

Putting NICE guidance into practice

Resource impact report: Obstructive sleep apnoea hypopnoea syndrome and obesity hypoventilation syndrome in over 16s (NG202)

Published: August 2021

Summary

This report focuses on the recommendations from NICE's guideline on [sleep apnoea](#) that we think will have the greatest resource impact nationally (for England), which will need the most additional resources to implement or potentially generate the biggest savings.

The recommendations below on different diagnostic tests and treatment would not in themselves lead to a significant resource impact.

Publication of the guideline, and the recommendations in sections 1.1 and 1.2, aims to raise awareness of symptoms and conditions associated with sleep disorders. This could lead to more people being referred to sleep services, receiving a sleep test and possibly treatment. This will lead to the following recommendations having a resource impact:

- Offer home respiratory polygraphy to people with suspected obstructive sleep apnoea/hypopnoea syndrome (OSAHS) (recommendation 1.3.1)

Recommendations also discussed in the resource impact that could have a significant resource impact and need to be assessed locally, are:

- For people with mild OSAHS - offer fixed-level continuous positive airway pressure (CPAP) (recommendation 1.5.2)
- Consider auto-CPAP as an alternative to fixed-level CPAP in people with mild OSAHS (recommendation 1.5.4)
- Consider a customised or semi-customised mandibular advancement (CMA) splint as an alternative to CPAP in people with mild OSAHS (recommendation 1.5.7)
- Consider referral for assessment for oropharyngeal surgery in people with severe OSAHS who have been unable to tolerate CPAP and a customised mandibular advancement splint despite medically supervised attempts (recommendation 1.7.4).

Financial impact

Resource impact report: Obstructive sleep apnoea hypopnoea syndrome and obesity hypoventilation syndrome in over 16s (August 2021) 2 of 18

This report is supported by a local [resource impact template](#). We encourage organisations to evaluate their own practices against the recommendations in the NICE guideline and assess costs and savings locally.

Around 666,000 people present to healthcare services each year with symptomatic sleep apnoea. Of these, the number of people referred to sleep services and who have a sleep test each year is currently around 121,000 (18%) (see table 1 below).

It is not anticipated that the guidance will result in an increase to the number of people presenting to healthcare services each year. The resource impact model currently does not account for any increase in the prevalence of sleep apnoea.

It is assumed implementing the recommendations in sections 1.1 and 1.2 of the guidance will drive additional referrals for sleep tests for people with mild OSAHS. This is because people with mild OSAHS are currently less likely to be referred and diagnosed.

The impact the guidance will have on identifying and referring more people with mild OSAHS for a sleep test is challenging to estimate. The resource impact considers the impact of 3 different scenarios: 2%, 5% and 10% increase in annual referrals for the number of people with mild sleep apnoea, and what this means in terms of activity and cost of diagnostic testing and treatment.

Further analysis of the scenarios for 2% and 10% are in Appendix A. The 5% estimate is used for illustrative purposes in this report. Table 1 below summarises the estimated activity for each scenario.

Table 1 Estimated number of people with OSAHS being referred, tested and treated using standard NICE assumptions for population of England

	Current practice	2% increase	5% increase	10% increase
Proportion of people presenting who are referred for a sleep test	18%	20%	23%	28%
Number of people referred and having a sleep test per year	121,000	134,000	154,000	187,000
Number of diagnostic tests each year (including repeat tests)	173,000	176,000	202,500	246,000
Number of people having CPAP each year (see appendix table A4)	3,600	4,000	4,600	5,600
Note: The figures above show estimates for all people with OSAHS being referred, tested and treated. The increase to these figures for each scenario is anticipated to relate to mild OSAHS only.				

Organisations can input estimates into the local resource impact template to reflect local practice and estimate the impact of implementing the guideline.

Services are commissioned by integrated care systems / clinical commissioning groups. Providers are NHS hospital trusts.

1 Introduction

- 1.1 The guideline offers evidence-based advice on OSAHS.
- 1.2 This report discusses the resource impact of implementing our guideline on 'Obstructive sleep apnoea/hypopnoea syndrome and obesity hypoventilation syndrome in over 16s in England'. It aims to help organisations plan for the financial implications of implementing the NICE guideline.
- 1.3 We encourage organisations to evaluate their own practices against the recommendations in the NICE guideline and assess costs and savings locally. Organisations can input estimates into the local resource impact template to reflect local practice and estimate the impact of implementing the guideline. The impact of additional referrals for sleep assessments for the mild population presenting with symptoms each year and the impact on treatments for people who have mild OSAHs (where practice is identified as variable) can be assessed.
- 1.4 Services are commissioned by integrated care systems / clinical commissioning groups. Providers are NHS hospital trusts.

2 Background

- 2.1 The prevalence of OSAHS in males aged 16 to 34 is estimated to be 3%, this increases to 13% in males aged 35 and over when linked to obesity. For females, the prevalence is estimated to be 2%, this increases to 6% in those aged 35 and over when linked to obesity ([Research in Obstructive Sleep Apnoea \(OSA\) \(sleep-apnoea-trust.org\)](https://www.sleep-apnoea-trust.org)). This gives a total number of people in England who have OSAHS of around 3.3 million.
- 2.2 The availability of services for investigation and management is variable. The guideline (particularly recommendations in sections 1.1 and 1.2) aims to raise awareness of symptoms and associated

conditions that are expected to lead to an increase in suspected OSAHS, as well as prompting assessment. This could increase the number of people with mild OSAHS (who are currently less likely to be referred) being assessed and referred to sleep services.

3 Recommendations with potential resource impact resulting from increase in referrals due to recommendations [1.1 and 1.2](#)

Diagnostic tests for OSAHS [\[recommendations 1.3.1 - 1.3.5\]](#)

3.1 Offer home respiratory polygraphy to people with suspected obstructive sleep apnoea/hypopnoea syndrome (OSAHS) [\[recommendation 1.3.1\]](#)

Background

3.1.1 The guideline states current practice is variable, with some sleep services offering oximetry as the first-line test and others offering home respiratory polygraphy. Reducing this variation will mean some services need to provide more home respiratory equipment and less home oximetry; this should lead to fewer repeat tests and optimal treatment.

Assumptions made

3.1.2 It is assumed implementing the recommendations in sections 1.1 and 1.2 of the guidance will drive additional referrals for sleep tests for people with mild OSAHS. This is because people with mild OSAHS are currently less likely to be referred and diagnosed.

3.1.3 Applying the prevalence estimates (see 2.1 above), 3.3 million people are estimated to have OSAHS. The table below shows assumptions made for people having a sleep test each year.

Table 2: Estimated number of people currently having a sleep test each year.

Population	Proportion %	Number of people
Total number of people who have OSAHS ¹		3,332,000
People presenting with symptomatic sleep apnoea each year ²	20	666,000
People currently referred and who have a sleep test each year ³ <u>Of whom:</u>	18	120,800
People having a sleep test at a hospital sleep service ⁴	13	16,000
People having a sleep test at home ⁵ <u>Of whom:</u>	87	104,800
People having home respiratory polygraphy ⁶	50	52,400
People having home oximetry ⁶	50	52,400
Notes:		
1) See paragraph 2.1.		
2) OSA Toolkit 2015 BLF 0.pdf		
3) Diagnostic Waiting Times and Activity Report (england.nhs.uk) .		
4) 13% of people currently have a sleep test at a hospital sleep service Hospital Admitted Patient Care Activity 2019-20 - NHS Digital , [activity code A84.7 admitted patient care n= 8,356 + outpatient n=7,559, total 16,000 people)		
5) 87% currently have a sleep test at home (121,000 – 16,000 = approx.105,000 people)		
6) Mid-point of clinical expert opinion suggests 50% have home respiratory polygraphy and 50% have home oximetry.		

3.1.4 For simplicity, it is assumed the prevalence of OSAHS remains at current levels over 5 years. This may increase over time. The template can be amended for local variations and estimates.

3.1.5 In future practice 90% of people are assumed to have a sleep test at home and 10% have a sleep test in a hospital setting. This represents a small decrease in the proportion currently having a sleep test in hospital, with current levels of hospital tests at approximately 13%.

3.1.6 In future practice an estimated 65% will have home respiratory polygraphy (RP) and 35% have home oximetry. Evidence supporting the guidance showed home RP has greater sensitivity and there are fewer repeat tests. For suspected mild OSAHS, this

could increase uptake of home respiratory polygraphy (RP) in line with recommendation 1.3.1.

- 3.1.7 One repeat test per person per year is assumed for people having home oximetry.

Test costs

- 3.1.8 The table below identifies different sleep test costs currently in use for diagnosing OSAHS. Users can input their own estimates for current and future use of each type of test.

Table 3: Sleep tests included in the template.

Description	Rec.	Reference cost 2019/20 / Health Economics (£)
Home respiratory polygraphy (DZ50Z)	1.3.1	189
Home oximetry (cost per health economics)	1.3.2	34
Inpatient polysomnography (DZ50Z) – regular day or night admissions	1.3.3 & 1.3.5	809
Inpatient respiratory polygraphy (DZ50Z) – elective inpatient	1.3.4	699

Costs

- 3.1.9 All the assumptions made are illustrative and can be amended by users locally.
- 3.1.10 The net activity and cost of recommendation 1.3.1 is summarised in tables 4 and 5 below using the 5% for an estimated increase in people referred for sleep studies.
- 3.1.11 Recommendations [1.3.1 to 1.3.5](#) all relate to options for sleep tests; therefore, the resource impact below includes the impact recommendation 1.3.1 may have on the usage of other options.

Table 4 Illustrative additional number of people having sleep studies by 2025/26 (year 5) and change in testing costs

5% increase in mild cases referred and having a sleep test	Unit cost of test £	Current number of people	Future number of people (2025/26)	Change in number of people / tests	Current Cost (£000)	Future Cost 2025/26 (£000)	Change in costs (£000)
Number of people referred and having a sleep test per year (not including repeat tests)		120,700	154,000	33,300	£25,500	£32,000	£6,500
- People having a sleep test at home (current 87%; future 90%)		104,800	138,600	33,800	£13,500	£20,400	£6,900
-People having a sleep test at a hospital sleep centre (current 13%; future 10%)		15,900	15,400	-500	£12,000	£11,600	£-400
Types of test							
People having home respiratory polygraphy tests (current 50%; future 65%) [rec. 1.3.1]	189	52,400	90,100	37,700	£9,900	£17,000	7,100
People having hospital respiratory polygraphy tests [rec. 1.3.4]	699	7,900	7,700	-200	£5,600	£5,400	£-200
People having hospital polysomnography [rec 1.3.3& 1.3.5]	809	7,900	7,700	-200	£6,400	£6,200	£-200
Number of home oximetry tests (current 50%; future 35%) [rec. 1.3.2]	34	52,400	48,500	-3,900	£1,800	£1,700	£-100
Number of repeat home oximetry tests	34	52,400	48,500	-3,900	£1,800	£1,700	£-100
Total resource impact (provider)		173,000	202,500	29,500	£25,500	£32,000	£6,500
<p>Note: For a 2% increase in referrals for sleep tests in people with mild OSAHS, the number of tests in 2021/22 is estimated to increase by 3,000 additional tests per year from 2025/26. For a 10% increase in referrals, the change is an increase of 73,000 more tests from year 2025/26. See Appendix A sensitivity analysis.</p>							

- 3.1.12 The change in activity and illustrative resource impact for each type of diagnostic test over 5 years can be seen in the resource impact template (resource impact over time sheet - columns n to w).
- 3.1.13 From table 4 above a 5% increase in cases referred and having a sleep test (which is anticipated to be for mild OSAHS only) would be around a 30% change in the number of sleep studies carried out per year using approx.121,000 as a baseline for the current number of sleep studies (see table 1 above).
- 3.1.14 The sensitivity analysis (Appendix A -table A3) provides further detail on the impact of each scenario per 100,000 population.

Benefits and savings

- 3.1.15 Implementing recommendation 1.3.1 should lead to fewer repeat tests. This will have capacity benefits for provider services and should lead to optimal treatment.
- 3.1.16 Improvements in diagnosis and treatment for mild OSA may prevent downstream NHS costs. OSA is an independent risk factor for coronary heart disease, type 2 diabetes and diabetic kidney disease [[S. Strausz et. al 2018](#)].

4 Other recommendations with a potential resource impact

Treatment for mild OSAHS

- 4.1 For people with mild OSAHS who have symptoms that affect their quality of life and usual daytime activities, offer fixed-level continuous positive airway pressure (CPAP) (subject to specific criteria - see recommendation 1.2.1) (recommendation 1.5.2)**

- 4.2 Consider auto-CPAP as an alternative to fixed-level CPAP in people with mild OSAHS who:**
- need high pressure only for certain times during sleep or
 - are unable to tolerate fixed-level CPAP or
 - are unable to use telemonitoring for technological reasons.
- or
- auto-CPAP is available at the same or lower cost than fixed-level CPAP, and this price is guaranteed for an extended period of time (recommendation 1.5.4)
- 4.2.1 The guideline committee anticipate an increased uptake of CPAP for people with mild OSAHS, especially as the estimate of overall prevalence of OSAHS has increased, and more people with mild OSAHS are expected to be referred and diagnosed. However CPAP is often not well tolerated or the preferred option [British Lung Foundation 2014](#), therefore the resource impact template assumes increased uptake of CPAP for mild OSAHS is from increased referral and diagnosis and not a change in preferences or tolerability of CPAP.
- 4.2.2 The template allows users to estimate the cost of CPAP for their locality. Some assumptions based on clinical opinion are given as a starting point. Due to the variable nature of meeting the recommendation criteria and provider preferences - based on patient comfort and suitability of CPAP devices, it is recommended users review and amend the assumptions locally.
- 4.2.3 The unit costs of CPAP included in the health economics analysis are given in Appendix B. Illustrative costs of CPAP using template assumptions are included in the sensitivity analysis.
- 4.3 Consider a customised or semi customised mandibular advancement (CMA) splint as an alternative to CPAP in people with mild OSAHS who have symptoms that affect their usual**

daytime activities (subject to recommendation criteria – see recommendation 1.5.7).

4.3.1 Clinical experts from the guideline committee identified that NHS services for customised oral devices are very limited and not routinely funded, with an estimated 2-5% of people receiving this treatment through NHS dental services. The resource impact template allows users to estimate the resource impact of more bespoke options for their locality.

4.4 Consider referral for assessment for oropharyngeal surgery in people with severe OSAHS who have been unable to tolerate CPAP and a customised mandibular advancement splint despite medically supervised attempts (recommendation 1.7.4).

4.4.1 Clinical experts from the guideline committee identified that surgery for people with severe OSAHS (other than tonsillectomy if applicable) is rare. This is also confirmed in [Hospital Episode Statistics 2019/20](#) activity data which shows 163 oropharyngeal surgeries carried out in 2019/20 (procedure code F32.5 Uvulopalatopharyngoplasty and F32.6 Uvulopalatoplasty). Surgery is usually given after all other treatments have been tried, therefore the resource impact of this option can be assessed locally in the template.

5 Implications for commissioners and providers

5.1 OSAHS falls under programme budgeting category 11X 'Problems of the respiratory system – other'.

5.2 The potential impact of the guidance depends on how many people have a sleep test each year. It is anticipated that referrals for people with mild OSAHS will increase as a result of implementing the guidance. In the month of April 2020 there were 5,507 people waiting 6 weeks or more for a sleep test (55% of people on the waiting list), [Monthly diagnostic waiting times and activity data NHS England](#). More recent and complete monthly data for 2021 is not

currently available and results may be affected by the pandemic. The pandemic is likely to increase waiting times because of increased demand on respiratory services.

5.3 The additional cost impact of treating more people with mild OSAHS with CPAP and providing subsequent follow up may not be significant but an increased number of referrals for these services is likely to affect waiting times and capacity in clinics. For diagnostic testing, there could be a significant impact on testing capacity, as well as a significant cost impact (per section 3 above). The level of significance in terms of resource and costs will be determined by the increase in referrals rather than any change in which diagnostic tests are undertaken.

5.4 Commissioners and providers of sleep services should review local arrangements and capacity in clinics and work together to reduce waiting times. The template assumes implementation occurs evenly over 5 years considering other demand pressures in respiratory services arising from the COVID-19 pandemic. The rate of implementation can be amended locally in the template.

5.5 Commissioners are integrated care systems / clinical commissioning groups. Providers are NHS hospital trusts.

6 Sensitivity analysis

6.1 The assumption in the model for the potential increase of 5% of people with mild OSAHS who are referred and have a sleep test each year depends on a number of variables, the main being waiting times and capacity at sleep services discussed in section 5 above.

The sensitivity analysis shows the resource impact is sensitive to the number of people with mild OSAHS having a sleep test and where those sleep tests take place. Varying population prevalence and the percentage of people presenting with symptoms each year

would not have an impact because this depends on the number of people able to access a sleep test.

- 6.2** Appendix A shows a summary sensitivity analysis from the template and more detailed analysis showing the illustrative resource impact for 2%, and 10% increased referrals for people with mild OSAHS. Varying the percentage of people with mild OSAHS having a sleep test by this range of 8% gives a ratio of 0.34%, with the net resource impact varying from £3m to £15m for the 2% and 10% scenarios respectively.
- 6.3** Varying the percentage of people having a sleep test at home (with the alternative being in hospital) by 5% to a minimum of 82% and a maximum of 92% has the greatest effect. The resource impact varies between £5m and £15m respectively. This is due to a combination of factors; the difference in cost of having a sleep study at home: £189 or £34, compared to a sleep test in a hospital setting: £699 or £809 and the assumption the home test favours respiratory polygraphy in line with recommendation 1.3.1. For a smaller variation (5%), the impact on costs is greater, making this variable more sensitive.
- 6.4** The percentage increase in the current number of sleep studies performed each year (n=121,000) using the 2% scenario is around a 10% change; at the 10% scenario the increase is around a 55% change. This results in a resource impact of £3m and £15m respectively.
- 6.5** In the scenarios for a 2% and 5% increase in mild OSAHS referrals there are expected to be resources released from not performing other diagnostic tests such as oximetry, actigraphy and having repeat oximetry tests. However, as the number of people referred increases, the overall number of tests increase beyond the point of any activity gains, therefore in the 10% scenario there is an additional cost (see sensitivity analysis table A2 below).

Appendix A. Results of sensitivity analysis - resource impact template

Sensitivity analysis resource impact - population of England

Individual variable sensitivity				Recurrent resource impact	Recurrent resource impact	Recurrent resource impact		
	Baseline value	Minimum value	Maximum value	Baseline resource impact (£000s)	Minimum resource impact (£000s)	Maximum resource impact (£000s)	Change (£000s)	Sensitivity ratio
People with mild OSAHS who are referred and have a sleep study each year	18.11%	20.11%	28.11%	7,101	2,590	14,619	12,029	0.34
People having a sleep study at a hospital sleep centre	13.15%	8.15%	18.15%	7,101	5,369	14,727	9,358	0.15
People having a sleep study at home	86.85%	81.85%	91.85%	7,101	14,727	5,369	-9,358	1.00

Sensitivity analysis for sleep study appointments - population of England

Individual variable sensitivity				Recurrent resource impact	Recurrent resource impact	Recurrent resource impact		
	Baseline value	Minimum value	Maximum value	Baseline number of appointments (including repeat tests)	Minimum appointments activity	Maximum appointments activity	Change (£000s)	Sensitivity ratio
People with mild OSAHS who are referred and have a sleep study each year	18.11%	20.11%	28.11%	173,000	176,000	246,000	70,000	0.66
People having a sleep study at a hospital sleep centre	18.11%	20.11%	28.11%	16,000	14,000	19,000	5,000	0.51
People having a sleep study at home	18.11%	20.11%	28.11%	157,000	162,000	227,000	65,000	0.68
People having home respiratory polygraphy	18.11%	20.11%	28.11%	52,400	78,000	110,000	32,000	1.00
People having home oximetry (includes repeat tests)	18.11%	20.11%	28.11%	105,000	84,000	118,000	34,000	0.53

Home respiratory polygraphy is more sensitive than other variables because the assumption is that not only will more people with be referred for sleep studes, more will offered home RP in line with rec. 1.3.1; therefore the variation from current baseline appointments is relatively larger (more than double using 10% scenario = 52,400 vs 110,000) resulting in greater sensitivity relative to other baseline appointments activity.

Table A.1 Illustrative annual costs of implementing the guideline for the population of England - 2% increase in mild cases referred.

Scenario 1: 2% increase CPAP = +400 devices; Approx. % increase in current number of sleep studies = 10%	2021/22	2022/23	2023/24	2024/25	2025/26
Implementation rate of guideline (%)	0.4	0.8	1.2	1.6	2
Home respiratory polygraphy total cost £000 [rec 1.3.1]	3,730	4,000	4,320	4,600	4,900
Resources released from other diagnostic tests / repeat tests £000	-3,590	-3,300	-3,070	-2,800	-2,560
Net resource impact – diagnostic testing £000	140	700	1,250	1,800	2,340
CPAP for mild OSAHS cost £000 (recs 1.5.2 & 1.5.4)	40	70	110	140	180
Customised mandibular advancement splint (rec 1.5.7) £000	10	20	40	50	60
Total cost for England (£000)	190	790	1,400	1,990	2,580

Table A.2 Illustrative annual costs of implementing the guideline for the population of England - 10% increase in mild cases referred.

Scenario 3: 10% increase CPAP = +2,000 devices; Approx. % increase in sleep studies = 55%.	2021/22	2022/23	2023/24	2024/25	2025/26
Implementation rate of guideline (%)	2	4	6	8	10
Home respiratory polygraphy total cost £000 [rec 1.3.1]	4,900	6,400	7,850	9,300	10,800
Resource impact of other diagnostic tests / repeat tests £000	-2,560	-1,260	30	1,300	2,600
Resource impact diagnostic testing £000	2,340	5,140	7,880	10,600	13,400
CPAP for mild OSAHS cost £000 (recs 1.5.2 & 1.5.4)	190	360	550	700	900
Customised mandibular advancement splint £000 (rec 1.5.7)	60	100	180	300	300
Total cash [cost] (£000)	2,600	5,600	8,610	11,600	14,600

Note: resources released from other diagnostic tests in this scenario result in a net cost because the change in activity is more significant and impacts all diagnostic testing, therefore the benefits of not doing other tests are not realised.

Note: CPAP and Customised mandibular advancement splints (CMAS) are included above for completeness. CMAS are not routinely funded and services offering customised oral devices are limited. Referral for surgery recommended in 1.7.4 depends on a number of variables and is usually performed after all treatments have been tried. The template allows providers to estimate costs of the above locally.

Table A.3 Illustrative resource impact of offering home respiratory polygraphy using standard NICE assumptions for population of 100,000.

Increase in mild cases referred and having a sleep test	2%	5%	10%
Increase in number of home respiratory polygraphy tests	46	67	102
Cost of delivering increased number of home respiratory polygraphy tests (£'000) Provider	9	13	19
Resource impact on other diagnostic tests (£'000) Provider	-4	-1	5
Resource impact per 100,000 (£'000)	5	12	24

Table A.4 Illustrative activity and cost of implementing recommendations 1.5.2 and 1.5.4 for the population of England

Increase in mild cases referred and having a sleep test	Current number/ £000s	2% increase	5% increase	10% increase
People having fixed-level CPAP	1,800	2,400	2,800	3,400
People having auto-CPAP	1,800	1,600	1,800	2,200
Total	3,600	4,000	4,600	5,600
Incremental number of CPAP devices		400	1,000	2,000
Cost per year (£000s) Provider	1,700	1,900	2,150	2,600
Resource impact for England (£'000)		200	450	900

Appendix B: Unit costs

Table B1: Unit costs of CPAP

CPAP	Device £	Consumables £	Re-titration £	Telemonitoring £	Total £
Fixed-level	248	120	45	45	458
Auto	357	120			477

Note: For simplicity, the above costs are assumed to apply annually although year 2 costs may be slightly lower. This is not anticipated to change the resource impact significantly; localities may amend unit costs in the template and use an average.

About this resource impact report

This resource impact report accompanies the NICE guideline on [sleep apnoea](#) and should be read in conjunction with it. Please visit the NICE website to view the [terms and conditions](#).

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