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Agreement Between Stroke Patients and Family Members For Ascertaining Pre-Stroke Risk of Sleep Apnea

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Abstract

Background—Ascertaining self-reported information about pre-stroke obstructive sleep apnea (OSA) risk in the acute stroke period is challenging as many stroke patients have deficits that hinder communication. We examined agreement between stroke patients without communication limitations and family members (proxy) with respect to pre-stroke risk of OSA.

Methods—Patient-proxy pairs (n = 42) were interviewed independently as part of the Brain Attack Surveillance in Corpus Christi Project from May 2010 - April 2011. The Berlin questionnaire was used to measure a high risk of OSA defined as the presence of at least two of the following conditions: 1) snoring behaviors/witnessed apneas, 2) daytime sleepiness, and 3) hypertension or obesity. Patient-proxy agreement was assessed using a kappa coefficient.

Results—Forty-three percent of patients self-identified as high risk for sleep apnea, and 45% of proxies identified patients as high risk. Patient-proxy agreement for high risk of pre-stroke OSA was fair (kappa = 0.28) with better agreement for spouses and children proxies (kappa = 0.38) than for other family members. Agreement was also fair for most individual questions.

Conclusions—Spouse and child proxy use of the Berlin questionnaire may be an option to assess a patient's pre-stroke likelihood of sleep apnea. Whereas prospective studies of incident stroke in patients with and without objectively confirmed sleep apnea would require formidable resources, the present results suggest that an alternative strategy may involve proxy use of the Berlin in a retrospective study design.

Keywords

Obstructive sleep apnea; Stroke; Proxy; Berlin Questionnaire

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Introduction

Obstructive sleep apnea (OSA) is a risk factor for ischemic stroke.(1,2) OSA also affects stroke outcomes, as it is associated with greater risk of death and disability among stroke patients.(3,4) Although OSA is an emerging risk factor for stroke occurrence and poor stroke outcomes, few large scale stroke studies have investigated the implications of preexisting OSA in regard to post-stroke treatment, screening priorities and their cost-effectiveness, and stroke prevention strategies.

Assessment of OSA is important to begin to answer questions regarding the emerging relationship between OSA and stroke. The most accurate assessment of OSA is through use of polysomnography (PSG); however, PSG is a procedure involving expensive equipment, trained technicians and overnight assessment of sleep habits.(5,6) Following a prospective cohort of individuals tested by PSG for stroke is challenging considering the number of subjects that would need to be followed and the financial and administrative challenges of administering PSG to all subjects over time to update their OSA status. Since PSG is not routinely performed, post-stroke assessments may be the most feasible estimate of pre-stroke OSA available. The Berlin sleep questionnaire may be a practical solution for assessing the pre-stroke risk of OSA in the acute stroke period.(7,8)

Assessment of pre-stroke OSA in the acute stroke period via questionnaires such as the Berlin questionnaire is not without challenges as at least 25% of stroke survivors have communication deficits.(9) Proxies such as spouses or children may be another option to assess risk of sleep apnea using the Berlin questionnaire; however, the reliability between stroke patient and proxy responses regarding pre-stroke sleep apnea is unknown. This study examined the agreement between stroke patients without communication limitations and family member (proxy) assessment for pre-stroke risk of sleep apnea using the Berlin questionnaire. We hypothesized that agreement would be good.

Methods

Stroke patients were identified through the Brain Attack Surveillance in Corpus Christi (BASIC) Project. The methods of the BASIC project have been previously described.(10,11) Briefly, stroke cases from Nueces County, Texas were identified from all hospitals in the county and validated by neurologists. A convenience sample of ischemic stroke patients ascertained from May 2010 – April 2011 were included in this analysis. Proxies were identified by patients as a family member or close friend that would know them best and patient-proxy pairs were interviewed in-person or by phone independently from each other to ascertain information related to the patient's pre-stroke sleep apnea symptoms.

The Berlin questionnaire was used to assess high risk for sleep apnea (yes versus no) as defined by the presence of at least two of the following conditions: 1) snoring behaviors and witnessed apneas (5 scored questions), 2) daytime sleepiness (3 scored questions), and 3) presence of hypertension or obesity (2 scored questions).(7) Snoring behaviors and witnessed apneas were considered present if the patient quit breathing at least 3 times a week during sleep or had two or more of the following symptoms: snoring, loud or very loud snoring, snoring at least 3 nights a week, or snoring bothers others. Daytime sleepiness was defined as ever falling asleep while driving or as having at least two of the following symptoms at least three days a week: feeling tired or fatigued after sleep, or feeling tired or fatigued during wake time.(12)

Hypertension status was abstracted from the patient's medical records and both proxies and patients reported on patient's height and weight to determine BMI. A body mass index (BMI) of greater than 30 was used to define obesity.

Patients and proxies self-reported their age, race-ethnicity, sex and level of education (high school education versus no high school education). Additionally, proxies were asked about their relationship with the patient, including speaking frequency and years they had known the patient. NIH Stroke Scale (NIHSS) for the patient was determined by retrospective chart abstraction using a previously validated method.(13)

This study was approved by the University of Michigan institutional review board (IRB) and by the IRBs of the 2 hospital systems in Corpus Christi.

Statistical Analysis

Means and standard deviations (SD) were computed for age, NIHSS score and years of patient-proxy relationship. Frequencies and percentages were computed for race-ethnicity, sex, level of education, patient-proxy relationship and speaking frequency, hypertension status and BMI. Overall patient-proxy agreement for reporting high risk of sleep apnea pre-stroke was assessed using a kappa statistic. Overall agreement was also stratified by proxy-patient relationship, defined as either spouse/child or other family member (above versus below median score). Agreement for presence of snoring behaviors and presence of witnessed apneas, daytime sleepiness and obesity was also explored. Among the snoring behaviors and witnessed apneas/daytime sleepiness, the patient-proxy agreement for each of the symptoms was also evaluated.

Results

A total of 42 patient-proxy pairs were interviewed an average of 19.9 days post-stroke (median = 14 days, Range = 3 to 76 days). The average patient age was 68 (SD = 12 years), 67% (n=28) were Mexican American and 33% (n=14) were non-Hispanic white. A similar number of male (55%, n=23) and female (45%, n=19) patients participated, and the average NIHSS score on admission was 5.3 (SD = 6.3). The majority of patients were hypertensive (86%, n=36), and 14% (n=6) had a BMI greater than 30. Proxies were spouses (52%, n = 22), children (31%, n = 13), siblings (10%, n=4), parents (5%, n=2) or other family members (2%, n=1). Proxies had known the patients for an average of 42 years (SD = 15) and spoke with the patient either daily (95%, n = 40) or weekly (5%, n = 2) (Table 1).

Based on the Berlin questionnaire results, 43% of patients self-identified as high risk for sleep apnea (n=18), and 45% of proxies identified the patient as high risk (n=19). Overall patient-proxy agreement for high risk of sleep apnea was fair (kappa = 0.28).(14) Agreement differed by patient relationship; spouse and child proxies (kappa=0.38 for both) had better agreement than other family members (kappa=0.13). Among 8 pairs, patients identified themselves as low risk whereas proxies identified them as high risk. Among 7 pairs, patients identified themselves as high risk and proxies identified them as low risk (See Table 2).

Among patients, 15 (36%) classified themselves as having snoring behaviors and witnessed apneas, and 36% of proxies classified patients as having these characteristics (kappa = 0.27). Agreement regarding the specific elements of this category was fair for loud or very loud snoring (kappa = 0.30), snoring bothers others (kappa = 0.31), and quit breathing at least three times a week during sleep (kappa = 0.30). Agreement in this category was poor for snoring at least 3 nights a week (kappa = 0.14) (See Table 3).

Assessment of daytime sleepiness showed 26% of patients and 24% of proxies scoring the patient positive on at least 2 elements (kappa = 0.30). Agreement was fair for being tired after sleep (kappa = 0.45) and tired during wake time (kappa = 0.43). No patients reported falling asleep while driving 3 or more times per week.

Assessment of obesity showed good agreement between patient and proxy, with a kappa of 0.74 (Table 3).

Discussion

Overall, ischemic stroke patient-family member proxy agreement for high risk of sleep apnea measured by the Berlin questionnaire in reference to the pre-stroke period was fair, as was agreement on most individual question items. However, when stratified by relationship, agreement was higher for children and spouses than for other family members.

Previous studies have presented conflicting evidence regarding use of the Berlin questionnaire among proxies to assess risk of sleep apnea. The Berlin questionnaire has shown poor correlation between bed partner assessments and PSG findings among acute stroke patients;(15) however, another study showed good sensitivity for proxy reports when compared to overnight PSG.(16) The latter study also compared the patient and bed partner responses on the Berlin questionnaire to the overnight PSG and found the bed partner assessment to be more accurate than the patient responses when compared to PSG. This could reflect that patients are generally less aware of their snoring and apnea habits during sleep than their bed partners. Our results among stroke patients reflect a similar pattern, with lowest agreement found among questions regarding snoring intensity and frequency; however, our study expands upon previous findings by including additional family members besides bed partners as potential proxies and focusing on the pre-stroke period for OSA risk assessment. Additional validation studies are necessary to understand the best approach for using proxy responses for the assessment of OSA among stroke patients, particularly given the prevalence of communication deficits among stroke patients.

Several limitations must be considered when interpreting these results. As discussed, the Berlin questionnaire is not the gold standard for diagnosis of OSA; it only assesses risk for OSA. Also, as the questionnaire was given post-stroke, there may be recall bias as the patients and proxies were asked to self-report symptoms prior to stroke. Additionally, our sample size (n=42 pairs) was limited and the convenience sample may not be representative of the entire population of stroke survivors, particularly as our focus was on patients with relatively mild stroke and no communication deficits. While other studies included only bed partners or children living at home as proxies,(15,16) our study included family members that may or may not be living with the patient. This could have led to lower agreement than using only members currently living in the same household; however, given that stroke patients are often elderly and there may no longer be a bed partner/spouse, including family members as proxies may be a more realistic approach than limiting to bed partners. Furthermore, the majority of our patients were Mexican American, which may limit the generalizability of our findings to the broader population of stroke patients. Our study also does not address the usefulness of the Berlin questionnaire in reference to the post-stroke period, and does not examine the utility of the Berlin as a screen for current OSA after stroke.

Nonetheless, the Berlin questionnaire may be a practical option with respect to both time and cost to assess pre-stroke OSA in stroke patients. We found fair agreement between proxy and patient classification of pre-stroke OSA; however, higher agreement among spouse and child proxies suggests that these specific family members may provide a better assessment of the risk for pre-stroke OSA. Although acute stroke patients may undergo sleep studies to obtain information that could affect their clinical care, our findings provide support for proxy use of the Berlin in research studies for which pre-stroke OSA risk must be assessed in a retrospective manner. Furthermore, administration of the Berlin questionnaire to a proxy in reference to the patient's pre-stroke state may provide clinicians

and family members a more comprehensive understanding of the contributors to the patient's stroke.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- We assessed pre-stroke risk of obstructive sleep apnea (OSA) by Berlin Questionnaire.
- We compared answers between patients and family members (proxy).
- Patient-proxy agreement was fair.
- Spouses and children had better agreement than other family members/friends.

Table 1
Stroke Patient and Proxy Characteristics, May 2010 - April 2011 in Corpus Christi, TX
(n=42 pairs)

Patient Characteristics		Frequency (%)	Mean (SD)*
Race Ethnicity	Non-Hispanic White	14 (33)	
	Mexican American	28 (67)	
Sex	Male	23 (55)	
	Female	19 (45)	
Education	Less than High School	13 (31)	
	High School	13 (31)	
	Above High School	16 (38)	
Hypertension	Yes	36 (86)	
	No	6 (14)	
Body Mass Index	<30	33 (79)	
	30	9 (21)	
Age			68 (12)
NIHSS** Score			5.3 (6.3)
Proxy Characteristics			
Race Ethnicity	Non-Hispanic White	14 (33)	
	Mexican American	28 (67)	
Sex	Male	11 (26)	
	Female	31 (74)	
Education	Less than High School	8 (19)	
	High School	14 (33)	
	Above High School	20 (48)	
Age			58 (16)
Patient-Proxy Relationship	Spouse	22 (52)	
	Child	13 (31)	
	Sibling	4 (10)	
	Parent	2 (5)	
	Other Family Member	1 (2)	
Patient-Proxy Speaking Frequency	Daily	40 (95)	
	Weekly	2 (5)	
Years proxy has known patient			42.0 (15)

* SD = standard deviation;

** NIHSS = NIH Stroke Scale

Table 2
Patient-Proxy Agreement for Risk of Sleep Apnea, May 2010 - April 2011 in Corpus Christi, TX (n=42 pairs)

Patient Risk Assessment	Proxy Risk Assessment		
	<i>Low</i>	<i>High</i>	<i>Total</i>
<i>Low</i>	16	8	24
<i>High</i>	7	11	18
<i>Total</i>	23	19	42

Table 3
Stroke Patient and Proxy Agreement, May 2010 - April 2011 in Corpus Christi, TX (n=42 pairs)

Category	Agreement	Kappa
High risk of sleep apnea	Fair	0.28
Snoring behaviors and witnessed apneas	Fair	0.27
Loud snoring	Fair	0.30
Snoring bothers others	Fair	0.31
Snoring at least 3 nights a week	Poor	0.14
Quit breathing while sleeping at least 3 nights a week	Fair	0.31
Daytime sleepiness	Fair	0.30
Tired after sleep time	Fair	0.45
Tired during wake time	Fair	0.43
Body mass index	Good	0.74