BMJ Open Respiratory Research

British Thoracic Society quality standards for home oxygen use in adults

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To cite: Suntharalingam J, Wilkinson T, Annandale J, *et al*. British Thoracic Society quality standards for home oxygen use in adults. *BMJ Open Resp Res* 2017;**4**:e000223. doi:10.1136/bmjresp-2017-000223

► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bmjresp-2017-000223).

Received 14 June 2017
Accepted 14 June 2017

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ABSTRACT

Introduction The purpose of the quality standards document is to provide healthcare professionals, commissioners, service providers and patients with a guide to standards of care that should be met for home oxygen provision in the UK, together with measurable markers of good practice. Quality statements are based on the British Thoracic Society (BTS) Guideline for Home Oxygen Use in Adults.

Methods Development of BTS Quality Standards follows the BTS process of quality standard production based on the National Institute for Health and Care Excellence process manual for the development of quality standards.

Results 10 quality statements have been developed, each describing a key marker of high-quality, cost-effective care for home oxygen use, and each statement is supported by quality measures that aim to improve the structure, process and outcomes of healthcare.

Discussion BTS Quality Standards for home oxygen use in adults form a key part of the range of supporting materials that the society produces to assist in the dissemination and implementation of a guideline's recommendations.

INTRODUCTION

BTS has been at the forefront of the production of guidelines for best clinical practice in respiratory medicine since the Society was established over 25 years ago. Guideline production methodology has evolved considerably in recent years, and a manual setting out the detailed policy for the production of BTS Guidelines is reviewed annually by the BTS Standards of Care Committee (SOCC).[1] BTS Guidelines received National Institute for Health and Care Excellence (NICE) accreditation in 2011.

The production of quality standards based on each BTS Guideline is a key part of the range of supporting materials that the Society produces to assist in the dissemination and implementation of a guideline's recommendations.

The purpose of the quality standards document is to provide healthcare professionals, commissioners, service providers and patients with a guide to standards of care that should be met for home oxygen provision in the UK, together with measurable markers of good practice.

BTS Quality Standards are intended for:

- Healthcare professionals to allow decisions to be made about care based on the latest evidence and best practice.
- People with chronic respiratory disease and their families and carers to enable understanding of what services they should expect from their health and social care provider.
- Service providers to be able to quickly and easily examine the clinical performance of their organisation and assess the standards of care they provide.
- Commissioners so that they can be confident that the services they are purchasing are high quality and cost effective.

NICE Quality Standards were used as a model for the development of BTS Quality Standards, and the development of these quality standards is based on the NICE Quality Standards Process Guide.[2]

This document contains quality standards for home oxygen in adults. This document was approved by the BTS SOCC in May 2017.

A quality standard is a set of specific, concise statements that:

- act as markers of high-quality, cost-effective patient care across a pathway or clinical area, covering treatment or prevention
- are derived from the best available evidence.

The rationale for these quality standards is drawn from evidence and recommendations summarised in the BTS Guideline on Home

Table 1 Membership of the BTS Home Oxygen Quality Standard Development Group

Name		
Dr Jay Suntharalingam	Co-chair	Consultant Respiratory Physician, Bath
Professor Tom Wilkinson	Co-chair	Consultant Respiratory Physician, Southampton
Joe Annandale	ARNS representative	Respiratory Nurse Specialist, Prince Philip Hospital, Wales
Ms Claire Davey	ACPRC representative	Advanced Practitioner Home Oxygen Service, Mile End Hospital
Ms Rhea Fielding	ARTP representative	Specialist Oxygen Respiratory Physiologist, University Hospitals of Coventry and Warwickshire
Dr Daryl Freeman	PCRS-UK representative	General Practitioner, Norfolk
Dr Michael Gibbons	POSC representative	Consultant Respiratory Physician, Royal Devon and Exeter
Mr Christopher Gingell	Lay representative	
Dr Maxine Hardinge		Consultant Respiratory Physician, Oxford
Dr Sabi Hippolyte		Respiratory Specialty Trainee, Royal Brompton Hospital
Mrs Vikki Knowles	PCRS-UK representative	Respiratory Nurse Consultant, Guildford and Waverley CCG
Ms Cassie Lee	ACPRC representative	Lead Respiratory Physiotherapist, Community Cardio-Respiratory Service, Imperial College Healthcare NHS
Professor William McNee		Professor of Respiratory Medicine, Edinburgh
Ms Jacqui Pollington		Respiratory Nurse Specialist, Mid Yorkshire Hospitals
Dr Vandana Vora	APM representative	Consultant in Palliative Medicine, Sheffield Teaching Hospitals Foundation Trust
Mr Trefor Watts	ARTP representative	Principal Physiologist, Walsall
Dr Meme Wijesinghe		Consultant Respiratory Physician, Royal Cornwall Hospital

ACPRC, Association of Chartered Physiotherapists in Respiratory Care; APM, Association of Palliative Medicine; ARNS, Association of Respiratory Nurse Specialists; ARTP, Association for Respiratory Technology and Physiology; PCRS-UK, Primary Care Respiratory Society UK.

Oxygen Use in Adults, which was published in 2015 (http://www.brit-thoracic.org.uk/guidelines).[3]

Each quality standard includes the following:

- A quality statement, which describes a key marker of high-quality, cost-effective care for this condition.
- Quality measures, which aim to improve the structure, process and outcomes of healthcare

The quality measures are not intended to be new sets of targets or mandatory indicators for performance management that need to be collected. The quality measures are specified in the form of a numerator and a denominator, which define a proportion or ratio (numerator/denominator). It is assumed that the numerator is a subset of the denominator population. The suggested numerator and denominator are provided to allow healthcare professionals and service providers to examine their clinical performance in relation to each quality standard. It is recognised that no national quality indicators will be available for this condition, and institutions will need to agree locally what information is required for the denominator to be used in each case and what the expected level of achievement should be, given local circumstances. A brief description about the quality standard in relation to each audience is given.

The main source references for these Quality Standards are BTS Guideline on Home Oxygen Use in Adults, 2015.[3] There is no specific order of priority associated with the list of quality standards.

METHOD OF WORKING

A Quality Standards Working Group was convened in November 2015 and met in March 2016. Table 1 shows the membership of the group.

Members of the Quality Standards Group submitted Declaration of Interest forms in line with the BTS policy, and copies of forms are available on request from BTS Head Office.

The draft document was considered in detail by the BTS SOCC initially in November 2016 and the BTS Quality Improvement Committee (in March 2017).

The document was made available on the BTS website for public consultation for the period from 11 January 2017 to 13 February 2017.

Following further revision the document was submitted for approval to the BTS SOCC in May 2017.

The quality Standards document will be reviewed in 2020, or following the publication of a revised guideline whichever is the sooner.

LIST OF QUALITY STATEMENTS

1. All patients should have home oxygen assessments carried out by a home oxygen assessment service that includes appropriately trained staff and appropriate equipment.

2. All patients being assessed for home oxygen should undergo a risk assessment that includes assessment of individual and household member smoking status, and other household risks of fire, trips and falls.

3. All patients initiated on home oxygen should have appropriate education and written information provided by a specialist home oxygen assessment team.

4. Patients with advanced stable cardiorespiratory disease who have resting saturations on air that meet the qualifying criteria should be referred for a long-term oxygen therapy (LTOT) assessment.

5. All patients being considered for LTOT should undergo serial blood gas assessments, by the home oxygen assessment service, when stable to confirm both the need for and tolerability of LTOT.

6. Review, reassessment and withdrawal
   a. All patients started on LTOT should be followed up with blood gas assessment within 3 months of initiation of therapy; this includes those patients who are discharged home from hospital on LTOT for the first time.
   b. All patients who continue on LTOT should be monitored at least on an annual basis by a home oxygen assessment service.
   c. All patients who are identified as no longer requiring any form of home oxygen should have this withdrawn.

7. Short burst oxygen therapy (SBOT) should only be offered in the context of cluster headache. SBOT should not be ordered for patients with chronic cardiorespiratory disease.

8. Nocturnal oxygen therapy (NOT)
   a. Patients with optimally treated cardiac failure, who are not eligible for LTOT, should only be offered NOT if there is evidence of sleep disordered breathing causing daytime symptoms.
   b. Patients with chronic hypercapnic respiratory failure with nocturnal hypoxaemia, who are not eligible for LTOT, should only be offered NOT in conjunction with non-invasive ventilation (NIV).

9. Ambulatory oxygen therapy (AOT)
   a. Patients not eligible for LTOT should only have AOT ordered to facilitate pulmonary rehabilitation or to improve mobility after appropriate formal assessment that includes an exercise test.
   b. Patients on LTOT, who are mobile outdoors, should only be offered AOT if this allows them to achieve 15 hours/day compliance with LTOT and/or improve capacity to undertake outdoors activities.

10. Palliative oxygen therapy (POT) can be considered as a trial for patients with hypoxaemia (saturations <92% on air) with refractory dyspnoea due to life-limiting disease that has not responded to opioids and non-pharmacological measures.

Quality statement 1	**All patients should have home oxygen assessments carried out by a home oxygen assessment service that includes appropriately trained staff and appropriate equipment.**
Rationale	The assessment and provision of home oxygen therapy requires expert knowledge and should be implemented by staff who have been adequately trained. Equipment used to assess patients for home oxygen should undergo regular calibration quality control checks to ensure they are of the highest quality. Where possible, patients initiated on home oxygen should have their baseline assessment of flow rate carried out using similar oxygen equipment to the equipment they will be receiving at home. Where possible patients should be offered oxygen equipment that is best suited to their individual needs.
Quality measure	**Structure:** ► Evidence that staff undertaking home oxygen assessments have undergone appropriate training, with evidence of ongoing CPD. ► Evidence that equipment used during assessments has had regular quality control checks. **Process:** ► Proportion of staff undertaking appropriate training. ► Proportion of equipment that has been adequately checked. **Numerator 1:** ► The number of staff that have demonstrated completion of appropriate training for performing home oxygen assessments with evidence of ongoing continuing professional development. **Denominator 1:** ► The number of staff undertaking home oxygen assessments. **Numerator 2:** ► The number of medical devices used during a home oxygen assessment that have undergone a quality control check within the last 12 months.

	Denominator 2: ▶ The number of medical devices used during a home oxygen assessment.
Description of what the quality statement means for each audience	**Service providers:** ▶ Ensure that all medical devices used during an assessment (including diagnostic equipment and oxygen delivery devices) must undergo regular annual quality control checks. ▶ Ensure all staff maintain continuing professional development. ▶ Service providers should ensure that a wide range of assessment equipment is available to cater to individual needs. **Healthcare professionals:** ▶ Healthcare professionals undertaking oxygen assessments must ensure they have undergone appropriate training and have maintained this expertise through continuing professional development. ▶ Healthcare professionals should ensure that they are able to identify equipment suitable for patients. **Commissioners:** ▶ Ensure that staff undertaking home assessments have access to, and funding for, appropriate training programmes. ▶ Ensure that equipment used during oxygen assessments has undergone regular quality control checks. ▶ Ensure processes are in place to check staff and equipment standards are met and to address training and quality issues when they are not. The service specification should reflect these quality standards. **People who require home oxygen:** ▶ Are offered a high-quality service staffed by trained healthcare professionals using quality control checked equipment.
Source references	BTS Guideline for Home Oxygen Use in Adults (2015).[3] There are no national standards or competencies.

Quality statement 2	**All patients being assessed for home oxygen should undergo a risk assessment that includes assessment of individual and household member smoking status, and other household risks of fire, trips and falls.**
Rationale	There is a significant risk of fire and personal injury by using oxygen while smoking (including e-cigarettes) or by using oxygen near a naked flame. Patients and/or household members who continue to smoke and who have access to home oxygen put themselves, other people, their surroundings, their property and neighbouring properties at risk. Home oxygen equipment and tubing can represent a trip hazard particularly for those with mobility issues or sight impairment.
Quality measure	**Structure:** ▶ Evidence that all patients being assessed for home oxygen undergo a holistic risk assessment that includes assessment of smoking status and other fire and falls risks before oxygen is installed. Risk assessments should take place in the patient's place of residence and involve two-way dialogue on lifestyle. NHS England has introduced an Initial Home Oxygen Risk Mitigation Form. The information on this form is intended to raise awareness of the potential dangers of providing home oxygen and will assist healthcare professionals to make a considered decision about the appropriateness of oxygen therapy. This form can be seen in online supplementary appendix 1. ▶ Evidence that all patients being assessed for home oxygen, and their household members, are given written information regarding the increased risk associated with smoking and the use of oxygen therapy. ▶ Evidence that patients being assessed for home oxygen who smoke are offered access to a smoking cessation service. ▶ In patients where risk assessment identifies potential safety issues, patients and carers should be assessed for understanding of the risks and given opportunities to ask questions about and discuss the risks and benefits of therapy. Any decision to proceed with installation of home oxygen in the presence of significant risks should be made after careful multidisciplinary team discussion and with full understanding of the potential implications of this decision by the patient ▶ Where risk assessments identify trip and fall safety risks, restrictions (eg, providing short tubing) that might limit a patient's independence within their home should be avoided. Where restrictions are necessary, advice and support should be provided to mitigate these.

	Process: ▶ The proportion of patients undergoing assessment for home oxygen who have undergone a holistic risk assessment. ▶ The proportion of patients who continue to smoke who have received written information regarding the increased risk associated with smoking and the use of oxygen. ▶ The proportion of patients who smoke at the time of referral for home oxygen assessment who have been referred to smoking cessation services. ▶ The proportion of patients continuing to smoke who have signed a consent form acknowledging the fire hazards of home oxygen. **Numerator 1:** ▶ The number of patients being assessed for home oxygen who have undergone a holistic risk assessment, including assessment of their and the rest of their household's smoking status. **Denominator 1:** ▶ All patients being assessed for home oxygen. **Numerator 2:** ▶ The number of patients being assessed for home oxygen who currently smoke, or who have household members who smoke, who have been provided with written information regarding the fire hazards associated with home oxygen therapy. **Denominator 2:** ▶ The number of people being assessed for home oxygen who currently smoke or who have a household member who currently smokes. **Numerator 3:** ▶ The number of people being assessed for home oxygen who currently smoke who have been offered access to smoking cessation services. **Denominator 3:** ▶ The number of people being assessed for home oxygen who currently smoke.
Description of what the quality statement means for each audience	**Service providers:** ▶ Ensure systems are in place to identify high-risk patients. ▶ Ensure accessible referral pathways to smoking cessation services. ▶ Ensure written information is available regarding the risks associated with smoking and home oxygen therapy. **Healthcare professionals:** ▶ Ensure that a risk assessment is carried out as part of a home oxygen assessment. ▶ Ensure patients who continue to smoke are advised of the increased risks when home oxygen is prescribed. ▶ Ensure that patients are referred to smoking cessation services where appropriate. **Commissioners:** ▶ Ensure that home oxygen assessment services are adequately resourced to carry out risk assessments. ▶ Ensure that smoking cessation services are adequately resourced to meet volume of referrals. ▶ May want to consider developing a local policy for the prescribing of oxygen to patients who are known smokers. **People who require home oxygen:** ▶ Are made aware of the potential hazards associated with home oxygen. ▶ Who continue to smoke have been offered access to smoking cessation services.
Relevant existing indicators/data sources	For example, local data collection/audit.
Source references	BTS Guideline for Home Oxygen Use in Adults (2015).[3]
Other information	Home oxygen and Domestic Fires; Brendan G. Cooper, DOI: 10.1183/20734735.000815 Published 1 March 2015.[4] Example domiciliary oxygen policy for patients who are known smokers: http://www.eastcheshire.nhs.uk/About-The-Trust/policies/O/Oxygen%20-%20Prescribing%20for%20Smokers%20and%20Users%20of%20E-Cigarettes%20ECT2582.pdf, https://www.blf.org.uk/support-for-you/oxygen/life-with-oxygen.

Quality statement 3	**All patients initiated on home oxygen should have appropriate education and written information provided by a specialist home oxygen assessment team.**
Rationale	Patients initiated on home oxygen without formal education are often poorly compliant with their oxygen long term. Patient education is therefore an essential component of receiving home oxygen and should be tailored to individual needs and involve learning setting goals. Patient education should be delivered by professionals competent in the assessment and delivery of home oxygen. Written information should be provided to supplement individual educational sessions, with consideration given to language and literacy issues.
Quality measure	**Structure:** ► Evidence to ensure that all patients receiving home oxygen receive education from a healthcare professional competent in the assessment and delivery of home oxygen. ► Evidence processes are in place to ensure all patients receiving home oxygen are provided with written information regarding their oxygen therapy. **Process:** ► The proportion of patients receiving home oxygen who have received education and written information regarding their oxygen. **Numerator:** ► The number of patients receiving home oxygen who have received formal education and been provided with written information regarding their oxygen. **Denominator:** ► The number of patients receiving home oxygen.
Description of what the quality statement means for each audience	**Service providers:** ► Ensure sufficient time is set aside in the assessment process for patients to receive education from a healthcare professional competent in the assessment and delivery of home oxygen. ► Ensure written information is available that takes into account all local language and literacy issues. **Healthcare professionals:** ► Ensure all patients initiated on home oxygen therapy receive education in a format that is appropriate to their needs. **Commissioners:** ► Ensure home oxygen assessment services are adequately resourced to provide initial and ongoing education to patients in a format that is appropriate to their needs. **People who require home oxygen:** ► Should receive both verbal and written information regarding their oxygen therapy and have the option to seek ongoing help as needed.
Relevant existing indicators/data sources	For example, local data collection/audit.
Source references	BTS Guideline for Home Oxygen Use in Adults (2015).[3]
Other information	https://www.blf.org.uk/support-for-you/oxygen.[5]

Quality statement 4	**Patients with advanced stable cardiorespiratory disease who have resting saturations on air that meet the qualifying criteria should be referred for an LTOT assessment.**
Rationale	LTOT improves life expectancy in patients with chronic obstructive pulmonary disease (COPD) with chronic stable hypoxaemia. Although data are lacking, it is assumed that this holds true for other cardiorespiratory diseases, including pulmonary fibrosis, cystic fibrosis (CF), pulmonary hypertension and cardiac failure. Measuring peripheral oxygen saturations is an easily accessible measure that quickly and reliably identifies potential patients who may benefit from LTOT and therefore require further assessment by a home oxygen assessment service. All healthcare professionals should be alert to the presence of hypoxia in advanced cardiorespiratory disease. The routine 6 monthly monitoring of patients with very severe COPD (ie, forced expiratory volume in 1 s of <30%) in primary care offers an opportunity for the timely identification of potential candidates for LTOT in this particular patient cohort[6] (See online Supplementary appendix 2 for NICE assessment criteria). Where similar opportunities exist for other cardiorespiratory conditions (eg, specialist clinics), these should be used in a similar way. Optimisation and treatment of underlying conditions as well as clinical stability (ie >8 weeks post infection) are essential prior to measurement and referral as both can have a positive impact on hypoxaemia, thus avoiding unnecessary LTOT assessments. Providing verbal or written information about the assessment process at the time of referral can improve understanding and increase the likelihood of subsequent attendance. This information could be provided to the patient by the referrer or sent out to the patient by the assessment team prior to their appointment.
Quality measure	**Structure:** ► Evidence that oxygen saturation is documented at least twice a year in the primary care clinical record for all patients with very severe COPD. ► Evidence that patients are referred appropriately to a local home oxygen assessment service. ► Evidence this pathway allows the transfer of appropriate information to the home oxygen assessment team (See online Supplementary appendix 3 for Home Oxygen Assessment Referral Form in Guideline). ► Evidence that locally relevant written information is provided to patients at the time of referral to a home oxygen assessment service. **Process:** ► The proportion of patients with very severe COPD on a primary care register with a documented oxygen saturation within the previous 6 months. ► The proportion of patients with very severe COPD meeting the qualifying criteria for LTOT referred to the home oxygen assessment service. ► The proportion of patients given written information before assessment by the home oxygen assessment service. ► The proportion of inappropriate referrals received by a home oxygen assessment service. **Numerator 1:** ► The number of patients with very severe COPD on a primary care register with a documented oxygen saturation in the previous 6 months. **Denominator 1:** ► The number of patients with very severe COPD on a primary care register. **Numerator 2:** ► The number of patients with very severe COPD on a primary care register with stable resting oxygen saturations ≤92% referred for a home oxygen assessment within the last 6 months. **Denominator 2:** ► The number of patients with very severe COPD on a primary care register with documented stable resting oxygen saturations ≤92% within the last 6 months. **Numerator 3:** ► The number of patients given written information prior to their assessment by the home oxygen assessment service. **Denominator 3:** ► The number of patients referred to the home oxygen assessment service. **Numerator 4:** ► The number of inappropriate referrals received by a home oxygen assessment service for patients who did not meet the qualifying criteria for an LTOT assessment, for example, SpO2 well above threshold (ie, above 94%), clinical instability and treatment not optimised. **Denominator 4:** ► The number of referrals received by a home oxygen assessment service.

Description of what the quality statement means for each audience	**Service providers:** ► Ensure that all health professionals involved in the management of patients with advanced cardiorespiratory disease have access to a pulse oximeter. ► Ensure systems are in place to make health professionals aware of the criteria for referral to the home oxygen assessment service and how to refer to this service. **Healthcare professionals:** ► Ensure oxygen saturations are recorded at least 6 monthly in primary care for all patients with more advanced COPD. ► Ensure oxygen saturations are checked for patients with advanced cardiorespiratory disease where LTOT may be considered. ► Ensure oxygen saturations are measured during a period of stability when all other treatment has been optimised. ► Ensure all patients referred to the home oxygen assessment service are given verbal or written information prior to their assessment. **Commissioners:** ► Ensure that home oxygen assessment services have sufficient facilities, staff and equipment to undertake assessments for all patients appropriately referred for an LTOT assessment. **People who require home oxygen:** ► Are given an explanation as to why they are being referred to the home oxygen assessment service with written information to support this.
Relevant existing indicators/data sources	For example, local data collection/audit.
Source references	BTS Guideline for Home Oxygen Use in Adults.[3] NHS Service Specification: Home Oxygen Assessment and Review Service 2012.[7] NICE chronic obstructive pulmonary disease in over 16 s: diagnosis and management, 2010 CG101.[6]
Other information	Online Supplementary file 3, BTS Guideline for Home Oxygen Use in Adults (2015): Home Oxygen Assessment Referral Form.[3]

Quality statement 5	**All patients being considered for LTOT should undergo serial blood gas assessments, by the home oxygen assessment service, when stable to confirm both the need for and tolerability of LTOT.**
Rationale	Arterial oxygenation can vary with disease course and particularly at exacerbations. Therefore the date of the last exacerbation should be included in the referral for LTOT so that the assessment can be performed during a period of clinical stability (ie ≥8 weeks free from exacerbation of symptoms that require medical management). LTOT should not be prescribed using oximetry alone. All patients requiring LTOT should undergo assessment for suitability using arterial blood gas (ABG) sampling; where ABG sampling is not possible, the current guidelines do allow the use of capillary blood gas (CBG) as an alternative. Two ABG measurements at least 3 weeks apart should be obtained before the need for LTOT is confirmed. An ABG should be repeated after oxygen titration is complete to determine a PaO2 >8 kPa has been achieved without precipitating respiratory acidosis and/or worsening hypercapnia. Patients with PaCO2 >6 kPa at rest should also have blood gases performed after each oxygen titration to monitor for worsening hypercapnia. Assessing patients when clinically unstable, relying on only one blood gas measurement or using CBG may result in overprescribing of LTOT.
Quality measure	**Structure:** ► Evidence that patients are stable at the point of assessment through documentation of clinical stability i.e. at least 8 weeks since last exacerbation. ► Evidence that all patients receiving LTOT have had an initial ABG assessment on air and on titration of oxygen. ► Evidence of two ABG measurements were performed at least three weeks apart. ► Evidence that oxygen flow rate has been appropriately increased to achieve PaO2>8kpa without worsening hypercapnia (i.e. increase in PaCO2 by >1kpa).

	Process: ► The proportion of patients who are assessed for LTOT after a documented period of clinical stability. ► The proportion of patients receiving LTOT who have had an ABG measurement performed. ► The proportion of patients with two ABG measurements performed at least three weeks apart prior to commencing LTOT. ► The proportion of patients who have had a reassessment of PaCO2 after titration of their oxygen flow rate has been completed. **Numerator 1:** ► The number of patients initially assessed for LTOT during a documented period of clinical stability. **Denominator 1:** ► The number of patients on the home oxygen assessment register assessed for LTOT. **Numerator 2:** ► The number of patients receiving LTOT who have documented evidence of a formal baseline ABG assessment that successfully met LTOT qualifying criteria. **Denominator 2:** ► The number of patients receiving LTOT on a home oxygen assessment service register. **Numerator 3:** ► The number of patients who have had two ABGs performed at least 3 weeks apart prior to commencing LTOT. **Denominator 3:** ► The number of patients on the home oxygen assessment register assessed for LTOT. **Numerator 4:** ► The number of patients receiving LTOT who have had repeat blood gases to assess for worsening hypercapnia after completion of oxygen titration. **Denominator 4:** ► The number of patients receiving LTOT on a home oxygen assessment register.
Description of what the quality statement means for each audience	**Service providers:** ► Ensure all home oxygen assessment services have the equipment and staff with required skills to perform ABGs. **Healthcare professionals:** ► Ensure duration of clinical stability is documented prior to commencing an LTOT assessment. ► Ensure two qualifying ABGs at least 3 weeks apart are performed prior to commencing LTOT. ► Ensure titration of oxygen to achieve PaO2 >8 kPa without worsening hypercapnia (>1 kPa rise). **Commissioners:** ► Ensure services are adequately resourced with appropriate staff and equipment to undertake high-quality home oxygen assessments. **People who require home oxygen:** ► Are assessed rigorously to ensure they receive a home oxygen order appropriate to their needs.
Relevant existing indicators/data sources	Home oxygen assessment service register of assessments and patients on LTOT.
Source references	BTS Guideline for Home Oxygen Use in Adults.[3] NHS Service Specification: Home Oxygen Assessment and Review Service 2012.[7]
Other information	Online Supplementary file 3, BTS Guideline for Home Oxygen Use in Adults (2015): Home Oxygen Assessment Referral Form.[3]

Quality statement 6	**Review, reassessment and withdrawal: (a) All patients started on LTOT should be followed up with blood gas assessment within 3 months of initiation of therapy; this includes those patients who are discharged home from hospital on LTOT for the first time. (b) All patients who continue on LTOT should be monitored at least on an annual basis by a home oxygen assessment service. (c) All patients who are identified as no longer requiring any form of home oxygen should have this withdrawn.**
Rationale	The patient's clinical status can vary with time, and a repeat assessment that the indication for LTOT is still present and that use is appropriate and well tolerated is required. Home oxygen assessment services require a robust identification and recall system for patients started on LTOT, which includes patients discharged home from hospital with a new LTOT order. Where home oxygen is no longer indicated, it should be withdrawn in a carefully planned systematic way including all relevant agencies. Where there are significant concerns about emergent risk, the provision of home oxygen should be reassessed by the home oxygen team, ensuring there is multidisciplinary input (eg, general practitioner, social worker, community matron, and so on). To ensure that appropriate risk assessments are carried out once LTOT is in use, risk assessments require review within 3 months and at each annual review.
Quality measure	**Structure:** ► Evidence that the local home oxygen assessment service reviews patients on LTOT via a face-to-face visit within 3 months of initiation. ► Evidence that the local home oxygen assessment service reviews patients on LTOT via a face-to-face visit annually. ► Evidence that patients who after reassessment no longer meet indication for LTOT have it withdrawn. ► Evidence that risk reassessments are completed at all reviews. **Process:** ► The proportion of patients on LTOT who are reassessed within 3 months of initiation of LTOT. ► The proportion of patients on LTOT who complete a yearly follow-up assessment of LTOT. ► The proportion of patients who no longer meet indication for LTOT who have LTOT withdrawn. ► The proportion of patients who have risk reassessments completed at each review. **Numerator 1:** ► The number of patients reassessed face to face within 3 months of initiation of LTOT. **Denominator 1:** ► The number of patients started on LTOT. **Numerator 2:** ► The number of patients on LTOT reassessed face-to-face annually. **Denominator 2:** ► The number of patients on LTOT. **Numerator 3:** ► The number of patients with LTOT withdrawn after reassessment. **Denominator 3:** ► The number of patients who no longer meet criteria at reassessment for LTOT. **Numerator 4:** ► The number of patients who have a risk assessment updated at review. **Denominator 4:** ► The number of patients on LTOT.
Description of what the quality statement means for each audience	**Service providers:** ► It is necessary to create a robust system of identifying patients started on LTOT and timely recall for reassessment. ► Implementation of reporting systems to demonstrate that quality measures are being achieved. ► Implementation of risk assessment process and escalation process in case of failed risk assessment. **Healthcare professionals:** ► Ensure all patients have an LTOT reassessment within 3 months of initiation of LTOT. ► Ensure LTOT is withdrawn promptly where it is no longer indicated after hospital-discharge initiation. ► Complete risk assessment at every reassessment and escalate where necessary. **Commissioners:** ► Ensure that there are appropriate resources and trained staff to follow up and reassess patients commenced on LTOT.

	People who require home oxygen: ► Should understand the importance of an oxygen reassessment, the appropriateness of withdrawal where indicated and the need for risk assessments and escalation where necessary.
Relevant existing indicators/data sources	Home oxygen assessment service register.
Source references	BTS Guideline for Home Oxygen Use in Adults June 2015.[3] BTS Guidelines for Oxygen Use in Adults in Healthcare and Emergency Settings 2017.[8] NICE Guidelines on Management of Cluster Headache 2012.[9]

Quality statement 7	**Short burst oxygen therapy (SBOT) should only be offered in the context of cluster headache. SBOT should not be ordered for patients with chronic cardiorespiratory disease.**
Rationale	Oxygen therapy should be used to treat hypoxaemia, and not simply breathlessness. There is no evidence to support the use of SBOT in patients with chronic cardiorespiratory disease. SBOT does not improve exercise tolerance or reduce breathlessness in patients with chronic cardiorespiratory disease and should not be ordered for use prior to or following exercise. SBOT does not improve health-related quality of life or reduce healthcare utilisation when ordered for patients following an acute exacerbation of COPD (AECOPD) and should not be ordered on discharge from hospital. The only indication for SBOT is for use in cluster headaches where there is evidence to show delivering high flow oxygen therapy (>12 L/min via non-rebreather mask) significantly reduces pain from acute attacks of cluster headache.
Quality measure	**Structure:** ► Evidence that patients with chronic cardiorespiratory disease do not have SBOT ordered. Patients who are hypoxaemic should be assessed for LTOT if resting stable saturation meets the qualifying criteria. ► Evidence that patients discharged from hospital with AECOPD are not ordered SBOT. ► Evidence that patients with cluster headaches have appropriate access to SBOT. **Process:** ► The proportion of patients with chronic cardiorespiratory disease with SBOT. ► The proportion of patients with cluster headaches who have access to SBOT. **Numerator 1:** ► The number of patients with chronic cardiorespiratory disease with SBOT. **Denominator 1:** ► The number of patients with SBOT. **Numerator 2:** ► The number of patients with cluster headaches who have appropriate access to SBOT. **Denominator 2:** ► The number of patients with SBOT for cluster headache.
Description of what the quality statement means for each audience	**Service providers:** ► Ensure systems are in place to provide LTOT, NOT and AOT assessments with cardiorespiratory disease, but not SBOT. ► Ensure systems are in place to provide SBOT to patients with cluster headaches. **Healthcare professionals:** ► Ensure all patients with chronic cardiorespiratory disease are not offered SBOT. Instead, where indicated, patients should be assessed for LTOT, NOT or AOT. ► Ensure all patients with cluster headache have access to SBOT. **Commissioners:** ► Ensure patients with chronic cardiorespiratory disease do not have access to SBOT. Facilities should be available for assessment for LTOT, NOT or AOT where indicated. ► Ensure patients with cluster headaches have access to SBOT. **People who require home oxygen:** ► Should have appropriate assessments for LTOT, NOT and AOT, where indicated. SBOT should only be available to patients with cluster headaches.
Relevant existing indicators/data sources	For example, local data collection/audit.
Source references	BTS Guideline for Home Oxygen Use in Adults June 2015.[3] BTS Guidelines for Oxygen Use in Adults in Healthcare and Emergency Settings 2017.[8] NICE Guidelines on Management of Cluster Headache 2012.[9]

Quality statement 8	**Nocturnal oxygen therapy (NOT): (a) Patients with optimally treated cardiac failure, who are not eligible for LTOT, should only be offered NOT if there is evidence of sleep disordered breathing causing daytime symptoms. (b) Patients with chronic hypercapnic respiratory failure with nocturnal hypoxaemia, who are not eligible for LTOT, should only be offered NOT in conjunction with NIV.**
Rationale	Treatment of patients with cardiac failure who are symptomatic from sleep disordered breathing with NOT leads to a reduction in daytime sleepiness and a modest improvement in exercise capacity. There is no evidence that patients with chronic respiratory disease who fail to meet the criteria for LTOT but who desaturate at night derive any long-term symptomatic or survival benefits from NOT. NOT is therefore not recommended in this group of patients (eg, COPD, interstitial lung disease (ILD)). Some patients with chronic respiratory disease, including those with CF, neuromuscular weakness or obesity hypoventilation, are at risk of developing nocturnal hypoxaemia in the setting of chronic hypercapnic respiratory failure. These patients should not receive NOT alone as they may develop uncontrolled type 2 respiratory failure. However, they may benefit from NOT given with NIV support. Some patients with chronic respiratory disease, including those with CF, neuromuscular weakness or obesity hypoventilation, are at risk of developing nocturnal hypoxaemia in the setting of chronic hypercapnic respiratory failure. These patients should not receive NOT alone as they may develop uncontrolled type 2 respiratory failure. However, they may benefit from NOT given with NIV support.
Quality measure	**Structure:** ► Evidence that NOT is provided for patients with cardiac failure with evidence of sleep disordered breathing on a sleep study causing daytime symptoms. ► Evidence that NOT is only provided for respiratory patients with hypercapnic respiratory failure in conjunction with NIV. **Process:** ► The proportion of patients with cardiac failure receiving NOT who have had a sleep study and completed an Epworth Sleepiness Scale before and after treatment. ► The proportion of patients with hypercapnic respiratory failure receiving NOT who are also being treated with NIV. **Numerator 1:** ► The number of patients with cardiac failure receiving NOT who have had a sleep study and completed an Epworth Sleepiness Scale before and after treatment. **Denominator 1:** ► The number of patients with cardiac failure receiving NOT. **Numerator 2:** ► The number of patients with chronic hypercapnic respiratory failure receiving NOT who are also being treated with NIV. **Denominator 2:** ► The number of chronic hypercapnic respiratory patients receiving NOT.
Description of what the quality statement means for each audience	**Service providers:** ► Ensure systems are in place to offer a sleep study and symptom assessment of cardiac patients before and after treatment. ► Ensure systems are in place to offer NOT in conjunction with NIV for respiratory patients in chronic hypercapnia respiratory failure. **Healthcare professionals:** ► Ensure clinical assessment of cardiac failure patients includes assessment of symptoms of sleep disordered breathing. ► Ensure awareness of risks of providing NOT alone without NIV treatment in chronic hypercapnic respiratory patients. **Commissioners:** ► Ensure that sufficient facilities, staff and equipment are available to diagnose and to treat patients with NOT when clinically indicated. **People who require home oxygen:** ► Are referred for assessment if demonstrating symptoms or signs of sleep disordered breathing or uncontrolled ventilatory failure in context of cardiac failure or chronic respiratory disease.
Relevant existing indicators/data sources	Local data collection/audit.
Source references	BTS Guidelines for Home Oxygen Use in Adults June 2015.[3]

Quality statement 9	**Ambulatory oxygen therapy (AOT): (a) Patients not eligible for LTOT should only have AOT ordered to facilitate pulmonary rehabilitation or to improve mobility after appropriate formal assessment that includes an exercise test. (b) Patients on LTOT, who are mobile outdoors, should only be offered AOT if this allows them to achieve 15 hours/day compliance with LTOT and/or improve capacity to undertake outdoors activities.**
Rationale	Patients who desaturate on exercise may tolerate higher levels of activity with the use of supplemental oxygen during pulmonary rehabilitation; therefore, gains made during pulmonary rehabilitation can be increased. Outside of a pulmonary rehabilitation setting, AOT should not be routinely offered to patients who are not eligible for LTOT. However, some patients, for example with ILD and disabling breathlessness, who do not qualify for LTOT but who desaturate may benefit from AOT, once all other medical interventions have been optimised. This may help improve mobility, by increasing functional capacity and/or time away from home. A formal assessment should be undertaken when considering AOT: this should include an exercise test to measure exercise capacity. In addition there should be consideration of the potential impact of carrying the oxygen equipment. Improved survival has been shown in patients on LTOT who achieve 15 hours per day of oxygen usage. AOT may be considered in patients who are mobile outdoors, who may not otherwise achieve 15 hours of usage. Patients who receive AOT should have compliance data recorded and reviewed annually.
Quality measure	**Structure:** ► Evidence of a formal assessment including an exercise test for patients on AOT. ► Evidence of compliance data for LTOT patients who are mobile outdoors achieving 15 hours per day with AOT. ► Evidence that compliance in patients receiving AOT but not LTOT is captured and analysed as part of ongoing assessment. **Process:** ► The proportion of patients with AOT who have appropriate formal assessment including an exercise test. ► The proportion of LTOT patients who are mobile outdoors with AOT who achieve 15 hours of usage per day. ► The proportion of patients on which AOT compliance data are collected. **Numerator 1:** ► The number of patients on AOT only who have been formally assessed including an exercise test. **Denominator 1:** ► The number of patients on AOT only. **Numerator 2:** ► The number of LTOT patients with AOT who are mobile outdoors and achieving 15 hours of usage per day. **Denominator 2:** ► The number of LTOT patients with AOT. **Numerator 3:** ► The number patients with AOT alone with compliance data recorded and reviewed annually. **Denominator 3:** ► The number of patients with AOT alone.
Description of what the quality statement means for each audience	**Service providers:** ► Ensure systems are in place to offer formal assessments of AOT including an exercise test. ► Ensure systems are in place for compliance data to be accessed. **Healthcare professionals:** ► Ensure formal assessment of AOT which includes an exercise test to help facilitate pulmonary rehabilitation or demonstrate improvement in mobility. ► Ensure utilisation of compliance data for patients on LTOT with AOT to check daily usage hours. **Commissioners:** ► Ensure adequate resources to enable formal assessments for AOT which include an exercise test. ► Ensure healthcare professionals have access to compliance data via home oxygen provider.

	People who require home oxygen: ▶ Are referred and undergo appropriate formal assessment for consideration for AOT provision including an exercise test. ▶ Should be consulted about their achievable levels of activity and about what they aspire to gain from increased activity. Where all other medical interventions have been tried, those who remain keen should undergo appropriate formal assessment for consideration of AOT, including an exercise test.
Relevant existing indicators/data sources	Local data collection/audit.
Source references	BTS Guidelines for Home Oxygen Use in Adults June 2015.[3]
Other information	Online Supplementary file 4, Protocol for ambulatory oxygen therapy assessment from the BTS Guidelines. Refer to the BTS Guideline for Home Oxygen Use in Adults June 2015 for more information about specific patient groups (eg, CF and ILD).[3]
Quality statement 10	**Palliative oxygen therapy (POT) can be considered as a trial for patients with hypoxaemia (saturations <92% on air) with refractory dyspnoea due to life-limiting disease that has not responded to opioids and non-pharmacological therapy, for example, fan therapy.**
Rationale	Dyspnoea is a subjective experience and patients with hypoxaemia do not experience a significant difference in symptoms on air versus oxygen therapy. However, POT may be considered for patients with cancer or end-stage disease with limited prognosis (limited to weeks) who are hypoxaemic and are experiencing intractable breathlessness unresponsive to opioids or non-pharmacological therapies (eg, fan therapy).
Quality measure	**Structure:** ▶ Evidence of appropriate assessment of patients requiring POT. ▶ Evidence of trial of opioids when not contraindicated. ▶ Evidence of trial of non-pharmacological therapies. **Process:** ▶ The proportion of patients with intractable breathlessness on POT whose oxygen saturation is less than 92%. ▶ The proportion of patients on POT who are on opioids and non-pharmacological therapies. **Numerator 1:** ▶ The number of patients on POT whose oxygen saturation is less than 92%. **Denominator 1:** ▶ The number of patients on POT for intractable breathlessness. **Numerator 2:** ▶ The number of eligible patients on POT who have tried opioids and non-pharmacological therapies. **Denominator 2:** ▶ The number of patients on POT for intractable breathlessness.
Description of what the quality statement means for each audience	**Service providers:** ▶ Ensure systems are in place to disseminate guidelines in primary and secondary care. ▶ Ensure access to specialist palliative care team to help with assessment and management of intractable breathlessness. ▶ Ensure availability of oxygen practitioner to monitor appropriate and safe use of POT at home. **Healthcare professionals:** ▶ Ensure patient is on maximum treatment for underlying disease and reversible causes have been optimally treated where possible. ▶ Ensure oxygen saturation and severity of breathlessness are recorded as part of assessment of intractable breathlessness. ▶ Ensure POT is discontinued if not providing symptomatic benefit. **Commissioners:** ▶ Ensure sufficient staff in specialist palliative care and oxygen team are available to allow timely assessment of patients requiring POT in the community as well as hospital. **People who require home oxygen:** ▶ Patients and carers are offered written information about POT on discharge from hospital.

Relevant existing indicators/data sources	Local data collection/audit.
Source reference	BTS Home Oxygen Guideline for Home Oxygen Use in Adults 2015.[3]
Other information	Online Supplementary file 5, Assessment protocol for palliative oxygen—see BTS Guideline for Home Oxygen Use in Adults.[3]

REPRESENTATION

Joseph Annandale represented the Association of Respiratory Nurse Specialists (ARNS), Claire Davey and Cassie Lee represented the Association of Chartered Physiotherapists in Respiratory Care (ACPRC), Rhea Fielding and Trefor Watts represented the Association for Respiratory Technology and Physiology (ARTP), Dr Daryl Freeman represented the Primary Care Respiratory Society UK (PCRS-UK) and Dr Vandana Vora represented the Association of Palliative Medicine (APM).

APPENDICES

- Appendix 1 – NHS England IHORM form. We are grateful for permission to include the IHORM form. This form was developed on behalf of NHS England and approved by the National Home Safety Committee. Further support documents are available from your NHS regional home oxygen lead.
- Appendix 2 – NICE 2010 COPD referral criteria
- Appendix 3 – Home oxygen assessment referral form from the BTS Home Oxygen Guideline
- Appendix 4 – Protocol for Ambulatory Oxygen Therapy Assessment from the BTS Home Oxygen Guideline
- Appendix 5 – Protocol for Palliative Oxygen Therapy from the BTS Home Oxygen Guideline

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BTS Quality Standards for Home Oxygen are endorsed by: The Association for Chartered Physiotherapists in Respiratory Care (ACPRC), The Association of Palliative Medicine (APM), The Association of Respiratory Nurse Specialists (ARNS), The Association for Respiratory Technology and Physiology (ARTP), The Primary Care Respiratory Society UK (PCRS-UK).

Contributors JS and TW were lead authors responsible for the overall editing and production of the document. DF, MG, VK, WM and TW were lead authors for quality statements 1–3. JA, CL, JS and TW were lead authors for quality statements 4 and 5. RF, SH, JP and MW were lead authors for quality statements 6 and 7. CD, MH and VV were lead authors for quality statements 8–10. All authors were responsible for the final approval of the document. GG attended the meeting as the lay representative and gave feedback on the draft document.

Funding This project received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests The British Thoracic Society operates a Declaration of Interest scheme, and it was a requirement that all members of the development group completed a Declaration of Interest form on an annual basis for the duration of the project. Forms were submitted annually by all authors, and all have confirmed that none of their interests were linked to home oxygen and therefore this document.

Provenance and peer review Not commissioned; internally peer reviewed.

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BMJ Open Respiratory Research

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BMJ Open Resp Res 2017 4:
doi: 10.1136/bmjresp-2017-000223