

Improving NIV care

Implementation Toolkit

The Improving NIV care Project Team:

Dr Rebecca Mason, Respiratory Consultant, Royal United Hospitals Bath
rebeccamason2@nhs.net

Dr Mark Juniper, Respiratory Consultant, Great Western Hospitals
mark.juniper@nhs.net

Mark Charania, Specialist Respiratory Physiotherapist, Gloucestershire Hospitals
mark.charania@nhs.net

Clare Evans, Deputy Director of Service and System Transformation, West of England AHSN
clare.evans14@nhs.net

Megan Kirbyshire, Senior Project Manager, West of England AHSN
megan.kirbyshire@nhs.net

Rosy Copping, Project Support Officer, West of England AHSN
rosy.copping@nhs.net

Trust Clinical Leads

Gloucestershire Hospitals NHS Foundation Trust: Dr Gagan Swami, Respiratory Consultant

Great Western Hospitals NHS Foundation Trust, Dr Quentin Jones, Respiratory Consultant

North Bristol NHS Trust: Dr Peter Creber, Respiratory Consultant

Royal United Hospitals NHS Foundation Trust: Dr Rebecca Mason, Respiratory Consultant

University Hospitals Bristol and Weston NHS Foundation Trust: Dr Diana Slim, Respiratory Consultant



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Introduction

This guide has been developed to support the implementation of a Non-Invasive Ventilation (NIV) Care Bundle for patients receiving NIV for acute hypercapnic type 2 respiratory failure.

Improving NIV care is the name of collaborative project involving all acute hospitals in the West of England. The project started in September 2022, building on work that was started locally prior to the Covid-19 pandemic.

The aims of **Improving NIV care** are:

- Implement the use of a standardised NIV care bundle
- Reduce the mortality rates of patients receiving NIV in hospital
- Improve staff knowledge and confidence
- Improve patient experience.

NIV 5 is the name of the care bundle that is being implemented through the **Improving NIV care** project.

Quality Improvement methodology will be used throughout this toolkit. To find out more about each of the tools used, visit the [West of England AHSN Academy Webpage](#). Specific links will be included throughout.

All resources in this toolkit can be found as downloadable versions on the West of England AHSN *Improving NIV care* webpage: <https://www.weahsn.net/niv/>

PART 1: Introduction to Improving NIV care

- 1.1 Background
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1.1 Background

The challenge

The British Thoracic Society (BTS) has conducted regular audits¹ of acute non-invasive ventilation (NIV) for over 10 years, which have sadly demonstrated worsening patient outcomes. These results prompted a National Confidential Enquiry² into the care of patients treated with NIV which subsequently identified many areas for improvement. As a result of this enquiry, the BTS developed quality standards for acute NIV (2018)³. Since their introduction, there has been a slight improvement in mortality rates as identified in the 2019 BTS NIV audit. However, mortality rates remain higher than in other comparable countries at 26%¹.

Improving the outcomes of patients with COPD is a key priority within the NHS England Southwest Respiratory Network. The delivery of this Quality Improvement project will work to support this priority given that NIV is a core treatment in patients with COPD admitted with acute hypercapnic respiratory failure. It has been demonstrated that using NIV appropriately in this patient group improves mortality rates.

What's happening locally in the West of England?

Local audit results from the 2019 BTS NIV audit, demonstrate mortality rates of between 16-35% in the acute hospitals in the West of England. One site had a mortality rate of 0%, however it is acknowledged that this is unlikely to be representative of overall NIV within the trust and is likely to be representative of an intense piece of work reviewing NIV practice at that time.

¹ National Adult Non-Invasive Ventilation Audit 2019 <https://www.brit-thoracic.org.uk/quality-improvement/clinical-audit/national-adult-non-invasive-ventilation-audit-2019/>

² Inspiring Change: A review of the quality of care provided to patients receiving acute non-invasive ventilation, National Confidential Enquiry into Patient Outcome and Death (2017) https://www.ncepod.org.uk/2017report2/downloads/InspiringChange_ExecutiveSummary.pdf

³ British Thoracic Society Quality Standards for acute non-invasive ventilation in adults 2018 <https://www.brit-thoracic.org.uk/document-library/quality-standards/niv/bts-quality-standards-for-acute-niv-in-adults/>

1.2 What is the NIV 5 care bundle?

Working with key stakeholders in the acute hospitals in the West of England, the project will seek to improve NIV outcomes through the implementation of a regional standardised care bundle, based on the BTS quality standards. The **NIV 5 care bundle** includes:



Appropriate case selection

NIV is only recommended in acute Type 2 Respiratory Failure where it is proven to be effective



Treatment Escalation Plan in place

ReSPECT to be completed with specific reference to suitability for invasive ventilation or NIV as ceiling of treatment



NIV to be started within 60 minutes of decision to treat



Inspiratory pressure of 20 cm H₂O achieved within 60 minutes



Arterial or capillary blood gas to be repeated within 2 hours of starting NIV

The care bundle is available in A4 format and in a smaller sticker format; either can be used and depends on the Trust set up. The bundle may need to be transferred to electronic patient records.

NIV 5 care bundle – A4 version

<p>Acute non-invasive ventilation is an evidence-based treatment for patients with specific conditions who develop hypercapnic (type 2) respiratory failure (PaCO₂ >6.5kpa) and acidosis (pH <7.35).</p> <p>Please note: Ward-based NIV should <u>not</u> delay intubation if it is more appropriate.</p> <p>For patients presenting in type 2 respiratory failure as a result of pneumonia or Asthma, only consider NIV if ward-based treatment is the ceiling of treatment.</p>	
<p>Appropriate patient selection</p> <ul style="list-style-type: none"> Is the patient in type 2 respiratory failure Do they have an appropriate indication for NIV? <i>Circle as appropriate.</i> COPD / Obesity Hypoventilation / Neuromuscular disease / Chest wall deformity / Congestive cardiac failure / Other: _____ 	<p>Name: _____</p> <p>Date of Birth: DD/MM/YYYY</p> <p>MRN Number: _____</p> <p>NHS Number: _____</p> <p>(OR AFFIX HOSPITAL LABEL HERE)</p>
<p>Have you completed a ReSPECT form which documents an appropriate treatment escalation plan? Is NIV appropriate? What should happen if this fails?</p> <ul style="list-style-type: none"> Have you discussed a ceiling of treatment with your patient? Have you documented a treatment escalation plan within the patient record? 	<p>Repeat blood gas (ABG / CBG) within 2 hours of commencing NIV</p> <p>If the results continue to improve repeat at 4 and 12 hours.</p> <p>If CO₂ does not fall by 1kPa / if pH does not normalise:</p> <ul style="list-style-type: none"> Are saturations maintained at 88-92% Has medical management been optimised? Have you considered mucus plugging? <i>Consider physio input</i> Is the mask fitting correctly? <i>(Mask leak 20-40l/min acceptable)</i> Are you delivering adequate pressures? If appropriate, consider involving ITU If further setting changes are made repeat ABG/CBG one hour later.
<p>NIV should be commenced within 60 minutes of decision to treat</p> <p>Before starting NIV have you offered appropriate medical treatment?</p> <ul style="list-style-type: none"> Maintain saturations 88-92% with controlled oxygen Sit patient upright / consider physiotherapy input Treat underlying condition; Consider bronchodilators, antibiotics and diuretics (if appropriate) Review CXR – exclude pneumothorax Consider absolute and relative contraindications 	
<p>Aim for inspiratory pressure of at least 20cmH₂O within 60 minutes</p> <p>Start with inspiratory pressure (IPAP) 12-15cmH₂O and expiratory pressure (EPAP) 4-5cmH₂O titrate over 20-30minutes.</p> <p>Usual pressures required:</p> <ul style="list-style-type: none"> COPD: IPAP 20-24 EPAP 4-6 Obesity hypoventilation: IPAP 24-28 EPAP 8-10 Neuromuscular disease: Titrate slowly as lower pressure settings may be sufficient 	<p>Date: DD/MM/YYYY</p> <p>Time Bundle Initiated: 00:00</p> <p>Signature: _____</p> <p>Print name: _____</p>

NIV 5 care bundle: sticker version

NIV 5 Care Bundle

<p>Acute non-invasive ventilation is an evidence-based treatment for patients with specific conditions who develop hypercapnic (type 2) respiratory failure (PaCO₂ >6.5kpa) and acidosis (pH <7.35).</p> <p>Please note: Ward-based NIV should <u>not</u> delay intubation if it is more appropriate.</p> <p>For patients presenting in type 2 respiratory failure as a result of pneumonia or Asthma, only consider NIV if ward-based treatment is the ceiling of treatment.</p> <p>To find out more about the NIV care bundle, see [insert trust location].</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-top: 10px;"> Tick once complete </div>	<div style="display: flex; justify-content: space-between; align-items: center; margin-bottom: 5px;"> <div style="flex-grow: 1;"> Appropriate patient selection </div> <input style="width: 40px; height: 20px;" type="checkbox"/> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-bottom: 5px;"> <div style="flex-grow: 1;"> Have you completed a ReSPECT form? Is NIV appropriate? What should happen if NIV fails? </div> <input style="width: 40px; height: 20px;" type="checkbox"/> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-bottom: 5px;"> <div style="flex-grow: 1;"> NIV should be commenced within 60 minutes of decision to treat </div> <input style="width: 40px; height: 20px;" type="checkbox"/> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-bottom: 5px;"> <div style="flex-grow: 1;"> Aim for Inspiratory pressure of <u>at least</u> 20cmH₂O within 60 minutes </div> <input style="width: 40px; height: 20px;" type="checkbox"/> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="flex-grow: 1;"> Repeat blood gas (<u>ABG/CBG</u>) within 2 hours of commencing NIV </div> <input style="width: 40px; height: 20px;" type="checkbox"/> </div>
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Date: DD/MM/YYYY	Time Bundle Initiated: 00:00	Signature:	Print name:
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It is recognised that some of the hospitals in the West of England are already using the BTS bundle. In these cases, the project will look to standardise their approach with other hospitals in the region. It is hoped that shining a spotlight on the NIV care bundle will improve adherence and subsequently improve mortality rates.

The project will also aim to improve staff knowledge and competence in the use of NIV and improve patient care and experience through enhanced communication.

1.3 The evidence

The evidence for the NIV QI bundle **Improving NIV care** is taken from the BTS NIV Quality standards: Non-invasive ventilation in acute respiratory failure British Thoracic Society Standards of Care Committee Thorax (2002; 57:192–211)³.

Respiratory failure is defined as a failure to maintain adequate gas exchange and is characterised by abnormalities of arterial blood gas tensions. *Type 1 failure* is defined by a PaO₂ of <8 kPa with a normal or low PaCO₂. *Type 2 failure* is defined by a PaO₂ of <8 kPa and a PaCO₂ of >6 kPa. Respiratory failure can be acute, acute-on-chronic, or chronic. This QI project is focused on **Improving NIV care** in acute type two respiratory failure.

- NIV has been shown to be an effective treatment for acute hypercapnic respiratory failure (AHRF), particularly in chronic obstructive pulmonary disease (COPD).
- Facilities for NIV should be available 24 hours per day in all hospitals likely to admit such patients.
- NIV should not be used as a substitute for tracheal intubation and invasive ventilation when the latter is clearly more appropriate.

- The beneficial effects of NIV have mainly been demonstrated in patients with a respiratory acidosis ($\text{pH} < 7.35$ and $\text{CO}_2 > 6.5$ kPa)⁴.
- The BTS guidelines suggest a pressure target of 20-30 cm H₂O. Increasing inspiratory pressure on NIV improves tidal volume and therefore helps to eliminate CO₂. In the NCEPOD review, inspiratory pressure was not increased at all in 20% of patients and the pressure target of 20 cm H₂O was not reached in 45% of cases.
- Arterial blood gas tensions improve rapidly in many patients with AHRF when they receive maximum medical treatment and appropriate supplementary oxygen. A repeat sample should usually be taken after a short interval to see if NIV is still indicated.
- Repeat arterial blood gas analysis should be measured in most patients after 1–2 hours of NIV and after 4–6 hours if the earlier sample showed little improvement.
- The BTS quality standard also states that if there has been no improvement in PaCO₂ and pH after this period, despite optimal ventilator settings, clinicians should consider other options including invasive ventilation. This highlights the need for an escalation plan and completion of a ReSPECT form.

1.4 The aim of Improving NIV care

The aim of *Improving NIV care* is to reduce mortality rates to the level achieved in the original studies of ward-based NIV delivery (10%) or lower for patients who require acute NIV for Type II Respiratory Failure⁵.

1.5 The role of the West of England Academic Health Science Network.

The Academic Health Science Network (AHSN) is a network of 15 organisations throughout England, who link all healthcare organisations in a region to improve healthcare at pace and scale. The West of England AHSN will support this project through project management, provision of resources and funding of collaborative events.

West of England Academic Health Science Network Map

- Bristol, North Somerset and South Gloucestershire STP (Healthier Together)
- Bath and North East Somerset, Swindon and Wiltshire STP
- Gloucestershire ICS (One Gloucestershire)



We have successfully implemented and spread other bundles of care across the region, including [PreciSSlon](#) and [PeriPrem](#).

⁴ BTS/ICS Guideline for the Ventilatory Management of Acute Hypercapnic Respiratory Failure in Adults [NIV | British Thoracic Society | Better lung health for all \(brit-thoracic.org.uk\)](#)

⁵ Plant PK, Owen JL, Elliott MW. Early use of non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease on general respiratory wards: a multicentre randomised controlled trial. *Lancet*. 2000 Jun 3;355(9219):1931-5. doi: 10.1016/s0140-6736(00)02323-0. PMID: 10859037.

1.6 Project Structure

Collaborative structure

The overall structure of the project is based on the 'Breakthrough Series Collaborative' model developed by the Institute for Health Improvement. We will hold a series of monthly collaborative online meetings with all teams and 1:1 calls in between. The aim of the meeting is to share failures and successes, understand how barriers have been overcome and to learn from data.

Project leads

Role	Name
Clinical Lead	Rebecca Mason
Deputy Clinical Lead	Mark Juniper
Allied Health Professional Representative	Mark Charania
Programme Manager	Clare Evans
Senior Project Manager	Megan Kirbyshire
Project Support Officer	Rosy Copping
Gloucestershire Hospitals Project Lead	Gagan Swami
Great Western Hospitals Project Lead	Quentin Jones
North Bristol Trust Project Lead	Peter Creber
University Hospitals Bristol and Weston Project Lead	Diana Slim
RUH Bath Project Lead	Rebecca Mason

Core project team

The core project team consists of the Clinical Lead, Deputy Clinical Lead, Allied Health Professional Representative, Programme Manager, Senior Project Manager, Project Support Officer as listed above, as well as representation from a communications manager and evaluation lead at the West of England AHSN.

Project governance

The project will report internally to the West of England AHSN Service and System Transformation Board. The SW Respiratory Network and Oversight Group will also be informed of the project, progress and the evaluation.

PART 2: The Project Approach

- 2.1 The project plan
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2.1 The project plan

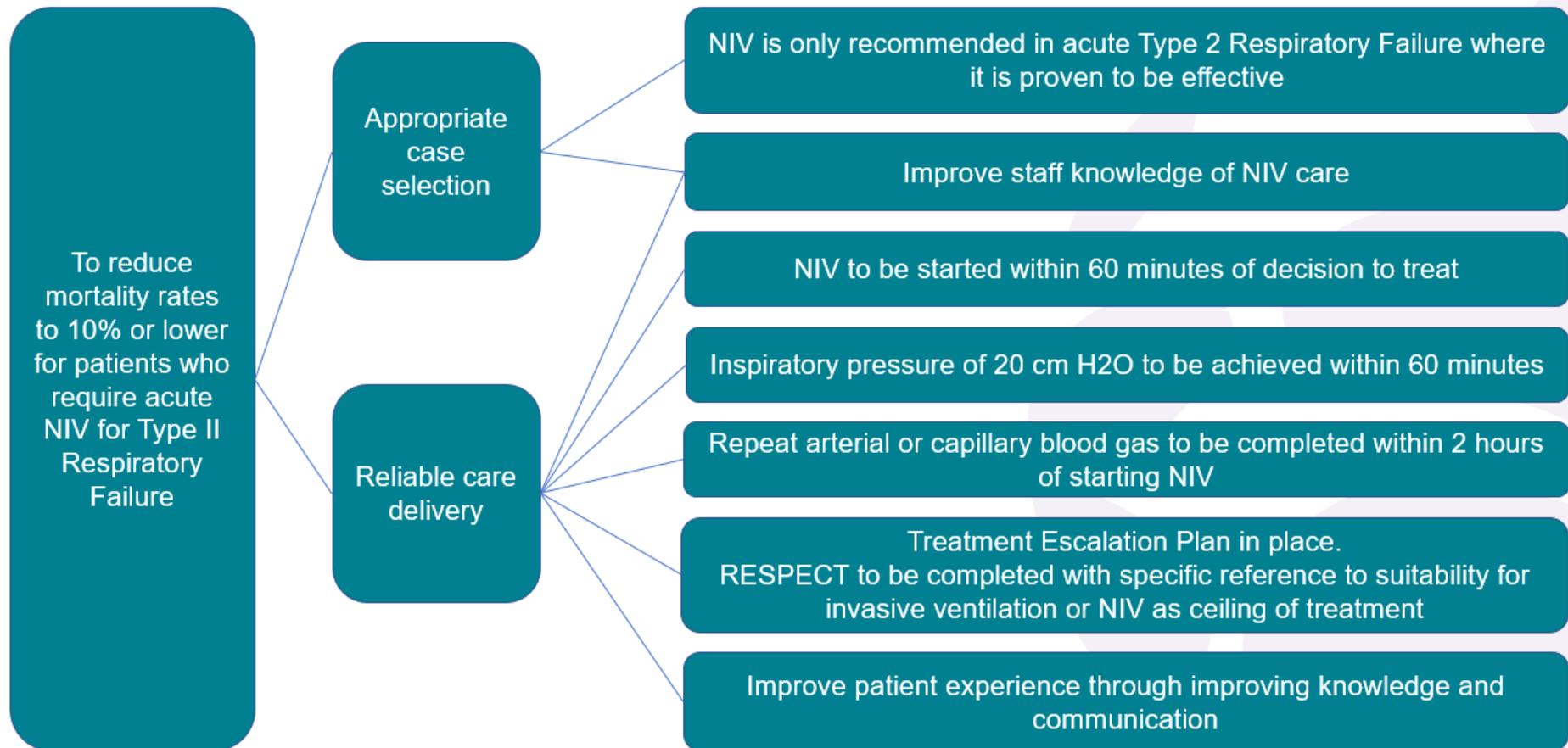
A driver diagram is a visual way of breaking down the stages of the project and can act as a personal project plan.

On the next page is the **Improving NIV care** driver diagram. There is a [blank driver diagram](#) template in the resources section online so that you can create your own diagram with your team. Although the aim and measurement strategy will be the same for all organisations, the details of the driver diagram in terms of actions required to achieve the goal might be different for individual teams.

This is a 10-month project, starting in December 2022 with a completion deadline of September 2023:

- Beginning of February 2023: Implementation of the bundle
- End of March 2023: Data collection will commence
- End of September 2023: End of improvement project
- October 2023 – February 2024: Ongoing data collection
- Spring 2024: Completion of the evaluation

Improving NIV care Project Driver Diagram



2.3 Communications and stakeholder engagement

Stakeholder mapping

To help you consider who your wider stakeholders are, it is helpful to complete a stakeholder mapping exercise. Below is the project stakeholder map but this may vary for your hospital, depending on your project and NIV service set up.

A blank stakeholder mapping template can be found [here](#) and instructions on how you use can be found [here](#) in the Academy page.

High Power	<p>INFORM, ENGAGE</p> <ul style="list-style-type: none"> -NHS England SW Clinical Respiratory Network -Southwest Respiratory Oversight Group -Trust executives -ICS commissioners 	<p>INFORM, INVOLVE, CO-PRODUCE, ENGAGE</p> <ul style="list-style-type: none"> -Acute respiratory physicians -Acute respiratory teams -Acute respiratory wards -Front door clinicians (acute medicine and ED) -Therapy teams -Critical Care Outreach -Service management -Simulation teams -Business intelligence -Patients
Low Power	<p>INFORM</p> <ul style="list-style-type: none"> -West of England AHSN Evaluation Insight Board -West of England AHSN Respiratory Steering Group West of England Board -Research and Development teams -Family / carers 	<p>INFORM, INVOLVE, CO-PRODUCE, ENGAGE, EMPOWER</p> <ul style="list-style-type: none"> -Community respiratory teams
	Low Impact	High Impact

Project team

It is recommended that you set up a multidisciplinary project team to include all roles involved in the process. Each person should have defined roles and ensure that effective communication is fed back to each discipline. Suggested members of the project team may include the clinical lead, and representatives from your therapy, nursing, emergency medicine, intensive care, and outreach teams. It may also be helpful to consider the speciality manager.

Regular meetings to review progress and discuss issues are important to ensure the practicalities of the project are being addressed, staff are being supported and messages are being appropriately disseminated. Frequency of these meetings can be decided by the

project lead and alternative ways of communicating such as posters, email and presentations at respiratory governance meetings can also be effective.

We suggest fortnightly meetings whilst in “Set-up” and “Early Implementation” phase, to be reduced to monthly as the project matures.

Executive sponsorship

Nominating an Executive Sponsor for the project is also vital. Plan to keep them briefed regularly as they can be important to unlock difficult obstacles if they arise. All chief executives and medical directors are aware of **Improving NIV care** and are pleased to see that a quality improvement project is underway to improve mortality rates. They can provide senior support if needed.

Communication resources

A suite of resources to support with communication within your hospital have been developed and can be found online. This includes a [poster](#) to put on staff notice boards, a [template email](#) and [project slides](#). An article for trust bulletins will be developed and shared with the teams directly. See the resources section for full communications [resources](#) available.

2.3 Implementing the NIV 5 care bundle

The **NIV 5 care bundle** has been developed by the project team and agreed by the clinical leads. The template is designed to be placed within project documentation, but it may need to be adjusted to your trust formatting. If your hospital uses electronic patient records, the bundle will need to be added to the IT system. An [A4 version](#) of the document is available as well as [sticker version](#).

The bundle will need to be approved according to each Trust approval and governance processes.

The bundle documentation should be utilised for every patient being considered for NIV and by every initiating clinician. This therefore means that all clinicians who are responsible for initiating, and monitoring NIV need to be informed of the NIV care bundle.

PDSA Cycles

It is recommended that you use [PDSA cycles \(plan-do-study-act\)](#) when implementing the NIV care bundle. PDSA cycles are a useful quality improvement tool that enable you to learn as you go and make changes at each stage. You may find it helpful to use a [learning log](#) for each cycle.

For example, it is recommended that you implement the bundle in one ward area first, learn from implementation before spreading to another. Consider what went well and should be repeated, and what could have made things easier? Additionally, as part of the project, we may use the NIVO score as a PDSA cycle.

2.4 Clinician knowledge and experience

Staff survey

A survey has been designed to capture the perceived confidence and competence levels of clinicians who are responsible for decision making and/or setting up NIV. It is to be

completed by nurses, Allied Health Professionals and doctors and will be repeated at the end of the project to understand the impact of the work programme and inform the evaluation and learning outcomes.

The West of England AHSN will design an infographic or summary of the findings for each Trust which can be shared with colleagues.

Staff training

The [project slide deck](#) has been developed to support training and to raise awareness of both the Improving NIV care project and the NIV 5 care bundle. The slide deck also includes a link to national training resources for completing the ReSPECT form.

We recommend this teaching is completed by March 2023 with refresher sessions throughout the QI project.

The number of clinicians trained will be captured on the data collection template (more information on this in section 3) and will be used as a process measure.

2.5 Patient experience

One of the key drivers for the project is to improve patient experience. As a collaborative, we will work together to design a strategy to improve patient experience and communication. The detail on this is to be confirmed and may be used as a test of change.

A Public and Patient Involvement strategy is also to be determined.

PART 3: Data Collection, Evaluation and Sustainability

- 3.1 Data collection
- 3.2 Sharing and celebrating progress
- 3.3 Evaluation and outputs
- 3.4 Sustainability

3.1 Data collection

A robust measurement strategy is important for ensuring that progress is tracked and maintained. The **Improving NIV care** measurement strategy has been developed by the core project team and clinical leads. The strategy categorises data as outcome, secondary, process and balancing measures and can be found in [Appendix 1](#).

Funding to support the collection of data will be provided to each site, to the amount of half a day a month for one year, at band 3 level. You will need to identify an appropriate individual who will be happy to complete this additional work. A nominated clinician who feels confident with project process and data collection requirements will need to support the data collector within each site.

The data will be gathered by the data collector who will populate an [Excel spreadsheet](#). Each month, the data will be shared with the West of England AHSN who will review the data and combine the data with all hospitals in the region.

A separate [patient identification spreadsheet](#) will need to be stored and completed as a log of the patients who are used in the data collection. This spreadsheet, which will have Patient Identifiable Information included, must not be shared with the West of England AHSN.

Baseline data on the mortality rate will be collected as part of this project and will allow for demonstration of any changes in outcome. Although it is useful to be able to compare data between trusts, it is important to remember that the data you are collecting is for improvement in your organisation, rather than for comparison or benchmarking, as each organisation is different.

Instructions for how to complete the spreadsheet can be found on the first tab.

3.2 Sharing and celebrating progress

Celebrating success as you go and thanking staff has a great impact on engagement and sustainability.

An infographic showing progress and impact using the data collected will be developed. This will be printable to be shared with colleagues monthly. Instructions for how to print the infographic will be included. This infographic has not yet been developed and will be produced following the test run of data collection.

Sharing data and progress, particularly for mortality rates, with stakeholders, is important for winning 'hearts and minds' and is helpful to ensure stakeholders view your project as a necessary change. Presenting a patient story from your organisation is also very helpful for

getting staff on board. It is suggested that you share your results in a newsletter and showcase in coffee rooms to make sure success is shared.

Don't forget to showcase to your executive sponsor as well!

3.3 Evaluation and outputs

The project evaluation will be completed by Spring 2024.

The evaluation will aim to explore 4 key themes:

1. To demonstrate whether mortality rates improve through the implementation of the ***NIV 5 care bundle***.
2. To understand whether staff confidence and competence improves as being part of the ***Improving NIV care*** project.
3. To learn from patient experience in order to improve NIV care.
4. To create standardisation of how NIV care is delivered by using a bundle and to investigate which elements of the bundle work most effectively.

3.4 Sustainability

Sustainability means '***holding the gains and evolving as required, definitely not going back***' and needs to be thought about from the beginning of the project⁶.

Consider the points below which increase the chance of the change being sustained.

- Team engagement is encouraged from the beginning
- The team have ownership of the change and have had input into it
- The team understand the need for change and have visible feedback on progress
- Senior leadership and organisational engagement are visible
- New processes are added to existing processes that are reliable
- Processes do not rely on one person and reliable processes are in place for change-over of staff if necessary
- Making the new processes as easy as possible (*'making it easy to do the right thing'*) – embedding processes into your electronic system can support this.

The NHS Sustainability Tool

The [NHS Sustainability Tool](#) utilises many of these factors and is useful to do with the team at the beginning, middle and end of the project and can guide you as to which areas to concentrate on. The AHSN can support you with this.

⁶ Scoville R, Little K, Rakover J, Luther K, Mate K. *Sustaining Improvement*. IHI White Paper. Cambridge, Massachusetts: Institute for Healthcare Improvement, 2016
<http://www.ihl.org/resources/Pages/IHIWhitePapers/Sustaining-Improvement.aspx>

Part 4: Resources

On the West of England AHSN website, you will find a plethora of resources which will support you with your project. Click on each of the links to go directly to the resource. The [Improving NIV care](#) webpage is also available for general information and can be used as a resource to share with stakeholders.

Implementation

- [NIV 5 care bundle – A4 version](#)
- [NIV 5 care bundle – sticker version](#)
- [Checklist for implementation](#)

Quality Improvement

- [Project driver diagram](#)
- [Blank template driver diagram](#)
- [Local stakeholder mapping](#)
- [Learning Log](#)

Communications and Engagement

- [Project brief](#)
- [Poster](#)
- [Evidence Bundle](#)
- [Project slides](#)
- [Lanyard/ID badge insert](#)
- [Draft email for colleagues](#)

Data Collection

- [Data collection spreadsheet](#)
- [Patient identification spreadsheet](#)
- [Measurement strategy](#)

Health inequalities

- [Project Equality and Health Inequalities Assessment \(EHIA\)](#)
If you have any comments on the Improving NIV care EHIA, please contact Senior Project Manager, Megan Kirbyshire: megan.kirbyshire@nhs.net

Coming soon:

- Infographic to share progress

Appendices

Appendix 1.

Improving NIV care



Measurement Strategy

Project background

The British Thoracic Society (BTS) has conducted regular audits of acute non-invasive ventilation (NIV) for over 10 years, which have sadly demonstrated worsening patient outcomes. These results prompted a National Confidential Enquiry into the care of patients treated with NIV (NCEPOD 2017) which subsequently identified many areas for improvement. As a result of this enquiry, the BTS developed quality standards for acute NIV (2018). Since their introduction, there has been a slight improvement in mortality rates as identified in the 2019 BTS NIV audit. However, mortality rates remain higher than in other comparable countries at 26%.

Improving the outcomes of patients with COPD is a key priority within the NHSE Southwest Respiratory Network. The delivery of this Quality Improvement project will work to support this priority given that NIV is a core treatment in patients with COPD admitted with acute hypercapnic respiratory failure. It has been demonstrated that using NIV appropriately in this patient group improves mortality rates.

Data collection components

There are three components to the measurement, each of which are described below.

The three strands to the data collection are:

- i. Baseline mortality rate
- ii. Demographics of patients receiving NIV care
- iii. Project quality improvement data

Baseline mortality rate

Rationale:

Local audit results from the 2019 BTS NIV audit, demonstrate mortality rates of between 16-35% in the acute hospitals in the West of England. One site had a mortality rate of 0%, however it is acknowledged that this is unlikely to be representative of the usual overall NIV Mortality for that individual trust.

It is recognised that this data is not sufficient for an up-to-date baseline measure of local mortality rate. The impact of the Covid-19 pandemic has been far reaching and most respiratory services have undergone service changes and transformation to their pathways, workforce and resources. A more recent baseline figure is therefore required.

Intended use:

The mortality rate for each site will be used as a local baseline measure ahead of the quality improvement project. Each trusts data will also be combined with the other trusts for combine figures. The data will also be included in the project evaluation.

Process:

The West of England AHSN will work with Unity Insights to access this information via HES data.

The coding that will be used is:

- Procedure code: E852 Non-invasive ventilation NEC
- No HRG codes will be used as these are related to outpatient outcomes
- Admission method:
 - o 21: Emergency via Accident and Emergency (A&E) services, including the casualty department of the provider
 - o 284: Other emergency admission (TBC)

Information collected will be:

$$\frac{\text{Total number of patients who died within that hospital admission per month}}{\text{number of patients who received NIV per month}}$$

The above will be multiplied by 100 to provide the mortality rate.

Data collection: February 2022-January 2023

- Broken down per month per site
- GRH and CGH combined
- BRI and WGH are to be kept separate
- One report accumulating all trusts.
- One report for national data

A monthly report will be provided from March 2023 with data for February 2023 (when the bundle is implemented) until March 2024.

Demographics and medical conditions requiring NIV care

Rationale:

Demographic data of patients requiring NIV care have been captured in previous reports and reviews. However clinical teams report that following the Covid-19 pandemic, the demographics of patients that require acute NIV have changed along with the distribution of conditions that are being treated. For example, anecdotally many individuals have gained weight during the pandemic leading to an increased BMI. As a result, trusts have identified an increased number of individuals presenting with Obesity Hypoventilation Syndrome.

Capturing more recent data about patients receiving acute NIV will ensure we are using an accurate baseline at the start of our project, taking into consideration current case mix and morbidity. This will allow a true comparison between mortality outcomes in the recent past and post introduction of the NIV QI bundle.

Intended use:

The data collected will be analysed and will be included in the project evaluation. These results will be crucial in informing whether introduction of the QI bundle has been associated with a change in patient outcomes.

Process:

A request will be put into the Business Intelligence team in each trust to gather demographic and condition data. This will be a standalone request and will relate to every patient who has received NIV in the last 12 months.

The below data is to be collected:

- Age
- Gender
- Ethnicity
- Social deprivation score (IMD)
- Condition for which being treated
- Hospital outcome (discharged or deceased)

Project quality improvement data

Rationale:

The Improving NIV Care project is a quality improvement project that aims to implement the NIV care bundle. 'Live' outcome and process measures are therefore required to understand whether the bundle is being fully utilised and the impact.

Intended use:

The data collected will be used to inform the project delivery and will be included in the evaluation of the project.

Process:

The data collection strategy outlined on page 3 breaks down the data that will be gathered throughout the project, detailing the location of the data points and frequency of the collection. This data will be collected by each trust and will be provided monthly. No personal identification details will be shared during the data collection process.

A sample of patients of two patients will be used per week (8-10 per month). The Business Intelligence teams will identify random patients who have *received* NIV in the preceding month to allow for coding to be inputted. For example, for the month of March, a report will be produced for patients who received NIV in February. The report will be ran on the 25th of each month.

The ICD-10 code for identifying patients is: E85.2 Non-invasive ventilation NEC (this includes Intermittent positive pressure ventilation NEC, Negative pressure ventilation, BIPAP).

Paediatrics will be excluded.

The analytical tools that will be used and the types of tables and charts will be considered following the first data trial.

Type of Measure	Measure	Operational definition	Source	Frequency / Duration	Collector	Reporting location
Outcome Measure	Mortality Rate	The percentage of patients who receive acute NIV and die during the hospital admission.	HES Data	Monthly	Project Manager	WEAHSN
Secondary Measures	Percentage of patients receiving the NIV care bundle	Percentage of patients receiving the NIV care bundle	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	Percentage of patients receiving all four elements of the bundle	Percentage of patients receiving all four elements of the bundle	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	Length of stay	Number of days of hospital admission from date first reviewed in the ED to date of death / discharge	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
Process	Reliable case selection	Percentage of patients who are receiving NIV who have Type 2 Respiratory Failure and a diagnosis where NIV is proven to be effective. Data to be captured includes: Diagnosis for which the patient is being treated with NIV CO2 and pH from first ABG reading	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	Treatment Escalation Plan	The percentage of patients who had a Treatment Escalation in place prior to commencing treatment	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	NIV 'decision to mask time'	Percentage of patients who received NIV within 60 minutes from the point of decision to treat	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	Inspiratory pressure at one hour	Percentage of patients who receive an inspiratory pressure of >20cmH2O within the hour. Where this is not achieved with good reason, the reason will be articulated.	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	ABG/CBG to be repeated within 2 hours of starting NIV	Percentage of patients who receive an arterial or capillary blood gas within 2 hours of starting NIV	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	Staff training	Number of staff trained on NIV care bundle	Training records	Monthly	Trainer / clinician	Spreadsheet / WEAHSN
	Reason why 20cmH2O wasn't achieved	A written reason why 20cmH2O wasn't achieved and the pH and CO2 measurement in the repeat ABG	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN

	Time NIV was initiated	The time that the NIV was initiated	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	The day that the NIV was commenced	The day that the NIV was commenced	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN
	Role of the clinician responsible for initiating NIV	The role of the clinician that started the NIV	Patient notes	Monthly	Data collector	Spreadsheet / WEAHSN

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