Emerging Nursing Roles in Collaborative Management of Sleep Disordered Breathing and Obstructive Sleep Apnoea

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Sleep perchance to ....

- “Sleep that knits up the raveled sleave of care, The death of each day's life, sore labor's bath, Balm of hurt minds, great nature's second course, Chief nourisher in life's feast.

William Shakespeare, Macbeth Act 2. Scene 2
Key Function of Sleep

• Consolidates memory

• Helps regulate immune function

• Cerebral restoration

• Body and vascular/ tissue restoration
Sleep Disordered Breathing: Problems and clinical patient presentation

• Noisy sleep snoring, gasping, grunting
• Broken sleep, partial awakenings (sleep arousals)
• Bed-partner sleep disturbance
• Sleep Bruxism movement
• Restless Leg Movement (RLM)
• Gastric Esophageal Reflux Disorder GERD
Who's at Risk of Sleep Disordered Breathing?

- **Current prevalence**
  - 5-10-17% Sleep apnea
  - 40-50% Snoring
  - 30% in Sleep bruxism (8%)

- **Screening**
  - Epworth sleepiness scale (ESS) Questionnaire
  - STOP-BANG questionnaire
  - Berlin questionnaire

- **Disruption**
  - Bed-partner / Observer reporting

Peppard PE, Young T et al. Increased Prevalence of Sleep-Disordered Breathing in Adults. Am J Epidemiol. 2013 1:177(9) 1006-1014
Spectrum and Severity of Most Common Obstructive Upper Airway Breathing Disorders

- • Snoring ➔ Upper Airway Resistance Syndrome (UARS)
- • UARS ➔ Obstructive Sleep Apnoea Mild (OSA)
- • OSA Mild ➔ Moderate ➔ Severe
- • Simultaneous ➔ Sleep Bruxism / RLM / GORD
SLEEP DISORDERED BREATHING or OBSTRUCTIVE SLEEP APNOEA?

• A Sleep Disordered Breathing (SDA) complaint

• APNEA = a reduction in airflow of >90% from baseline and lasting >10 seconds

• HYPOPNEA = a reduction in airflow of 30-50% from baseline and lasting >10 seconds followed by arterial desaturation > 4 or 3%

• Frequency of events determines severity of condition, which results in brief arousals from sleep

• 3 Types of Sleep Apnoea
  • Central
  • Obstructive (Most common)
  • Mixed

  • International Classification of Sleep Disorders 3rd Edition American academy of Sleep Medicine 2010
SLEEP: Stages and Sleep Study Diagnostics

- Polysomnography (PSG)
- Out of centre sleep test (OCST)
- Track events within sleep
- 90 minute cycles
Sleep Cycles Construct: NREM / REM Sleep

Hypnogram showing 5-6 90 Minute NREM-REM Cycles per night
SLEEP STUDY : Records and Scores Sleep Disordered Breathing *Repetitive* Events

• **AHI** = Apnea Hypopnea Index
  - 5> 15> 30 Events/ hr  *Mild* > *Moderate* > *Severe*

• **RDI** = Respiratory Disturbance index
  - 10>20> 40 Events / hr  *Mild* > *Moderate* > *Severe*

• **ODI** = Oxygen Desaturation Index
  - No of times below baseline /hr

• **Differential Diagnosis**
Classifying Sleep Disordered Breathing

• **DIFFERENTIAL DIAGNOSIS**
  - **Obstructive Sleep Apnea (OSA)**, Central Sleep Apnea (CSA), Mixed Sleep Apnea, or Hypopnea events resulting in sleep fragmentation.

• **APNEA**
  - 90% or reduction of airflow >10 seconds due to complete collapse of the airway

• **HYPOPNEA**
  - Reduction of pressure airflow between 30-50% for >10 seconds with oxygen desaturation of >4 or 3 % respectively with continued respiratory effort and possible sleep arousal
Obstructive Sleep Apnea (OSA) Anatomy

Anatomic factors affecting airway

- Large tongue (scalloping)
- Long soft palate
- Tonsils or adenoids
- Retrognathia
- Large neck (fat bagel)
- Obesity
- Retro-positioned maxilla
- Inferiorly positioned hyoid bone
Airway Anatomy and Airflow

Anatomical Imbalance

The interaction between upper airway soft tissue structures and craniofacial structures

- Soft tissue
- Bony enclosure
- Airway size

- Normal
- Obesity
- Small maxilla & mandible

Watanabe, et al. AJCCM 165:260, 2002

Starling Resistor Model: Tissue Collapse

Decreased Diameter --> Increased Velocity
Increased Velocity --> Decreased Pressure
Tongue fat distribution in apneics is increased in specific locations of the tongue (greater in the retro-glossal region)

- Tongue size (scalloped tongue forms) and tongue fat are correlated with AHI.

2-10% Weight gain/loss significant effects on tongue fat

Lower and more posterior hyoid bone position significant predictor

*(Kim et al, Sleep 37;1639-1648, 2014)*
OSA: A MULTIFACTORIAL ETIOLOGY

Obstructive Sleep Apnea: Much More Than Just an Anatomical Problem

- Ineffective upper-airway muscles during sleep
- Low arousal threshold
- Impaired Anatomy
- Ventilatory control instability (high loop gain)
- CPAP
- Airway obstruction

Each trait is a potential therapeutic target

Obstructive Sleep Apnea Comorbidities

- **Increased risk:**
  - Hypertension and Cardiovascular Disease
  - Cardiac Arrhythmias
  - Immune System Compromise
  - Irritability Mood Disorder, Depression
  - Learning, Memory Problems

- **Association:**
  - Metabolic Disorders (Type 2 Diabetes)
  - Sleep Bruxism (Dental Damage, Jaw Dysfunction & Morning Headaches)
  - Gastric Esophageal Disease (GERD)

OBSTRUCTIVE SLEEP APNEA (OSA) : Review

- **Obstructive sleep apnea is highly prevalent** in the general population worldwide, especially in its mild form.
  - Clinical manifestations correlate poorly with disease severity measured by the apnea–hypopnea index (AHI), which complicates diagnosis.

- **Full Polysomonography (PSG )** might be more appropriate to assess suspected mild cases.
  - Limited ambulatory OCST diagnostic systems are least accurate in mild disease.

- **Superior efficacy of CPAP in reducing AHI.**
  - Offset by greater tolerance of oral appliances, especially in mild disease.

- **Severe OSA is associated with adverse health consequences**, including cardio/metabolic comorbidities.
  - The association with mild disease is unclear.

COLLABORATIVE MANAGEMENT MODEL
SUCCESS

WHAT PEOPLE THINK IT LOOKS LIKE

SUCCESS

WHAT IT REALLY LOOKS LIKE
Nurse Practitioner Role in co-ordination of complex service delivery interactions

- Team lead by sleep physician
- Co-ordination with respiratory physician (to include pulmonologist)
- ENT/Otolaryngologist / Maxillofacial surgeon involvement
- Sleep laboratory respiratory technologist
- OCST (Home sleep test) provider
- Dental specialists
- Cognitive behavioural therapy provider service
- Nutritionist, weight management support
Targeting Collaborative Therapies

Novel Approaches to Treat OSA:
Towards Targeted Therapies for Sleep-Disordered Breathing

Ineffective upper-airway muscles during sleep
Low arousal threshold

Impaired Anatomy

Devices/Future Drugs/Training

Certain sedatives

Ventilatory control instability (high loop gain)

Supplemental O₂ CO₂ Acetazolamide

Oral appliance
Upper airway surgery
Weight loss
Position Therapy

CPAP

Airway obstruction

PALM Scale: >50% of OSA patients could potentially be treated without CPAP using a single, or a combination of therapies, directed at the abnormal trait(s)

Phenotype Perspectives in OSA Treatment Approaches

Obstructive Sleep Apnea

Regional Distribution of Fat
Craniofacial Structure
Soft Tissue Structures
Neural Control of Airway

Determined by MRI

After Schwab 2016
Comprehensive OSA Management Approach

**CPAP**
Continuous positive airways pressure

**Oral Appliances**
Several types, dependent on clinical Presentation, patient anatomy and proposed device tolerance

**Positional aids**
Encourage patient to avoid supine position and encourage left or right lateral sleeping position

**Weight : BMI Management**
Multifactorial engagement with prevailing circumstances/presentation

**Surgical Options (Less common)**
- Uvulopalatopharyngoplasty (UPPP)
- Radiofrequency volumetric tissue reduction (RFVTR)
- Septoplasty and Turbinate Reduction
- Glosseal resection
- Orthognathic Surgery: Jaw resection
- Weight loss surgical interventions: Bariatric surgery
Obstructive Sleep Apnea: Management options

- **CPAP**
  - 100% Efficacy 50% Tolerance

- **Oral Appliance Therapy (OAT)**
  - Not as Effective, Not as Obtrusive
  - Portable/ Quiet

- **Surgery**
  - Most invasive

Vanderveken O, et al Objective measurement of compliance during oral appliance therapy for sleep-disordered breathing 2012 Thorax: 0: 1-6
Oral Appliance effectiveness at velopharyngeal level

Volumetric Reconstructions of the Upper Airway in a Responder Showing the Increase in Caliber of the Upper Airway With Mandibular Advancement Splint (MAS)

Chen et al. Thorax 2010;65:726-732

Therapeutic Orthotic Functional Matrix
How effective is therapy?

- Individual Variation & Tolerance
  - Snoring, OSA, Sleep Bruxism

- Evidence Based Effectiveness?
  - Comparative Crossover Studies
  - Cardiovascular / BP
  - Day-time sleepiness
  - QOL

- Adherence
  - Efficacy vs Effectiveness CPAP Vs OAT
  - Mean Disease alleviation (MDA) compared to alternative approaches

TAP appliances

MANAGEMENT CONSIDERATIONS IN OSA

“Good work ....... but I think we need just a little more detail right here”
Thank you!

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