**Wait times for sleep apnea care in Ontario: A multidisciplinary assessment**

Brian W Rotenberg MD MPH FRCSC1, Charles F George MD FRCPC2, Kevin M Sullivan PhD MPH MHA3, Eric Wong MD MCiSc(FM) CCFP4

**BACKGROUND:** Obstructive sleep apnea (OSA) is a highly prevalent disorder that is associated with significant patient morbidity and societal burden. In general, wait times for health care in Ontario are believed to be lengthy; however, many diseases lack specific corroboration of wait time data.

**OBJECTIVE:** To characterize wait times for OSA care in Ontario.

**METHODS:** Cross-sectional survey. A survey tool was designed and validated to question physicians involved in OSA care about the length of the wait times their patients experience while traversing a simplified model of OSA care. The survey was sent to all otorhinolaryngologists and respirologists in the province, as well as to a random sample of provincial family physicians.

**RESULTS:** Patients waited an average of 11.6 months to initiate medical therapy (continuous positive airway pressure), and 16.2 months to initiate surgical therapy. Sleep laboratory availability appeared to be the major restriction in the patient management continuum, with each additional sleep laboratory in a community associated with a 20% decrease in overall wait times. Smaller community sizes were paradoxically associated with shorter wait times for sleep studies (P<0.01) but longer wait times for OSA surgery (P<0.05). Regression analysis yielded an $r^2$ of 0.046; less than 5% of the wait time variance could be explained by the simplified model.

**CONCLUSION:** Patients experienced considerable wait times when undergoing management for OSA. This has implications for both individual patient care and public health in general.

**Key Words:** Obstructive sleep apnea; Polysomnogram; Sleep study; Snoring; Uvulopalatopharyngoplasty; Wait times

---

**Les temps d’attente pour les soins de l’apnée du sommeil en Ontario : Une évaluation multidisciplinaire**

**HISTORIQUE:** L’apnée obstructive du sommeil (AOS) est un trouble à forte prévalence qui s’associe à une morbidité et à un fardeau sociétal considérables pour le patient. En général, on croit les temps d’attente très longs avant de recevoir des soins en Ontario. Cependant, de nombreuses maladies ne s’associent à aucunes données corroboratives précises sur les temps d’attente.

**OBJECTIF:** Caractériser les temps d’attente pour les soins de l’AOS en Ontario.

**MÉTHODOLOGIE:** Un outil afin de procéder à une étude transversale a été conçu et validé en vue d’interroger les médecins participant aux soins de l’AOS au sujet des temps d’attente que connaissent leurs patients lorsqu’ils sont exposés à un modèle simplifié de soins de l’AOS. Tous les otorhinolaryngologistes et pneumologues de la province ont été interrogés, de même qu’un échantillon aléatoire de médecins de famille de la province.

**RÉSULTATS:** Les patients ont attendu en moyenne 11,6 mois pour amorcer le traitement médical (pression positive continue), et 16,2 mois pour amorcer le traitement chirurgical. La disponibilité des laboratoires du sommeil semblait la principale restriction dans le continuum de prise en charge des patients, chaque nouveau laboratoire de sommeil installé dans une collectivité s’associant à une diminution de 20 % des temps d’attente globaux. Paradoxalement, les plus petites collectivités s’associaient à des temps d’attente plus courts pour procéder aux études du sommeil (P<0,001) mais à des temps d’attente plus longs avant l’opération contre l’AOS (P<0,05). L’analyse de régression a donné lieu à un $r^2$ de 0,046. Moins de 5 % de la variance de temps d’attente s’expliquait par le modèle simplifié.

**CONCLUSION:** Les patients ont dû affronter des temps d’attente considérables pour la prise en charge de l’AOS, ce qui a des conséquences à la fois sur les soins individuels aux patients et sur l’ensemble de la santé publique.
to developing these same initiatives in other areas of care is a lack of data regarding disease-specific wait times. The primary objective of the present study was to gather data describing the pattern of wait times for OSA treatment in Ontario and to describe the overall wait time a patient with OSA experiences during their health care management process. A secondary objective was to characterize parameters that may influence these wait times.

METHODS

The present research study was approved by the University of Western Ontario (London, Ontario) Research Ethics Board. Wait time data were collected via cross-sectional survey of the main physician groups involved in OSA care: family physicians (FPs), respirologists (RESPs) and otolaryngologists (ENTs). Triangulation of wait-time data from these three sources painted a picture of the overall length of time patients wait for OSA management.

Survey tool development and validation

For study purposes, a simplified model of the typical OSA care pathway was developed, reflecting the time points patients encounter during their management (Figure 1). The arrows indicate intervals during which patients wait—these time intervals were the main outcome measure of the study. A survey tool was developed to incorporate respondent demographic and wait time data. Respondents estimated the wait time that their patients experienced for each of the intervals. Wait time intervals were grouped into a six-item ordinal scale as follows: less than one month, one to three months, four to six months, seven to nine months, 10 to 12 months and longer than 12 months. The physician demographic variables recorded were the following: speciality (ie, FP, ENT or RESP), age, sex, years in practice, size of practice (measured by an estimate of the number of active patients in the practice), practice location (urban, small town, rural or remote) and practice type (academic versus nonacademic, and solo versus group practice). Respondents were also queried about the number of sleep laboratories in their catchment area.

The survey tool was validated with an 11-respondent pilot study, during which reliability estimates were also calculated. Wait time estimates for each step of the study model were compared with actual wait times assessed via formal chart review. Both construct validity and test-retest reliability were assessed by comparing means and SDs for each parameter pair and by calculating Cronbach’s alpha (α), with α>0.70 set as the a priori threshold for acceptability. Proximity of the means served to gauge measurement accuracy, while proximity of the SDs acted as the benchmark for measurement precision. The overall mean α of the survey items was 0.931 for validation assessment and 0.871 for reliability assessment—both values were well above the a priori threshold value. The survey was, therefore, deemed to be reliable and valid as a tool for the present project.

Sample size calculation

The survey was initially designed to be distributed across Canada, with sample size estimates calculated accordingly. However, a low response rate from all provinces other than Ontario hampered the planned distribution; consequently, the sample size calculation was revised accordingly to reflect an Ontario-only distribution. The provincial sample pool consisted of approximately 228 RESP, 226 ENTs and 10,328 FPs (based on 2007 National Physician Survey data [11]). Sample size estimates were generated to detect a 25% difference between groups with 95% confidence and 80% power. This resulted in a final per group sample size requirement of 80 completed surveys and 160 surveys per physician group (based on an anticipated response rate of 50%) to detect a 25% difference between groups. A decision was made to send surveys to all Ontario RESP and ENTs, and to a random sample fraction (4% [n=400]) of the FPs. Randomization of the FP group was performed using tools available at www.random.org.

Survey distribution and collection

For RESP and ENTs, the survey was distributed as a weblink on www.surveymonkey.com, with an e-mail sent to Ontario members of the respective national societies requesting their participation. Embedded measures in the online survey were designed to preserve both anonymity and prevent an individual from completing the survey more than once. There was no e-mail registry for FPs; instead, a formal written survey was mailed with self-addressed, stamped, return envelopes. A modified Dillman survey protocol was used to improve response rates.

Statistical analysis

Data were analyzed using SPSS version 12.0 (SPSS Inc, USA). Analysis was performed excluding all continuous variable outlier values below the first and above the 99th percentile. Continuous, normally distributed variables were compared using ANOVA. Nominal and ordinal variables were compared using χ² analysis. The nonparametric Kruskal-Wallis test was used for analysis involving the three groups, while the Mann-Whitney U test was used to analyze between-group differences. In addition, each dependent variable was recoded to a binomial ordinal variable differentiating between three months and less, and greater than three months. Bivariate analysis to identify correlations between variable pairs was performed with Pearson correlation coefficients. Logistic regression models were developed, with all two-way interactions being tested for. A two-tailed P<0.05 was considered to be statistically significant.

RESULTS

Sample description

Data regarding the three physician groups are presented in Table 1. A high response rate was achieved from ENTs (91.6%) and RESP (72.4%), with a lower response rate from FPs (47.5%). All demographic and practice descriptor variables were significantly different between groups, except for sex distribution. The demographic data were compared with the 2007 National Physician Survey (11) and found to be consistent,
suggestions that the respondents were an adequate and representative sample.

Wait time perceptions

Family physicians were asked how long it took for a patient to be seen in a sleep clinic, be seen by an ENT, be seen by a RESP and to undergo a sleep study. The most common response for most wait times in the first, third and fourth scenario was ‘1 to 3 months’ (40.3%); whereas for an ENT referral, the most common response was ‘7 to 9 months’ (35.5%). RESPs had a modal response of ‘1 to 3 months’ for items 1, 3 and 4 (40.3%, 52.3% and 40.7%, respectively) except for sleep studies and either type of surgery, for which modes were ‘4 to 6 months’, ‘7 to 9 months’ and ‘7 to 9 months’ (35.5%, 32.7% and 43.8%, respectively). Again, approximately 50% of responses indicated a longer wait time than three months for the time intervals. The average number of sleep laboratories in the ENTs catchment area was 2.1. ENTs reported a slightly shorter overall wait time than three months for all intervals. The average estimate of the number of three months or less versus greater than three months. In this analysis, there was a large proportion of patients waiting longer than three months per scenario (average 54.5%); this rose to almost 80% of patients waiting longer than three months for any surgical intervention. FPs reported a very large proportion of answers in excess of this also. To examine this issue, responses were converted to a binomial value of three months or less versus greater than three months. In this analysis, there was a large proportion of patients waiting longer than three months per scenario (average 54.5%); this rose to almost 80% of patients waiting longer than three months for any surgical intervention. FPs reported a slightly shorter overall wait time for sleep studies compared with RESPs and ENTs (7.2 months, degrees of freedom = 2; P=0.027), but this was not clinically significant. No other statistical difference across groups was noted at P=0.05, indicating good agreement among the groups.

Although the modal responses from the three physician groups for most wait time situations were ‘1 to 3 months’, there was a very large proportion of answers in excess of this also. To examine this issue, responses were converted to a binomial value of three months or less versus greater than three months. In this analysis, there was a large proportion of patients waiting longer than three months per scenario (average 54.5%); this rose to almost 80% of patients waiting longer than three months for any surgical intervention. FPs reported a slightly shorter overall wait time for sleep studies compared with RESPs and ENTs (7.2 months, degrees of freedom = 2; P=0.027), but this was not clinically significant. No other statistical difference across groups was noted at P=0.05, indicating good agreement among the groups.

Figure 2 shows the overall wait times experienced by patients as they traversed the healthcare system in Ontario. CPAP (continuous positive airway pressure); ENT (Otolaryngologist); mo (months); RESP (Respirologist).

| TABLE 1 |
| Sample demographics |
| Specialty | ENT | RESP | FP | Test statistic | P |
| Total population, n | 225 | 225 | 10,000 | – | – |
| Sample population, n | 225 | 225 | 400 | – | – |
| Sample fraction, % | 100 | 100 | 4 | – | – |
| Response rate, % | 91.6 | 72.4 | 47.5 | – | – |
| Age, years (mean) | 46.1 | 46.5 | 53.9 | 46.207* | <0.001 |
| Sex, % female | 77.7 | 32.5 | 38.1 | 22.528† | 0.087 |
| Years in practice, n (mean) | 13.9 | 14.2 | 22.3 | 55.771* | <0.001 |
| Practice location, % urban | 82.7 | 82.7 | 61.6 | 22.258† | <0.001 |
| Practice type, % academic | 36.9 | 42.9 | 9.5 | 56.394† | <0.001 |
| Size of practice, n (mean) | 53.4 | 55.2 | 77.4 | 30.648† | <0.001 |

ENT: Otolaryngology; FP: Family physician; RESP: Respirologist. *ANOVA; †Pearson’s χ²

| TABLE 2 |
| Top three reasons for long wait times rated according to specialty |
| Specialty | Otolaryngology | Respirology |
| Factor | 1st | 2nd | 3rd | 1st | 2nd | 3rd |
| Inadequate clinic time | 4.9 | 10.7 | 7.3 | 6.1 | 16.0 | 6.1 |
| Inadequate OR time | 8.3 | 6.8 | 5.3 | 5.5 | 2.5 | 1.8 |
| Not enough sleep labs | 18.9 | 11.2 | 3.9 | 16.0 | 7.4 | 6.7 |
| Inadequate awareness | 8.7 | 9.7 | 9.7 | 6.7 | 6.1 | 9.8 |
| Not enough specialists | 4.4 | 8.3 | 7.3 | 8.0 | 6.1 | 6.1 |
| Cost to patient | 2.4 | 3.4 | 6.8 | 1.2 | 4.9 | 3.7 |

Data presented as %. labs: Laboratories; OR: Operating room.

which the most common response was ‘7 to 9 months’ (34.5% and 35.8%, respectively). RESPs had a modal response of ‘1 to 3 months’ for items 1, 3 and 4 (40.3%, 52.3% and 40.7%, respectively) except for sleep studies and either type of surgery, for which modes were ‘4 to 6 months’, ‘7 to 9 months’ and ‘7 to 9 months’ (35.5%, 32.7% and 43.8%, respectively). Again, approximately 50% of responses indicated a longer wait time than three months for the time intervals. The average number of sleep laboratories in the ENTs catchment area was 3.1, comparable with that of RESPs (2.8). There was no statistically significant difference between physician groups at P=0.05 for any of the other wait time intervals, with means compared using ANOVA or, nonparametrically, using χ² analysis.

Although the modal responses from the three physician groups for most wait time situations were ‘1 to 3 months’, there was a very large proportion of answers in excess of this also. To examine this issue, responses were converted to a binomial value of three months or less versus greater than three months. In this analysis, there was a large proportion of patients waiting longer than three months per scenario (average 54.5%); this rose to almost 80% of patients waiting longer than three months for any surgical intervention. FPs reported a slightly shorter overall wait time for sleep studies compared with RESPs and ENTs (7.2 months, degrees of freedom = 2; P=0.027), but this was not clinically significant. No other statistical difference across groups was noted at P=0.05, indicating good agreement among the groups.

Figure 2 shows the overall wait times experienced by patients as they traversed the healthcare system in Ontario. CPAP (continuous positive airway pressure); ENT (Otolaryngologist); mo (months); RESP (Respirologist).
Can Respir J Vol 17 No 4 July/August 2010

Predictors of wait times

Pearson correlation coefficients were calculated for wait time intervals versus demographic and practice descriptor variables. Correlations were weak ($r < 0.4$) and none were significant. No significant two-way interactions were identified in the regression analyses. Two variables were predictors of wait times for a sleep clinic visit: community size ($P < 0.01$), with smaller community size associated with shorter wait times; and number of sleep laboratories ($P < 0.001$), with increasing number of sleep laboratories associated with shorter wait times. Time to pharyngeal surgery had one predictive variable – community size ($P < 0.05$). No other significant predictors were identified.

DISCUSSION

Long wait times for OSA care in Ontario have been anecdotally suspected; however, the present study was the first to scientifically demonstrate the surprisingly lengthy care delays experienced by these patients. In the simplified model of care studied in the current survey, patients waited a mean of 11.6 months for CPAP by these patients. In the simplified model of care studied in the current study, only one of these patients had already been heavy users of health services for several years, and in excess of the use of the general population. Moreover, once a diagnosis of OSA was made and treatment initiated, evidence suggested that health care expenses markedly decreased by almost 50%. Although Canada-specific data regarding this topic are sparse, one study by Pekel et al (18) reported hospital stays of 1.27 days per patient per year before OSA diagnosis, which decreased to 0.53 days per patient per year after diagnosis. Importantly, these improvements were only seen in patients who had initiated and adhered to CPAP treatment. When treatment delays are prolonged, as our study demonstrated, patients suffer and health care costs rise.

The present study has several potential limitations. As with all surveys, questions can be misinterpreted. Ideally, our initial survey validation should have mitigated the severity of this problem. Also, respondents estimated ordinal wait times for their patients, as opposed to conducting a formal medical record review to ascertain precise wait times. However, asking respondents to formally review their own records would have substantially compromised the response rate. Selection bias exists in the form of the relatively low response rate of the FP arm, thus resulting in a potentially nonrepresentative sample. Our random sample, however, matched the demographics identified in the 2007 National Physician Survey, suggesting that adequate representation was achieved. Also, it may have been helpful to know the estimated number of patients per year that the physician referred for sleep studies because it may have affected the wait time outcomes and statistical results. An additional potential source of bias was that of physicians possibly overestimating their wait times in the knowledge that publication of data regarding longer wait times creates pressure for government to provide more resources.

The most important consideration in interpreting our results was that the survey was based on a simplified model of OSA care. We idealized the care process by assuming that patients underwent linear progression between discrete points along the management spectrum without backtracking, and without failure of initial therapy at the end. This is not a fully accurate reflection of reality, wherein there are many other care permutations that could potentially have been measured. Thus, our simplified model was able to paint a basic picture of the wait time...
issue for OSA. However, the reality is likely an analogous – but different and probably more severe – wait time problem for the management of OSA in the province of Ontario.

ACKNOWLEDGEMENTS: The authors acknowledge Mr Irvin Sherman for his assistance in preparing this manuscript.

REFERENCES
