PREVENTING DELAYS IN DIAGNOSIS AND TREATMENT OF OSA BY UTILIZING HOME SLEEP TESTS

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Intermountain Sleep Disorder Centers
PREVALENCE OF OSA

Figure 2 - Prevalence and Treatment of Obstructive Sleep Apnea (OSA) in the U.S. Adult Population (2016)

U.S. Adult Population
245.2 M

Prevalence OSA (AHI>5)
29.4 M

Undiagnosed
23.5 M

Diagnosed
5.9 M

80%
20%

85%
10%
5%
100%

CPAP
5 M

Oral Appliances
0.6 M

Surgery
0.3 M

Lifestyle
5.9 M
DIFFICULTIES PATIENTS FACE

- Not screened for OSA symptoms during PCP visits
- Not referred by PCP
- Patient unaware of symptoms or accepts symptoms as normal.

Cost of testing and treatment
- One PSG can cost over $4000.00
- 75% of patients only willing to spend $51.00 out of pocket per month
- 25% unwilling to spend any money out of pocket
- High deductible health plans

- Long wait times for consultation/no urgent consult spots
- Long wait times for in-lab PSG tests
- Limited follow up appointments
**DIFFICULTY SLEEP PROVIDERS FACE**

- **Demand Exceeds Capacity - Sleep Specialists**
  - Volume of patients - 29.4 Million in USA with OSA
  - Number of sleep specialist: 5,675
    - 7 Anesthesiologists
    - 140 Family medicine specialists
    - 3,641 Internal Medicine
    - 238 Otolaryngologists
    - 251 Pediatricians
    - 1,398 Psychiatrists & neurologists

  *does not account for PA’ and NP’s*

- **Number of OSA patients per sleep specialist =**
  - 5,180.61

* does not account for patients with other sleep disorders
DIFFICULTY SLEEP PROVIDERS FACE

- Demand Exceeds Capacity - Sleep Specialists
  - Limited clinic time
    - No availability for time sensitive issues:
      - severe oximetry results
      - severe medical complications
      - insurance expirations
      - DOT renewals for drivers/pilots
      - insurance-mandated appointments.
    - Patient’s scheduled with wrong specialty based on availability instead of co-morbid conditions.
      - example-pulmonologist or PA-C seeing patient with seizure disorder instead of neurologist
  - Limited time to interpret studies
  - Limited time to write TX orders
DIFFICULTY SLEEP PROVIDERS FACE

- **Demand Exceeds Capacity - Sleep Specialists**
  - Not enough Sleep techs
    - Limits testing availability
    - Delays scoring/interpretation

- **Demand Exceeds Capacity - Bed availability**
  - Limited lab capacity

- **Insurance constraints**
  - Providers not covered under plans
  - Time-specific treatment guidelines
  - Insurance limitations for in-lab PSGs/Requires HSTs
  - Fixed financial allocations for sleep management
  - Prior authorization requirements
  - Insurance limitations/qualifiers for TX
Average Wait Times

United Kingdom

- Total Population = 58.8 Million
- Average New Sleep Patients per Year=20,000
- Total Sleep Labs= 84
- Total PSG beds = 170
- Average wait time from referral to consult = 6 months
- Average time from consult to CPAP titration = 4 months
- Average time from referral to TX = 14 months
AVerAGE WAIt TiMES

Australia

- Total Population = 18.97 Million
- Average New Sleep Patients per Year = 53,500
- Total Sleep Labs = 65
- Total PSG beds = 244
- Average wait time from referral to consult = 9 weeks
- Average time from consult to CPAP titration = 21 weeks
- Average time from referral to TX = Up to 40 weeks
Canada

- Total Population = 31.4 Million
- Average New Sleep Patients per Year=
- Total Sleep Labs=
- Total PSG beds =
- Average wait time from referral to consult = 4-6 Months
- Average time from consult to CPAP titration = 8-30 months
- Average time from referral to TX = 24 months
**AVERAGE WAIT TIMES**

United States of America

- Total Population = 280 Million
- Average New Sleep Patients per Year = 1.17 Million
- Total Sleep Labs = 1,292
- Total PSG Beds =
- Average wait time from referral to consult = 2-10 Months
- Average time from consult to CPAP titration =
- Average time from referral to TX =
CONSEQUENCES OF DELAYED DIAGNOSIS/TREATMENT

Undiagnosed Sleep Apnea: A Hidden Health Crisis

In the U.S. the estimated economic cost of undiagnosed obstructive sleep apnea was nearly $150 billion in 2015.

- **Workplace Accidents**: $6.5 billion
- **Motor Vehicle Accidents**: $26.2 billion
- **Comorbid Diseases**: $30 billion
- **Lost Productivity**: $86.9 billion

**TOTAL**: $149.6 billion

Source: American Academy of Sleep Medicine, 2016 | www.sleepeducation.org
CONSEQUENCES OF DELAYED DIAGNOSIS/TREATMENT
CONSEQUENCES OF DELAYED DIAGNOSIS/TREATMENT

The Probable Cause

“A key finding in the medical investigation was the engineer’s post-accident diagnosis of severe, obstructive sleep apnea, and the probable cause of the accident was determined to be the result of the engineer having fallen asleep while operating the train...”
CONSEQUENCES OF DELAYED DIAGNOSIS/TREATMENT

The Probable Cause

- Epworth Sleepiness Scale = 12/24
- STOPBANG =
- AHI = 52.5/hour
- AHI 67.5/hour when supine
CONSEQUENCES OF DELAYED DIAGNOSIS/TREATMENT
Improvement in obstructive sleep apnea diagnosis and management wait times: A retrospective analysis of a home management pathway for obstructive sleep apnea

Samuel Alan Stewart, MD, FRCPC, R Skromne, MD, FRCPC, J Reid, MD, FRCPC, Lenta Penez, MD, FRCPC, Mark Fenton, MD, FRCPC, John Gjeeve, MD, FRCPC, David Cotton, MD, FRCPC

Improvement in obstructive sleep apnea diagnosis and management wait times: A retrospective analysis of a home management pathway for obstructive sleep apnea


Obstructive sleep apnea is a common condition within the Canadian population. The current gold standard for diagnosis and management of patients is in-laboratory polysomnography; however, the limited availability of testing options for patients has led to long wait times and increased disease burden within the population. The Sleep Research Laboratory in Saskatoon (Saskatchewan) implemented a home management program to assist in parallel with the in-laboratory system several years ago in an effort to increase their capacity and reduce wait times. The present study was a retrospective analysis of all patients referred to the program between 2009 and 2012. The home management system has improved wait times by diagnosing and managing up to one half of the real patient population, reducing the time for in-laboratory testing from a median of 152 days in 2009 to 92 days in 2012 (P<0.001). Moving toward home management, patients who meet strict criteria can be assessed without polysomnography, reducing the in-laboratory workload and ultimately, reducing wait times.

Key Words: Monitoring, physiological; Polysomnography, Saskatchewan; Sleep apnea; Time factors; Time to treatment

Obstructive sleep apnea (OSA) is a common chronic respiratory condition. Recent reports estimate the prevalence of diagnosed OSA to be 3% of the adult Canadian population, with an additional 15% at high risk for the condition (1). It is believed that 10% of Canadian adults with OSA remain undiagnosed. OSA rates are on the rise, likely secondary to increasing obesity rates (2). OSA is typically diagnosed during in-laboratory polysomnography (PSG), however, current access to such testing in Canada is limited, either to be insufficient, although there is limited literature to verify this claim. Previous studies have relied on questionnaires to estimate wait times (3); however, no study has evaluated ‘true’ wait times for PSG using real-world patient data.

There has been increasing interest in home diagnosis and management pathways using a variety of cardiorespiratory home monitors and the use of automatic continuous positive pressure airway (auto-CPAP) technology. We previously published a randomized controlled trial validating the use of an OSA home-monitoring pathway (4). Based on the results of this and other similar trials (5-9), we have implemented a centralized program for managing OSA patients with either in-laboratory PSG (referred to as ‘sleep lab’ (SL)) or at home using level III testing and auto-CPAP (referred to as home monitoring (HM)). There are currently no Canadian data regarding the impact of an HM pathway on wait times for in-laboratory PSG, on assigned rates between in-lab PSG and HM pathway or on the compliance with Canadian Thoracic Society (CTS) OSA wait time guidelines.

The purpose of the present study was to provide retrospective analysis of OSA diagnosis and management wait times from 2009 to 2012. This study aimed to investigate the evolution of the patient assignment rates between the two diagnostic pathways over times to investigate wait times in both pathways and to determine compliance with current national guidelines for OSA diagnosis and management, and to determine the impact of HM implementation on wait times overall.

METHODS

The Sleep Disorders Centre at Saskatchewan Health Hospital and the University of Saskatchewan (Saskatoon, Saskatchewan) developed a streamlined process for managing OSA patients with either in-laboratory PSG (referred to as 'sleep lab' (SL)) or at home using level III testing and auto-CPAP (referred to as home monitoring (HM)). There are currently no Canadian data regarding the impact of an HM pathway on wait times for in-laboratory PSG, on assigned rates between in-lab PSG and HM pathway or on the compliance with Canadian Thoracic Society (CTS) OSA wait time guidelines.

The purpose of the present study was to provide retrospective analysis of OSA diagnosis and management wait times from 2009 to 2012. This study aimed to investigate the evolution of the patient assignment rates between the two diagnostic pathways over times to investigate wait times in both pathways and to determine compliance with current national guidelines for OSA diagnosis and management, and to determine the impact of HM implementation on wait times overall.

1. Absence of coexisting cardiac or respiratory disease.
2. Moderate to high acute probability of OSA.
3. Lack of risk of hyperventilation.
4. Absence of coexisting sleep conditions such as insomnia or restless leg syndrome.
5. Ability to use level III technology at home with minimal supervision.

SL pathway

In-lab PSG was performed according to standard criteria (10) using the Sandman version 9 in-lab PSG system (Malinckrodt Inc, Canada). Split-night PSG with CPAP titration was typically performed in cases of moderate to severe OSA according to current American Academy of Sleep Medicine criteria. OSA was defined as a decrease of flow by >20% for >10 s accompanied by ≥3% desaturation or arousal (5). OSA was defined as an apnea-hypopnea index (AHI) ≥5.

HM pathway

In-lab PSG was also performed according to standard criteria (10) using the Sandman version 9 in-lab PSG system (Malinckrodt Inc, Canada). Split-night PSG with CPAP titration was typically performed in cases of moderate to severe OSA according to current American Academy of Sleep Medicine criteria. OSA was defined as a decrease of flow by >20% for >10 s accompanied by ≥3% desaturation or arousal (5). OSA was defined as an apnea-hypopnea index (AHI) ≥5.

Deceased: Dr. Samuel Alan Stewart, Department of Internal Medicine, University of Saskatchewan, Saskatoon, SK, Canada, 1347 E-Wing, Academic Health Sciences Building, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 5C6. Telephone 306-337-2553, fax 306-344-1124, e-mail sam.stewart@usask.ca

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Prior to implementation of a home management pathway the average time from referral to Study was 152 days.

During the study 50% of newly referred patients were triaged to a Home Management Pathway.

At the end of the study (2012):
- Time from referral to HST was 42 days
- Time from referral to Auto-PAP was 47 days
- Time from referral to In-lab PSG was 92 days
THE FAST TRACK PROGRAM

Intermountain Sleep Disorder Centers Home Management Model

Traditional Pathway

Consult

PSG or HST

TX or additional testing ordered

Follow up appointment

Fast Track Pathway

HST

TX or additional testing ordered

Consultation
Referral and Records Reviewed

Pt triaged into Fast Track or Traditional Care Pathway

Fast Track pt given education on Fast Track, HST, and APAP
Pt scheduled for HST and follow up consult

Pt completes HST

MD interprets HST results & writes TX orders
THE FAST TRACK

Pt notified of HST results

Pt given education on diagnosis and TX orders

TX orders sent to home health/testing scheduled

• Usually APAP
THE FAST TRACK

Patient attends consult

Pt & treatment efficacy evaluated by clinician

TX changes and follow up as needed.
WHO QUALIFIES FOR THE FAST TRACK?

Inclusion Criteria

- Patient’s with high likelihood of OSA based on:
  - A STOP-BANG score of 3 or >
  - An Epworth Sleepiness Score of 13 or >
  - An abnormal overnight oximetry
  - No health conditions that exclude use of HST
  - No insurance limitations that limit Fast Track option
### WHO QUALIFIES FOR THE FAST TRACK?

**Inclusion Criteria : STOP-BANG**

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Snoring</strong></td>
<td>Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?</td>
</tr>
<tr>
<td><strong>2. Tired</strong></td>
<td>Do you often feel tired, fatigued or sleepy during the daytime?</td>
</tr>
<tr>
<td><strong>3. Observed</strong></td>
<td>Has anyone observed you stop breathing during your sleep?</td>
</tr>
<tr>
<td><strong>4. Blood Pressure</strong></td>
<td>Are you being, or have been, treated for high blood pressure?</td>
</tr>
<tr>
<td><strong>5. Body mass index</strong></td>
<td>Is your body mass index &gt; 35 kg/m²?</td>
</tr>
<tr>
<td><strong>6. Age</strong></td>
<td>Are you &gt; 50 years old?</td>
</tr>
<tr>
<td><strong>7. Neck circumference</strong></td>
<td>Is your neck circumference &gt; 40 cm?</td>
</tr>
<tr>
<td><strong>8. Gender</strong></td>
<td>Are you male?</td>
</tr>
</tbody>
</table>
WHO Qualifies for the Fast Track?

Inclusion Criteria: STOP-BANG

![Graph showing probability of STOP-Bang responses against severity categories. The x-axis represents STOP-Bang responses ranging from 0 to 8, and the y-axis represents probability ranging from 0 to 100. The graph includes lines for Severe, Moderate, Mild, and None categories.]
### WHO QUALIFIES FOR THE FAST TRACK?

**Inclusion Criteria : Epworth Sleepiness Scale**

Use the following scale to choose the most appropriate number for each situation:

- **0** = would never doze
- **1** = Slight chance of dozing
- **2** = Moderate chance of dozing
- **3** = High chance of dozing

<table>
<thead>
<tr>
<th>Situation</th>
<th>Chance of dozing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td></td>
</tr>
<tr>
<td>Watching TV</td>
<td></td>
</tr>
<tr>
<td>Sitting, inactive in a public place (e.g. a theatre or a meeting)</td>
<td></td>
</tr>
<tr>
<td>As a passenger in a car for an hour without a break</td>
<td></td>
</tr>
<tr>
<td>Lying down to rest in the afternoon when circumstances permit</td>
<td></td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
<td></td>
</tr>
<tr>
<td>Sitting quietly after a lunch without alcohol</td>
<td></td>
</tr>
<tr>
<td>In a car, while stopped for a few minutes in the traffic</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

**Score:**

- **0-10** Normal range
- **10-12** Borderline
- **12-24** Abnormal
WHO Qualifies for the Fast Track?

Inclusion Criteria: Abnormal Oximetry
WHO QUALIFIES FOR THE FAST TRACK?

Inclusion Criteria: Abnormal Oximetry

- Percent time < SpO2 90%
- SpO2 waveforms
- Heart rate
- Duration of desaturations
- Lowest SpO2%
- Number of desaturations
- Study quality
- Indication for study
- Demographic information
- Mean SpO2%
FAST TRACK-EXCLUSION CRITERIA

- Age < 18
- STOPBANG < 3 (unless oximetry suggests OSA)
- BMI > 50
- Cardiovascular disease, arrhythmia or stroke
- Hx of central sleep apnea
- Cognitive impairment
- Impaired mobility or dexterity
- Hx of inconclusive results on HST
- Long acting opioid use
- Hx of suspicion of narcolepsy
- Neuromuscular/Neurodegenerative d
- OHS
- Hx or suspicion for parasomnias
- Hx of PLMS
- Hx of UPPP
- Pt has previously tested + for OSA
- Hx of intolerance/refusal of CPAP
FAST TRACK-EXCLUSION CRITERIA-INSURANCE LIMITATIONS

- Pt has Medicare (requires consult prior to testing)
- Pt has UHC (requires consult prior to testing)
- Pt has Tricare/VA (authorizes only specific tests)
- Pt has Utah Medicaid (No coverage for HST)
- Pt has no insurance (to allow time apply for financial assistance)
**THE FAST TRACK - TOTALS**

- Number of Referrals reviewed = 2,781 (03/01/2016-02/11/2016)

- Number of pt’s triaged to Fast Track = 578
  - Percentage of patients triaged to Fast Track = 21%

- Number of pt’s scheduled on the Fast Track = 422
  - Number who have completed HST = 356 (84%)
  - Number who Canceled HST/Fast Track = 55 (13%)
  - Number whose tests are still pending = 11 (3%)
  - Number whose consults are still pending = 133 (31%)

- Number of patient’s who have completed the Fast Track = 233

- Number of pt’s prescribed APAP/other PAP therapy = 341
  - Number with negative test / no TX needed or waiting till consult = 10
  - Number refused = 4
  - Number in need of titration prior to TX = 1

- Fast Track pt’s referred for follow up in-lab PSG = 51
  - Percentage of pt’s referred for follow up in-lab PSG = 14%
# Fast Track Time Frames

(March 1, 2016 through February 11, 2017)

<table>
<thead>
<tr>
<th>Days from Referral HST Testing</th>
<th>Days from Referral till TX Orders are sent</th>
<th>Days from Referral to Date of Consult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td>17.3</td>
<td>27.1</td>
<td>70.5</td>
</tr>
<tr>
<td>Min</td>
<td>Min</td>
<td>Min</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Max</td>
<td>Max</td>
<td>Max</td>
</tr>
<tr>
<td>116</td>
<td>124</td>
<td>189</td>
</tr>
<tr>
<td>Mode</td>
<td>Mode</td>
<td>Mode</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>62</td>
</tr>
<tr>
<td>Median</td>
<td>Median</td>
<td>Median</td>
</tr>
<tr>
<td>14</td>
<td>21.5</td>
<td>67</td>
</tr>
</tbody>
</table>
FAST TRACK TIME FRAMES
REDUCES DAYS FROM REFERRAL TILL TX IS ORDERED

Traditional Pathway
Average 90 days

Fast Track
Average 27 days

SAVES 63 Days!!
Home Sleep Tests are less expensive for patients than traditional in-lab studies

- Approximate cost of in-lab Split night PSG = $4000.00
- Approximate cost of a HST = $500.00
- Approximate savings to patient/insurance= $3500.00

* Additional savings include reducing office visit (Consult acts as follow up)
Increased Clinic/Bed Availability

- More HSTs can be performed per sleep tech
  - 1 tech per 6 HSTs vs 1 tech per 2 PSGs
  - Creates more in-lab bed availability/sooner appointments for complex patients needing PSG.

- Fast Track can reduce need for one follow up appointment
  - Creates more availability for follow up appointments
Increased patient satisfaction
Increased patient satisfaction
FAST TRACK - COMPLIANCE RATES

- Number of pts who are compliant with PAP therapy after completing the Fast Track = 153

- Number of pts who are non-compliant with PAP therapy after completing Fast Track = 61

- Number of pts whose compliance is currently unknown = 6

*Compliant is defined as using PAP therapy greater than 4 hours per night and greater than 70% of nights.
FAST TRACK - COMPLIANCE RATES

- Percent of who are compliant with PAP therapy after completing Fast Track = 67%
- Percent who are not compliant after completing Fast Track = 27%
- Percent whose compliance is unknown after completing Fast Track = 6%

*Compliant is defined as using PAP therapy greater than 4 hours per night and greater than 70% of nights.*
There is a high volume of patients seeking care for sleep apnea.
Sleep Centers have limited capacity to provide timely treatment and diagnosis.
The use of home sleep tests can significantly reduce the time between referral, diagnosis, and treatment of Obstructive Sleep Apnea.
Our home management care model has:
- reduced delays in diagnosis and treatment
- reduced costs for patients
- increased follow-up appointment availability & bed availability for in-lab PSGs
- Improved customer satisfaction ratings
ANY QUESTIONS?
WORKS CITED


