002
2. Quality Standards - Services providing long-term ventilation for childrenand young people. Version 3 April 2015: West Midlands Quality Review Service.
3. Jardine E, et al. Core guidelines for the discharge home of the child onlong term assisted ventilation in the united Kingdom. Thorax 1998; 53:762-767.
4. Amin et al. CANADIAN JOURNAL OF RESPIRATORY, CRITICAL CARE, AND SLEEP MEDICINE 2017, VOL. 1, NO. 1, 7–36
5. Robert D et al. Clinical Review: long-term noninvasive ventilation. CritCare 2007; 11: 210- 219
6. Han YJ et al. Home mechanical ventilation in childhood-onset hereditary neuromuscular disease: 13 years experience at a single center in Korea.Plos one 10(3): e0122346
7. Fauroux B, Abel F, Amaddeo A, *et al*. ERS Statement on pediatric long term noninvasive respiratory support. *Eur Respir J* 2021;

6. Key Words

Long term ventilation, Non-invasive ventilation, ventilation in children, home ventilation

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

Wish to acknowledge and thank the Non Invasive Ventilation Working Group for their contributions in the creation of this SOP.

Contact and review details	
SOP Lead (Name and Title) Clare Suart, Deputy Head of Nursing Helen Hickey Kay Calvert	**Executive Lead** Chief Medical Officer
Details of Changes made during review: New SOP	

Appendix 1 – Competency and Work Booklet for Non-Invasive Ventilation (NIV)

(on next page)

University Hospitals of Leicester NHS Trust
Women's & Children's Education Team

Competency and Work Booklet for Non-Invasive Ventilation (NIV)

For Registered Practitioners working in a clinical setting that provide Non-Invasive Ventilation Management

Name:	
Ward/Unit:	
Date Commenced:	
Date Completed:	

Introduction

The following competency booklet is for Registered Practitioners working in a clinical area that provides care to patients that require Short and Long-Term Non-Invasive Ventilation (NIV) working within the Children's Hospital at the Leicester Royal Infirmary.

To commence this competency package, the nurse must:

- Be supported by their Line Manager as appropriate to undertake the training.

Aims & Objectives

Completing this training package will enable Registered Practitioners to have the theoretical and practical skills to undertake the care of Short & Long-term Non-invasive Ventilation for patients with acute and chronic conditions requiring this support.

How to complete this competency?

The elements of this training package that must be completed are as follows:

- Attend a theory session
- Complete all elements of the work booklet
    - Read through and understood background information
    - Watched Training Videos
    - Theory Assessment
    - Practice Assessments

On completion of all required elements of this competency and work booklet, it is required that the *'Declaration of Competence'* is reviewed and signed by your Line Manager. The *'Declaration of Competence'* will need to be scanned and e-mailed to the Children's Education Team, who will then update your HELM passport.

Declaration of Competence

I Ward Manager/Clinical Skills Facilitator confirm that_____(Name) has been assessed by a competent Registered Practitioner who has been deemed appropriate to assess their colleagues as judged by the below criteria.

Signature:_____(Ward Manager/Clinical Skills Facilitator)

Print name:_____ Date: _____

	Date Evidence Seen	Assessor Name/ Signature
Attended a theory-based training session		
Read through and understood background information		
Successfully completed the theory assessment		
Successfully completed the practical Assessment		

I (Registered Practitioner) declare that I have gained the knowledge and skills required to undertake in practice, and I am accountable for my own decisions and actions.

Signature:_____(Registered Practitioner) Print name:_____

Date:_____

A copy of the declaration form must be scanned via email to the Children's Education & Practice Development Team. This will then be updated on to your HELM Passport. A copy will also need to be placed in the learner's personal file.

EDUCATION TEAM ONLY	Seen by	Date	Added to HELM

Background Information

Non-Invasive Ventilation (NIV)

NIV is now commonly used as a treatment for acutely and critically unwell patients due to the vast improvements in NIV technology and it now being increasingly available for use. The number of children requiring long-term ventilation (LTV) has also grown exponentially in recent years and will continue to increase.

NIV is defined as ventilatory support provided through a mask (nasal, nasal & mouth or full face). NIV's purpose is to support the acutely unwell patient with respiratory support preventing from further deterioration and promoting recovery. For children with chronic conditions requiring long term ventilation it will provide safety and improve quality of life for the patient. Any child requiring LTV means they require a mechanical aid for breathing; this happens with children who suffer with airway obstruction or abnormalities, neuromuscular disease, pulmonary disease and disorders of respiratory control.

NIV is divided into two categories Continuous Positive Airway Pressure (CPAP) or Bi-level Intermittent Positive Airway Pressure (BIPAP). Both types of NIV support can be delivered via the ventilators within the Children's Hospital. Currently Resmed and Nippy Junior+ are the primarily used Ventilators being used within the Children's Hospital.

Continuous Positive Airway Pressure (CPAP)

CPAP is a method of ventilation that delivers one constant positive pressure to the patient through both inspiration and expiration and is used on patients that are breathing spontaneously. The CPAP setting is performed to allow alveoli to remain open at the end of exhalation thus improving capacity for oxygenation and reducing the effort of breathing. Whilst mechanical ventilation is being used this is known as PEEP (Positive End Expiratory Pressure). The PEEP provided during CPAP acts as a splint to prevent the airway from collapsing thus preventing obstruction which can be beneficial for patients with certain obstructive sleep disorders. CPAP can therefore be utilised in patients requiring short- and long-term NIV. For CPAP to be effective the patient using this must be making a respiratory effort.

Bi-level Intermittent Positive Airway Pressure (BIPAP)

BIPAP is a method of ventilation that delivers an Inspiratory Positive Airway Pressure (IPAP) and an Expiratory Positive Airway Pressure (EPAP) to the patient. BIPAP is an increased amount of respiratory support in comparison to CPAP. Currently there are two types of BIPAP settings used within the children's hospital which will be explored further on.

On BIPAP settings the patient receives an expiratory positive airway pressure (EPAP) which means as they breathe out they will still receive pressure like they would during CPAP. Unlike CPAP as the patient takes a breath in they receive an increased amount of pressure known as inspiratory positive airway pressure (IPAP). IPAP therefore will always be set at a greater pressure than EPAP. An example of this setting would be 12/8 or 18/10. The IPAP will support the respiratory muscles having to work as hard during the inspiration phase of breathing and increase the patient's tidal volume. On this setting the patient also receives the benefits like during CPAP due to them still receiving EPAP pressure on exhalation keeping the airways open.

Whilst receiving BIPAP patients will have a backup rate set. This rate will usually be set just below the expected amount of spontaneous breaths expected for the age of the child over a minute. This means that the patient will have a minimum amount of breaths they will need to spontaneously initiate themselves within a time frame otherwise the ventilator will instigate the breath on behalf of the patient.

An inspiration time (Ti) will also be set for the patient receiving BIPAP. This is decided by the clinician deciding on the patient's ventilation settings but is usually at a ratio 1:2 (I:E). The inspiration time is there to ensure the patient is supported in breathing for the desired amount of time during inhalation before the IPAP then decreases to the EPAP setting.

Spontaneous Time (ST) & Pressure Support (PS)

The first of the two BIPAP settings is known as Spontaneous Time (ST) on Resmed Ventilators and Pressure Support (PS) on Nippy Junior+ Ventilators. Both settings provide the same support but are named differently by manufacturers due to features available on each machine.

During Spontaneous Time (ST)/ Pressure Support (PS) when the patient initiates a breath, they will receive a partially or fully supported breath (IPAP) for all breaths assisting the patient to achieve the desired IPAP that has been set by the clinician for a set inspiration time. In this setting if the patient does not achieve the backup breath rate set then the ventilator will supply with additional breaths until this is achieved.

Pressure Assisted Control (PAC) / Pressure Control (PC)

The second of the two BIPAP settings is known as Pressure Assisted Control (PAC) on Resmed Ventilators and Pressure Control (PC) on Nippy Junior+ Ventilators. Both of these settings provide the same support but are named differently by manufacturers due to features available on each machine.

During PAC or PC the patient will receive the set IPAP pressure for a set amount of time before reducing to the EPAP pressure. This will also be delivered at a set rate. This is usually utilised in patients that cannot trigger breaths for themselves but will support patient initiated breaths.

Complications to be considered when administering Non-Invasive Ventilation

- Patient or family failing to tolerate or co-operate with NIV.
- Inappropriate mask due to anatomical facial abnormalities, incorrect sizing or wrong type of mask for patient (i.e nasal mask if they are a mouth breather).
- Risk of abdominal distension.
- Increased risk of vomiting and aspiration
- Risk of pressure sores.

Key Non-Invasive terminology

CPAP	Continuous Positive Airway Pressure the patient receives at a fixed rate.
BIPAP	BIPAP is a method of ventilation that delivers an Inspiratory Positive Airway Pressure (IPAP) and an Expiratory Positive Airway Pressure (EPAP) to the patient.
ST/PS	Spontaneous Time/ Pressure Support
PAC/PC	Pressure Assisted Control/ Pressure Control
IPAP	Inspiratory Positive Airway Pressure.
EPAP	Expiratory Positive Airway Pressure.
Ti (Inspiratory Time)	Used in BIPAP modes and Refers to the length of time (in seconds) you will spend in inspiration.
Back Up Rate	Back up respiratory rate that is set (measured in breaths per minute).
Rise Time	Rise time is the time taken for the increase in pressure from EPAP to IPAP
FiO2	The fraction of inspired oxygen is the concentration of oxygen in the gas mixture. (Room Air FiO2 = 21%)
Humidification/Humidifier	Humidification adds water vapour to the air breathed as it comes out of the device. This helps you avoid getting a dry nose or throat, keeps your airway moist.
Trigger	Sensitivity in which the machine detects patient inspiration. (Higher trigger = More sensitive)
Leak	Intentional leak: when a mask user inhales, they takes in needed oxygen. Carbon Dioxide (CO_2) is expelled upon exhalation. A CPAP mask has holes built into its structure that allow the CO_2 to escape so that users are not oversaturated with CO_2. Unintentional leak **(Measured on vent)**: When air is escaping from mask or circuit from poor fitting/ fault.

Local Policies and Guidelines

This training package is based on local policy and guidelines. It is important that nurses completing this training package are aware of the following policies in order to gain the underpinning knowledge and best practice to be able to deliver safe and effective Non- invasive ventilation care.

- Initiation of Long Term Non-invasive Ventilation UHL Children's Medical Guideline
- Infection Prevention UHL Policy
- Waste Management UHL Policy
- SOP for LTV

Training Videos, Guides & Further Support

Youtube Learning Videos

This QR link will take you to the Children's Education Youtube channel. On this channel there is a **NIV support playlist** that covers various aspects of NIV care to support your learning. You should take time to view these videos to consolidate your learning.

Resmed Academy

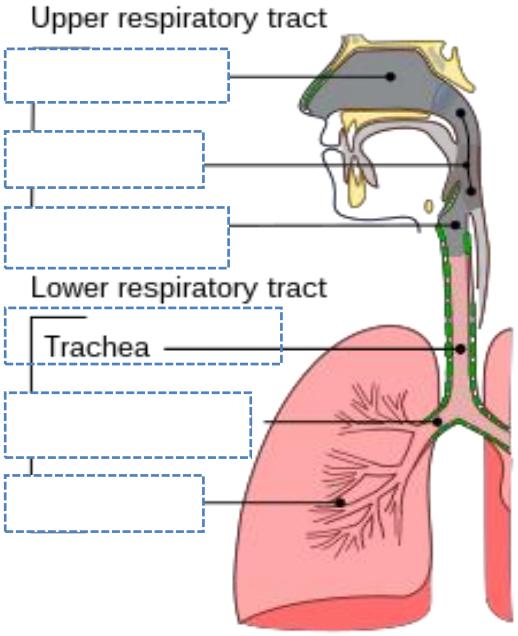
Resmed have support material which is free to sign up to. There is a lot of information available so pick what is relevant to your learning needs.

As well as the above the resources there will be a support package held in each of the areas that have nurse NIV patients. This will contain guides on each of the types of ventilators as well as contact numbers and escalations pathways for when further support is needed.

Theory Assessment

Questions to assess knowledge of caring for patients with non-invasive ventilation

1) Can you label the diagram of the Respiratory System below:



2) Name 3 conditions that may require Long-term NIV:

-
-
-

3) What does CPAP stand for and how does this support a patient requiring this?

4) What do IPAP/EPAP stand for and what do they mean in relation to ventilation settings?

5) What does Spontaneous/Timed setting mean?

6) What does Pressure Assisted Control mean?

7) When should prescription settings be checked and who can perform these checks?

8) How often should observations be performed on a child on established LTV and who can perform these?

9) How often should checks be performed on the ventilator when in use by a patient?

10) What is meant by tidal volume?

11) What are the pressures being delivered by a vent measured in?

12) Why is a leak valve (Anti-asphyxia valve) essential during NIV?

13) How often does a NIV circuit require changing?

14) Name 3 common areas of skin that may be vulnerable by NIV support:

-
-
-

15) What measures can be used to support skin integrity?

16) Name 3 risks associated with NIV:

-
-
-

17) What humidification temperature should be set if the patient is on a humidified circuit?

Resmed Astral

University Hospitals of Leicester Trust
Children's Hospital Ventilator
Training Checklist

Name of Registered Practitioner: _____

Assessor Name: _____

This competency checklist is designed to complete with Staff Nurses undertaking Non-Invasive Ventilation training to ensure they have sufficient knowledge of how to use the ventilator to care for patients when using this device.

Competency to complete	***Tick***
I understand how to connect to mains power and know how to determine if using mains or battery power.	
I am able to power the ventilator on and off.	
I am able to correctly fit mask and check for any excessive mask leak	
I am able to turn the ventilator on to deliver ventilation pressures.	
I understand where to check the ventilator is delivering the correct pressure.	
I understand where to look to check the ventilator settings against ventilator prescription.	
I understand what to do if these settings differ from ventilator prescription.	
I am aware of the alarms that are set and what they mean.	
Aware of how to respond to the alarms set on the ventilator.	
I know who to contact if we have continued problems with alarm settings.	
I am able to mute and unmute alarm and risks of leaving alarm muted.	
I am able to attach ventilator to Oxygen supply.	
I am aware of how to assess how much oxygen the patient will be receiving.	
I know who to contact for ongoing consumables (masks, circuits etc)	
I have been explained signs of pressure sores and what to do if I think one is developing.	
I understand how to assemble wet ventilator circuit.	
I understand how to assemble dry ventilator circuit.	
I am able to correctly learn circuit and understand what to do in the event of an error	
I understand how to clean mask and when to change circuit.	
I understand to only use distilled water for humidifier.	
I know that humidifier should always be placed below the ventilator and what temperature this should be	
I have been shown how to check the inlet filter	

Signed by Registered Practitioner: _____
Signed Assessor: _____
Date: _____

Resmed Stellar

University Hospitals of Leicester Trust Children's Hospital Ventilator Training Checklist

Name of Registered Practitioner: _____

Assessor Name: _____

This competency checklist is designed to complete with Staff Nurses undertaking Non-Invasive Ventilation training to ensure they have sufficient knowledge of how to use the ventilator to care for patients when using this device.

Competency to complete	*Tick*
I understand how to connect to mains power and know how to determine if using mains or battery power.	
I am able to power the ventilator on and off.	
I am able to correctly fit mask and check for any excessive mask leak	
I am able to turn the ventilator on to deliver ventilation pressures.	
I understand where to check the ventilator is delivering the correct pressure.	
I understand where to look to check the ventilator settings against ventilator prescription.	
I understand what to do if these settings differ from ventilator prescription.	
I am aware of the alarms that are set and what they mean.	
Aware of how to respond to the alarms set on the ventilator.	
I know who to contact if we have continued problems with alarm settings.	
I am able to mute and unmute alarm and risks of leaving alarm muted.	
I am able to attach ventilator to Oxygen supply.	
I am aware of how to assess how much oxygen the patient will be receiving.	
I know who to contact for ongoing consumables (masks, circuits etc)	
I have been explained signs of pressure sores and what to do if I think one is developing.	
I understand how to assemble wet ventilator circuit.	
I understand how to assemble dry ventilator circuit.	
I am able to correctly learn circuit and understand what to do in the event of an error	
I understand how to clean mask and when to change circuit.	
I understand to only use distilled water for humidifier.	
I know that humidifier should always be placed below the ventilator and what temperature this should be	
I have been shown how to check the inlet filter	

Signed by Registered Practitioner: _____

Signed Assessor: _____

Date: _____

NippyJr+

University Hospitals of Leicester
Trust Children's Hospital
Ventilator Training Checklist

Name of Registered Practitioner: _____

Assessor Name: _____

This competency checklist is designed to complete with Staff Nurses undertaking Non-Invasive Ventilation training to ensure they have sufficient knowledge of how to use the ventilator to care for patients when using this device.

Competency to complete	*Tick*
I understand how to connect to mains power and know how to determine if using mains or battery power.	
I am able to power the ventilator on and off.	
I am able to correctly fit mask and check for any excessive mask leak	
I am able to turn the ventilator on to deliver ventilation pressures.	
I understand where to check the ventilator is delivering the correct pressure.	
I understand where to look to check the ventilator settings against ventilator prescription.	
I understand what to do if these settings differ from ventilator prescription.	
I am aware of the alarms that are set and what they mean.	
Aware of how to respond to the alarms set on the ventilator.	
I know who to contact if we have continued problems with alarm settings.	
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I am able to attach ventilator to Oxygen supply.	
I am aware of how to assess how much oxygen the patient will be receiving.	
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I understand how to assemble dry ventilator circuit.	
I am able to correctly learn circuit and understand what to do in the event of an error	
I understand how to clean mask and when to change circuit.	
I understand to only use distilled water for humidifier.	
I know that humidifier should always be placed below the ventilator and what temperature this should be	
I have been shown how to check the inlet filter	

Signed by Registered Practitioner : _____
Signed Assessor: _____
Date: _____

University Hospitals of Leicester NHS

Trust Women's & Children's Education

Team

Competency and Work Booklet for Non-Invasive Ventilation (NIV)

For Registered Practitioners working in a clinical setting that provide Non-Invasive Ventilation Management

Appendix 2 : Pathway for LTV admission to base ward

Insert Patient Sticker

	LTV consultant signed	
Settings appropriate for ward and documented in clinical notes		
Confirmed level 1 or level 2 LTV requirement		
Placed on LTV MDT agenda to be discussed		
Named consultant identified and documented in notes		
Parental training completed		
Discharge plan commenced and EDD documented on Nervecentre		
Appropriate skills on ward confirmed for next 48 hrs		
Physio informed of transfer		
OT informed of transfer		

Nurse staffing for BABIES AND CYP needing LTV will be influenced by a number of factors, including patient diagnosis and complexity, severity of presenting illness, age, PEWS and ward layout. This chart provides only a guidance on the level of staffing, monitoring and documentation required. Patient assessment should inform nursing and medical staff as to the dependency of the patient. This should be reviewed, adapted and documented as required. Notes: for patients requiring overnight ventilator support in the night time but not in the day, staffing should be altered per shift as per the stability and supervision required						
Patient status	LTV patient –'well' settings, Fit for Discharge (FFD)		Complex LTV/ 'well' setting but not Fit For Discharge (FFD)		LTV patient 'unwell/ sick' settings	
	LTV BABIES AND CYP, well settings – admitted due to non-respiratory reason / FFD / Awaiting housing etc.	LTV BABIES AND CYP, well settings – admitted due to non-respiratory reason / FFD / Awaiting housing etc.	Complex LTV patient with comorbidities	Complex LTV patient with comorbidities	LTV patient on unwell settings – admitted due to respiratory reason and increase secretions	LTV patient on unwell settings – admitted due to respiratory reason and increase secretions
Open Bay or Cubicle	Open Bay	Cubicle	Open Bay	Cubicle	Open Bay	Cubicle
Staffing	Nurse/patient ratio dependent on skill and professional judgment. HCSW or NA with appropriate competencies can be allocated with appropriate RN supervision	Nurse/patient ratio dependent on skill and professional judgment. HCSW or NA with appropriate competencies can be allocated with appropriate RN supervision	Nurse/patient ratio dependent on skill and professional judgment. HCSW and RN working in partnership	Nurse/patient ratio dependent on skill and professional judgment. RN or NA with RN allocated to support	Nurse/patient ratio dependent on skill and professional judgment Fluid decision based on clinical findings, trajectory of illness and dependency of other patients.	Nurse/patient ratio dependent on skill and professional judgment.
Monitoring	Continuous saturation monitoring only when asleep or if concerned	Continuous saturation monitoring only when asleep, if concerned or if no parent present/ no staff member directly with the child	Continuous saturation monitoring only when asleep or if concerned	Continuous saturation monitoring only when asleep, if concerned or if no parent present/ no staff member directly with the child	Continuous saturation monitoring 3 lead ECG monitoring Blood gas frequency as dictated clinically	Continuous saturation monitoring 3 lead ECG monitoring Blood gas frequency as dictated clinically
Documentation	**Ventilator:** *Checks*: Ventilator settings including mode and pressures, O2 requirement (l/min), Tidal Volume (Vte) and Leak *Frequency*: start of shift, as a part of troubleshooting and with vital signs **Humidifier:** *Checks*: humidifier on, temperature/ setting, water filled Frequency: start of shift, as a part of troubleshooting and with vital signs **Vital signs:** 4 hourly observations • RR & WOB • Oxygen Saturations • Heart Rate • BP • CRT • AVPU/ GCS • Temperature • PEWS	**Ventilator:** *Checks:* Ventilator settings including mode and pressures, O2 requirement (l/min), Tidal Volume (Vte) and Leak *Frequency*: start of shift, as a part of troubleshooting and with vital signs **Humidifier:** *Checks:* humidifier on, temperature/ setting, water filled Frequency: start of shift, as a part of troubleshooting and with vital signs **Vital signs:** 4 hourly observations • RR & WOB • Oxygen Saturations • Heart Rate • BP • CRT • AVPU/ GCS • Temperature • PEWS	**Ventilator:** *Checks:* Ventilator settings including mode and pressures, O2 requirement (l/min), Tidal Volume (Vte) and Leak *Frequency*: start of shift, as a part of troubleshooting and with vital signs **Humidifier**: *Checks:* humidifier on, temperature/ setting, water filled Frequency: start of shift, as a part of troubleshooting and with vital signs **Vital signs:** 4 hourly or more frequently as condition dictates: • RR & WOB • Oxygen Saturations • Heart Rate • BP • CRT • AVPU/ GCS • Temperature • PEWS	**Ventilator:** *Checks:* Ventilator settings including mode and pressures, O2 requirement (l/min), Tidal Volume (Vte) and Leak *Frequency:* start of shift, as a part of troubleshooting and with vital signs **Humidifier:** *Checks:* humidifier on, temperature/ setting, water filled Frequency: start of shift, as a part of troubleshooting and with vital signs **Vital signs:** 4 hourly or more frequently as condition dictates: • RR & WOB • Oxygen Saturations • Heart Rate • BP • CRT • AVPU/ GCS • Temperature • PEWS	**Ventilator:** *Checks:* Ventilator settings including mode and pressures, O2 requirement (l/min), Tidal Volume (Vte) and Leak *Frequency:* start of shift, as a part of troubleshooting and with vital signs **Humidifier:** *Checks:* humidifier on, temperature/ setting, water filled Frequency: start of shift, as a part of troubleshooting and with vital signs **Vital signs:** 1-2 hourly as condition dictates: • RR & WOB • Oxygen Saturations • Heart Rate • BP • CRT • AVPU/ GCS • Temperature • PEWS	**Ventilator:** *Checks:* Ventilator settings including mode and pressures, O2 requirement (l/min), Tidal Volume (Vte) and Leak *Frequency:* start of shift, as a part of troubleshooting and with vital signs **Humidifier:** *Checks:* humidifier on, temperature/ setting, water filled Frequency: start of shift, as a part of troubleshooting and with vital signs **Vital signs:** 1-2 hourly as condition dictates: • RR & WOB • Oxygen Saturations • Heart Rate • BP • CRT • AVPU/ GCS • Temperature • PEWS

Pathway for discharge of long-term non-invasive ventilation in children

NHS University Hospitals of Leicester NHS Trust
Caring at its best

Insert Patient Sticker	

1. Entrance to pathway

Needs long term ventilator support/ nocturnal ventilator support Yes ☐
Parents' informed consent to initiating long term NIV support Yes ☐

Staff member signature/ Name:_____/ Dated:_____

2. Admission checklists - appropriateness for NIV:

Level of support (see appendix 1): Level 1 ☐, Level 2 ☐, Level 3 ☐
Appropriate for NIV: Yes ☐ MDT date: ___

3. Final NIV settings

Interface	Final Ventilation Settings
1. Total face mask: ☐ 2. Full face mask – type:_____ ☐ 3. Nasal mask – type:_____ ☐ 4. Nasal pillow – type:_____ ☐ 5. Nasal prong: _____ ☐ 6. Other: _____ ☐	1. Ventilator- _____ 2. Mode 3. Pressures – IPAP___/EPAP___cm H_2O 4. Ti BUR 5. Oxygen/Air 6. Trigger settings: _____ 7. Duration/ Time off in day: _____hrs

4. Investigation checklists:

i. Aspiration (SALT assessment):

Needed ☐ Not Needed ☐:

Swallowing - safe ☐/ Unsafe☐

If deemed unsafe swallow - alternative modes of feeding – nasogastric tube☐/ PEG ☐/ any other mode☐

Any other comments:

ii. Reflux disease: Yes ☐ No ☐ possible ☐:
pH study ☐/ Barium swallow☐/ impedance study ☐
Comments:

iii. Final oximetry/ sleep study/ O2-CO_2 study pre-discharge date:Results:

iv. Other investigations:

Staff member signature/ Name:_____/_____Dated: _____

5. Discharge Check list

1. Communication with community team: ☐
2. Consider immunization (e.g. RSV prophylaxis/ seasonal influenza/ Covid-19, other relevant): ☐ (if applicable)
3. MDT:
   a. ☐ Identify Lead Consultant : _____
   b. ☐ Identify clinical lead (local hospital/ community): Named local clinical lead informed _____
   c. ☐ Does the child need a referral for continuing healthcare funding? : _____
   d. ☐ Out of county : consider transfer to local hospital before discharge home:_____
4. Equipment checks as applicable: (include, if appropriate, model name/ serial number/ date checked/ date next check due)
   a. ☐ Ventilator/ CPAP machine: _____
   b. ☐ Humidifier : _____
   c. ☐ Oxygen: ___
   d. ☐ Saturation monitor : _____
   e. ☐ Suction machine : _____
   f. ☐ Accessories/ consumables: _____
   g. Funding agreed for equipment from the relevant Clinical Commissioning Group (CCG):
5. Discharge document checklist
   a. Discharge letter ☐
   b. Respiratory escalation management plan (REM) ☐
   c. Ventilator Prescription ☐
   d. ReSPECT paperwork (where available) ☐

6. Parents training:
   a. ☐ BLS: _____
   b. ☐ Feeds – feeding pump: _____
   c. ☐ NG tube – checking / replacement:
   d. ☐ Ventilator/ humidifier/ Sats monitor
   e. ☐ Oxygen training
   f. ☐ Suction unit
   ☐ Follow up sleep study requested to physiologist_____(month)
   ☐ Next clinic review in _____(months)

Staff member signature/ Name:_____/
_____Dated: _____

SLEEP STUDY (POLYGRAPHY) REFERRALS

Date of referral: ____ / ____ / _____

Referral request: Polygraphy (full sleep study) [ ] *Select appropriate*
Polygraphy WITH capnography [ ]
Overnight oximetry [ ]

REFERRING CLINICIAN

NAME

DESIGNATION:

DEPARTMENT:

HOSPITAL:

Consultant in charge

Has the referral been approved by consultant? Yes [ ] No [ ]

PATIENT DETAILS

NAME:

HOSPITAL NUMBER:

DATE OF BIRTH:

DIAGNOSES:

IMPORTANT CLINICAL FINDINGS (must include ENT examination where OSA considered)

REASON FOR REFERRAL Why are you requesting a sleep study?

Has this child had a PSG or overnight oximetry before? Yes [ ] No [ ]

If yes, what is the reason for re-referral?

Please ensure form is complete. Incomplete requests will be returned.

Checklist (**Sleep service ONLY**) (select appropriate study):

1. OSA referrals: Basic Polygraphy (Flow, Respiratory effort including RIPsum, Saturations, Heart rate, Actigraphy from Somno unit)
2. Nocturnal hypoventilation: Polygraphy with Capnography (Flow, Respiratory effort including RIPsum, Saturations, Heart rate, Actigraphy from unit, Capnography via TCM5).

Ventilation Prescription

Name:	
Hospital Number:	
Date of Birth:	
Consultant:	
Date:	

Clinical Settings

Mode (CPAP/ST/PAC)		**IPAP (cmH2O)**		**EPAP (cmH2O)**	
Ti Min (secs)		**Ti Max (secs)**		**Back-up RR (BPM)**	
Trigger		**Cycle**		**Rise Time (msecs)**	

Circuit Settings

Circuit Type	
Patient Interface	
Mask Type	

Alarm Settings

Low Min Vent		**High Leak**	
Non-Vented Mask		**High Pressure**	
Low Pressure		**High Resp Rate**	
Low Resp Rate		**Apnea Alarm**	
Alarm Volume			

Signature: Designation:
Date:

Confirmed By:
Signature: Designation:

Any queries please do not hesitate to contact The Children's LTV Team.

Children's LTV Team
C/O ward 28
Leicester Royal Infirmary

University Hospitals of Leicester Trust
Children's Hospital
Ventilator Training Checklist

Name of Child/Young Person:

……

Printed Name of Parent/Guardian:

……

Name of Ventilator:

……

This competency checklist is designed to complete with parents/guardians prior to discharge to ensure they have sufficient knowledge of how to use the ventilator to care for their child/young person at home when using this device.

Competency to complete	***Tick***
I understand how to connect to mains power and know how to determine if using mains or battery power.	
I am able to power the ventilator on and off.	
I am correctly fit mask and check for any excessive mask leak	
I am able to turn the ventilator on to deliver ventilation pressures.	
I understand where to check the ventilator is delivering the correct pressure.	
I understand where to look to check the ventilator settings against ventilator prescription.	
I understand what to do if these settings differ from ventilator prescription.	
I am aware of the alarms that are set and what they mean.	
Aware of how to respond to the alarms set on the ventilator.	
I know who to contact if we have continued problems with alarm settings.	
I am able to mute and unmute alarm and risks of leaving alarm muted.	
(If O2 requirement) **I am able to attach ventilator to Oxygen supply.**	
(If O2 requirement) **I am aware of how much oxygen my child should receive overnight.**	
I know who to contact for ongoing consumables (masks, circuits etc)	
I have been explained signs of pressure sores and what to do if I think one is developing.	
I understand how to assemble wet ventilator circuit. ***(If required)***	
I understand how to assemble dry ventilator circuit. ***(if required)***	
I am able to correctly learn circuit.	
I understand how to clean mask and when to change circuit.	
I understand to only use distilled water for humidifier.	
I know that humidifier should always be placed below the ventilator.	
(Astral only) I have been explained about 24 hour service cover package.	

Signed by parent/guardian:

……

Signed by competent assessor:

……

Print competent assessor name:

……