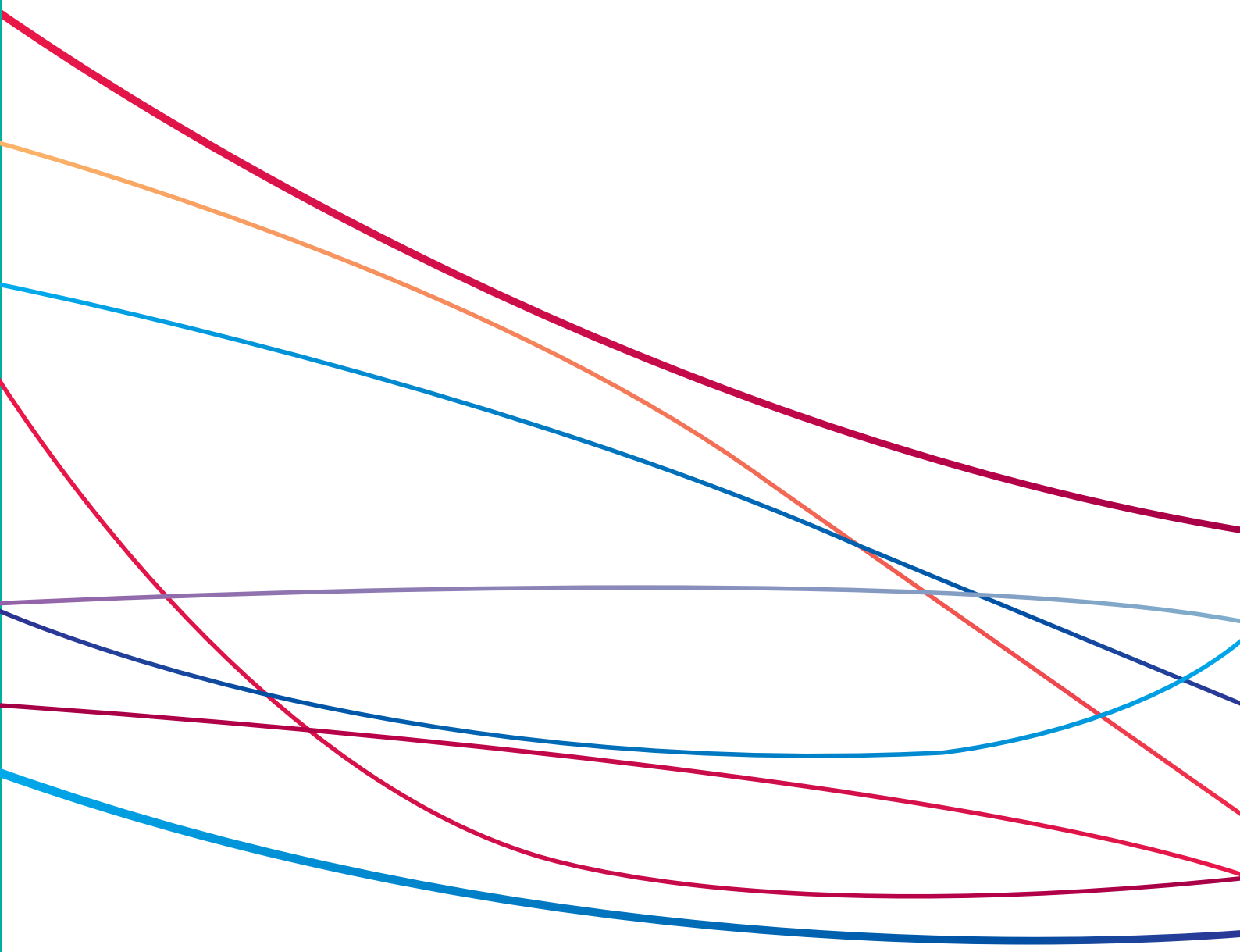
Department of Health

Transforming Respiratory and Sleep Diagnostic Services

A Good Practice Guide



NHS

Transforming Respiratory and Sleep Diagnostic Services

A Good Practice Guide

February 2009

DH INFORMATION READER BOX

Policy HR/Workforce Management Planning Clinical	Estates Performance IM & T Finance Partnership Working
Document Purpose	Best Practice Guidance
Gateway Refence	10833
Title	Transforming Respiratory and Sleep Diagnostic Services
Author	Department of Health – 18 Weeks Team
Publication Date	01 Feb 2009
Target Audience	PCT CEs, NHS Trust CEs, SHA CEs, Care Trust CEs, Foundation Trust CEs, Medical Directors, Directors of PH, Directors of Nursing, PCT Chairs, NHS Trust Board Chairs, Special HA CEs, Directors of HR, Directors of Finance, Allied Health Professionals, GPs, Communications Leads, Emergency Care Leads, Healthcare Scientists, Respiratory Physiologists, Respiratory Physicians and those collating data for the national diagnostics census.
Circulation list	
Description	Respiratory physiology and sleep services will play an important part in sustaining an 18 weeks patient pathway, and delivery of the local clinical visions that form a key part of the NHS Next Stage Review. This document provides good practice and the evidence to support the delivery of high quality, low wait services.
Cross Ref	N/A
Superseded Docs	N/A
Action Required	N/A
Timing	N/A
Contact Details	Mark Cohen Elective Care & Diagnostics 4N14 Quarry House LS2 7UE
For Recipient's Use	

© Crown copyright 2009

First published February 2009

Produced by COI for the Department of Health

The text of this document may be reproduced without formal permission or charge for personal or in-house use.

www.dh.gov.uk/publications

Contents

Foreword

By Professor Sue Hill PhD DSc CBiol FIBiol Hon MRCP OBE
Chief Scientific Officer and National Clinical Lead for Physiological Measurement

There is a significant and increasing demand for respiratory and sleep physiology diagnostic services driven by the prevalence and incidence of respiratory disease and sleep-related breathing problems in the population and the challenges of addressing the associated care.

Respiratory and sleep services are an integral part of many clinical pathways for patients with respiratory problems either for example as a result of suspected respiratory disease or sleep-related breathing problems or pulmonary manifestations of systemic diseases or occupational effects.

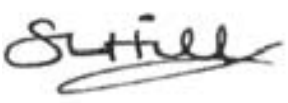
This document supports the continued delivery of low wait planned care services associated with the 18 weeks target and the clinical visions outlined by each of the ten SHAs in England as part of Lord Darzi's Next Stage Review of the NHS. It aims to help commissioners understand where respiratory and sleep services fit into their local strategy for clinical care and providers by suggesting innovative ways in which these services can be delivered.

Practical evidence-based advice is provided on how to improve people's access to, and experience of, respiratory and sleep diagnostic services. This guidance document has been designed to stimulate both discussion and to introduce new ways of working aimed at providing accessible and sustainable low wait respiratory and sleep services for the future against the backdrop of growing demand.

Consideration should be given locally to the creation of integrated respiratory and sleep networks so that as much care as possible can be provided close to the patient's home or through the provision of direct access services for primary and community care, while maintaining efficient access to high quality specialist and supra-specialist skills and facilities as required.

This document is the result of contributions from a large number of dedicated practitioners working in the NHS and included input from patient representatives. It was brought together by the tremendous efforts of Dr Brendan Cooper, Dr Martin Allen and Paul White to whom we are very grateful for their input and endeavours.

Please use this guide to inform local dialogue and decision making and in doing so improve the care and experience of patients with respiratory and sleep related breathing problems.



Executive Summary

Respiratory physiology diagnostics involve a wide range of testing for patients with suspected respiratory disease or conditions that affect the functioning of the respiratory system, as well as the provision of some therapeutic services. Sleep physiology tests are included in this area and are conducted to identify abnormal sleep patterns and pathologies, and to assess and provide therapeutic intervention.

Respiratory and sleep diagnostics play an important part in sustaining the 18 weeks patient pathway and delivering low wait planned services, as well as in the delivery of the local clinical visions that form a key part of the NHS Next Stage Review. These services are critical in the diagnosis and understanding of common diseases such as chronic obstructive pulmonary disease (COPD), asthma, and obstructive sleep apnoea (OSA). Considering solely these three conditions, there is a significant and increasing demand for both respiratory and sleep services. The COPD national strategy (due to be published in 2009) will also show the critical importance of these services in the care and management of patients.

This document provides good practice and the evidence to support the requirement for high quality, low wait services and the mechanism for achievement and delivery using the three key components of systems and process, technology and workforce to support the development of new service models in the following ways:

- **System and process**: enabling efficient clearance of historical backlogs; introducing effective booking and schedule management systems; reducing the number of patients who do not attend appointments (DNAs), and increasing the proactive use of available data to manage services.
- **Technology:** encouraging the use of remote reporting, multifunctional equipment, leading edge technology and investment in IT support.
- **Workforce:** pioneering the development of multidisciplinary teams incorporating the developing role of healthcare scientists and using existing resources more effectively by extension of working hours and ensuring that the right staff are available for the right task.
- **New service models:** introducing and making better use of one stop clinics and providing diagnostics earlier in the patient pathway associated with clearly defined referral criteria.

The levers and incentives introduced by Lord Darzi's review and other recent health reforms provide the opportunity for more effective commissioning and delivery of respiratory and sleep services, including the use of local tariffs and practice based commissioning. This is a transformational document to encourage commissioners and local service providers to work together to become self improving and deliver a quality service which results in better patient outcomes.

The context and vision for respiratory and sleep services

1 Respiratory and Sleep Physiology Services together are classified as one of eight diagnostic specialties recognised within the National Physiological Measurement Programme together with:

- Audiology.
- Cardiac Physiology.
- Clinical Neurophysiology.
- Gastrointestinal Physiology.
- Ophthalmic and Vision Science.
- Urodynamics.
- Vascular Technology.

2 The DH document '*What is Physiological Measurement*?[1]' sets out the multiplicity of tests that fall under this banner (including respiratory and sleep diagnostics), their applicability to clinical practice and the need for all Physiological Measurement services to:

- Be patient centred.
- Be accessible to patients in convenient locations[2].
- Be clinically effective and cost effective.
- Realise the benefits of new technology.
- Sustain 18 weeks referral to treatment patient pathways.
- Contribute to the provision of the most effective treatment for patients by detecting disease earlier.
- Support the best possible patient experience by providing excellent patient information.

3 Diagnostic services in general are recognised as providing important cross-cutting care within the local clinical visions, articulated by SHAs in England as part of the Next Stage Review (NSR) of the NHS entitled '*High Quality Care for All*[3]'. Each SHA was responsible for setting out its own vision for high quality services – developed in discussion with patients, carers and members of the general public – across eight clinical pathway groupings:

1 'What is Physiological Measurement? A guide to the tests and procedures conducted by Physiological Measurement diagnostic services' DH (May 2007) Located at www.18weeks.nhs.uk within the physiological measurement section.

2 Some tests should be carried out in primary care or even at patients' homes, avoiding needless travel to and from hospital and with results made available more quickly. Other more specialist tests should be carried out in centres of excellence. To make this a reality, it will be important to draw on the expertise of professional bodies.

3 'High Quality Care For All' the NHS Next Stage Review Final Report published in June 2008. The document can be found at www.ournhs.nhs.uk/.

- Maternity and Newborn Care.
- Children's Health.
- Planned Care.
- Mental Health.
- Staying Healthy.
- Long-term conditions.
- Acute care.
- End-of-life Care.

4 Understanding the role of diagnostics in the future delivery of low-wait healthcare is essential if the rate, flow and distribution of patients throughout the elective and non-elective systems is not to be compromised. By utilising appropriate diagnostic tests, sequenced correctly, there will be the potential to match demand with real capacity.

5 For any respiratory and sleep diagnostics that are carried out in primary care, both the quality of the test – delivered to agreed set standards – and the interpretation of the results must be equivalent to that found in traditional secondary care providers. If this is the case, and if it is appropriate for patients, making tests directly accessible and bookable by primary care practitioners has significant potential to change and improve current practice.

6 The 18 weeks access target is different from previous waiting time targets and directly impacts on departments that provide respiratory and sleep services. Instead of focusing on a single stage of treatment (such as outpatients or inpatients) the 18 weeks pathway addresses the *whole* patient pathway from referral up to the start of treatment. Diagnostic services in general have historically developed long waits and have had less attention placed on them, but the 18 weeks patient pathway has shone a light on this so called "hidden wait".

7 The focus on Quality as the main organising principle for the NHS as outlined in Lord Darzi's final report of the Next Stage Review, "High Quality Care for All" has put patient safety, patient experience and effectiveness as key metrics that will inform its success. This will ensure that the NHS over the next decade focuses on the things that really matter to patients, and meets both rising expectations and the challenges it will face over that time. Work is currently ongoing in seven key areas[4]:

- Quality improvement.
- Innovation.

4 More information can be found at the Our NHS, Our Future website (http://www.ournhs.nhs.uk/)

- Primary and community care.
- Workforce.
- Leadership.
- Informatics.
- Systems and incentives.

8 Respiratory physiology involves the provision of a wide range of diagnostic testing for patients with suspected respiratory disease or conditions that affect the functioning of the respiratory system and some therapeutic services associated with their treatment. Sleep physiology investigations are included in this area and conducted to identify abnormal sleep patterns and pathologies, and to assess and provide therapeutic intervention.

9 In both areas significant attention needs to be paid to the ability of IT systems to accurately record the results of test done (to inform the patient pathway and clinical decision making), the volume of tests performed (to ensure that accurate income for service continuity and improvement is derived) and to support data capture to inform capacity and demand planning.

Respiratory physiology services

10 Respiratory physiology services are utilised in many different clinical pathways to identify both normality and abnormaility. The specific commissioning requirements to assess, diagnose and treat obstructive lung disease (e.g. asthma, COPD) across all levels of care, inclusive of respiratory physiology diagnostics, has been recently published and is downloadable from the 18 weeks website[5]. It is intended to stimulate discussion between PCTs and providers to achieve seamless integrated care from primary assessment of the patient through to sub specialist or tertiary care and treatment.

11 Lung function tests can determine the functioning of the respiratory system and often include the tests in the list below (this list is only indicative and is not exhaustive). In addition a summary table can be found in figure 1, giving brief details of the test, the reason for doing it and the NSR Clinical Pathway Groupings to which it is applicable.

- ***Airway function tests***
  Spirometry is the most common test of airways function, but more complex tests such as airways resistance, peak flow or oscillometry can be used to assess airway function with more sensitivity. Airway function is central to the diagnosis and monitoring of COPD, asthma and cystic fibrosis. The issue of quality spirometry performed by competent staff is essential for any

5 Download from: http://www.18weeks.nhs.uk/Content.aspx?path=/achieve-and-sustain/Specialty-focussed-areas/Respiratory/

screening/case-finding of respiratory disease.

- ***Lung mechanics***
  Measuring either the size of the lungs ("lung volumes"), or the properties of the chest wall and lung in terms of mechanical function (e.g. mouth pressures) are very important in both forming a diagnosis (e.g. muscle weakness) or treating patients with restrictive disorders and can clarify the diagnosis of some obstructive diseases.

- ***Gas exchange (rest & exercise)***
  Measurement of gas exchange function is routinely tested with the "transfer test" but it is indirectly measured by blood gas analysis or oximetry either at rest or during exercise. This is important both in diagnosis but also plays a key part in monitoring disease progression or interventions. The transfer test is helpful in the differentiation between asthma and COPD, or for detecting pulmonary vascular damage after drug-induced fibrosis or in diagnosing interstitial lung disease.

- ***Physiological response to exercise/ challenge***
  Challenging the respiratory system is often a useful way to determine both the presence and severity of respiratory disorders or to help diagnose a condition where symptoms can be intermittent. Pre-operative assessment of respiratory responses is a mainstay of assessing post-operative complications in cardiothoracic surgery. Specific challenges of the airway can be helpful in detecting underlying asthma and have an important role to play in occupational health.

- ***Responses to therapeutic interventions (e.g. bronchodilators, oxygen)***
  Assessment of pharmaceutical interventions using lung function tests is an important adjunct to the monitoring of symptoms in many respiratory diseases. The physiological assessment of oxygen requirements is a key requirement for the provision of home oxygen services in the UK.

- ***Ventilatory control at rest***
  The assessment of ventilatory control is a much under-used technique and is limited to a few specialist centres. Its use for research is important in understanding the mode of action of therapeutic interventions such as oxygen and non-invasive ventilation. Future use may include the recovery of respiratory responses after exacerbations in COPD. The most common test performed is the assessment of patients with respiratory failure to see if they are fit to fly by challenging them with a hypoxic gas mix.

Figure 1: Table summarising the main respiratory physiology tests, along with the key reasons for their use and the NSR Clinical Pathway Groupings to which they are most relevant.

Test	Reason for test	Description	NSR Clinical Pathway Groupings
Airways function *(Spirometry, peak flow, etc)*	To assess normality or screen for abnormality in lung/airway function	To measure airway function and dynamic lung volumes during either forced or relaxed respiratory manoeuvres	1,2,3,5,6,7
Lung mechanics *(Lung volumes, resistance, muscle function)*	Diagnosis, monitoring intervention or disease progress	To measure lung volumes and mechanical function of chest wall	1,2,3,5,6
Gas Exchange *(Blood gases, gas transfer, hypoxic challenges)*	Assessment of acid-base status or gas exchange function to explain dyspnoea	Blood gases are assessed either by invasive (stabs) or non-invasive (oximetry, etc.) techniques	1,2,3,5,6,7,8
Physiological challenges *(Full exercise testing, field tests, bronchial challenges, etc)*	To assess post-operative outcome in cardiothoracic surgery or to assess airway sensitivity	To measure the cardio-respiratory responses to progressive exercise in a controlled manner	2,3,5,6
Intervention responses *(Oxygen assessments, NIV monitoring , etc)*	To assess the requirement and efficacy of interventions including oxygen, ventilation and drugs	Assessments of physiological parameters such as lung function, blood gases, health status, etc.	1,2,3,5,6,7,8
Ventilatory control at rest *(Breathing patterns, exhaled breath sampling, etc)*	To assess breathing patterns and their appropriateness or to measure exhaled markers of disease	Assessment of hyperventilation or inflammatory markers (e.g. NO, breath condensates) in disease	1,2,4,5,6,7
Skin allergy testing *(Skin prick testing, etc)*	To assess for Type 1 allergy to specific substances (e.g. house dust)	Skin prick testing of specific allergens to support a possible cause of uncontrolled asthma	1,2,6

For further guidance on test see *"What is Physiological Measurement?"* pp56-66. (Referenced earlier)
NSR Clinical Pathway Groupings: 1. Maternity and Newborn Care, **2.** Children's Health **3.** Planned Care, **4.**Mental Health, **5.**Staying Healthy, **6.**Long-term conditions, **7.** Acute care **8.** End-of-life Care

- ***Skin allergy testing***
  This is a supportive test which helps the clinical team appreciate the contribution reactions to common allergens that assist in the advice and treatment given to asthmatic patients.

In all of these tests what is important is not just that the measurements are made to the correct standards by competently trained staff but that the **reporting and interpretation** of the results is accurate, clear and understandable so that the correct diagnosis is made, repeat measurements do not have to be carried out and patients receive the appropriate treatment.

12 Most services are located in dedicated respiratory and lung function laboratories in acute hospital Trusts. However, many departments offer services including spirometry, oxygen assessments and blood gases for primary care in a variety of delivery packages (e.g. direct access or services provided in the community), or training to other health professionals who are measuring spirometry and blood gases.

13 The service is predominantly delivered by a group of healthcare scientists (clinical respiratory physiologists) in a secondary care setting who will work with highly specialised equipment to perform basic and complex lung function tests. All these tests whether basic or complex require total patient co-operation in order to produce reliable and accurate results. A major necessity of the clinical respiratory physiologist's role is the ability to encourage the patient to perform the test to the best of their ability, with the correct technique to produce a successful respiratory test with valid results. There are about 30 to 40 clinical scientists (nationally) who support respiratory physiology services, especially in sleep and ventilation, exercise physiology and more specialist investigations, and in reporting and clinically interpreting the results of respiratory investigations.

Sleep physiology services

14 Sleep physiology services are utilised by many clinical specialities particularly respiratory medicine and ENT to support the investigation and treatment of patients who suffer from a variety of sleep related problems including excessive daytime sleepiness, loud snoring, impaired alertness and nocturnal choking episodes. The specific commissioning requirements to assess, diagnose and treat sleep related breathing problems (e.g. Obstructive Sleep Apnoea (OSA)) across all levels of care, inclusive of sleep diagnostics, has been recently published and is downloadable from the 18 weeks website[6]. It is intended

6 Download from: http://www.18weeks.nhs.uk/Content.aspx?path=/achieve-and-sustain/Specialty-focussed-areas/Respiratory/

to stimulate discussion between PCTs and providers to achieve seamless integrated care from primary assessment of the patient through to sub specialist or tertiary care and treatment.

15 Sleep physiology tests are used primarily to investigate sleep breathing disorders and can include the following (this list is indicative only and is not exhaustive). In addition a summary table can be found in figure 2, giving brief details of the test, the reason for doing it and the NSR Clinical Pathway Groupings to which it is applicable.

- ***Oximetry and other simple sleep monitoring devices***
  Overnight pulse oximetry can be a useful screening test to detect moderate or severe OSA, as long as there is appropriately skilled interpretation, in order to avoid false positives (e.g. from conditions such as COPD, hypoventilation syndromes, and Cheyne-Stokes breathing of heart failure). Normal overnight oximetry reduces the probability of OSA, although false negatives occur, particularly in thin, young individuals. A clearly abnormal tracing allows fast tracking into appropriate assessment and treatment. Along with other relatively limited sleep apnoea monitoring devices for use at home, these approaches are commonly integrated into OSA management pathways. Overnight oximetry is also appropriately used to subsequently monitor the effectiveness of treatments such as CPAP, NIV and supplemental oxygen.

- ***Multi-channel sleep studies.***
  More comprehensive approaches, which monitor several aspects of respiratory and cardiovascular function (sometimes also body movements and posture, using position/movement sensors or video) can accurately diagnose and assess the severity of OSA, but, again, these require specialist interpretation. They are currently a good compromise between the simple, but limited approaches such as oximetry, and the much more expensive and labour-intensive polysomnography.

- ***Polysomnography***
  Polysomongraphy (PSG) monitors many body functions including brain (EEG), eye movements (EOG), muscle activity or skeletal muscle activation (EMG) and heart rhythm (ECG) during sleep. With additional video monitoring, polysomnography represents the most complete assessment of abnormalities during sleep, useful in the management of parasomnias and nocturnal movement disorders. When undertaken during the day in the form of several short naps, known as the multiple sleep latency test

Figure 2: Table summarising the main sleep tests, along with the key reasons for their use and the NSR Clinical Pathway Groupings to which they are most relevant.

Test	Reason for test	Description	NSR Clinical Pathway Groupings
Overnight Oximetry *(Pulse oximetry)*	To screen for overt sleep breathing disorders or respiratory failure during sleep	Monitoring pulse oximetry and heart rate when suspicion of sleep apnoea is high	1,2,3,5,6
Multi-channel sleep studies. *(Cardiopulmonary study – EEG)*	To evaluate the nature of sleep breathing disorders including central and obstructive sleep apnoea and snoring	Monitoring of respiratory, oxygen, sound and movement signals	1,2,3,6
Polysomnography *(Cardiopulmonary study + EEG)*	To evaluate sleep quality and the nature of sleep breathing disorders	Monitoring of sleep staging, respiratory, oxygen, sound and movement signals	1,2,3,6

For further guidance on test see *"What is Physiological Measurement?"* pp56-66. (Referenced earlier)

NSR Clinical Pathway Groupings: 1. Maternity and Newborn Care, **2.** Children's Health **3.** Planned Care, **4.**Mental Health, **5.**Staying Healthy, **6.**Long-term conditions, **7.** Acute care **8.** End-of-life Care

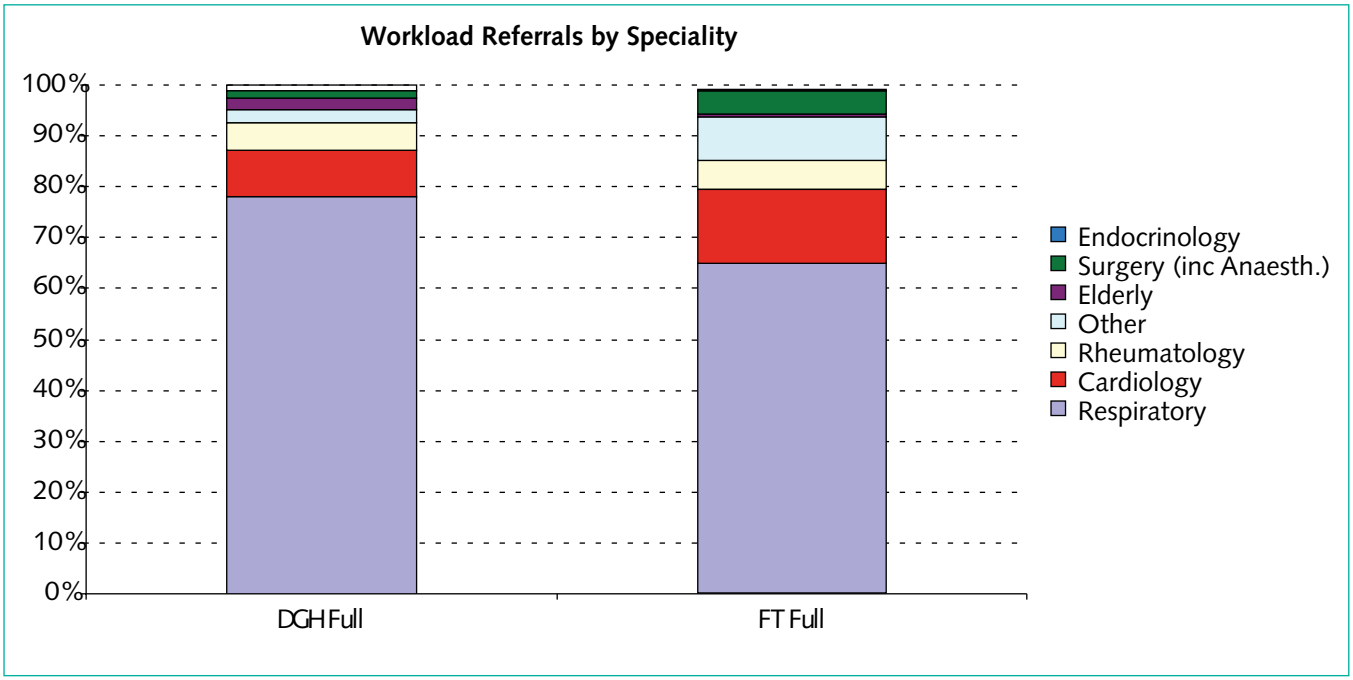
(MSLT) or maintenance of wakefulness test (MWT), polysomnography can give an indication of the drive to sleep and the ability to stay awake. Furthermore the MSLT is a key diagnostic test for the diagnosis of narcolepsy. Polysomnography should not be used in the routine diagnosis of sleep apnoea.

- ***Other sleep physiology tests***
  Overnight studies of carbon dioxide levels can be helpful to assess and monitor patients on or requiring non-invasive ventilation, or experiencing potential carbon dioxide retention during oxygen therapy at night.

- ***Continuous Positive Airway Pressure (CPAP) Titration studies***
  The initiation of CPAP is performed in different ways in different units. The provision of adequate patient education and support is more important than the specifics of the titration. This area of practice has recently been covered in a National Institute of Clinical Excellence (NICE) Health Technology Assessment of CPAP, and guidance from both the British Thoracic Society (BTS)[7] and the Association for Respiratory Technology and Physiology (ARTP)[8].

7 For more information, go to the BTS website: www.brit-thoracic.org.uk/
8 For more information, go to the ARTP website: http://fp.artpweb2.f9.co.uk/

Figure 3: Referral patterns for one calendar year into respiratory physiology from all Trusts involved in the 2005 ARTP survey. The difference in referral patterns between a District General Hospital (DGH) and a Foundation or Teaching Trust (FT) is demonstrated.



Just as is the case for respiratory physiology tests, what is important is not just that the measurements are made to the correct standards by competently trained staff but that the **reporting and interpretation** of the results are accurate, clear and understandable so that the correct diagnosis is made, repeat measurements do not have to be carried out and patients receive the appropriate treatment as soon as possible.

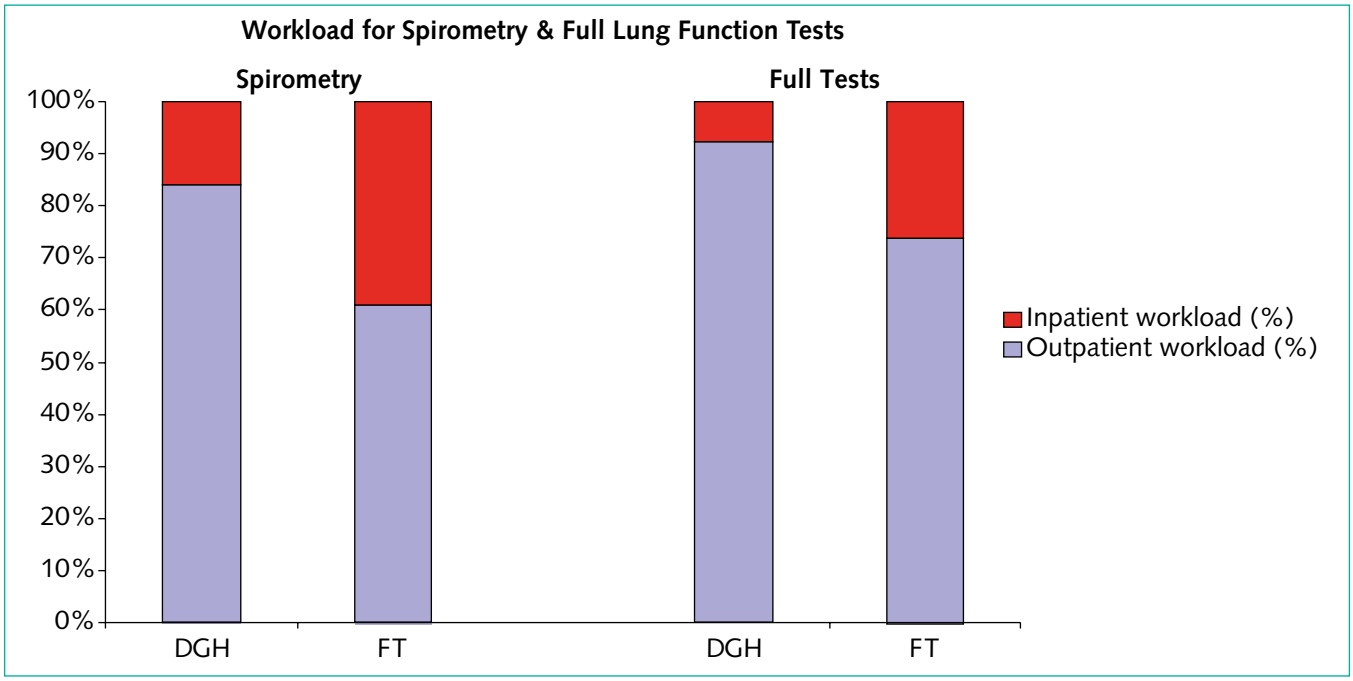
16 Sleep physiology diagnostics are predominantly associated with respiratory physiology, but there are a few dedicated units within other specialties such as neurology, anaesthesia and ENT.

Ventilatory therapy, such as NIV and CPAP, are based in secondary care and provide ongoing support for patients on these treatments.

Referrals to respiratory physiology services

17 The main specialties that refer to respiratory physiology services are respiratory medicine and cardiology. This referral pattern, including the proportion of inpatients, will vary depending on the type of hospital. The data showing source of referral from a recent ARTP survey is shown in figure 3. In addition, figure 4 shows the split in workload between

Figure 4: Figure showing the split of work between Inpatients and Outpatients for Spirometry and Full Pulmonary Function Tests. The data source is also the 2005 ARTP survey.



inpatients and outpatients based upon the same data source.

Referrals to sleep physiology services

18 Sleep disorders are a common reason for patients to visit their GP and to be sent for assessment in secondary care. People with sleep related breathing problems present with common symptoms such as daytime sleepiness, poor sleep quality, snoring and witnessed unusual breathing patterns during sleep, but they require special sleep investigations to determine the nature of the problem and appropriate therapy. Some sleep centres (e.g. at the Churchill Hospital in Oxford) receive the majority of their referrals for sleep studies direct from GPs, but at other centres where there are less referrals direct from GPs, Respiratory medicine and ENT refer most patients for sleep studies.[9]

Models of care for respiratory and sleep physiology

19 The SHA clinical visions that have been articulated across eight clinical pathways as part of the NSR provides both opportunities and some specific challenges for respiratory and sleep physiology services as outlined below:

9 Thanks are due to Professor John Stradling (Churchill Hospital, Oxford) for this information.

- ***Maternity, newborn care and children's health***
  Specialist centres in paediatric physiology (e.g. Great Ormond St Hospital, London) can provide lung function tests in neonates and pre-school children to detect asthma, cystic fibrosis and other rare respiratory disorders. Sleep apnoea in children has more serious implications for growth and development if left untreated. Quality lung function specialists in paediatric physiological measurement will be central to delivering appropriate services (spirometry, lung volumes, sleep studies, etc.).

- ***Planned care***
  Chronic Obstructive Pulmonary Disease (COPD) patients require care networks (possibly managed) to help in the detection and monitoring of disease processes (airways obstruction, hypercapnic ventilatory failure) and subsequent escalating interventions (pulmonary rehabilitation, oxygen, Non-invasive ventilation (NIV) etc.). Physiological measurement is central in the assessment and delivery of care. Patients with sleep problems require a planned assessment to achieve a correct diagnosis and a thorough discussion of legal implications (e.g. driving) before careful assessment of treatment options, including Continuous Positive Airway Pressure (CPAP) therapy followed by plans for subsequent monitoring and support.

- ***Mental health***
  It is unlikely that respiratory physiology will play a significant role in this area, except in the assessment of patients with co-morbid conditions.

- ***Staying healthy***
  High Street spirometry screening and primary care lung health checks will form the norm for citizens in the future with advice on and support for smoking cessation or healthy respiratory choices.

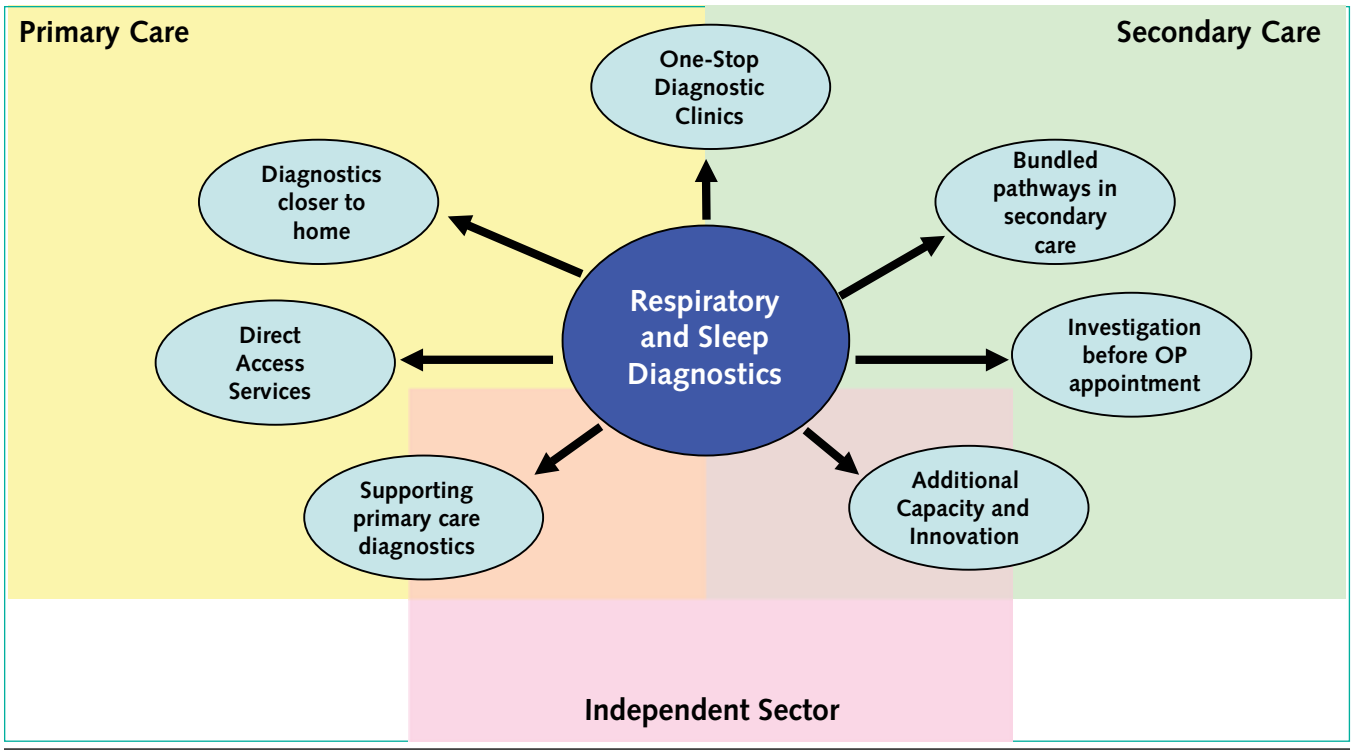
- ***Long-term conditions***
  COPD, asthma, restrictive lung diseases, obstructive sleep apnoea and respiratory muscle disease requiring monitoring of response and ongoing assessment of changes in severity of condition using physiological measurement services. The initiation of CPAP, NIV, oxygen and pharmaceutical interventions require accurate and reliable measures of respiratory function to acceptable standards of quality.

- ***Acute care***
  The provision of acute care requires that quality measurement of blood gases, oximetry and some lung function tests can be used to titrate interventions and help patients get established on acute NIV or oxygen treatment.

- ***End-of-life care***
  The provision of home oxygen services require accurate assessment and appropriate monitoring of patients whose requirements alter in the terminal stages of their disease. However, whilst sometimes inappropriate, some investigations will help clinicians in reaching decisions about end of life care.

20 This good practice guide is aimed at supporting the requirement for high quality; low wait respiratory and sleep physiology services for these clinical pathway groupings and the mechanism for achievement and delivery using the key levers of systems and process, technology and workforce and new service models. It explores new models for accessing tests and ways of making additional capacity from limited resources. By utilising the expertise largely available in secondary care, it should be possible to deliver more diagnostic screening and some treatments in primary care in the future[10]. It is necessary for General Practice to grow its standards of knowledge and patient management skills in this area as more services are transferred into the community and general practice settings. Figure 5 provides an illustration of this vision.

Figure 5: A diagram showing the different possible settings and models of care for respiratory and sleep diagnostics.



10 Calverley, P. Fulfilling the promise of primary care spirometry. Eur. Respir. J., January 1, 2008; 31(1): 8 – 10.

Understanding the scale of the challenge

Scale of the challenge – respiratory physiology

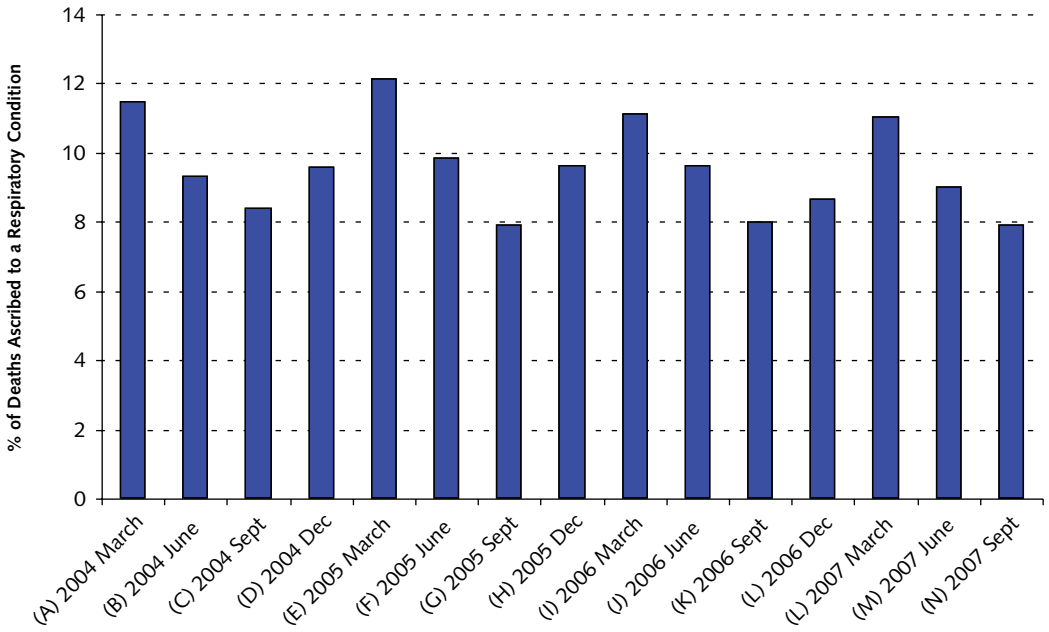
21 Respiratory disease is the third most commonly reported long-term illness in Great Britain. In 2005, a general household survey[11] reported that over 6% of men and women reported having a long-term respiratory illness. This prevalence is corroborated by British Lung Foundation data from 2004. Rates are highest in the older age groups reaching almost 1 in 10 of the over 65 year olds. Respiratory problems are also prevalent in children, although a separate good practice guide will be published to cover paediatric services.

22 Respiratory diseases are the prime reason for visits to the GP and for hospital admission. Many of the common respiratory disorders have very similar presenting features such as wheeze, cough, breathlessness and chest discomfort. Many non-respiratory diseases can also have similar presenting features (e.g. heart failure, anaemia, thyrotoxicosis, anxiety, de-conditioning and reflux disease). Also, lung disease often co-exists with other diseases (obesity, sleep apnoea and smoking related conditions) meaning that it is often not diagnosed at a first visit. Figure 6 uses data from the Office for National Statistics (ONS)[12] and shows the percentage of reported deaths that are due to a respiratory condition. On average the figure is around 10%, but a clear seasonal variation is also obvious.

23 COPD is an umbrella term for a group of lung diseases which include chronic bronchitis, emphysema and small airways disease. Lung damage over a long period of time impairs the flow of air in and out of the lungs and causes breathlessness. There are an estimated 3 million people with COPD in the UK[13], although only an estimated 900,000 are correctly diagnosed[14]. Data from the Information Centre shows that the average number of GP consultations for people with COPD where the cause was COPD is 2.76. In 2006-7 there were 179,460 inpatient admissions for England where COPD was the primary cause of treatment causing estimated total costs of approximately £276m[15]. In the UK, the rate of COPD has been increasing nearly three times faster amongst women than men[16]. The

11 Office for National Statistics (ONS), General Household Survey 2005. http://www.statistics.gov.uk/ghs/
12 ONS – Health Statistics Quarterly (http://www.statistics.gov.uk/statbase/Product.asp?vlnk=6725&More=N)
13 Stang P, Lydick E, Silberman C et al. The Prevalence of COPD: Using smoking rates to estimate disease frequency in the general population. Chest 2000; 117: 354S-359S
14 Lung Report III (2003), British Lung Foundation
15 Data provided by HES and the DH Analytical Team
16 Breathing Fear – The COPD Effect, Allen & Hanburys 2003

Figure 6: Chart showing the percentage of deaths, by quarter for 2004 to 2007, that are attributable to a respiratory condition in England and Wales.



increasing prevalence of COPD is also recognised internationally[17].

National drivers for change – respiratory physiology

24 A recent paper by *Shahab et al*[18], which is a specific study of individuals over 35 years of age, shows an even higher prevalence of COPD in England and notes that people with spirometry defined COPD were more likely to be older, manual workers, male and socioeconomically deprived. In addition they were more likely to be smokers as shown in figure 7.

17 Buist AS, McBurnie MA, Vollmer WM, et al. International variation in the prevalence of COPD (the BOLD Study): a population-based prevalence study. Lancet 2007;370:741–750

18 L Shahab, M J Jarvis, J Britton and R West: Prevalence, diagnosis and relation to tobacco dependence of chronic obstructive pulmonary disease in a nationally representative population sample. Thorax 2006;61;1043-1047.

Figure 7: A table showing the prevalence of spirometry-defined COPD by smoking status reproduced from Shahab et al. The study used data from 8,215 adults and the information in the table above is shown as a percentage of the total number of participants in the study.

COPD	Total (n=8,125)	Never Smokers (n=3,686)	Ex-Smokers (n=2,551)	Smokers (n=1,978)
Mild	5.5	4.9	5.5	6.8
Moderate	5.8	3.1	7.1	9.3
Severe/Very Severe	1.9	0.7	2.7	3.2
Overall	13.3	8.7	15.2	19.3

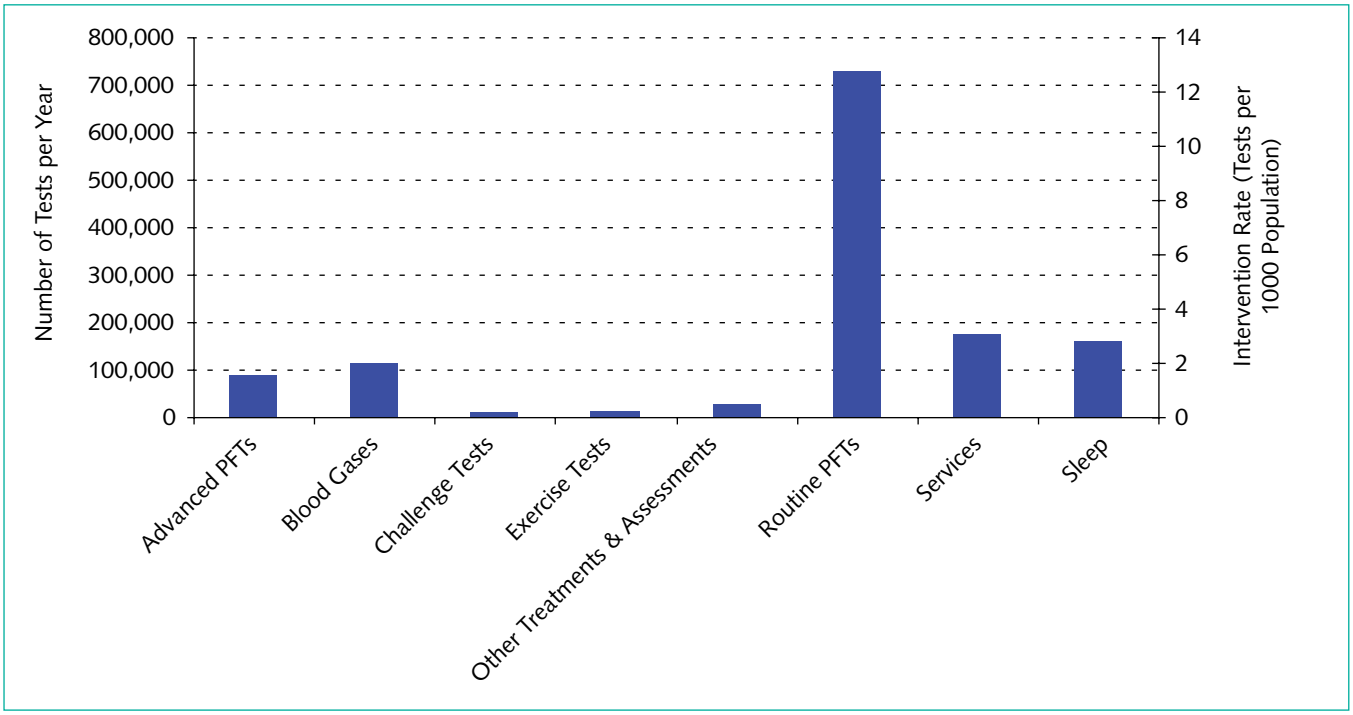
25 There are huge economic costs attributable to morbidity and mortality from a range of respiratory diseases. The Chief Medical Officer's annual report of 2004 recommended that a National Service Framework for COPD should be published, with a key advisory note about development of a spirometry screening service in primary care[19]. The DH aims to publish a National Strategy for COPD in 2009. This could potentially substantially increase the requirements for spirometry testing/screening to ensure that patients are both identified and accurately diagnosed.

26 Although there are currently a large number of people who have respiratory disease, relatively small numbers have actually undergone respiratory physiological investigations to ensure that their diagnosis and their treatment are correct or appropriate. Nevertheless, there are people currently waiting for tests and estimates of international intervention rates suggest that there remain many patients who are under-investigated and undiagnosed in the UK[20].

27 Data concerning the number of respiratory physiology tests carried out in the UK is available from the 2005 ARTP survey[21]. Figure 8 shows the numbers of tests carried out in 2005[22] and the intervention rates (numbers of tests per 1000 population). Intervention (or access) rates are an accepted means of assessing the level of access to a particular healthcare service and are important to study to ensure that patients' symptoms in a given population are being adequately investigated.

19 http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/AnnualReports/DH_4115776
20 Department of Health unpublished guidance document on physiological measurement intervention rates
21 The 2005 ARTP survey can be downloaded from: http://fp.artpweb2.f9.co.uk/files/ARTP/ARTP%20Survey%202005%20-%20Final%20Report.pdf
22 The 2005 ARTP survey asks departments to submit the number of tests they carry out per month. A 91% response rate was achieved in the survey. The data presented here multiplies the monthly number by 12 and divides by 0.91 to correct for the response rate.

Figure 8: Chart showing the intervention rate (number of tests per 1000 population), and the total number of respiratory physiology tests carried out in the UK (data reproduced from the 2005 ARTP survey).



28 The demand for respiratory physiology has however been increasing. The 2005 intervention rate (number of tests per 1000 population) for simple lung function tests in England was 12, excluding services in primary care[23], with other countries reporting higher rates of between 20 and 100[24]. The reason for the international rates being higher are likely to be related to a number of factors including: relative under-diagnosis of respiratory physiology problems in parts of the UK, a greater proportion of private providers, the existence of a fee for service system and greater historical use of ambulatory diagnostics.

29 It is possible that the changing prevalence and incidence of conditions where the investigations may play a useful role the current intervention rates may cause an increase in the requirements of local populations for these tests. The incidence of interstitial pulmonary fibrosis[25] (IPF) is

23 ARTP survey 2005 (www.artp.org.uk)
24 Data was obtained for Medicare in Australia and for Ontario in Canada (Ontario Health Insurance Plan).
25 Dempsey OJ, Kerr KM, Gomersall L, Remmen H and Currie GP, Idiopathic pulmonary fibrosis: an update. QJM 2006 99(10):643-654.

currently 7-20/100,000 population and is therefore a relatively rare (<1:100) presentation for lung function testing. However, lung function is important in the diagnosis and assessment of severity of IPF[26].

30 One of the problems with expanding diagnostic lung function test provision widely is the realisation that correct interpretation of the data is as important as the quality of the measurement. Errors in interpretation can lead to misdiagnosis and the use of reference ranges does not always provide an accurate interpretation of the data measured[27].

Scale of the challenge – sleep physiology

31 Sleep physiology problems are also a major reason for GP visits. Brief periods of breathing cessation (apnoeas) or a marked reduction in tidal volume (hypopnoeas) may result in sleep disturbance and are common in adults during sleep. Studies have shown that these conditions are a significant risk factor for motor vehicle accidents[28] and can have an adverse impact on the quality of life. As a result there is a substantial and growing demand by patients for access to diagnostic studies and effective treatment. There are more than 80 recognised sleep disorders, which may affect the timing, quality and quantity of sleep. Sleep apnoea probably constitutes over 75% of the sleep workload in departments. Estimates of the prevalence of sleep disorders vary, but a figure of 4% of middle-aged men and 2% of middle-aged women has been reported.

32 Obstructive sleep apnoea/hypopnoea (OSA) is increasing in prevalence largely as a result of increased recognition of the condition along with increasing obesity in the population. The main cause of sleep apnoea is upper airway narrowing in the oro-pharynx, which is exacerbated by neck obesity and agents which reduce muscle tone in the upper airway (e.g. alcohol). In most sleep apnoea clinics the average BMI of patients is in the region of 30-34, so that a little over half are technically in the obese range, which is similar to the patient group with type 2 diabetes. In a smaller proportion of patients, OSA is due to craniofacial abnormalities that reduce the size of the oro-pharynx, and space occupying masses such as enlarged tonsils. Often it is a mixture of these risk factors that conspire to produce OSA.

26 Martinez FJ and Flaherty K. Pulmonary Function Testing in Idiopathic Interstitial Pneumonias Proceedings of the American Thoracic Society (2006) 3:315-321

27 Hong Y, Ra SW, Shim TS, et al. Poor interpretation of pulmonary function tests in patients with concomitant decreases in FEV1 and FVC. Respirology 2008 13(4):569-74.

28 George CF. Reduction in motor vehicle collisions following treatment of sleep apnoea with nasal CPAP. *Thorax* 2001;56:508–512.

Figure 9: A table showing the burden of sleep disorders in terms of prevalence from a number of common diseases.

Disease	Prevalence No. per 10,000	Future
Sleep apnoea	Males: 400 Females: 140 All: 270	More prevalent with increase in obesity Figures based on admissions – most treated as out-patients
Sleep disorders	Insomnia: 1,000 (Most acute, 100 chronic) Nocturnal limb movements: 100-200 Narcolepsy, idiopathic hypersomnolence: 25	Currently poor diagnosis, many patients untreated but likely to increase, especially in the elderly

National drivers for change – sleep physiology services

33 Changing demographics, towards an ageing population, are likely to also increase the prevalence of OSA in the future, although a current tendency to accept excessive daytime sleepiness as normal in an older age group reduces the likelihood of it being recognised, investigated and treated. Other sleep and breathing disorders, such as the combination of obesity hypoventilation and OSA and pure obesity hypoventilation, are rising due to increasing levels of obesity in the general population. In addition, the useful symptomatic benefit achieved with non-invasive ventilation in neuromuscular disorders, such as Duchenne dystrophy and Motor Neurone Disease, is further leading to its increased use. Central sleep and breathing abnormalities are less common, and usually due to associated conditions such as heart failure (producing Cheyne-Stokes, or periodic, breathing) and may also be important in paediatric practice.

34 The prevalence of OSA among adults in England is 27 per 1,000. Age and obesity are major predictors of OSA, so with an aging population who may be more obese, more people may be affected. However, obesity, smoking and lack of exercise not only contribute to the prevalence of OSA but are strongly associated with the well known co-morbidities of hypertension, heart disease, Type 2 Diabetes, and possibly stroke (SIGN 2003)[29]. Further information is available in figure 9.

35 Demand for sleep physiology tests has significantly outstripped supply in the

29 Scottish Intercollegiate Guidelines Network, Management of OSA in Adults. A national clinical guideline No. 73. June 2003.

Figure 10: Data from the Churchill Hospital in Oxford showing the number of referrals received for sleep studies over the most recent 12 month period.

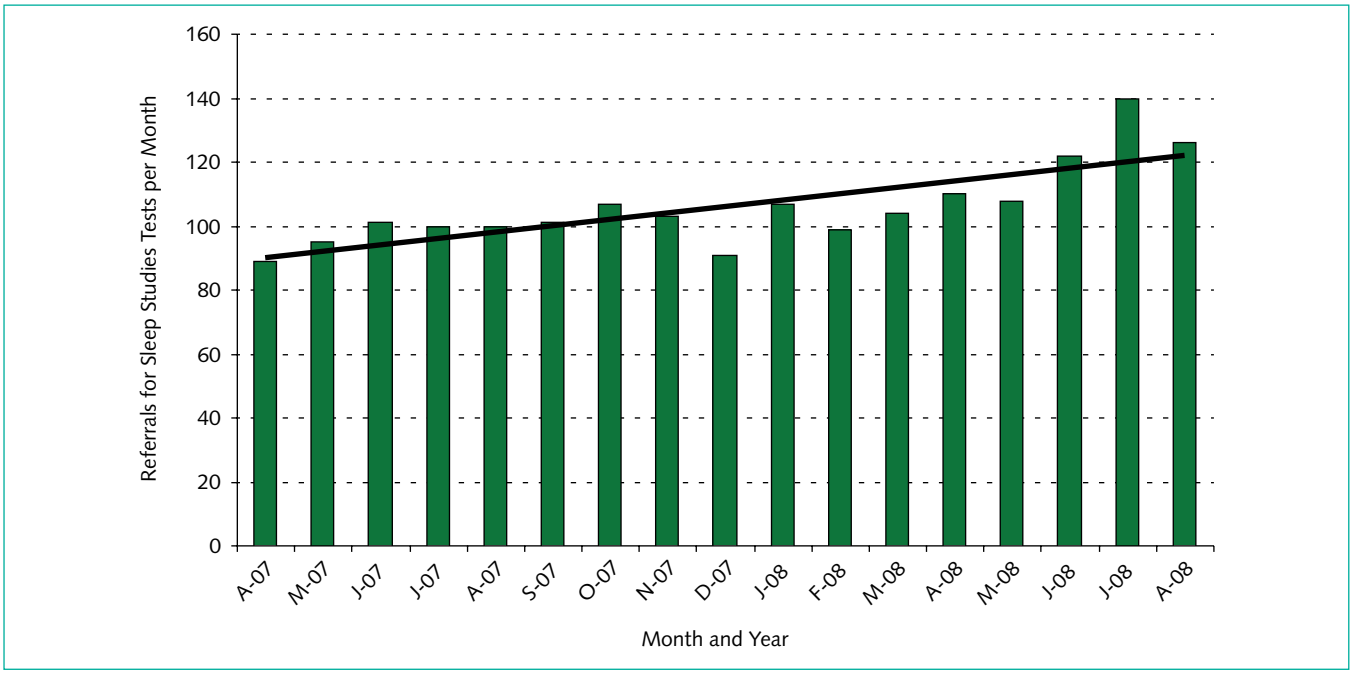
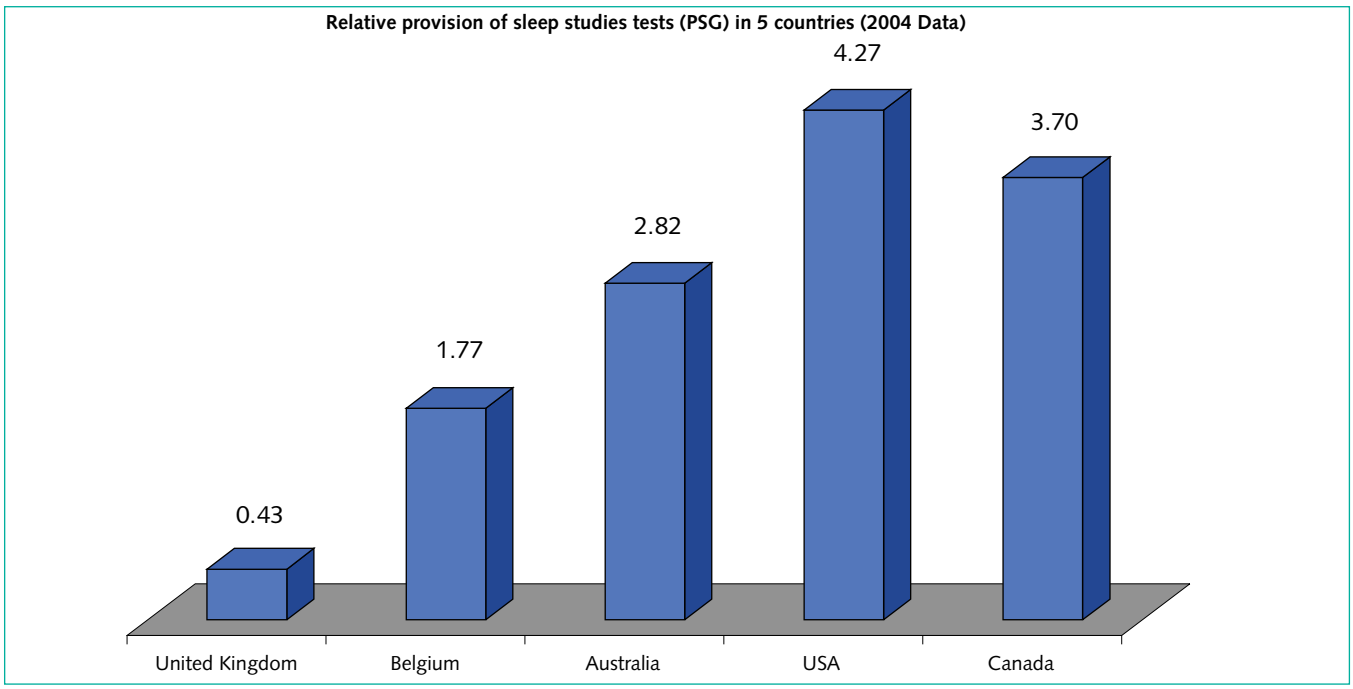


Figure 11: A comparison of the level of provision of PSG sleep tests in the UK and four other countries (per 1,000 population).



NHS. The 2005 intervention rate (number of tests per 1000 population) for sleep physiology in England was between 1 and 1.6[30]. Figure 10 shows data from the Churchill Hospital in Oxford[31] and demonstrates a significant increase in the number of referrals received over the most recent 12 month period. In addition, figure 11 shows the provision of a subset of sleep physiology tests (PSG) and shows that the level of provision of sleep studies tests in many other countries is significantly higher than the UK[32].

36 The National Institute for Clinical Excellence (NICE) define apnoea as a temporary absence or cessation of breathing. Their guidance continues by mentioning that OSA is a condition in which a person experiences repeated episodes of apnoea because of a narrowing or closure of the pharyngeal airway during sleep. A recent publication in March 2008 recommended CPAP for the treatment of moderate and serious cases of the condition and noted that (only in certain cases) it may also be an appropriate treatment for people with mild sleep apnoea[33]. The symptoms and risk factors as defined by NICE are shown in Figure 12.

37 Relatively small numbers of people who have sleep-disordered breathing, have had a sleep study to confirm that the diagnosis and treatment are correct. Despite two decades of education and awareness raising, severe cases of sleep apnoea are still regularly referred from primary care. Even though the 18 weeks target has raised awareness of sleep apnoea further, and has led to a reduction in long waits, estimates of international intervention rates (above) suggest that there are many patients in England who are under-investigated.

38 Patients on CPAP treatment for OSA can benefit from this treatment which is associated with a significant and substantial improvement in their QALYs with a cost-effectiveness estimated in 2000 as £8,300 per QALY in the first year, which reduces to £4,400 over five years[34,35].

30 ARTP survey 2005 (www.artp.org.uk) and the DH Monthly Diagnostics Census
31 Thanks are due to Professor John Stradling (Churchill Hospital, Oxford) for this data.
32 American Journal of Respiratory and Critical Care Medicine; Vol 169, 2004, p668-672.
33 The NICE technology appraisal for CPAP can be found at: http://www.nice.org.uk/TA139
34 Working Group on Acute Purchasing: Nasal Continuous Positive Airways pressure in the Management of Sleep Apnoea, Trent Institute for Health Services Research, October 2000.
35 NICE guidelines on the use of CPAP are currently in preparation and due for publication in January 2008 (http://guidance.nice.org.uk/page.aspx?o=350198).

Figure 12: Symptoms and risk factors for OSAA as described by NICE

Symptoms of OSHAS		Risk Factors for Developing OSA
Impaired alertness		Increasing age
Cognitive impairment		Obesity
Excessive daytime sleepiness		Being male
Snoring		Specific craniofacial characteristics (such as retrognathia)
Nocturia		Enlarged tonsils
Morning headaches		Enlarged tongue
Sexual dysfunction		Use of alcohol or sedatives

Summary

39 Future service provision models will need to change in relation to the key patient outcomes of improving health and well being, through the provision of safe, effective and responsive respiratory and sleep services which are efficient, affordable and equitable.

40 Overall, as the emphasis in healthcare switches to tackling the COPD epidemic, the likelihood of increasing numbers of obese patients developing sleep apnoea and the need to screen the population for evidence of poor lung health increases, the requirement for respiratory and sleep diagnostics is set to grow significantly in the next 10-20 years.

41 The NSR sets an expectation to deliver more acute services and diagnostics in primary care. Much of the expertise to do this is found in secondary care, but with increasing knowledge and creative working it should be possible to develop evidence based models of care within primary care that provide better access for patients.

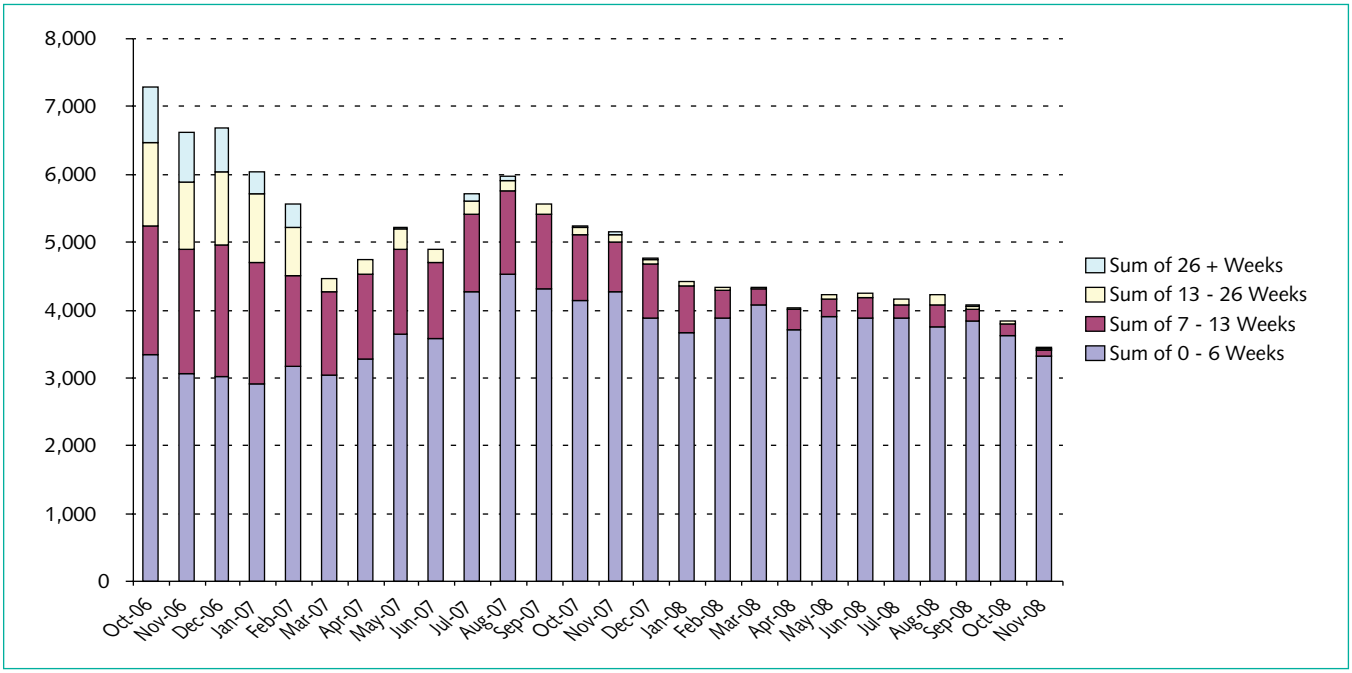
The relationship of 18 weeks and the NSR to respiratory and sleep services

42 The key targets that the NHS achieved at the end of 2008, and are working to deliver in sustainable way are:

- >90% of pathways where patients are admitted for hospital treatments should be completed within 18 weeks; and
- >95% of pathways that do not end in an admission should be completed within 18 weeks.

43 Progress to date in achieving these targets has seen a significant reduction in the current long waits in the system. Respiratory and sleep diagnostic services will need to undertake appropriate planning to make sure capacity is available both to clear current backlogs and to

Figure 13: All waiters for sleep tests between October 2006 and November 2008[36].



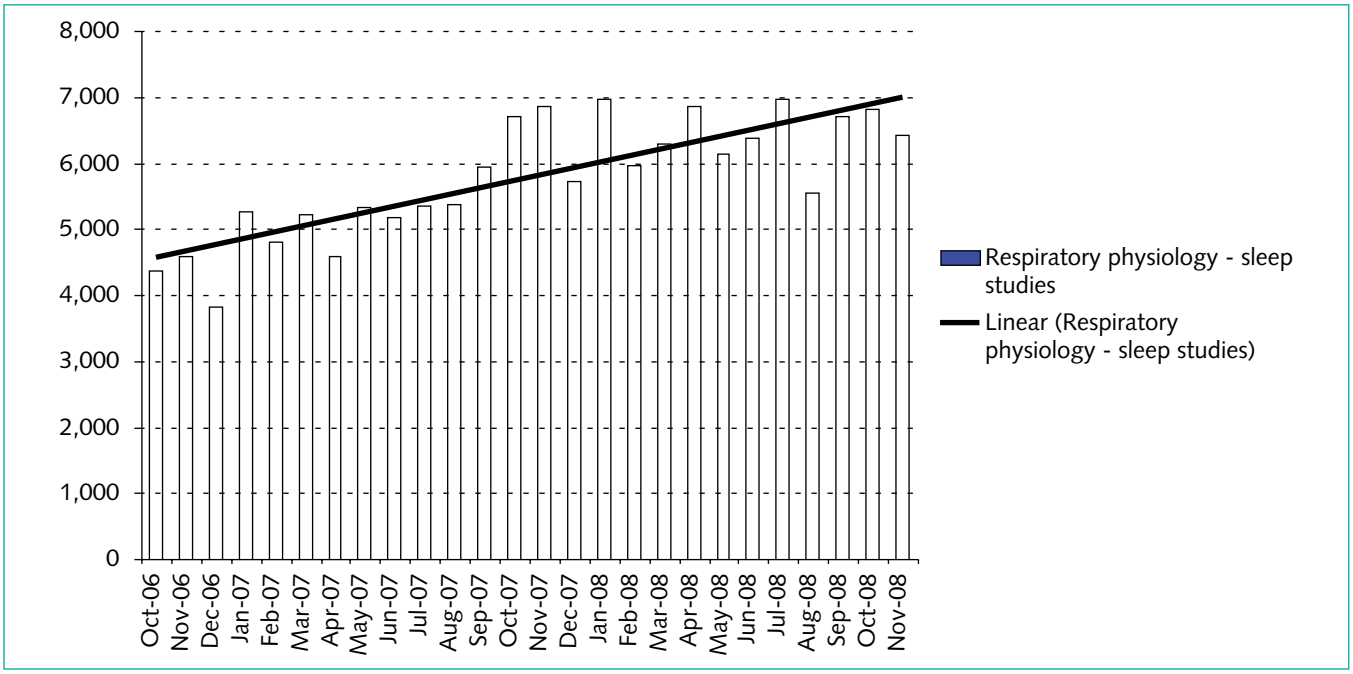
provide a sustainable low wait service in 2009 and beyond.

44 Between January 2006 and November 2008, waits for respiratory and sleep tests have significantly reduced, but more progress is still necessary. These services are now a more visible part of end-to-end patient pathways (e.g. including preoperative assessments), requiring service providers and commissioners to think and act differently.

45 The NSR SHA clinical visions note the importance of health targets in the delivery of progress within the NHS over the past five years, and mention that future services must have low waits. Figure 13 shows the reduction in the number of long waiters for sleep physiology studies over the last two years, with significant progress being evident towards the waiting time targets of March 2007[37]. However after March 2007 there was a 20% increase in the number of waiters, as patients were moved off "hidden" waiting lists. At the end of March 2008, the waiting time target stated that no patient should wait any more than 6 weeks for any diagnostic test with sustainability of a wait much less than 6 weeks (as articulated in the NSR

36 DH Monthly Census from October 2006 to November 2008.
37 This target stated that no patient should wait longer than 13 weeks for any diagnostic test.

Figure 14: Activity for sleep physiology tests between October 2006 and November 2008[38]. Note that the data quality of activity information in diagnostics is poor so these figures should be used to conclude general trends rather than exact values.



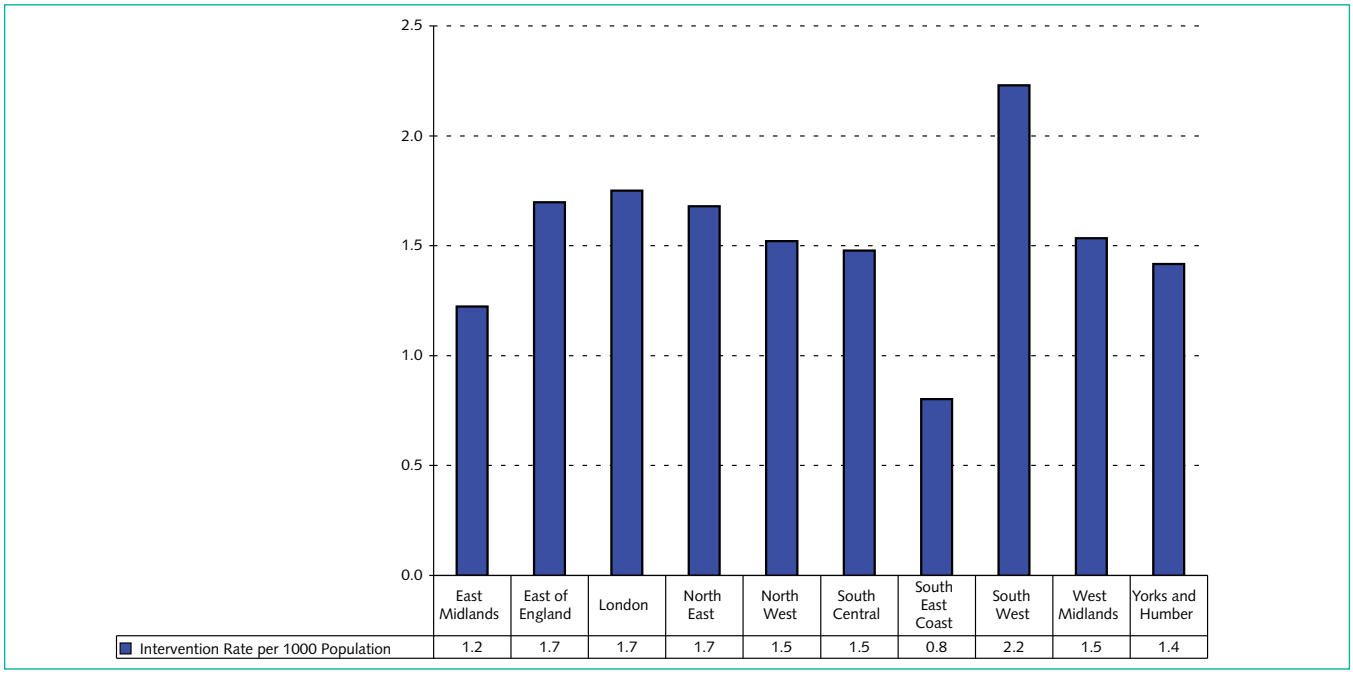
SHA clinical visions) now being the key challenge.

46 The data that is collected by the Department of Health also shows how the number of sleep tests carried out in England has changed. Over the period from October 2006 to November 2008 (figure 14) one can observe a noticeable increase which is due to both increasing demand and the use of initiatives to clear historic backlog. The accuracy of activity reporting however still needs to be improved to ensure that it is both correctly reflected in any business planning processes and appropriate income is derived to support service continuity and ongoing improvement/innovation.

47 The activity can also be divided by population to give intervention rates for sleep tests. This is presented in figure 15 by SHA (using activity data for 1 calendar year from December 2007 to November 2008) showing that there is a significant variation in the rate of provision in different regions of the country. As stated earlier intervention rates are an accepted means of assessing the level of access to a particular healthcare service and are

38 DH Monthly Census from October 2006 to November 2008.

Figure 15: Intervention rates for sleep studies tests (per 1,000 population between December 2007 and November 2008). The figure shows the wide variation across the country in the provision of these tests.



important in understanding the level of investigation in a given population.

48 The evidence on which this document is largely based is from the experience of eight DH NHS Physiological Measurement Development Sites[39], which tested innovative delivery models and solutions to reducing waiting times, predominantly in NHS provided respiratory and sleep services during 2006/07. Some of the evidence is based on early findings and requires ongoing refinement, testing, analysis and evaluation. The experience from these sites is presented in a series of case studies available on the 18 weeks website, with the relevant case studies referenced throughout this good practice guide. This evidence is supplemented by evidence from other NHS sites and services provided by other organisations that have demonstrated improvements in the delivery of their services.

39 Referred to as the NHS Development Sites in the rest of this document

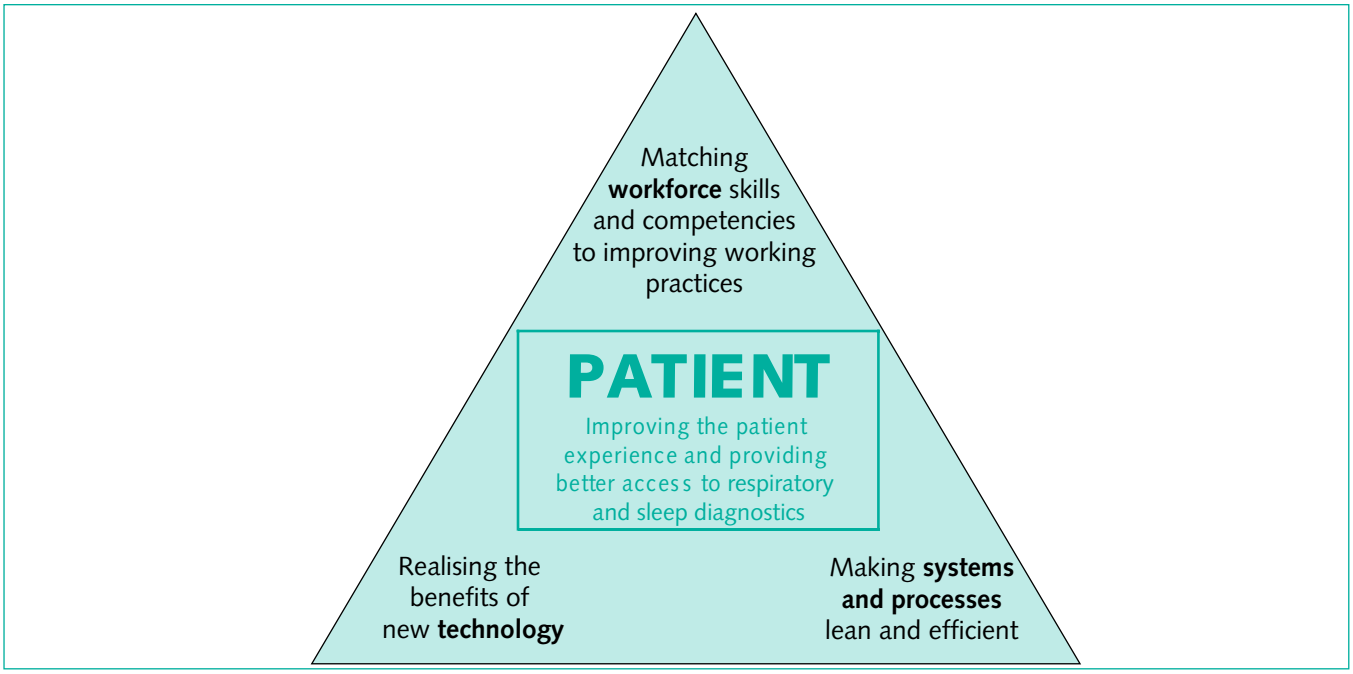
How to achieve the vision and context

49 Respiratory and sleep physiology services may be transformed by using existing knowledge about improving NHS *systems and process,* bringing together evidence about *innovative technology* and providing the training to enable a competent productive *workforce to deliver the right processes at the right skill level* (all shown in figure 16). Each of these key themes are covered separately in the following paragraphs.

50 This section triangulates evidence to support these essential components of integrated improvement for delivering these services.

51 A web-based Quality Enhancement Tool (QET) will be developed and piloted for respiratory and sleep physiology services over the coming year. The QET methodology is based upon the proven *Global Rating Scale* for endoscopy services which has demonstrated significant quality improvement around the patient experience, models of care, pathways and systems and processes. A QET has already been rolled out in one other physiological measurement area, audiology[40], and will be developed in other physiological measurement areas during 2009-10.

Figure 16: The key delivery levers for achieving the vision for respiratory and sleep physiology services.



40 Further details about the audiology Quality Enhancement Tool can be found at http://audiology.globalratingscale.com

52 The aims of the QET are to:

- Support improvement and innovation.
- Support business case development.
- Allow access to national good practice.
- Provide evidence for an accreditation framework.
- Provide commissioners with information to make informed decisions about provider services.

Systems and processes

53 Waiting times for respiratory and sleep tests can be radically reduced by getting the basic systems and processes right. For example;

- In addition to national requirements, sites should collect appropriate data locally about respiratory and sleep services to ensure the most efficient service provision (e.g. activity, efficiency, capacity and workforce).
- Improving referral quality by education and audit.
- Use of screening questionnaires to maximise correct information available during consultation.
- Ensuring the correct test is available at the correct time.
- Using innovative ways of seeing patients for initial screening tests that are more effective (e.g. multiple patient session for CPAP initiation).
- Better waiting list management using effective IT systems.
- Better collection of waiting times to exclude "follow-up" patients.
- Adopting "lean" thinking to processes and pathways.
- Direct access services into primary care for diagnostics (though tests often require specialist interpretation).
- Outreach services, including specialist community chest physicians.
- Outreach services and direct access services into primary care for diagnostics.

A number of these areas are covered in more detail in the following paragraphs.

Collection of appropriate data together with understanding of capacity and demand for respiratory and sleep physiology services

54 In order to understand the scale of the challenge for NHS services, commissioners should ensure that providers:

- Collect and analyse demand data for all stages of the pathway, against agreed lists, in order to determine the rate of referral, and any changes to this.
- Maintain data sets, which record the type of referral, referral source including speciality, referral date, appointment date, attendance record, waiting and/or clearance times.
- Use their activity data to provide an accurate record of tests that are carried out, ensuring that financial flows under payment by results are correct.
- Understand and plan the capacity of the service (encompassing all sessions and different types of referrals) and

how this needs to alter to meet current demand and any fluctuations.

- Utilise data to inform service redesign and models of provision to ensure that access is improved and that patient flow is balanced into and out of the service associated for example with variations in demand and capacity.

There are IT tools available such as simple local assessments (e.g. University Hospitals Birmingham (UHB) Workload Spreadsheet – available on the 18 weeks website[41]) using pivot tables to enable quick and easy assessment of staff time utilisation. More expensive systems of local IT intranet management for lung function and sleep physiology are commercially available (e.g. HD PRISM also available on the 18 weeks website[42]) that improve the effectiveness of staff and the reduction in duplication of administration processes. Empowering a local IT network for a respiratory physiology service that connects seamlessly with main hospital IT requesting/results systems is the key to effective respiratory physiology and sleep testing service delivery.

55 Case studies in this section show that the NHS development sites have illustrated the benefits that can be achieved through understanding their local demand and historical activity levels and estimating the capacity needed for sustainable services with reduced waiting times.

56 In order to fully understand the services' capacity and how it relates to demand for respiratory and sleep physiology services, commissioners and providers need to:

- Understand demand for the service and where it comes from.
- Know the number of diagnostic sessions and slots available for each test.
- Utilise and analyse data to inform service redesign and models of provision to ensure that access is improved and that patient flow is balanced into and out of the service.

57 A *Physiological Measurement 18 Weeks Productivity Tool*[43] has been made available, which uses a number of simple inputs to allow an estimate to be made of departmental capacity. It then calculates clearance times based upon the services' current waiting list and an estimate of potential efficiency gains to be made. The tool assists with the two stage process of:

41 http://www.18weeks.nhs.uk/Content.aspx?path=/achieve-and-sustain/Diagnostics/Physiological-measurement/Development-site-case-studies
42 http://www.18weeks.nhs.uk/Content.aspx?path=/achieve-and-sustain/Diagnostics/Physiological-measurement/Development-site-case-studies
43 The tool can be found at: http://www.18weeks.nhs.uk/Content.aspx?path=/achieve-and-sustain/Diagnostics/Physiological-measurement/productivity-tool

- Clearance of current backlog.
- Maintenance of a stable schedule for a "low wait" diagnostic service.

58 If there is insufficient capacity to see the required number of patients in the time available, contingency measures may need to be implemented. These could include:

- Creating additional capacity by increasing the hours of operation – this is the most effective way of increasing capacity for marginal cost (see the following paragraph) and also potentially provides appointment slots when it is more convenient for patients (i.e. evenings and weekends).
- Validation to exclude duplicates e.g. those patients who have been seen, no longer need care or who have died.
- Pooling of patients into single lists where possible.
- Agreements with neighbouring trusts.
- Exploring options with the independent sector.

Utilising all the benefits of patient management systems

59 There are a variety of patient management systems for respiratory and sleep services which are either developed internally (e.g. at the Royal Devon and Exeter Hospital (RDE)) or bought as commercial systems (e.g. PRISM at University Hospitals Birmingham – UHB). Lung function results should automatically transfer to a common database, record journal notes regarding the session and automatically save these in the patient's record, either in PAS or in a PAS-compatible office management system. It is important to note that implementation of such changes requires a project manager and the formation of an implementation group with all the

Case Study: University Hosptial of North Staffordshire NHS Trust

"Optimising the use of available resources"

An initial capacity analysis showed that equipment was standing idle at certain times of the day, and that highly qualified staff were performing simple and routine investigations. This led to an extension of the working day (now from 8am until 6pm) managed by staff working a 4 day week but longer days, allowing an extra 12 patients to be seen each week.

In addition the roles of junior staff were extended allowing them to perform more detailed investigations under supervision thus making more efficient use of the available workforce. Periods of high and reduced activity were noted allowing the pattern of service delivery to change accordingly.

involved stakeholders (hospital IT, software providers, lung function department, clinicians, etc.) Clarity about what is expected for all parties is essential early on in the project. Economy of scale and considering sharing hospital servers with other diagnostic services should be considered.

60 To maximise the benefits of IT, service managers should ensure that their respiratory and sleep departments:

- understand how their Patient Management System (PMS) works.
- ensure that there is appropriate and early segmentation of lists and that appropriate patient targeting can be carried out.
- understand how PMS interfaces to the local IT infrastructure and choose and book and plan to ensure that the NHS Trust and PCT can share the management information across systems in line with Connecting for Health policy.
- ensure the capabilities of the local PMS are being used to put appropriate workflow and local procedures in place.
- receive adequate training to ensure they use the system to its maximum effect with recognition that local IT support may be required, where possible contracts should be in place to ensure that local services are able to receive system upgrades.

61 The main barrier to achieving lower waiting times is to move from waiting to scheduling systems and therefore fully booked respiratory and sleep services. This

Case Study: University Hosptial Birmingham NHS Foundation Trust

"Introduction of an electronic patient management system"

Limitations to existing IT infrastructure included its incompatibility with other systems in use across the trust and that there were no staff available for system development. After requesting support from the Trust IT department, commercial PRISM software was installed at a cost of £50k for 5 years. The new system displays the results of diagnostic investigations and can interface with the Lorenzo PAS and local intranets to provide availability information to referring clinicians.

Significantly fewer data errors and loss now occur with this electronic appointment booking, results recording and activity recording. This has released scientific staff for more clinical testing, thus increasing capacity by 10 to 15% and enabling the reduction of waiting lists.

requires the appointment list to be broken down by triaged needs and an assessment made of the available capacity to assess and manage clinical priority patients and all other patients currently referred for each care pathway[44].

62 Having built an understanding of capacity and demand and implemented clear referral criteria, respiratory and sleep physiology services may benefit from implementing booking systems, which could consist of:

- A booked in advance service to outpatients rather than an ad hoc on demand service which is an inefficient use of staff time.
- Improved management of patients who do not attend (DNAs) through a clear and consistently applied DNA policy and booking at short notice into cancelled slots.
- Innovative ways of calling patients for appointment and reminding them of the date.

63 Effective booking will be achieved if adequate patient information is included on the referral form. This will help to speed up processing and ensure any tests that are required can be completed without delay, including reporting and interpretation, to support informed clinical decision making.

64 From the end of July 2007, primary care providers are able to select some respiratory and sleep physiology tests via the "diagnostic" section of the Choose and Book form. Current forms can be found on the Choose and Book website[45], which are subject to ongoing review and change as a result of user feedback. The requests for tests are reviewed and patients appointed appropriately, with results and interpretation provided to the individual who requested the test. The "host" organisation has the ability to reject the request if it is thought to be inappropriate or unsafe for the patient.

65 Commissioners and providers should have an understanding of the capacity of their departments. Choose and Book will require departments to understand their productivity – i.e. the number of tests they can theoretically carry out, related to specific numbers of slots in a booking schedule. The productivity tool referred to in paragraph 57 can assist with the understanding of real capacity.

66 Booking systems can also be improved by:

a) Reviewing existing internal paper-based referral systems and redesigning them,

44 http://www.healthcarecommission.org.uk/_db/_documents/04018762.pdf
45 http://www.chooseandbook.nhs.uk/staff/implementation

to enable all bookings to be made chronologically by date of referral and not date received by the department.

b) Validating all waiting lists to eliminate any duplicate entries, to free up capacity which otherwise would be lost.

67 Scheduling or booking arrangements should be as efficient as possible and all available capacity appropriately managed and utilised where possible by dedicated administrative staff.

68 NHS and other respiratory physiology services are encouraged to introduce a Patient Tracking List (PTL) to prospectively manage their waiting lists on the basis of referral to treatment, this will ensure that a focus on improving access to definitive treatment is both established and maintained irrespective of the route of referral and provision of service. To deliver the 18 weeks Referral to Treatment target PTL's are an operational tool providing a systematic approach to identifying patients who need to be treated (or who need a particular appointment or test as part of their pathway) within a specified time. An easy to follow guide is available on the 18 weeks website[46].

Manage demand, by introducing better referral criteria

69 In order to target diagnostic resources, there will need to be carefully designed referral criteria enabling the most effective "triage" of patients to physiological investigations in harmony with other routine diagnostic interventions as part of the 18 weeks pathway (e.g. blood tests and chest X-rays).

70 Improved access to diagnostic tests directly from primary care is also essential, as currently many respiratory and sleep diagnostic services are provided following an outpatient consultation with a specialist within the acute Trust setting[47]. Effective referral criteria will support the management of these various sources of demand and are a key element of service transformation processes ensuring equitable provision and that patients with defined symptoms flow into the most appropriate service.

71 Experience from the NHS Development Sites suggests that an effective grouping for establishing and maintaining lists for adult respiratory and sleep services after adopting the referral management outlined above is important (paragraph 69 and 70). This is shown in figure 17.

46 Full details about the PTL methodology can be found at http://www.18weeks.nhs.uk/public/default.aspx?load=ArticleViewer&ArticleId=947

47 Survey performed by the British Thoracic Society

Case Study: North Stoke Primary Care Trust

"Development of a primary care based spirometry service"

The NICE guidelines on COPD diagnosis and treatment highlight the need for spirometry to be available in primary care. Currently patients are often sent to hospital (which does not follow the NICE guidelines); or tested by the GP practice nurse (who may not have regular access to training and mentoring required to maintain appropriate standards).

North Stoke PCT has pioneered a third way – an expert who supports and assesses the competence of those nurses who were performing spirometry and also to perform the test in practices who could not provide the service. The impact on the patients has been considerable, particularly in identification of a number of patients (around 30%) who have a normal spirometry result and should not be included on the register, thus freeing up capacity to where it is really needed.

Mini Case Studies: Correct referrals for sleep tests

Situation	Commentary
A 39-year-old bus driver presents to his GP along with his wife. She is complaining he snores every night and spends much of the evening asleep in front of the television. The GP notices he is obese (BMI 42) with a neck circumference of 19 inches, with previous diagnoses of hypertension and non-insulin dependant diabetes. The patient doesn't feel he has any problems.	*This patient needs to be fast-tracked through a secondary care sleep service. Preferably he will have a sleep study which is appropriately interpreted, followed by a one-stop clinical assessment and CPAP provision by specialist staff, should he turn out to have OSA, which seems likely. He should not drive his bus during this period, thus rapid assessment and treatment is critical.*
An obese 60-year-old, heavy smoking, man presents with snoring, breathlessness and morning confusion. The GP carries out spirometry – it shows airflow limitation (an FEV1/VC is 1.1/3.7 litres), and his resting O_2 saturation (by oximetry) is low at 88%.	*This man needs urgent assessment. He is hypoxic at rest and is likely to be in ventilatory failure, given that he may have three reasons for this: COPD, obesity hypoventilation, and OSA.*

Situation	Commentary
A 26-year-old man presents with snoring and requests help. The GP records that he does not smoke, is not sleepy (Epworth Sleepiness Scale (ESS) = 5/24, normal <9), there is no report of witnessed apnoeas, minimally overweight (BMI 26 and neck circumference 16 inches) and he has a normal resting O_2 saturation of 97%.	*This man is therefore very unlikely to have significant OSA requiring treatment, and simple advice for the snoring in the first instance (such as some weight loss, and possibly a dental device) can be safely offered.*

Figure 17: Suggested patient list groupings for respiratory and sleep services (after adopting referral management).

Patient grouping for adult respiratory physiology
a. Urgent patients including those with sudden breathing difficulty or associated concurrent symptoms that are referred from medical services
b. New patients with breathing difficulty ● Referred to respiratory physiology service for "assess and treat" pathway with quality practice assessments ● Referred to respiratory physiology service for a two stage pathway with an assessment appointment when spirometry and blood gas is measured and information provided, followed by therapy assessment (e.g. bronchodilator or oxygen assessment, etc).
c. Existing patients with conventional treatments (eg. inhaled drugs) to be re-assessed for other treatments (oxygen, NIV, nebulisers, etc)
d. All other existing patients

Patient grouping for adult sleep physiology services
a. Urgent patients including those with severe excessive daytime sleepiness who drive for a living or are having severe family/work problems because of sleepiness
b. New patients with sleep-breathing difficulty ● Referred to respiratory physiology service for "assess and treat" pathway with quality practice assessments ● Referred to sleep apnoea service for "assess and treat" pathway with quality practice assessments ● Referred to sleep apnoea centre for a two stage pathway with an assessment appointment when overnight oximetry (or similar) and Epworth Score is measured and information provided, followed by therapy assessment (e.g. CPAP, nasal surgery, etc).
c. Existing patients with conventional treatments (eg. CPAP) to be re-assessed for other treatments (e.g. additional oxygen, NIV, weight loss, etc)
d. All other existing patients

Adopting "*Lean*" processes

72 There are advantages in the use of "Lean" process methodology. Lean is an approach to improve flow and eliminate waste that was developed by Toyota. "Lean" is about getting the right things to the right place, at the right time, in the right quantities, while minimising waste and being flexible and open to change. Service model improvement stems from adopting a lean system design approach and fully using the resources that are available in respiratory and sleep physiology departments. A major way to achieve improved use of resources is to undertake a local process mapping exercise[48]. This could lead to improved workflow, better understanding and use of patient management systems and greater efficiency of all staff, with better team working[49].

73 Many NHS respiratory and sleep physiology services have made significant changes to their delivery models as a result of lean thinking. These changes are detailed in Appendix 1. The concept of shared pathways leading to "networks" for patients with specific disorders means that local cooperation can speed up the access to appropriate diagnostic and therapeutic services. The areas merge and overlap and have no fixed boundaries.

48 Several development sites have undertaken this exercise
49 http://www.institute.nhs.uk/ServiceTransformation/Lean+Thinking/

Technology

74 Embracing the benefits of new technology has been highlighted by the Government as critically important in delivering services for 21st century healthcare as highlighted by the Health Industries Taskforce[50]. This applies equally to respiratory and sleep physiology where innovations in current and emerging technology that support the assessment and treatment of breathing difficulty mean that services need to constantly evolve and reap the benefits of new technology.

75 Guidance is available from NHS Purchasing and Supply Agency (PASA) Centre for Evidence-based Purchasing (CEP) for the purchase of physiological measurement and diagnostic equipment. Specifically CEP are producing a buyers guide to spirometers, which covers all of the things to consider when choosing which spirometer to buy or use including operational considerations, performance, economic and purchasing information. The guide includes comparative tables on all of the products currently on the market. It will be available to download from the CEP website in early 2009[51].

76 General manufacturer's information is also published annually in the European Respiratory Society Buyers Guide which gives up to date information on diagnostic and therapeutic respiratory equipment[52].

77 Challenges faced within organisations include the need to break with tradition/ culture and apply a way of working that continues to look for a better way to deliver services to patients. This means keeping abreast of changing technology, not only for its potential to transform patient care but also for the opportunities and challenges it raises for workforce development. The use of digital technologies (e.g. Personal Digital Assistants (PDA)) can be used to improve the running of or access to testing services. Associated with the introduction of all new technology is the need for standards and protocols for tests and reporting to ensure that high quality and safe services are provided for patients. Specifications for respiratory and sleep services will be published in the near future on the 18 weeks website.

78 Information is provided in figure 18 on a number of very new technological developments and whilst these may not constitute a major part of the current solution to respiratory and sleep physiology services, providers and commissioners are encouraged to keep

50 DH Strategic Implementation Group, Health Industries Taskforce 'Innovation for health: making a difference'
51 More information can be found at: http://www.pasa.nhs.uk/cep
52 More information can be found at: http://dev.ersnet.org/129-buyers-guide.htm

Figure 18: A summary table showing the impact of new technology on respiratory and sleep diagnostic dervices.

Technology	Description	Potential impact
Respiratory physiology		
Portable blood gas machines*	Enable blood gases measured by trained staff across healthcare settings	Expensive consumables (£7/sample) compared to hospital based services but allows portable service closer to the patient
Forced oscillometers*	Can detect severe airways disease without forced maximal manoeuvres	Technology currently expensive at not very portable and reference values poor
LTOT software	Enables efficient use of staff time and allows single follow-up of clinics	Already available and relatively cheap
Personalised respiratory monitors	Enable patients to self-monitor and operate a "traffic light" approach to disease management	Already available and relatively cheap. Need clinical validation
Electronic departmental administration system	Enables automatic, requesting, results and activity data generation as well as appointments and department administration of resources	Already available and relatively cheap. Can link to Lorenzo/PAS. Modular delivery enables spread of costs over several years
Results databases	Data can be held in a common website repository and accessed by patients, and across healthcare settings	Need to consider simple solutions like final reports as "PDF" files so that can be sent in email or viewed on website
Spirometers with "fool-proof" quality control software*	Will enable screening in primary care and on the "High St" with more reliability. When coupled with "expert review" could revolutionise the quality and reliability of primary care spirometry	Trained operators will still need to acquire technical standards to achieve reliable test results in primary care. Early attempts show promise
Ultrasonic pneumography*	May enable measurement of gas exchange function in primary care. They are portable, maintenance free systems that allow accessible lung function. Point of Care Testing, bedside and other ambulatory applications; outside the confinement of the lung function department	Very new development which has the potential to revolutionise testing. Operators will still require training standards and protocol, but the potential to test in primary care is more realistic
Measurement of wheezes*	Enables the detection of early obstructive lung disease from tidal breathing using acoustic signal acquisition and processing with advanced signal processing techniques. Acoustic markers such as wheezes, rhonchi and cough are recorded using propriety lung-sound sensors	Primary care needs a simple "screener" to detect airways obstruction when suspicion of COPD is moderate/high. Potential to revolutionise primary care spirometry testing
Sleep physiology		
Sleep apnoea screeners*	Can detect sleep apnoea by monitoring a respiratory signal and an arousal signal, but still requires accurate interpretation	Already available and relatively cheap (<£400)

* Many of these devices have been clinically validated

Technology	Description	Potential impact
Auto-titrating CPAP machines	Can be used to establish CPAP pressure, removing requirement for overnight stay in hospital for CPAP titration	Widely available and may become entry level CPAP within a few years if found to be cost effective
Portable multi-channel sleep screeners*	Can detect sleep apnoea and other sleep disorders with home studies by monitor multiple signals, but still requires accurate interpretation	Widely available and cost from about £2000
"Smart Cards" for CPAP	Enable monitoring patient compliance and settings remotely and allow change of settings without sleep centre visit	Widely available

these solutions and evidence on the benefits they can provide, under review.

79 Appropriately funded spirometry by trained competent individuals with quality assurance and infection control measures is cost-effective and beneficial to patients[53,54]. It is now wholly evident that using guidelines and providing training in spirometry is essential for an effective service that avoids duplication, misdiagnosis or inappropriate treatments.

Technology specific to treatments

80 **Use of auto-titrating CPAP machines with memory cards for monitoring treatment**. These devices can alter the amount pressure required by automatically analysing breathing and increasing or decreasing the CPAP needed. The information is stored digitally onto a memory card which can be posted from a remote location and a replacement card sent in return. The "smart card" can also alter the settings of the machine to save the patient travelling to a health centre for follow-up.

Technology specific to screening

81 **Use of 2 channel (respiratory & arousal signals) screeners** that measure airflow and oximetry or oximetry and pulse rate. By detecting the breathing events and their associated arousals it is possible to detect and quantify the presence and degree of OSA, but specialist interpretation and further studies are usually required.

82 **Use of FEV1 only screeners** in primary care to detect reduced lung function. Simple measuring devices that record the FEV1 from full inhalation and a sharp blow out for one second makes it possible to measure a screening FEV1 value for initial classification of normal or abnormal spirometry when compared with reference ranges. This may help to alleviate the

53 Spirometry: a guide to training, technique and equipment Asthma *Journal* (2002), **7 (3)**: 140-142
54 Spirometry: – training, technique and equipment. *Practice Nurse* 23rd March 2007

Case Study: Royal Devon and Exeter NHS Foundation Trust

"Increasing activity with home based CPAP"

The previous sleep study service was based around a two-bedded sleep suite, able to provide only 2 CPAP studies a week on 1 night before home-based CPAP titration was introduced. The remaining nights were used for diagnostic sleep studies.

To introduce patients to home based CPAP they take part in an afternoon master class led by a senior clinical physiologist to familiarise themselves with the CPAP ventilators and to learn how to fit their mask. Depending on the day of issue they trial the units at home over 4-6 nights. Patients then return for a one to one session with the clinical physiologist to allow data download and analysis, which allows calculation of a suitable CPAP pressure facilitating issue of their personal fixed pressure CPAP unit on the same day.

The introduction of two 4-patient master classes per week with home based CPAP auto titration and keeping the existing one night slot in the sleep suite meant that the number of studies increased from 2 to 10 per week and ultimately exceeded the referral rate. This will allow the provision of master classes to reduce to one per week once historical backlogs have been cleared. The waiting times for CPAP issue have fallen from 52+ weeks in January 2006 to 7 weeks in April 2007.

difficulties of quality spirometry, which requires considerable training and expertise to be reliable. However, there will be the need to have some training, standards and protocols for staff to use even these simple devices to obtain effective results.

83 **Use of "spot-check" pulse oximeters** to screen for respiratory failure and pick up potential hypoxemia in conjunction with portable blood gas analysers (which can detect CO_2 retention and Type 2 respiratory failure). Cheap reliable spot-check oximeters enable simple screening of oxygen levels in the primary care setting with reasonable care and reliability. Using a cut-off value of <92% can give a reliable indication of abnormal blood oxygen values which can then be verified with a blood gas (arterial stab or capillary blood gas value) on a portable blood gas machine.

Workforce

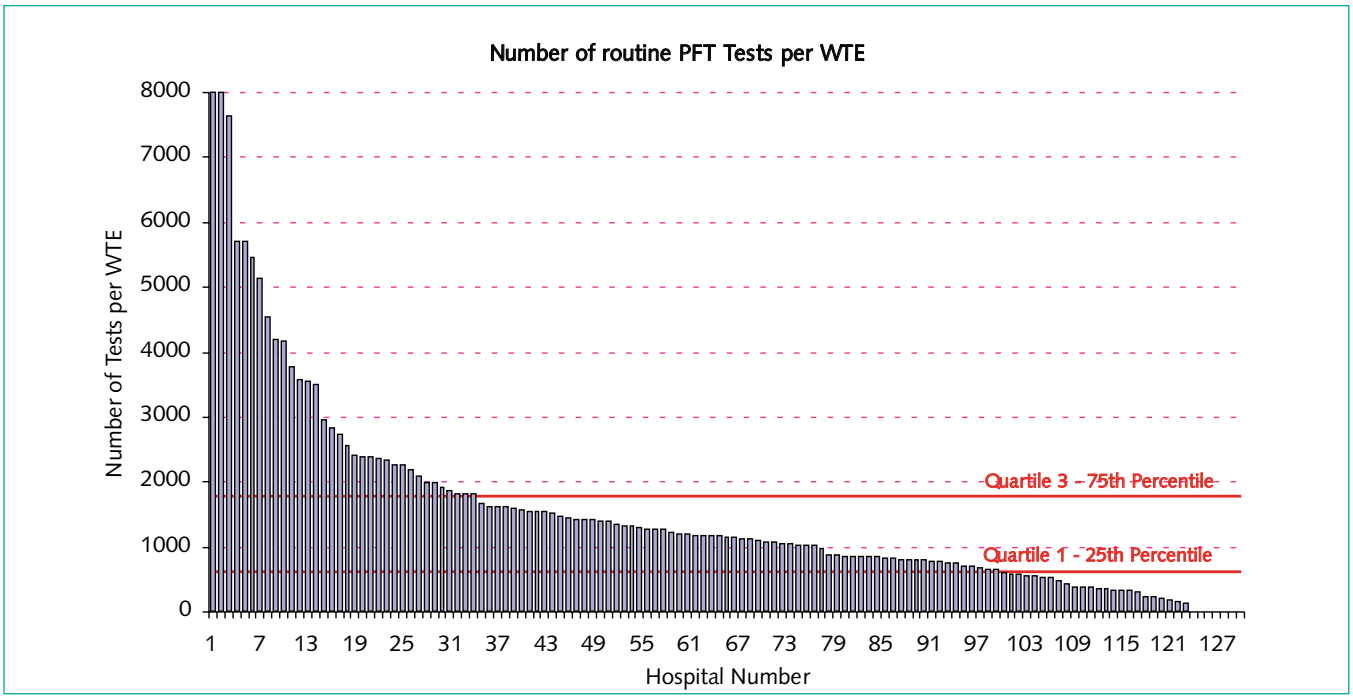
84 In every part of the NHS, the workforce is critical in implementing effective services with plans needing to be affordable and supported by significant role redesign, skill mix and productivity gains. There is a large variation in respiratory physiology and sleep physiology staffing per unit population and per unit productivity. This leads to wide ranging service models, with different levels of care for patients. Figure 19 demonstrates this by showing the number of simple Pulmonary Function Tests (PFTs) carried out by appropriate staff in 131 hospitals using information from the 2005 ARTP survey.

85 By using the same staff in a different way, it is possible increase capacity and reduce wastage. Breaking services down into components that can be delivered by non-medical staff on different Agenda for Change bands (e.g. Band 3: "meet and greet", Band 6: measurement and results, Band 8: report and oversee quality) enables better utilisation of more highly trained staff to deliver specialist services effectively. The patient experience can be more enjoyable and shorter.

Extended roles for healthcare scientists in respiratory and sleep services

86 The delivery of the complete range of respiratory and sleep services for adults and children will require a respiratory workforce spanning the whole career

Figure 19: The variation in productivity per WTE calculated by comparing the staffing available for routine PFT and the number of routine PFT tests carried out per year.



framework, inclusive of medical staff. The use of Healthcare Science Assistants and Associate Practitioners (Band 2 to 4) to offer routine issue of screeners, CPAP and consumables will release more qualified staff (Band 5-7 staff) for more complex diagnostic and therapeutic duties. This needs to be supported by appropriate education and training. Key to delivering the 18 weeks pathways however, is the introduction of an associate practitioner role, which would be recognised in both the NHS and independent sectors. The delivery may be by less qualified staff but the responsibility of quality and patient care remains with the more highly qualified staff.

87 Patient centred services in the future will require the development of generic physiology assistants who can measure a variety of basic diagnostic measurements (e.g. spirometry, electrocardiogram, phlebotomy, capillary blood gases, etc.) in a "one stop" service. This will require integrated workforce planning between diagnostic departments as well as working in teams such as a respiratory physiology team including specialist nurse, physiotherapist, healthcare scientist (respiratory physiologists) and consultant respiratory physicians performing outreach clinics in primary care for long term conditions as part of a care network (possibly managed).

88 The interpretation of respiratory and sleep physiology investigations is undertaken by physiologists, clinical scientists and physicians. Clinical scientists and physicians have an important role in putting the results within the clinical

Case Study: University Hosptials Birmingham NHS Foundation Trust

"Staff workload analysis"

A time and motion study is carried out regularly involving all staff recording every activity carried out in a standard format for a week. This has allowed calculation of the amount of time spent on their core jobs (lung function testing, sleep studies, scientific work, etc.) versus time spent on peripheral work (phoning, filing, A&C, etc.). This analysis was simply entered into a Microsoft Excel spreadsheet and using the "Pivot Table" function allows simple analysis of the time spent on each activity daily and as a weekly average.

Subsequently, its been possible to reveal inefficient fragmentation in the workday, devise better staff rotas that are more flexible. The key benefits have been an improvement in waiting times for lung function and sleep study tests and the production of staff skill tables allowing the planning of training for generic roles across physiological measurement.

context of the patient history. Physicians look at the results of examinations together with findings from other investigations and produce a management plan for the patient.

89 The introduction of new technology and of streamlining systems and processes as outlined earlier in this document, together with new models of care, provide opportunities in themselves for reprofiling of the current workforce, defining and utilising skill sets and introducing new ways of working.

90 A range of redesigned and new workforce roles have emerged at the NHS development sites to support innovative solutions to the long waits for respiratory and sleep physiology services. These are summarised below and related to the new pathway outlined at the beginning of this document. They do not cover the pathway as a whole but demonstrate a function and competence based approach to achieving the aim of utilising skill mix to meet the pathway requirements. They represent a combination of expanding the roles of the current workforce, new administrative roles and a potential new role to support the new model of care.

91 The table in figure 20 illustrates that significant workforce transformation can be achieved within current respiratory and sleep services. There is potential for greater efficiencies, with skills and competences required to deliver service outputs being more closely matched to the healthcare scientist career framework[55] level descriptors. The NHS development sites have highlighted the importance of administrative duties of respiratory staff being kept at a minimum. Efficiency of respiratory physiologists was greatly improved when highly skilled and

Case Study: University Hosptials Birmingham NHS Foundation Trust

"Captains and Teams"

Leading on from the "Staff workload analysis" above, it was possible to devise a staff rota that increased flexibility allowing scientific staff to be more effectively used and to empower mid-grade staff to better utilise their knowledge and experience. This was primarily achieved by a Band 6 clinical physiologist acting as a "Captain", encouraging the Team to support one another and ensuring that the team of 5 physiologists see patients efficiently by keeping their waiting to a minimum. The Captain takes responsibility for sorting out the workload if any one is on leave; marshals work if patients are late or take a long time to test and help to "fill gaps" by working flexibly where required.

55 www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4123204

Figure 20: A table showing the impact of extended roles in respiratory and sleep services.

Pathway stage	Role	Impact	Site where it was developed
Sleep Apnoea Referral	Expanded role of Respiratory Physiologist	● extension of the scientist role ● an increase in the number of patient appointments ● less time for physicians spent on follow-up clinics	UHB
Improved scheduling to most appropriate list using PRISM	Office Manager/ Administration Co-ordinator	● efficient and consistent administrative hub ● all telephone calls handled in one place ● repetition of administrative tasks reduced ● efficiently equitably managed waiting list ● activity reports quality and consistency has improved	UHB Royal Free Hampstead
Telephone follow up	Expanded role of secretarial and administrative staff in potential follow up	● reduced the number of clinic appointment slots available for follow-up by 120 a month ● corresponding gain of 15 hours of clinic time a week for a qualified physiologist ● this capacity has been reinvested into breathing and sleep assessment and treatment slots and is helping to drive down waiting lists	UHB

competent administrative or clerical staff who are trained to understand the patient flow, scheduling and listing of patients and waiting list management were introduced into departments.

92 In common with making services more lean by process mapping and redesign, is the need to undertake a similar process for workforce redesign and profiling by mapping the functions that need to be undertaken and then identifying the skills and competences required to undertake the task/s and defining the supporting education, training and assessment needs. This can be done locally, and has been undertaken in part by some of the NHS development sites. Work in both the 18 weeks pathways for *obstructive lung disease* and *sleep disorders* will be undertaken nationally in the near future to define the requirements for both the medical and non medical workforce to support the local commissioning and delivery of these services.

93 The opportunities for the roles outlined above to be nationally transferable and defined to support local implementation will be explored. Work will continue on the definition of the associate practitioner role to undertake routine adult breathing/ sleep assessment and treatment, which would support both the NHS and independent sector requirements. The workforce capacity in this high volume

task area could be increased relatively quickly, affordably and safely through the new models of education and training provision. Within the NHS such a role would exist within a team comprising of a range of different professionals and roles undertaking the breadth of breathing difficulties and balance cases, including for patients with breathing more complex needs.

94 Further work through the Modernising Scientific Careers (MSC) programme will help to clarify new training and career pathways for the future healthcare science workforce and will build on some of this earlier work. Currently proposals to significantly change the way the whole of the healthcare science workforce is trained, and its overall career structure are out to consultation[56].

Leadership

95 There is strong evidence from the organisations cited in this document that one of the biggest success factors is due to inspirational leadership and a 'can-do' attitude. To achieve major change in workforce transformation and system redesign, strong clinical and managerial leadership is essential.

96 Clinicians and managers play a key role in discussing how the service can be provided and how new innovations can be incorporated. It is important that all providers are involved in discussions relating to future provision.

97 Senior departmental staff have an opportunity to shape the local agenda by contributing to respiratory physiology and sleep diagnostic groups to share good practice and agree locally negotiated solutions to current and future challenges.

98 To achieve the major change in workforce transformation strong clinical leadership is essential. A variety of leadership models are being developed and these include:

- ARTP Regional Groups Leadership Training.
- ARTP Mentoring programme for Heads of Department within the profession and within each Trust from other scientists.
- ARTP Working Groups documents present the guidelines and evidence for Heads of Service and Trust management to establish effective and modernised lung function facilities in primary, secondary care and the independent sector.
- Re-modelling of lung function department staff along the UHB "Captain and Team" model (see

56 For more details see: www.dh.gov.uk/CSO

previous case study) where people leading the team on a particular day may not be the most senior member of staff.

- Consideration of teams covering several areas of physiological measurement (see case study below) including respiratory, cardiology, neurophysiology enabling a more flexible workforce.

99 In addition, the NHS Institute for Innovation and Improvement has developed a Leadership Qualities Framework[57] (LQF) which provides a context within which leadership development for healthcare professionals can be placed. In conjunction with the Academy of Medical Royal Colleges (AoMRC), the Medical Leadership Competency Framework has been developed based on this LQF. It is anticipated that this will form a robust basis for leadership development of the healthcare science workforce both now and in the future and provide an integrated approach with medical staff.

100 To deliver the vision outlined in this document requires all staff working in respiratory and sleep services to come together with healthcare professionals from primary and community care in a network based approach to provide leadership, expertise and advice on the achievement of integrated care across all levels of local provision for patient benefit.

Case Study: University Hosptials Birmingham NHS Foundation Trust

"Generic Band 4 Physiologists"

A training schedule has been designed to enable staff to train as Assistant Physiologists with education to Diploma level and based around competences in several areas of physiological measurement.

A possible model includes workers who can perform and ECG, spirometry, take capillary blood, measure blood pressure, take venous bloods and set up an EEG test. They would gain the appropriate modular professional national physiological qualifications (ARTP Part 1, ACST Part 1, ETPA Part 1) as well as phlebotomy and other skills.

Discussions are continuing with HEIs and professional bodies over how these qualifications can be delivered.

57 For more details see: http://www.nhsleadershipqualities.nhs.uk/ and www.institute.nhs.uk/mlcf

Supporting commissioners and providers

101 Respiratory and sleep physiology services can be provided and supported through a variety of models in addition to the current secondary care based service. This includes services in the community, for example outreach sessions by respiratory physiologists from the local hospital, and independent sector providers.

102 Respiratory and sleep physiology services should be commissioned to provide patients with services that are responsive to their needs and that empower patients to be good partners in achieving those needs. Critical to this is ensuring appropriate referral criteria are used and are uniformly implemented across the main referral streams.

103 As part of World Class Commissioning[58], all current and potential providers of respiratory and sleep services (both NHS and independent sector) should be consulted in relation to adoption of the suggested referral criteria and new pathways outlined in this document.

104 In sustaining 18 weeks, commissioners play a key role in shifting the focus to pathways of care and in ensuring commissioned services are effective, high quality and appropriately resourced. This creates an environment that it is receptive to positive change by ensuring:

- A patient-centred and outcome-based local approach to commissioning.
- Strong and non-adversarial relationships between key stakeholders.
- Trust.
- Transparency.
- A willingness to manage risk and learn.
- Constant review of delivery.
- Shared problem solving and risk management.
- A commitment to changes in financial flows (tariff unbundling).

105 Work is ongoing with NHS West Midlands to unbundle the payment by results tariff for appropriate respiratory and sleep services. Practice Based Commissioning together with the development of a tariff for high volume tests, either by a direct access to the hospital or providing the services in the community are key levers to demonstrate the value of respiratory and sleep services and facilitate their future development.

58 The world class commissioning programme is designed to raise ambitions for a new form of commissioning that has not yet been developed or implemented in a comprehensive way anywhere in the world. World class commissioning is about delivering better health and well-being for the population, improving health outcomes and reducing health inequalities. Further details on World Class Commissioning can be found at: http://www.dh.gov.uk/en/managingyourorganisation/commissioning/worldclasscommissioning/index.htm

106 Successful commissioning can drive forward the delivery of 18 weeks by ensuring the following:

- Commissioning of whole pathways and not just stages of treatment.
- Commissioning for patient outcomes focusing on quality of life and health gain. Build measures into contracts to ensure resources are improving the health and health gain of the local population.
- Utilisation of flexibilities and policy levers to commission services to ensure they are productive and meet the needs of patients.
- Development of a performance framework to allow for continuous review with providers of services and ensuring this is embedded into the contract.
- Development of a PCT and/or SHA wide network in helping to implement these pathways, spreading good practice and making best use of all available capacity and expertise.

107 Questions to ask when commissioning respiratory and sleep services include:

- Do we know that local respiratory and sleep services will provide the tests appropriate to the incidence and prevalence of relevant diseases within the local population?
- Does the service provider have a good clinical governance structure?
- How will quality assurance be carried out?
- Will there be a regular audit?
- How will the provider communicate with the referrer?
- Is there a way to ensure that the respiratory physiology or sleep test report and its interpretation follows the patient on their pathway?

108 Suggested actions for SHA/18 weeks leads include:

- Understand the demand (including unmet demand) for local services (earlier sections of this document on the "size of the challenge" can be used as a starting point).
- Know what the current gaps are in respiratory and sleep services for delivery of the NSR and for sustaining the 18 weeks wait and work to fill these gaps thereby integrating care between primary and secondary care.
- Commission education and training provision to deliver a workforce fit for the future to deliver the 18 weeks pathway and low wait planned services in a sustainable way.

109 Suggested actions for PCTs/ Commissioners:

- Understand the demand in the local population to direct the right level of service to meet those needs and use this to develop and integrated care model.
- Develop a robust quality governance framework for provision of respiratory and sleep services, including the community and independent sector.
- Put mechanisms in place to commission appropriate workforce, including robust workforce planning, for the future to deliver new models of care.
- Provide a combination of service redesign and adequate capacity for the sustainability of an 18 weeks patient pathway.

110 Commissioning pathways that are published on the 18 weeks website[59] exhibit many different elements that need to be commissioned. Particular attention needs to be given as to how the interface with ENT and other scheduled and unscheduled care is taken forward.

111 As part of the PCT commissioning cycle, all current and potential NHS providers of respiratory and sleep physiology services should be consulted in relation to adoption of the suggested referral criteria and new pathway outlined in this document and to engage in broader local implementation plans. Developing a PCT and/or SHA wide network will be useful in helping to implement this pathway and in spreading good practice and making best use of all of the available capacity, expertise and leadership within teams.

59 See the following website for details of all of the published 18 weeks commissioning pathways: http://www.18weeks.nhs.uk/Content.aspx?path=/achieve-and-sustain/Commissioning-pathways

Acknowledgements

Respiratory and Sleep Physiology Services

- Dr Martin Allen – Joint National Project Lead for Respiratory and Sleep Physiology Services
- Dr Brendan Cooper – Joint National Project Lead for Respiratory and Sleep Physiology Services
- Paul White – Independent Healthcare Consultant (Health Horizons Ltd)
- Keith Butterfield – Vice Chair, ARTP
- Alan Moore – Manufacturers Liaison Officer, ARTP
- Nigel Clayton – Manufacturers Liaison Officer, ARTP
- Prof. John Stradling – Consultant Physician (Oxford Radcliffe Trust)
- Prof. John McFarlane – Consultant Physician (University Hospitals Nottingham)
- Dr. Tony Davison – Consultant Physician (Southend University Hospital NHS Foundation Trust)
- David Long – Nurse (Taunton and Somerset NHS Trust)
- Dr. Duncan Keeley – GP (Oxfordshire)
- Dr Graham Burns – Consultant Physician (Newcastle Upon Tyne Hospitals NHS Foundation Trust)

Physiological Measurement Development Sites

- East Kent Hospitals NHS Trust
- Leeds Teaching Hospital NHS Trust
- Norfolk & Norwich University Hospital NHS Trust
- Royal Devon & Exeter NHS Foundation Trust (RDE)
- Royal Free Hampstead NHS Trust (RFH)
- Pennine Hospitals Acute Trust
- University Hospital Birmingham NHS Foundation Trust (UHB)
- University Hospital of North Staffordshire NHS Trust (UHNS)

Appendix 1: Detailed listing of Lean solutions applicable to Respiratory and Sleep Physiology Services

Lean solution	Benefits	Site	Impact on waiting times and/ or capacity
Workforce			
Develop simple Time & Motion Tool	Staff rota improved (moved to "Captain-led" teams.) Staff duties determined – training programme started to ensure staff work in a more generic/less specialist way	UHB	Increased capacity by 10-20%. More flexible working, better patient and staff satisfaction Increased capacity and more effective use of slots
Appointment of A&C2 to answer patient queries	Released physiologist time to see patients. Increased capacity and decreased waiting	RDE, UHNS	Increases physiologist's time to see patients
Use of Consultant Clinical Scientists and Principal Clinical Physiologists for Sleep Clinics	Decreases the need for medical consultant time	UHB, United Bristol Hospital, Heart of England Foundation Trust	Development of HCS led services releases medical consultant time and increase capacity and decrease waiting time
Generic Physiologists	Allows a flexible workforce between respiratory, cardiology and neurophysiology. These staff can serve primary and/or secondary care reducing waiting times and supporting "one-stop" services	UHB	(Insufficient funds obtained to trial- but outline training programme sketched out using professional body certificates of competence.) Likely to be of great benefit
PM Department across a number of PM areas at the Trust	Allows for greater flexibility of service. Generic physiologists require broader training at a basic (Band 4) level	RDE Walsall Manor	Increased flexibility should reduce waiting times and increase patient experience
Shared administration with physiological measurement depts	Accurate data recorded on PAS Increased through-put Free up time for the expansion of the blood gas service Improved use patient satisfaction survey	Royal Free Hospital	Waiting times reduced from 6 weeks to 2-3 weeks Patients arriving for lung function without referral forms has gone down from 20% to 0%
Rescheduled the workforce	Rescheduled the workforce and increase productivity, also allowing patients to have tests conducted in extended hours	UHNS	Increase in productivity

Lean solution	Benefits	Site	Impact on waiting times and/ or capacity
Lung Function			
Referral protocols for lung function tests	A referral form has been introduced with robust data entry Decrease in inappropriate referrals to the service	UHNS, RFH	Less wasted appointments on inappropriate tests Increased patient throughput
Extended hours of opening and workforce roles	Now open from 08.00 until 18.00 for early morning and early evening appointments Staff working hours have been changed so they are fulfilled over a 4 day week	UHNS, UHB	Increased the number of investigating sessions available by 6. Now see an extra 12 patients each week
Clinical physiologists providing community based spirometry & training	Improved spirometry quality (ARTP/ BTS standard) Raised Primary Care staff awareness Invalid results minimised Better diagnosis Patients are treated nearer to home	UHNS, RFH, UHB	Less duplication of spirometry – overall increased capacity
IT Solutions			
Develop Departmental IT System	Phase 1: Networked major lung function testing kit Requests linked to EPR Phase 2: Purchase and installation of commercial digital administration system (PRISM) linked to Lorenzo System	UHB UHNS UHB	Move towards electronic patient record. Results standardised, less manual data entry by scientific staff Ready for Connecting for Health, Results widely available, lees manual entry and duplication Expected capacity increase
Developed own code for waiting list/activity data (Excel)	Reduced staff time chasing up appointments and activity data. Waiting list pivots enable 18 weeks targets hit	RDE	Increased capacity – more staff available to see patients
Designed bar code stock control for CPAP (Paradox)	Semi-automated stock control allows feed up staff time and increased capacity	RDE	Increased capacity – more staff available to see patients
Clinical management database linked to CPAP database	Allows automated stock control	RDE, UHNS, UHB	Increased capacity – more staff available to see patients

Lean solution	Benefits	Site	Impact on waiting times and/ or capacity
Extend working day	Extra capacity with no extra staff or accommodation costs	Leeds Teaching Hospital NHS Trust, UHNS	20-25% extra capacity using same infrastructure
Sleep			
Multi-patient sleep diagnostic sessions	Increased capacity and workflow	UHB RDE	150% capacity increase Reduced waits from 100 days to <21days Increased capacity by 500%. Waiting time from 52 to 3 weeks
Reduce CPAP annual recall	Manufacturer's claim technology such that no need for annual electrical safety checks	UHB, Churchill Hospital, Oxford; RDE	Increased capacity by decreasing number of follow-up appointments
CPAP Titration/Issue Appointments	3 patient visits instead of 5	UHB	Increased capacity by abolishing "patient issue" appointments
Revision of waiting list		UHB	Decreased waiting times by 5-10%
Screening Referral Protocols for sleep studies	A screening referral form has been introduced with robust data entry and audit Decrease in inappropriate referrals to the service	UHNS,	234 (19.6%) of sleep referrals rejected as inappropriate Increased capacity for true "sleep apnoea" and not "snorers"
CPAP Trial reduction from 4 to 2 weeks	increased capacity and workflow	UHB, UHNS	Enabled time to download oximeters after MPS
Introduced home CPAP auto titration studies	Increased capacity and workflow	RDE	Increased capacity by 100% to 500%
Ability to recharge PCT form CPAP issue	Decreased waiting times	UHB	Abolished "patient issue" visits – increasing capacity and decreasing waits
Home sleep and titration studies	Increases throughput of patients for both diagnostics and treatment monitoring	UHB, RDE	Increased capacity from 5 studies per week to >25 Increased capacity 5 times
Sleep screeners in GP practices	Suspected severe OSA patients can have "one-stop" screening in primary care	Various NHS and IS trials under way	In development, but likely to speed up pathways

Lean solution	Benefits	Site	Impact on waiting times and/ or capacity
New Models			
GP Diagnostic Support	Partnership of hospital, PCT, manufacturers and IT to streamline diagnostics by developing a locally based diagnostic investigations within in primary care setting	Leeds Teaching Hospitals	First pilot site running Second pilot site ready to start. Arrhythmia nurses in post and equipment and IT support issues PBC Business Case being developed Trust workforce redesign
Referral Criteria	Robust referral criteria needs to be developed, along with its impact and validation	UHNS, RFH	Faster throughput of diagnostic tests

© Crown copyright 2009

292924 1P 750 Feb 09
Produced by COI for the Department of Health

If you require further copies of this title visit
www.orderline.dh.gov.uk and quote:
292924/Respiratory and Sleep Services or write to:
DH Publications Orderline
PO Box 777
London SE1 6XH
E-mail: dh@prolog.uk.com

Tel: 0300 123 1002
Fax: 01623 724 524
Minicom: 0300 123 1003 (8am to 6pm, Monday to Friday)

www.dh.gov.uk/publications

recycle
When you have finished with this please recycle it

50% recycled
This is printed on 50% recycled paper