

Risk Stratification in Adenotonsillectomy

Who stays and who goes?

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Ben Who?

- Consultant paediatric anaesthetist
- Public
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 - PMH (Perth W.A.)
- Private
- ENT
- Operation Rainbow Australia



Risk stratification...

- Statistical process
- Identification of factors before the occurrence of an event

Risk Stratification...simple

- Risk:
 - Probability of danger, loss or injury
- Stratify:
 - To place into layers
- K.I.S.S. – Low, Moderate or High Risk

For anaesthetists...



- What % of patients on your (paediatric) ENT lists:
 - Have had overnight oximetry or polysomnography?
 - Have adenotonsillectomy (for OSA) based on clinical history (SNORES ++) and (examination) alone?

History

- Many children undergo surgery
 - based on history and examination alone
- Snoring has poor specificity for OSA
 - **Nightly snoring** is:
 - **Sensitive – 91%**
 - **But not completely specific – 75%**
- Most apnoea occurs in REM (early hours of morning – often missed).

So - How can we stratify...

If all of our patients are not completely investigated prior to their intervention?



Size (& Snore) - doesn't always matter

What's new?

- What's not new?
 - OSA have an ↑ risk for complications intra/post-op (A&A 2009).
- What hasn't changed?
 - Agreement to disagree – on everything
 - Diagnostic criteria (OSA) & Investigation
 - Classification – **SEVERITY**
 - Patient selection
 - Choice of facility

Indications for T's & A's

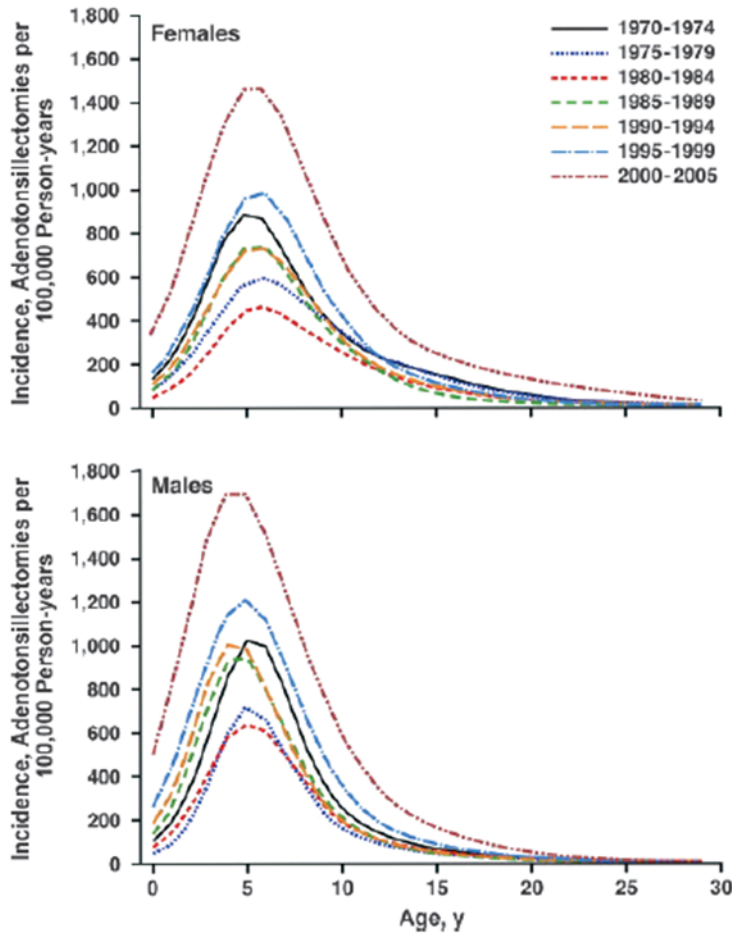


Figure 1 The rate of adenotonsillectomy (T&A), normalized to 100 000 person years, in Olmsted County, Minnesota, USA between 1970 and 2005. The nadir surgery occurred 1980–1984, but in the 1990s there has been a resurgence in the rate of T&A. Reproduced with permission from Erickson *et al.* (7).

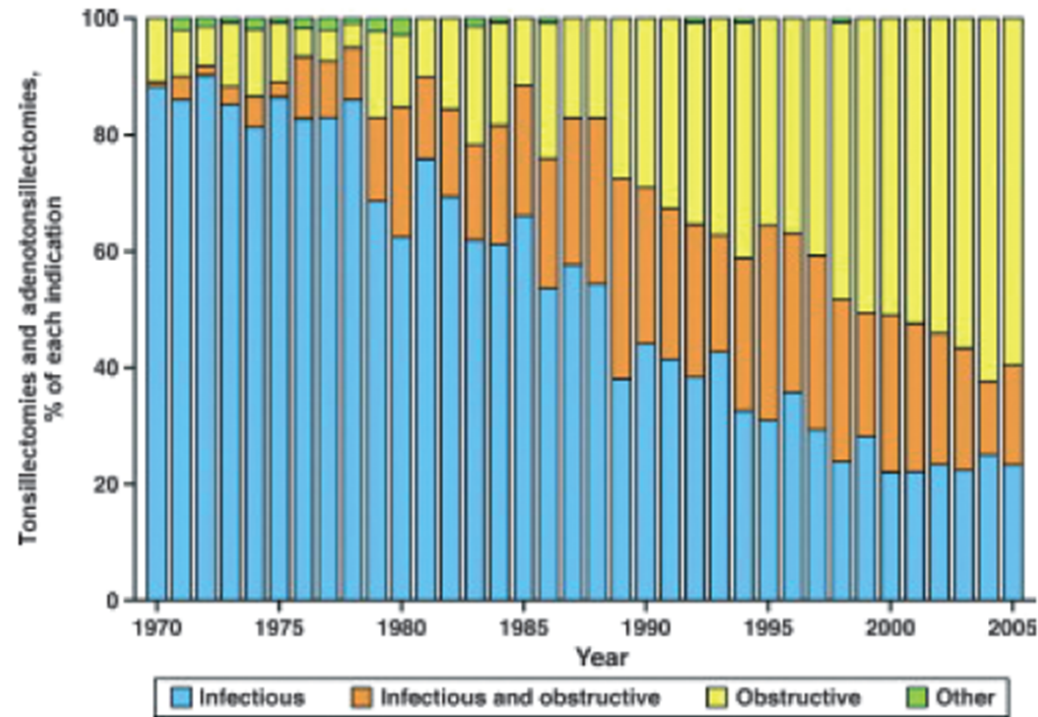
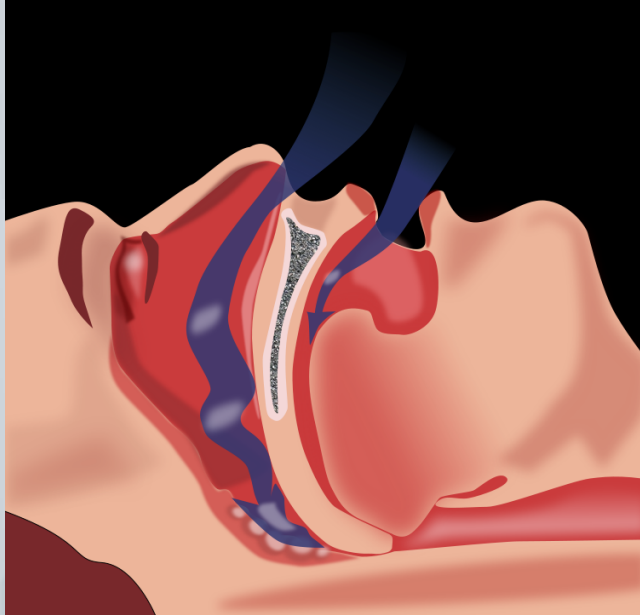


Figure 2 Surgical indications for adenotonsillectomy (T&A) in Olmsted County, Minnesota, USA between 1970 and 2005. Reproduced with permission from Erickson *et al.* (7).

ENT position paper - 2008

- ↑ in access to adenotonsillectomy for children with mod/severe OSA is urgently required.

What is OSAS..?



Sleep disordered breathing

- Continuum of severity
 - Partial upper airway obstruction
 - **Primary snoring (5 – 27%)**
 - Intermediate conditions
 - Upper airway resistance syndrome
 - Obstructive hypoventilation
 - Continuous episodes complete upper airway obstruction
 - **OSAS (1 – 3%)**

Not a new problem...

- 1889 (Hill - BMJ)
 - Snoring and restlessness at night – cause of backwardness and stupidity in children.
- First case series in children – 1976



Left untreated..?

- Neurocognitive/psychological
- Behavioural
- Failure to thrive
- Poor school performance
- Cardiovascular dysfunction
- Pulmonary disease



What's the big deal...

- Children with OSA are at increased risk for post-operative respiratory complications (A&A 2011)
 - Airway obstruction
 - Post-obstructive pulmonary oedema
 - Relief of longstanding PEEP
 - Pneumonia
 - Respiratory failure

Where...

- Where do the majority of these complications occur?
 - Recovery
 - Ward
 - Home

Most important risk factor...

- **Severity of OSA**

- Important determinant of this risk

BUT...

- It is the **most difficult risk factor to assess** (A&A 2011).



Coexisting medical conditions and young age – close runners up

Who cares?

- Estimated mortality 0.6 per 10,000
 - <1/3 mortality associated with bleeding
- 1985 – 2007
 - 36 malpractice claims – death/brain injury
 - 19 - airway complications/post-op airway events

Case 1

- 5 year old – female
- Recurrent tonsillitis
- 18kg.
- URTI 4 weeks ago.
- Snores a bit – Parents – no apnoea
- No other medical problems



Can she go home?

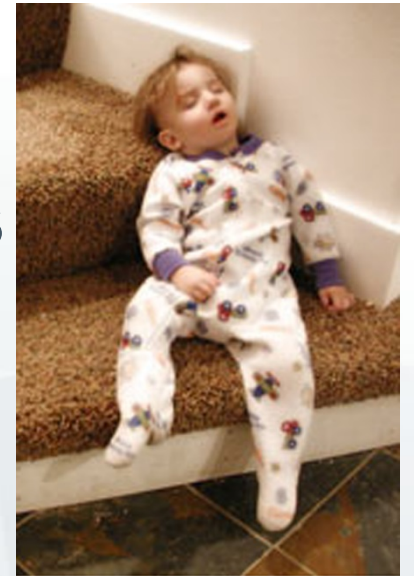
Who goes home...

- At least 4 years or older (maybe >3)
- No significant OSA (normal oximetry)
- No medical co-morbidity
- Car, Sensible parents, Phone
- Within 1 hour of hospital
- Eat, drink, analgesia
- 6 hour stay in recovery
- No bleeding



Case 2

- 3 years, 10 months – Male
- Snores ++ and mouth breathes
- Frequent sleep arousals - parents
- Daytime somnolence
- Seen by private ENT surgeon
 - Large tonsils
- 15kg, currently well



Clinical Tidbit

- Children with SpO₂ nadir of < 85%
 - Post-adenotonsillectomy
 - Required half the total analgesic morphine dose post-op
 - Compared with children in >85% group

Diagnosis OSA

- History
- Overnight oximetry
- Polysomnography



Overnight Oximetry

- Easy & Inexpensive
- **High positive predictive value**
- BUT a normal/inconclusive result doesn't rule out OSA



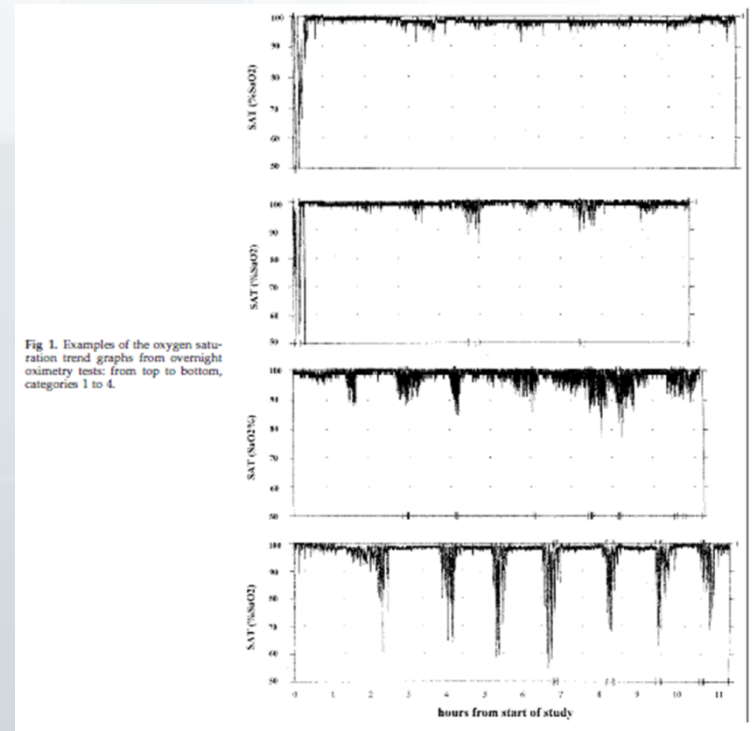
Pre-op overnight SpO₂ nadir <80% is associated with increased risk of post-op complications

Nixon – Pediatrics 2004

- Periodic clusters of desaturations
 - 3 or more desaturations <90%
 - 97% PPV for OSA in otherwise healthy children

TABLE 1. The McGill Oximetry Scoring System Devised in Phase 1 and Validated in Phases 2 and 3

Oximetry Score	Comment	Criteria				Recommendation
		No. of Drops in SaO ₂ <90%	No. of Drops in SaO ₂ <85%	No. of Drops in SaO ₂ <80%	Other	
1	Normal study/inconclusive for OSA	<3	0	0	Baseline: stable (<3 clusters of desaturation) and >95%	Additional evaluation of breathing during sleep required to rule out OSA
2	OSA, mild	≥3	≤3	0	Three or more clusters of desaturation events ¹⁴	Recommend T&A on the waiting list
3	OSA, moderate	≥3	>3	≤3	Three or more clusters of desaturation events ¹⁴	Recommend surgery within 2 wk
4	OSA, severe	≥3	>3	>3	Three or more clusters of desaturation events ¹⁴	Recommend urgent surgery (within days)



Case 3

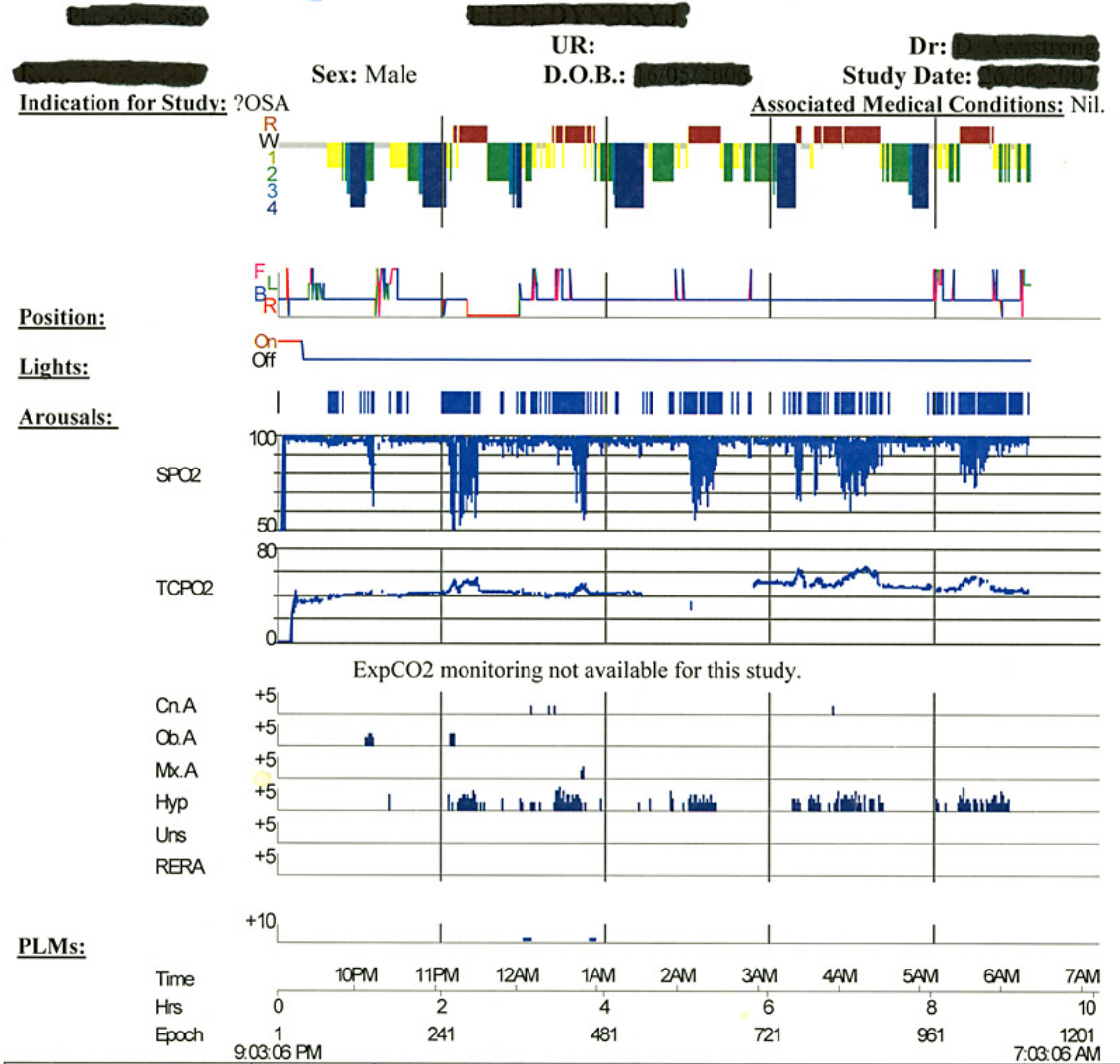
- 2 year old – Female
- 10kg, Currently well
- Crouzon syndrome
- Large tonsils – grade 4
- Snores++, restless ++, sleep arousals++
+, apnoea
- ?Airway – MRI with LMA



Case 3

Severe OSA

- SpO2 nadir
 - 44%
- AHI – 35
- REM-RDI
 - >60



RDI =	35.9 /hr	SpO ₂ nadir =	44 %	Arousal I =	42.4 /hr
OAHI =	35.4 /hr	Avg SpO ₂ drop =	12 %	% Resp Ar =	59 %
CnAHI =	0.5 /hr	SpO ₂ < 90% =	18.2 /hr	PLMI (TST) =	2.1 /hr
REM RDI =	80.5 /hr	SpO ₂ ≥4% drop =	26.1 /hr	% PLM Ar =	1 %
CnPauseI =	0.0 /hr	Avg TcCO ₂ ↑ REM =	11 mmHg	Avg TcCO ₂ TST =	46.1 mmHg

Minimum duration of respiratory events: 2 resp cycles or ≥ 10 sec

No. supine or semi-supine REM sleep: 5

Very few go to ICU...

- Age < 2 years (? 3 years) +/-
- Severe OSA
- Weight < 3rd centile (+/- morbid obesity)
- Neuromuscular Disease
- Syndromes (prone to airway obstruction)
- Complex/congenital heart disease
- Cor pulmonale, RVH or PHTN
- Risk of haemorrhage post-op



Polysomnography

- Gold standard in diagnosis of OSA
- Detailed evaluation of:
 - Sleep quality
 - Breathing during sleep



Does not predict which patients will have
adverse outcomes post-op

But **SEVERITY** is linked to adverse peri-operative events

PSG

- Mild OSA:
 - AHI 1 – 4/hr
- Moderate OSA:
 - AHI 5 - 9/hr
- Severe OSA:
 - AHI > 10/hour

High risk predictors...

- Overnight oximetry nadir $<85\%$
- Severe OSA on PSG or oximetry
- Young age - <2
- Co-morbid conditions (craniofacial, syndromes, muscular, weight $< 3^{\text{rd}}$ centile, obesity, airway)

OSA & Adenoidectomy: Day case, Overnight or ICU?

Leong & Davis, J. Laryngol, 2007

Low Risk

- Most children

Moderate Risk

- Age < 3
- Overnight oximetry nadir < 80%
- FTT
- Asthma
- Recent RTI
- Obesity

High Risk

- Age < 2
- PSG: Severe OSA or >30% central
- A: Craniofacial etc
- B: Prem. lung disease
- C: Pulm. HT
- Neuromuscular disease.
- Morbid obesity

Day case (am list)

Overnight (SaO₂, CPAP)

ICU

Mild-Mod. OSA (Moderate Risk)

- Abnormal oximetry
 - SpO2 nadir >85%
 - Age > 3
 - No co-morbidity
 - Probably ok for peripheral/private
 - Close observation
 - Oximetry overnight
- Abnormal oximetry
 - SpO2 < 3 dips <85%
 - Age < 3
 - OSA on oximetry or PSG
 - Not meeting ICU criteria
 - Tertiary facility, ward oximetry overnight

Summary

- Most important predictors of risk..?
 - **Severity of OSAS**
 - **Young age**
 - Co-existing medical conditions

Summary

- Low risk - Majority of children
 - Day case (if done in AM)
- Moderate
 - Facilities/staff to administer CPAP
 - Overnight oximetry - ? 2nd night
- High risk
 - Very few need ICU

Summary

- SpO₂ nadir <85%
 - Predictive of respiratory complications
- Children with pre-op SpO₂ nadir <85%
 - Very sensitive to opioids

Conclusion

- More children presenting with OSA.
- Identifying children at risk of post-op complications - challenging.
- Right patient in the right hospital with the right personnel.

	Good Outcome	Bad Outcome
Good Process	Deserved Success	Bad Break
Bad Process	Dumb Luck	Poetic Justice

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