

## Joint Trust Guideline for the Use of Overnight Oximetry Studies in Children

A clinical guideline recommended for use

<b>For Use in:</b>	All ward areas with paediatric patients
<b>By:</b>	Paediatric medical and nursing staff
<b>For:</b>	All paediatric patients
<b>Key words:</b>	Oximetry, obstructive sleep apnoea, desaturations, snoring
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This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document.

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## Quick reference guideline

Sleep disordered breathing is a common and serious cause of morbidity during childhood.

Obstructive sleep apnoea syndrome (OSAS) is a potentially very serious condition if undiagnosed in children. Mild to moderate OSAS can lead to daytime somnolence, behavioural problems and sleep disturbances. If severe, OSAS can lead to pulmonary hypertension and ultimately death.

All children who are at risk of obstructive sleep apnoea for whatever cause should as a minimum have an overnight oximetry study looking for desaturations during sleep.

Children who are at increased risk of developing this condition include;

- Obese children
- Children with facial abnormalities
- Children with large tonsils and adenoids.

The request for an oximetry study can be made by any health professional if there is a history suggestive of obstructive sleep apnoea. The referral letter should be approved by one of the respiratory paediatric nurses. They will contact the parents, instruct them in the use of the pulse oximeter and issue the oximetry machine. They will download the completed study for the Respiratory paediatrician to assess. Once assessed, a report is produced and a letter sent to the referring health professional.

## Objective

To provide guidance on the referral and investigation of possible obstructive sleep apnoea in children with snoring or other causes of upper airway obstruction.

To provide a pathway of care for both children referred via ENT and those from other sources.

Furthermore, this guideline advises the action to take when a child is at risk of acute physiological deterioration.

## Rationale

Primary sleep-related pathology may directly cause daytime symptoms, and only through treatment of the sleep disorder is resolution possible. Sleep related pathology may be a co-morbid condition contributing to daytime symptomatology and through treatment of the sleep related pathology the patient can become more responsive to treatment of co-existing disorders.

There is a spectrum of obstructive sleep disordered breathing from persistent primary snoring to the frank intermittent occlusion seen in obstructive sleep apnoea syndrome. Obstructive sleep apnoea is characterised by recurrent episodes of partial or complete airway obstruction resulting in hypoxaemia, hypercapnia and/or respiratory arousal.

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The upper airway resistance syndrome is characterised by brief, repetitive respiratory effort-related arousals during sleep in the absence of overt apnoea, hypopnoea or gaseous exchange abnormalities.

Habitual snoring has been reported in 3-12% of the general paediatric population, although only 1-3% of snorers has OSAS. It is therefore important to distinguish primary snoring from more serious forms of obstruction.

Early recognition of sleep disordered breathing is important for effective treatment with adenotonsillectomy or continuous positive airway pressure.

Implementation of an obstructive sleep apnoea risk assessment tool aids identification of children at risk of physiological deterioration from this condition. It also facilitates rapid medical assessment and an increased level of monitoring if necessary.

The sleep history is the most important tool for gathering information on sleep symptoms; and BEARS (**B**edtime, **E**xcessive daytime sleepiness, **A**wakenings, **R**egularity, **S**norings) is an easy to remember mnemonic device for gathering the history.

### **Factors Associated with High Risk of Obstructive Sleep Apnoea**

#### **Neurological**

Seizure Disorders	Head injury
Cerebral Palsy	Prematurity
Hydrocephalus	Central Apnoea
Arnold Chiari malformation	Myelomeningocele
Myotonic Dystrophy	

#### **Craniofacial Abnormalities**

Micrognathia	Retrognathia
Macroglossia	maxillary Hypoplasia

#### **Anatomical Obstructions**

Excessive soft tissue of the neck	Nasal stenosis
Short neck	Choanal Atresia
Tonsillar hypertrophy	Laryngeal papillomas/tumours
Redundant oropharyngeal mucosa / long uvula	
Adenoidal hypertrophy	Subglottic stenosis
Pharyngeal flap surgery	Subglottic haemangioma
Laryngeal web / stenosis / mass	

#### **Syndrome Disorders**

Achondroplasia	Beckwith-Wiedemann
Apert's	Trachea Collins

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Down's	Stickler's
Pierre Robin	Fetal Alcohol
Prader Willi	Marfan's
Klippel-Feil	Hemifacial microsomia

### **Other diseases**

Hypothyroidism	Crouzon's disease
Goitre	Gastro-oesophageal reflux
Morbid obesity	

### **Clinical History of Obstructive Sleep Apnoea Syndrome**

#### **Symptoms occurring during sleep**

Snoring  
Witnessed apnoea  
Choking noises  
Increased work of breathing  
Paradoxical breathing  
Enuresis  
Restless sleep  
Diaphoresis  
Hyperextended neck  
Frequent awakenings  
Dry mouth

#### **Symptoms occurring during wakefulness**

Mouth breathing  
Nasal obstruction  
Poor school performance  
Aggressive behaviour  
Hyperactivity, irritability  
Attention deficit disorder, inattention  
Excessive daytime sleepiness  
Morning headaches

### **Physical Examination in Obstructive Sleep Apnoea Syndrome**

#### **General**

Sleepiness  
Obesity  
Failure to thrive / faltering growth

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### **Head**

Swollen mucous membranes  
Deviated septum

Adenoidal features (infraorbital darkening, elongated face, mouth breathing)  
Tonsillar Hypertrophy  
High arched palate  
Overbite  
Crowded oropharynx  
Macroglossia  
Glossoptosis  
Midfacial hypoplasia  
Micrognathia/retrognathia

### **Cardiovascular**

Hypertension  
Loud P2

### **Extremities**

Clubbing (rare)  
Oedema

### **Overnight pulse oximetry testing with OSAS**

Pulse Oximetry is a method of non-invasive continuous monitoring of arterial oxygen saturation. The probe may be placed on an earlobe, finger, toe or foot (in the younger infant). Using spectrophotometric principles for recording, the pulse oximeter circumvents the complications associated with the transcutaneous measurement of the partial pressure of oxygen or the use of an indwelling arterial catheter.

In cases of OSAS, oximetry has shown to be a useful test if positive, with a low sensitivity (43%) and a high specificity (98%).

It has a positive predictive value of 97% indicating that a positive test is highly indicative of OSAS.

It is, however, not a useful test if negative. It has a 47% false negative rate which means that a negative test does not exclude the diagnosis of OSAS. This will be stated clearly in letters of reported sleep studies.

### **Making a referral for an overnight oximetry study**

#### **Initial Referral**

The referral can be made by any member of the paediatric team or ENT team or the GP when a history in keeping with OSAS is apparent in a child. A comment on the tonsillar examination would be useful where appropriate.

The referral may be because of congenital or acquired structural airway changes resulting in symptoms and signs of OSAS.

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It can also be made in circumstances where recurrent tonsillar infections cause faltering growth in a child who may need a tonsillectomy or an adenotonsillectomy.

A referral by a junior doctor or non medical MDT member for this test must be with the agreement of the named consultant for the child.

A written referral should be made to the **‘Paediatric Respiratory Nursing Team’** stating clearly the reason behind the request. In some instances it may be more appropriate to refer to the respiratory team for a full respiratory assessment prior to an oximetry study (e.g. a child with Down’s syndrome).

The endocrine team have devised a referral form for their MDT to use in their weight management clinic regarding referral for oximetry (Appendix 3).

### The Process after referral.

1. The referral will be put onto the electronic console by the staff at Rouen Road for the paediatric respiratory nursing team to review.
2. The paediatric respiratory nursing team will accept the referral. If there are any queries regarding the referral they will discuss it with Dr Kavanagh or Dr Upton.
3. Once accepted the patient will be placed on to the waiting list for the test.
4. Some urgent cases if discussed with the respiratory team can be arranged when the next available machine is ready. This is a respiratory consultant decision.
5. The respiratory nurse will send the family a letter asking them to make contact with the team regarding the test. If there is no response to this letter, they will send a letter one week later.

If there is still no response the case is passed to Dr Kavanagh/Dr Upton who will contact the initial referrer and GP and copy the parents. A letter will also be sent to the parents stating the reasons why this test is important and why they should attend. The paediatric respiratory nurses will also phone the family. If needed safeguarding checks will be undertaken. We endeavour to try to be as flexible as we can with the families and can offer an overnight stay for this test if necessary.

6. The parent is given an appointment with the respiratory nurse. They are then taught how to use the oximetry machine. They are also given a parental feedback form (Appendix 1) to write any relevant comments applicable to time when the study was done. Parents are asked to return the machine the following day for analysis.
7. The respiratory nurse downloads the study and creates a printout which is then passed to Dr Kavanagh / Dr Upton for reporting.
8. The consultant then reports the study on a standard format (Appendix 2) devised by Dr Kavanagh. This report will be generated within 2 weeks of the test being

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undertaken. A letter is then generated and typed and sent to the referrer with advice.

9. If severe OSAS is apparent on the oximetry study the reporting consultant will email the referrer that day to make them aware of the result.

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## Clinical audit standards

To ensure that this guideline is compliant with the above standards, the following monitoring processes will be undertaken:

- Random reviews of the system to see whether referrals are appropriate
- Retrospective audit of the case notes to establish whether referrals were appropriate and what the waiting time for the test was. All tests should now be reported on a standard formatted page with comments added by Dr Kavanagh / Dr Upton. The time from the test being undertaken until a report is generated can also be audited.
- Review of all non attenders despite several letters and phone calls to be undertaken by Dr Kavanagh / Dr Upton who will contact the original referral source and GP.

## Summary of development and consultation process undertaken before registration and dissemination

The author listed above created this guideline on for use within the paediatric patients. During its review it was circulated for comment to consultants in the following teams:

Paediatric Medical, Paediatric Surgical, ENT consultants. It was also circulated amongst the paediatric Respiratory Nursing Team, Senior Paediatric Nurses and Clinical Governance.

All comments made have been addressed and incorporated where necessary in the document. This version has been approved by the Clinical Guidelines Assessment Panel.

## Distribution list/ dissemination method

Copies of the document are to be found in: -

- The Trust Intranet
- UEA NAM

## References/ source documents

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4. MacLean J, Fitzsimons D, Fitzgerald D, Waters K. The spectrum of sleep-disordered breathing symptoms and respiratory events in infants with cleft lip and/or palate. *Arch Dis Child* 2012; 97; 1058-1063
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# Joint Trust Guideline for the Use of Overnight Oximetry Studies in Children

## Appendices

### Appendix 1: Parental assessment of oximetry study sleep

<b>HOSPITAL NUMBER:</b>
<b>NAME:</b>
<b>DATE OF BIRTH:</b>
<b>CONSULTANT:</b>
<b>TODAYS DATE:</b>
<b>AGREED DATE MACHINE TO BE RETURNED:</b>
<b>A delay in returning the machine could affect your child's treatment.</b>
<b>MASIMO NUMBER:</b> 16 16691      16 21844      1622666
<b>Time</b> <input type="checkbox"/> <b>Date</b> <input type="checkbox"/> <b>Alarms</b> <input type="checkbox"/>
<b>Is child currently on oxygen? If yes how much?</b>

**Start time of study.....**

**End Time Of study.....**

**Please note time of any unusual incidents and write what happened.**

**Was the study representative of what usually happens or not? (And if not what was different?)**

**Thank you for your co-operation with this. The study will be downloaded and given to your child's doctor who will inform you of the results. This may take 3 weeks. If you wish to discuss this further please contact the paediatric respiratory nursing team on telephone number 01603287851 in the first instance.**

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## Appendix 2: Consultant oximetry reporting form

Name	
Hospital Number	
Age at time of study	
Date of study	
Length of oximetry recording	
Mean oxygen saturation	
Number of desaturations of >4%	
Number of desaturations/hr	
Length of time with saturations<90%	
Desaturation index	
Number of desaturations <90%	
Number of desaturations <85%	
Number of desaturations <80%	
Number of desaturations <75%	
Number of desaturations <70%	
Number of cluster desaturations	
Summary	

### Appendix 3: Weight management oximetry referral suitability form



Name

Date of Birth

Address

General Practitioner

Use Label

#### Risk Assessment for Obstructive Sleep Apnoea

The Risk Assessment is intended to highlight children at increased risk of adverse outcomes from Obstructive Sleep Apnoea (OSA). The risk assessment looks at predisposing conditions, aggravating factors and determines the need for overnight oxygen saturation monitoring.

The risk assessment is appropriate for any child who is suspected of having OSA. After determining the score, consider the need for oximetry. If oximetry is indicated, copy the form and send it to the Paediatric Respiratory Specialist Nurses (Helen Shorten, Alison Betteridge and Catherine Moates).

#### Score 2 points for each positive finding

Total

Predisposing Conditions [Maximum 4 points]	<ul style="list-style-type: none"> <li>• Syndrome associated with reduced muscle tone (eg Down's Syndrome, Prader-Willi Syndrome, known neuromuscular disorder) <input type="checkbox"/></li> <li>• Laryngomalacia <input type="checkbox"/></li> <li>• Known anatomical abnormality of the airway <input type="checkbox"/></li> <li>• Cranio-Facial Malformation (eg Cleft Palate, Pierre-Robin Syndrome, Treacher Collins' Syndrome) <input type="checkbox"/></li> <li>• Skeletal Dysplasia (eg Achondroplasia/Hypochondroplasia) <input type="checkbox"/></li> <li>• Morbid Obesity (BMI &gt;98<sup>th</sup> centile) <input type="checkbox"/></li> </ul>	
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#### Score 1 point for each positive finding

Total

Nocturnal Symptoms [Maximum 3 points]	<ul style="list-style-type: none"> <li>• Snoring (&gt;3nights/week) <input type="checkbox"/></li> <li>• Audible Obstruction during sleep <input type="checkbox"/></li> <li>• Repeated nocturnal waking <input type="checkbox"/></li> <li>• Visible respiratory effort during sleep <input type="checkbox"/></li> <li>• Neck extension during sleep <input type="checkbox"/></li> </ul>	
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Daytime Symptoms [Maximum 2 points]	<ul style="list-style-type: none"> <li>• Day-time hypersomnolence <input type="checkbox"/></li> <li>• Irritability/inattention <input type="checkbox"/></li> <li>• Mouth breathing/Nasal Obstruction <input type="checkbox"/></li> <li>• Morning headaches <input type="checkbox"/></li> </ul>	
Aggravating Factors [Maximum 2 points]	<ul style="list-style-type: none"> <li>• Asthma <input type="checkbox"/></li> <li>• Chronic lung disease (eg Broncho-pulmonary Dysplasia, Cystic Fibrosis) <input type="checkbox"/></li> <li>• Gastro-oesophageal Reflux <input type="checkbox"/></li> <li>• Sedating medication <input type="checkbox"/></li> </ul>	
<b>Indication for Oximetry</b>		<b>Grand Total</b>
Actions	<ul style="list-style-type: none"> <li>• Score <math>\leq 3</math> - consider oximetry if strong clinical suspicion of OSA</li> <li>• Score <math>\geq 4</math> - Strongly suggestive of OSA - Oximetry strongly recommended</li> <li>• Score <math>\geq 7</math> - Indicates potentially severe OSA - Urgent Oximetry required (within 1 month)</li> </ul>	
<b>Risk Assessment Completed by</b>		<b>Date</b>
Sign & Date		