# Quality Improvement Tool – Non-Invasive Ventilation

RESPIRATORY
QUALITY
IMPROVEMENT

# CONTENTS

This document and all appendices are available do download from: https://www.brit-thoracic.org.uk/standards-of-care/quality-improvement/non-invasive-ventilation/

# INTRODUCTION

Acute non-invasive ventilation (NIV) provides a survival benefit and reduced hospital stay for selected patients with chronic obstructive pulmonary disease (COPD) who present with acute hypercapnic respiratory failure (AHRF).[1,2] Evidence also supports the use of ward-based NIV for patients with milder AHRF (pH 7.30-35). As services have evolved, acute NIV has been used successfully for patients with AHRF due to other conditions, such as obesity-related respiratory failure, neuromuscular diseases and chest-wall conditions. The British Thoracic Society (BTS) first produced an acute NIV guideline in 2002,[3] with updated national guidance published in 2008[4] and 2016.[5]

The BTS also established a national acute NIV audit, with annual audits conducted between 2010-2013.[6] All audit cycles raised important concerns about the quality of NIV care and the organisation of NIV services in the UK. To explore these concerns, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) conducted a detailed review of clinical practice in all hospitals in the United Kingdom. NCEPOD's study of NIV, 'Inspiring Change,' identified a number of key areas where the organisation of care and clinical application of NIV could be improved.[7] Drawing from prior evidence, national guidelines and NCEPOD's 21 recommendations, BTS has recently produced an NIV Quality Standard.[8] Its purpose is to provide a set of specific, concise statements to act as markers of high-quality, cost-effective patient care.

This document builds on previous BTS QI Tools to bring together information on QI methodologies with targeted information relating to the new BTS Quality Standards, to help healthcare staff design and implement changes to drive up the quality of care in their own institutions.

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# ACKNOWLEDGEMENTS

# PART 1 – QUALITY IMPROVEMENT METHODOLOGY

Part 1 of this document provides an overview of some quality improvement methodologies and theory. There are many comprehensive sources of information on QI[9-15] – it is recommended that these resources are reviewed together with local expertise before embarking on QI activity.

Improving quality is about making healthcare safe, effective, patient-centred, timely, efficient and equitable. Quality improvement represents a systematic approach that uses specific techniques to improve quality.

## IMPROVEMENT JOURNEY



| Build will and conditions for change | Understand current system | Develop aim and change theory | Identify specific change ideas, test and refine in context | Implement locally, using PDSA cycles to build in sustainability | Scale up and spread where relevant |
|---|---|---|---|---|---|
| Building the case for improvement and senior buy in eg. NICE quality standard | Understand how items, processes work together eg. BTS National tobacco audit | Specific time-bound aims to drive action eg. Nicotine replacement | Identify specific changes and test strategies at a small scale eg. new nicotine prescribed process | Ensure changes become standard practice eg. embed nicotine prescription as 'business as usual' | Spreading change locally and nationally eg. placing nicotine prescription example on the repiratory futures website |

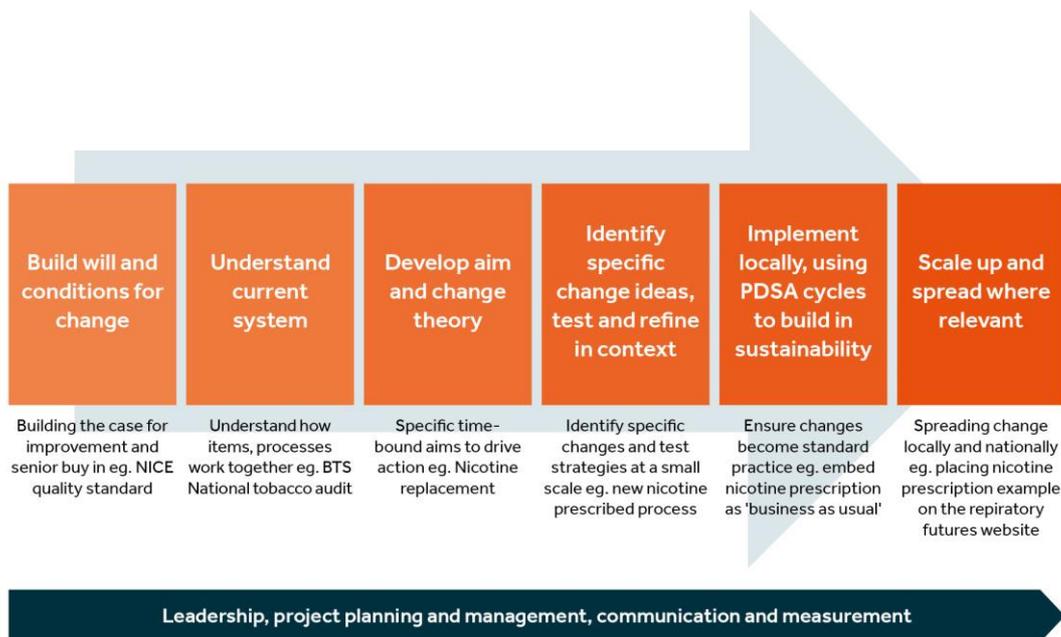Leadership, project planning and management, communication and measurement

Figure 1: The Improvement Journey diagram is adapted from the original published by NHS Education for Scotland on the Quality Improvement Zone (2017)

## 1.1 PRINCIPLES OF QUALITY IMPROVEMENT

The underlying principles of quality improvement include:

- Understanding the problem, with emphasis on what the data tells you.
- Understanding the processes and systems within your organisation, especially the patient pathway and whether these can be simplified. Process mapping is commonly used to map the pathway or journey through part or all of a patient's journey and supporting processes. Process mapping is extremely useful as a tool to engage staff in understanding how the different steps fit together and which steps add value.
- Analysing demand, capacity and flow of the service. For a process improvement to be made there needs to be a detailed understanding of the variation and relationship between demand, capacity and flow. For example, demand is often stable and flow can be predicted in terms of peaks and troughs. In this case, it may be variation in capacity that causes the problem.

- Choosing the tools to bring about change including leadership and clinical engagement, skills development, and staff and patient participation. It is important not to underestimate the involvement of all relevant staff, including non-clinical staff, which are often the first point of contact for patients. Many clinicians will be keen to improve the quality of service they offer but may be unfamiliar with QI approaches. Patients and carers have a significant role to play and may define quality differently from clinicians and managers.
- Evaluating and measuring the impact of change. 'Measurement for improvement' asks how an intervention can be made to work in a given situation and what will constitute 'success.'

## 1.2 VARIATION AS A FOCUS IN QUALITY IMPROVEMENT

Two broad types of variation in healthcare include variation in the organisation of services or processes and variation in clinical practice. A certain amount of variation is considered normal and many quality improvement approaches assess whether the system, process or clinical practice is within control limits. They then use this as a key measurement tool, to help understand the level of variation in the system and to measure it over time. Unwarranted variation can lead to inefficiency, waste and harm or lost opportunities.

## 1.3 QUALITY IMPROVEMENT APPROACHES

There are many theories and approaches in quality improvement, some of the main models and concepts are summarised below.

## 1.3.1 MODEL FOR IMPROVEMENT (INCLUDING PDSA)

This is an approach to continuous improvement where changes are tested in small cycles that involve planning, doing, studying, acting (PDSA), before returning to planning, and so on. Each cycle starts with hunches, theories and ideas and helps to form them into knowledge that can inform action and ultimately, produce positive outcomes. The cycles use three key questions:

- 'What are we trying to accomplish?'
- 'How will we know that a change is an improvement?'
- 'What changes can we make that will result in improvement?'
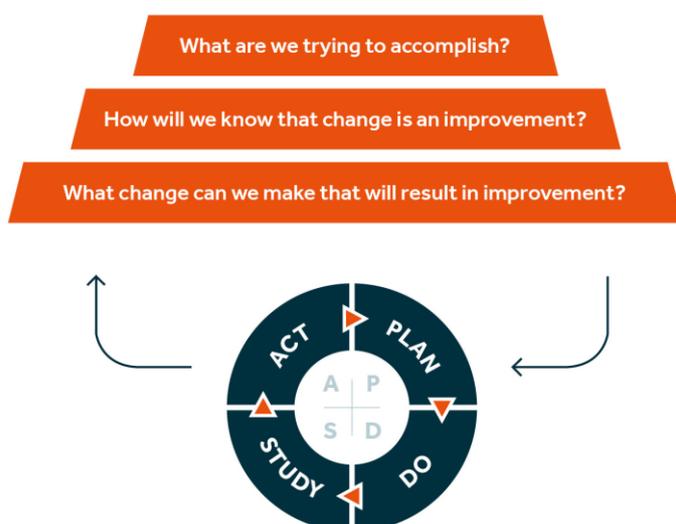
**THE MODEL FOR IMPROVEMENT**



Figure 2: taken from *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance,* 2ND edition, Gerald Langley, Ronald Moen, Kevin Nolan, Thomas Nolan, Clifford Norman, Lloyd Provost. Jossey-Bass Pub., San Francisco, 2009, p. 24

# 1.3.2 STATISTICAL PROCESS CONTROL (SPC)

This approach examines the difference between natural variation (known as 'random/common cause variation') and variation that can be controlled ('assignable/special cause variation'). The approach uses control charts that display boundaries for acceptable variation in a process. Data are collected over time to show whether a process is within control limits in order to detect poor or deteriorating performance and target where improvements are needed.

**STATISTICAL PROCESS CONTROL CHART**



Figure 3: SPC chart – The further a data point is from the centreline the more chance that there is an identifiable cause for the variation and the opportunity to intervene. These assignable variations therefore facilitate targeted interventions.

This process relies on several steps to produce a robust analysis. Data are collected over time to show whether a process is within control limits in order to detect poor or deteriorating performance and target where improvements are needed. The data itself needs to be normally distributed with measurements independent of each other. The mean value can then be calculated and the standard deviation of this. The upper and lower control limit is then usually set at 3 standard deviations above and below the mean. The data can then be plotted and the process assessed to determine whether it is out of control. Indications for this include:

- Any point falls beyond the above or below the control limits.
- 8 consecutive points fall on one side of the centreline.
- 2 of 3 consecutive points fall within a zone 3 sigma away from the mean.
- 4 of 5 consecutive points fall within a zone 2 to 3 sigma away from the mean.
- 15 consecutive points are within 1 sigma away from the mean.
- 8 consecutive points not within 1 sigma of the mean.

Further information on statistical methods that can be used to evaluate variation and identify outliers is available from the Healthcare Quality Improvement Partnership.[16]

### 1.3.3 THEORY OF CONSTRAINTS

The theory of constraints came from a simple concept similar to the idea that a chain is only as strong as its weakest link. It recognises that movement along a process, or chain of tasks, will only flow at the rate of the task that has the least capacity. The approach involves:

- Identifying the constraint (or bottleneck) in the process and getting the most out of that constraint
- Recognising the impact of mismatches between the variations in demand and variations in capacity at the process constraint
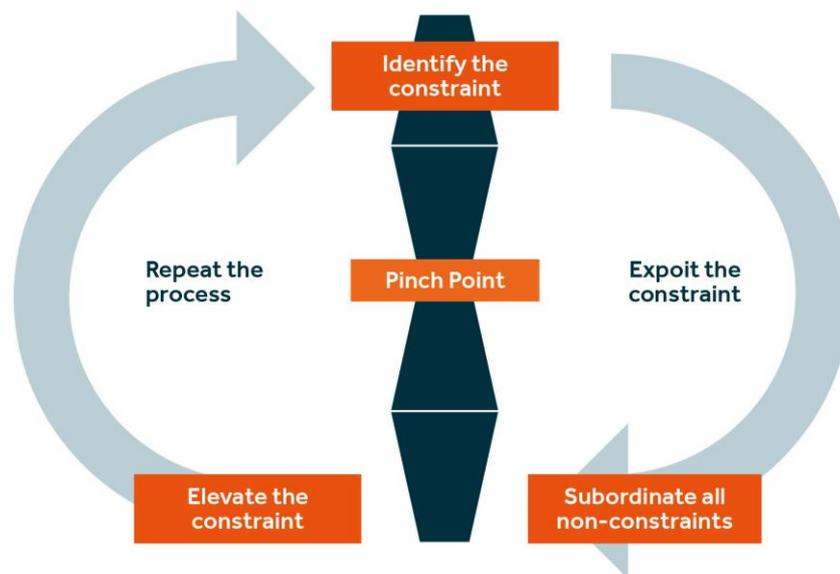


Figure 4: Theory of constraints cycle: 1 identify the system's constraint(s), 2 decide how to exploit the system's constraint(s), 3 subordinate everything else to the above decision(s), 4 elevate the system's constraint(s), 5 of in the previous steps a constraint has been broken, go back to step 1, but do not allow inertia to cause a system's constraint.

## 1.4 BARRIERS TO SUCCESSFUL QUALITY IMPROVEMENT

Many challenges have consistently been identified in QI programmes including[17]:

A. Convincing people that there is a problem
B. Convincing people that the solution chosen is the right one
C. Getting the data collection and monitoring systems right
D. Excess ambitions
E. Organisational context, culture and capacities
F. Lack of staff engagement
G. Leadership
H. Securing sustainability.

For further information on this topic and how to increase quality improvement capacity is available from The Health Foundation.[18]

# PART 2 – NIV QUALITY IMPROVEMENT

## 2.1 APPLYING QI TECHNIQUES TO IMPROVE CARE

The NCEPOD NIV review identified significant scope to improve NIV care across the UK and the BTS Quality Standards provide a framework within which the quality of care that a service provides can be measured.[7] A number of key factors are useful targets when using QI methodology to improve NIV care. In the sections that follow we set out some ideas that may be useful when setting up a QI project aimed at improving NIV care. This list is not comprehensive and the ideas suggested below are intended as a guide or starting point.

## Key factors to consider when using QI methodology to improve NIV care may include:

1. Treating the right patients: Is NIV indicated?
2. Making a ceiling of treatment decision or escalation plan before starting NIV.
3. Documenting NIV settings and the adjustment in settings in response to new information (e.g. blood gas results).
4. Starting NIV within 60 minutes of the decision to treat with NIV.
5. Continuous monitoring of the patient over the first 24 hours or until the initial respiratory acidosis has resolved.
6. Staff training and competency.
7. Use of an NIV care bundle.

For any QI project, it is important that sufficient resource is identified to enable completion of the project. For example, for this toolkit we are grateful for the contribution and material provided from the Improving NIV Through Understanding (INTU) study. A summary of the INTU study is provided in Appendix 1. This was an NIHR Collaborations for Leadership in Applied Health Research and Care (CLAHRC) - North West London funded research driven quality improvement project. Funding for the study included a full-time post for 12 months. Whilst smaller scale projects would not need similar resource, it is important that hospital trusts facilitate the necessary time, staffing and support to enable QI project completion.

Before starting a QI project, it is important to develop a clear aim. What do you want to achieve and by when? Developing a driver diagram or action effect diagram to set this out will help to clarify the aims and the processes that you will need to go through to achieve them. It is a good idea to work with a wide group of stakeholders to develop the aims and diagrams together.

At the start of the project, it is also useful to map the process of care. This helps to identify both potential changes that may improve the process of care as well as identifying people who will be able to help with obtaining, recording and analysing data to ensure the project is sustainable. These may include clinical coders, ward clerks, managers and administrative staff, IT and information governance teams as well as the clinical teams involved directly in care. These data can then be analysed by using statistical process control (SPC) charts to measure the impact of change and potentially document improvement.

The key factors listed above are areas of practice that define good NIV care. They are process measures. Improving all of these processes will result in good quality NIV care. This will therefore result in the delivery of the desired outcome of the overall project, the outcome measures. This could include outcomes such as: mortality, morbidity, organisational establishment and patient experience.

In undertaking a QI project, it is also important to consider balancing measures. These are metrics that should be tracked to ensure that any improvement in one area does not negatively impact another area. For example, if patients treated with acute NIV receive increased time with staff, then it may be the case that other patients receive less time, potentially reducing their patient experience.

Specific changes should be identified that will have an impact on each of the process measures listed above. In order to measure the impact of change and know if the change is an improvement, it is important to continuously gather and record data on both the individual processes and the desired outcomes.

## Examples and resources

**Appendix 1:** *Improving NIV Through Understanding*, the INTU study is an example of a completed NIV QI project. This was an NIHR Collaborations for Leadership in Applied Health Research and Care (CLAHRC) – North West London funded research driven quality improvement project.

**Resources:** NHS Improvement Quality, Service Improvement and Redesign (QSIR) tools: This is a comprehensive collection of proven quality, service improvement and redesign tools, theories and techniques that can be applied to a wide variety of situations. You can search the collection alphabetically for a specific tool (including SPC charts) or browse groups of tools using one of four categories: https://improvement.nhs.uk/resources/quality-service-improvement-and-redesign-qsir-tools/

## 2.1.1 INVOLVING PATIENTS IN QUALITY IMPROVEMENT

High quality care is safe, effective and patient centred, resulting in good patient experience. Putting the patient at the centre of quality improvement and involving patients and their advocates in co-designing projects for change can help to achieve patient centred quality improvement and ultimately a higher standard of care. Gaining patient feedback on the service is essential and we can learn from their experiences to identify where we need to improve. Ideally patient experience could be monitored in an on-going way so that it can be used to monitor change and improvement. Empowering patients by involving them in designing their services and also informing them (e.g. improving understanding of their conditions, treatment options) will result in a more patient-centred service, hopefully improving outcomes.

## Examples and resources

**Appendix 2:** An example of a patient feedback questionnaire for an NIV service – Imperial College Healthcare NHS Trust (ICHT). It showed that patients often do not feel involved in their care and/or understand the need for treatment with NIV. By using thematic analysis to review the results of this questionnaire, key areas were identified for change. These included differences in staff training and competency across different areas in the service. It led to a redesign of the training programme to standardise it across all areas in the hospital.

**Appendix 3:** A patient information leaflet that was re-designed with patients during focus groups and structured interviews using PDSA cycles to review and develop the final leaflet (ICHT).

**Resources:** ICHT NIV video for patients: https://www.youtube.com/watch?v=RSgwIEziWO0&t=2s

## 2.1.2 TREATING THE RIGHT PATIENT – IS NIV INDICATED?

## Problem

Case note reviewers in the NCEPOD study concluded that NIV was either not appropriate or not indicated for almost 20% of patients.[7] Reasons for this included treatment of hypoxaemia rather than hypercapnia, or treatment of metabolic acidosis. Of the group in which NIV was not indicated and may have been the wrong treatment, almost two thirds died. Treating the right patients for the right indication is clearly essential. Training in and understanding of NIV is central to this element and is also central to many of the other factors that will be discussed. As such staff training and competencies are discussed as a separate factor in section 2.1.7.

## Process

A process map of the patient pathway and decision to treat with NIV should identify:

- How and from where are the patients presenting to the NIV service?
- When and where is the decision to treat with NIV being made?
- How and by whom is the decision to treat with NIV being made?
- Is this decision supported or reviewed? And if so by whom?
- How is the decision documented?
- What criteria are being used to make the decision? (For example blood gas analysis)
- What systems are in place to support or inform the decision? (For example an NIV algorithm or access to NIV guidelines/training).
- Are there clear criteria that must be met before NIV can be initiated?

Stakeholders who can help to process map the initial stages of the NIV pathway and get the information that is needed may include members of the MDT (e.g. doctors, nurses, physiotherapists, occupational therapists, other AHPs) from acute medicine, critical care, emergency medicine, outreach services, and respiratory medicine. Patients and their advocates must also be involved where possible, in addition to clinical leads, guideline committee members, QI teams, IT and communication teams, clinical coding, business analysts and general managers. This is the same group of people who may be involved in other factors discussed below and as with all QI, having a wide and informed stakeholder group will help to implement changes that are locally relevant and carefully thought out. It may be useful to produce a stakeholder map to facilitate this.

## Demand, flow and capacity

Understanding the demand, flow and capacity of the service is essential when planning improvement change. The demand and flow can be reviewed retrospectively using clinical audit but in order to do this, systems need to be in place to accurately record care. IT and information teams as well as clinical coders may be able to help collect this data.

The capacity of the service to make the correct decision to treat patients with NIV will depend on the systems in place to support this, and the training and competency of staff (discussed more below). The pathway mapping above should help to identify the systems in place to support the capacity of the service and where there may be areas for improvement.

## Choosing tools for change

Multiple different QI tools may be appropriate for use when addressing this problem. At the start of a

QI project it may be helpful to develop a stakeholder map to identify who is needed to help ensure the success of the project and which individuals within the hospital may be able to take up the different roles. Pathway mapping each separate element to understand processes will also be useful to help direct improvement change.

It would be helpful to consider the following:

- Who are the key individuals who can lead this change, do they have enough time and support to do so?
- Do these individuals have the skills to deliver this change, and engage and enthuse other stakeholders including at an executive level?
- Is there robust QI training in place?
- Are all key stakeholders involved including patients and staff?
- Who is going to deliver the change?
- What will that change look like?
- How will the change be measured? And by whom?

## Evaluating the impact and measurement of change

When considering the aim to 'improve NIV care,' choosing the right patients to treat is a process measure i.e. it is not the final outcome or an outcome measure but part of the essential processes that when done correctly will influence the outcome. This is also the case for many of the other factors discussed below. In order to evaluate if influencing any particular process measure has positive impact it is necessary to measure the primary outcome measures alongside the process measure itself. In this case in order to see if treating the correct patients (i.e. only those in whom NIV is indicated and appropriate) improves quality of care it will be necessary to document the percentage of all NIV patients treated with NIV who had an indication for NIV and treatment was appropriate. This measure 'percentage of patients who receiving indicated and appropriate treatment' can be reported on a SPC chart. This will allow changes to be evaluated to see if they affect the process measure and if that in turn affects the outcome.

## Examples and resources

**Appendices 4a and 4b:** BTS algorithm and a local ICHT NIV algorithm adapted from the BTS Guideline via PDSA cycles to take local factors into account. For example, the ICHT NIV algorithm includes 'Continuous cardiac and Sp02 monitoring for at least the first 12 hours' whereas BTS suggests continuous $SpO_2$ as routine for all, with ECG monitoring advised for patients with pulse rate >120 bpm, dysrhythmia, or possible cardiomyopathy.

## 2.1.3 CEILING OF TREATMENT AND ESCALATION DECISIONS

## Problem

National guidelines suggest that a ceiling of treatment and escalation plan should be made prior to starting NIV.[6] The NCEPOD review found that 90% of UK hospitals included escalation planning in their local guideline.[7] Escalation planning is important as NIV treatment only succeeds in approximately two thirds of cases.[5,7] When NIV fails to improve hypercapnia the risk of death is high. Advance planning of what actions should be taken if NIV fails can facilitate early escalation of treatment or palliation of the patient. Despite the importance of making treatment escalation decisions, it is known that they are not documented in a substantial proportion of cases (BTS 2013: 26%, NCEPOD: 36%).[5,7]

## Process

Processes that will need to be considered include:

- Who is responsible for making the decision?
- When is the decision made?
- Is the decision documented? And how?
- What information is used to make the decision? (Patient wishes, functional status, comorbid conditions, access to records)
- Why is it not being done? (Staff confidence, experience, seniority, lack of information or access to information)
- Lack of understanding of the limitations of NIV?
- Lack of recognition of the potential to deteriorate?

Stakeholders who could help with this process mapping may include palliative care teams and GPs, in addition to those previously listed (e.g. patients, patient groups and all members of the clinical team).

## Demand, flow and capacity

All patients starting NIV treatment should have an escalation plan and/or ceiling of treatment set. How this is decided on and documented may be complex. Understanding the challenges and barriers to completing these tasks will be essential to guide change. The capacity of the service to make these decisions in a timely manner will depend on how the service is led, who has the authority and experience to make these decisions in the acute setting, and if they are available at the right time point.

## Choosing tools for change

A number of different tools may be appropriate but full stakeholder engagement is essential when setting ceilings of treatment and escalation plans. Patient involvement is vital. What do patients understand by ceiling of treatment decisions, what do they want to discuss and at what point? Structured interviews may be a useful way to explore this. Mapping the decision-making process may help identify barriers and potential solutions. The examples below could be considered and tested using PDSA cycles:

| Problem | Potential solutions |
|---|---|
| No senior person available | Consider alternative ways to involve the senior decision maker acutely - telephone help, different working patterns. |
| | Consider alternative decision makers through education and training. |
| Lack of background clinical information | Working with IT and clinical record teams to facilitate information exchange between primary and secondary care. |
| | Ensuring clear documentation of previous decisions. |
| | IT solutions to DNACPR / treatment escalation forms. |

| | |
|---|---|
| Staff lack of confidence | Conducting structured interviews with doctors may help gauge understanding about the importance of these conversations |
| | Embedding treatment escalation discussions into the education framework. |

## Evaluating the impact and measurement of change

SPC charts allow the percentage of patients with timely decisions being made to be tracked and improvement demonstrated. By reviewing measures in each PDSA cycle the effect of changes can be demonstrated.

**Resources:** SPC charts: https://improvement.nhs.uk/resources/statistical-process-control-spc/

## 2.1.4 DOCUMENTING NIV SETTINGS AND AIMS

### Problem

Prescribing NIV and clearly documenting treatment aims (including target oxygen saturations, ABG parameters and ventilator settings) can result in improved delivery of NIV treatment. This is recommended in recent BTS guidelines.[5] The NCEPOD report found that where NIV settings were adequately documented patients were less likely to die.[7] Documentation of settings was poor in 50% of cases despite more than two thirds of hospitals having an NIV settings prescription chart and more than 80% having a designated NIV observations chart. This may reflect organisational issues and support systems as well as clinical issues.[7]

### Process

When designing a new prescription or observation chart or re-establishing an old one it may be important to understand the following:

- Who is responsible for filling in the prescription and deciding on the settings and aims?
- What training will they have?
- What are the barriers to completing the documentation adequately?
- Who will be responsible for deciding and documenting settings changes?
- Will the documentation be electronic and if so who needs to be involved to help make changes to the electronic processes?
- How will use of the documentation be audited?

### Demand, flow and capacity

The capacity for medical staff to complete the documentation adequately may be inhibited by a number of factors, including but not limited to time, training, knowledge of local processes, and staff turnover. It is important to understand these issues and involve the stakeholders who will have to use the resources in the process of instituting the changes. NIV "champions" could be identified as part of the QI team to help promote good practice amongst colleagues during routine clinical care.

### Choosing QI tools for change

PDSA cycles will once again be essential to test versions of any new documentation resource and review of each version should involve stakeholders and be open to feedback. It may also be useful to process map exactly when, where, by whom and how the documentation will be completed and used.

## Evaluating the impact and measurement of change

Having established a method for documenting and prescribing NIV settings it will be important to embed its use into standard clinical practice. It may be useful to plot the percentage of patients in whom the tool is used correctly as a settings prescription chart and to review cases where it was not. Regular and personalised feedback can help discover unexpected barriers to the use of new tools and also promote their use. Regular reporting to the clinical teams of performance can help build a culture of improvement within the teams.

## Examples and resources

**Appendix 5:** NIV prescription example (Sherwood Forest Hospitals NHS Foundation Trust).

## 2.1.5 STARTING NIV WITHIN 60 MINUTES OF DECISION TO TREAT

## Problem

NIV treatment is often delayed and this can be detrimental to patient outcomes. Whilst a time-limited trial of standard medical therapy (e.g. controlled oxygen and drugs) may be appropriate provided the patient is not in extremis, acute NIV should not be delayed. Clinical deterioration due to treatment delay may result in worsening acidaemia. For pre-NIV blood gas measurements, worsening acidaemia is associated with an increase in mortality. Therefore, BTS and NCEPOD recommend prompt initiation of treatment and the BTS standards define this as within 60 minutes of the decision making blood gas.[6-8]

## Process

Mapping the processes involved in setting up NIV will help to identify reasons for delay and should include:

- Who is making the decision and when the decision is made who is notified?
- Whose responsibility is it to set up the NIV?
- What equipment is needed and where is it kept? Is there enough equipment readily available? Do staff know where it is?
- What skills do staff need to set up NIV and are skilled people readily available? Is there variation between shifts – in hours vs out of hours?
- For existing in-patients can NIV be set up in any area or does the patient have to move to another ward/clinical area? Does this cause delays?
- Is there an agreed pathway between all hospital services involved in the care of patients treated with NIV?

The same people involved in the decision to treat are likely to be able to help process map this aspect of the patient pathway, but particular attention should be made to involve those stakeholders who are actually involved in the set-up of NIV and the transport of patients and equipment, e.g. porters. It may be helpful to follow a patient through this part of the pathway in real-time to identify the barriers and challenges experienced. For example, what is the process for achieving transfer of the patient to a designated NIV area?

Barriers may include:

- ABG being completed and reviewed and identification of correct patients
- Failure to recognise ABG importance

- Specialist review to start NIV treatment
- Machine availability

Potential solutions:

- Improving awareness of which patients should be treated with NIV
- Use of an NIV care bundle
- Training and competency of all staff involved in the care of patients treated with NIV
- Developing a clear and adequately resourced pathway

## Demand, flow and capacity

The capacity to provide NIV within 60 minutes will depend on the organisational set up of the service

and the clinical recognition of the problem (i.e. timely review of and accurate interpretation of the blood gas result). It may be necessary to think of and try new ways of working such as taking the NIV machine to the patient rather than relying on moving the patient in a timely fashion. The infrastructure and staff required to do this may have to be reconsidered and the service reconfigured, being mindful of the fact that patient safety is paramount at all times and should be carefully considered when implementing changes.

## Choosing tools for change

When implementing large changes in the way a service works it will be important to have good leadership skills within the team which can help motivate stakeholders within the service as well as getting executive support to facilitate changes.

## Evaluating the impact and measurement of change

In order to assess this measure it is important that there is reliable documentation of the ABG timing and the time NIV is initiated. Again this process measure can be plotted on an SPC chart and cases or periods where the targets are not met could be examined using exception reporting and rule breaks to identify them.

## Balancing measures

Increased demand on existing specialist staff may impact care of patients in other areas. To assess this, one option could be to document the workload of specialists directly involved in NIV care e.g. specialist nurses and physiotherapists (including number of consultations, time from referral to consultation) before and after implementation of the 60-minute standard. Time spent e.g. transferring patients to an NIV agreed area should also be recorded, and any impact identified e.g. are patients waiting longer for inpatient specialist review?

## 2.1.6 CONTINUOUS MONITORING IN FIRST 24 HOURS OR UNTIL INITIAL RESPIRATORY ACIDOSIS HAS RESOLVED

## Problem

The NCEPOD review recognised that patients receiving acute NIV were often not monitored closely enough in the first 24 hours, potentially leading to delayed recognition of deterioration or NIV failure. BTS and NCEPOD recommend continuous monitoring of pulse oximetry (and respiratory rate and ECG as appropriate) for the first 24 hours or until the resolution of acidosis.[7,8]

## Process

BTS recommend that NIV is carried out in designated areas with designated staff at a ratio of 1 nurse: 2 patients. This is in part to ensure a competent core staff, but also to ensure adequate monitoring. Mapping the current processes within the hospital for monitoring of patients on NIV will help to identify what is needed to meet this standard.

- What is currently done? How often are patients monitored, by whom, how is this done (central monitoring, observations rounds), how are the observations recorded?
- Are there early warning scores in place and are they used appropriately?
- When continuous monitoring does not occur – why not? (Too few staff, too many conflicting pressures, lack of understanding, not enough beds in designated areas, not enough equipment?)

## Demand, flow and capacity

Understanding the demands on staff and clinical areas to achieve this level of input and their capacity to do this will help identify where and why the standards are not met. There may be variation across shifts (in hours/ out of hours) or areas (level 2 areas vs resus vs the wards) and understanding the variation will help to identify areas for improvement.

## Choosing tools for change.

Many different tools may be appropriate for use. It may be that several of the factors that have been discussed can be included into a locally useful bundle. The bundle should be carefully designed to address key points that when considered together help to improve patient care. The format, layout and use of the bundle should be tested locally through repeated PDSA cycles to ensure that it is functional in the hospital where it will be used. Key stakeholders must be involved in its design and its use should be audited as a process measure.

## Evaluating the impact and measurement of change

As changes are made it will be important to evaluate if their impact is beneficial – for example introducing a new observation chart may actually make the process less time efficient and take staff away from direct patient care. Continually monitoring outcomes and processes will help identify these patterns.

## Examples and resources

**Appendix 6:** Example NIV observation chart from EPIC, an electronic medical record system.

**Appendices 7a and 7b:** Examples of NIV care bundles (ICHT and developed for this QI Tool).

## 2.1.7 STAFF TRAINING AND COMPETENCY

## Problem

All of the measures discussed above rely to some extent on good clinical knowledge, understanding of NIV and competency in managing NIV patients. This is the case for all members of the MDT. In order to deliver a high quality and effective service the BTS Quality Standards ask hospitals to be able to demonstrate levels of staff competency and training.[8]

People who may be able to identify training needs and help with improvement include:

- Practice development nurses
- Post graduate education teams
- Mandatory training organisers
- Medical schools/AHP education leads
- Unit training leads and directors for medical education.

## Process

Training is often disorganised and ad hoc. Competency may be inconsistent across and within staff groups, which impacts standards of care.

When considering how to improve this process, it is important to assess the following areas:

- What training is currently available?
- How often is training delivered, who delivers it and who is it for?
- What content is used?
- Is training standardised across all departments delivering care in the pathway?
- Is the training recorded and are competencies assessed?
- Is training mandatory for those involved in the pathway?
- Is it known how many staff are trained and/or competent?
- Do staff feel confident in managing NIV patients?
- Do patients feel confident that the staff are competent?

What are the barriers to training staff?

- Sufficient levels of staffing to allow staff to be released for training
- Availability of staff to deliver teaching and competency
- Specialist teams agreeing on training process
- All members of the MDT (doctors, nurses and allied health professionals) agreeing to take part in training
- Equipment availability for training

Potential solutions:

- Designated training role to allow more time
- Build planned training days into rotas
- Development of an agreed training pathway that all teams conform to
- Integration into existing mandatory training
- Use of a standardised training package e.g.:
  - Theory
  - Practical component – Simulation training
  - Assessment of competency (on ward)

## Demand, flow and capacity

Having understood what is currently available and what barriers there may be to implementing change, it is now necessary to consider what an ideal training programme may look like and how gaps might be filled.

Things to consider may include:

- Ways of training (online, simulation, small group teaching).
- Are there other people who can provide the training (peer to peer teaching, practice development nurses, etc.) and can teaching be delivered in MDT groups?
- Composition of initial training versus refresher training
- Who can sign off competencies and do they have the time and the skills to be teachers and trainers?
- What extra resources will be needed to achieve this new demand on the training programme?

## Choosing tools for change

Many different tools may be useful here. For example when considering new ways to deliver training PDSA cycles could be used to test and obtain feedback on different resources, and staff questionnaires may help to identify training gaps. When designing competency frameworks it will be important to involve local stakeholders as well as wider groups and consider national guidelines and qualifications.

## Evaluating the impact and measurement of change

Measuring the impact of training on clinical care can be difficult, however it will be useful to record the numbers of people who have been trained and who have competencies signed off. It may be useful to survey staff before and after training to ask them about their own training needs and feelings regarding competency and confidence, and then review if these needs were met by any training resource.

## Balancing measures

Record compliance with other Trust mandatory training before and after initiation of NIV training programme to assess if NIV training causes training gaps in other areas.

## Examples and resources

**Appendix 8:** Example of a Clinical Competency Assessment Framework (ICHT).

**Appendix 9:** Example of suggested levels of competency according to role in service (developed for this QI Tool).

**Resources:** NHS Health Education England e-Learning for Healthcare NIV training package: https://www.e-lfh.org.uk/programmes/acute-niv/. ICHT training video describing the patient centred approach to NIV: https://vimeo.com/263869617

# APPENDICES

All appendices are available do download from: https://www.brit-thoracic.org.uk/standards-of-care/quality-improvement/non-invasive-ventilation/

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