Family support is beneficial to the management and prognosis of patients with obstructive sleep apnoea

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Background: This study aimed to explore the correlations between continuous positive airway pressure (CPAP) treatment-related self-efficacy and family support among patients with obstructive sleep apnoea (OSA) to provide a basis for improving patients' CPAP treatment compliance.
Methods: From May to Dec 2017, a cross-sectional study was conducted in the emergency wards, otorhinolaryngology wards, respiratory wards, and outpatient clinic of our hospital. A total of 112 patients with OSA treated with home ventilators were administered with the Self-efficacy Measure for Sleep Apnoea (SEMSA) and Perceived Social Support from Family (PSS-Fa) Scale.
Results: On the SEMSA, participants had a disease risk perception score of 2.61±0.31, an outcome expectation score of 2.44±0.17, and a self-efficacy score of 2.55±0.13. Mean total score on PSS-Fa was 10.15±2.73, with 10.7%, 45.5% and 43.8% of participants showing a low level, a medium level, and a high level of family support, respectively. Outcome expectation and self-efficacy were positively correlated with family support.
Conclusions: The self-efficacy and outcome expectation of patients with OSA are positively correlated with their level of family support.

Keywords: Obstructive sleep apnoea (OSA); self-efficacy; family support

Introduction

Obstructive sleep apnoea (OSA) is a chronic disorder of the upper respiratory system that is characterized by the repetitive collapse of the upper airway during sleep. The collapse results in hypoxemia along with increased sympathetic overdrive, blood pressure, and carbon dioxide levels in the blood. The resulting hypoxia is, in turn, linked with a wide range of problems stemming from oxidative stress and inflammation, including multiple cardiovascular morbidities and coronary artery-related and all-cause mortality (1). Furthermore, OSA is closely related to metabolic syndrome, including obesity, hyperlipidaemia, hypertension, and diabetes (2).

Patients with OSA must consistently receive continuous positive airway pressure (CPAP) to attain improved functional outcomes and reduce the health risks associated with OSA. Unfortunately, the nonadherence rates of CPAP are high (3). Weaver *et al.* (4) noted that the domain-specific self-efficacy of patients with OSA might influence CPAP compliance. Stepnowsky *et al.* further confirmed that self-efficacy and outcome expectation had significantly positive correlations with CPAP compliance (5). Presently, there are few studies on how OSA patients' self-efficacy relates to family support; most existing studies on CPAP compliance interventions for patients with OSA focused on strategies such as social support cognition (6,7). The purpose of this study was to investigate the self-efficacy and family support

of patients with OSA, and to examine the correlation between the two. Ultimately, we hoped to provide further knowledge for improving patients' treatment compliance.

CPAP is the most common and efficacious therapy for OSA. It has been demonstrated to safely and effectively manage OSA symptoms with regular long-term use, but its therapeutic benefits depend on treatment adherence (2). Specifically, it should be used for more than 4 h/night. Currently, adherence rates to CPAP are low, and there is little evidence regarding how adherence might be improved (8,9). As noted, Weaver *et al.* (4) and Stepnowsky *et al.* (5) both showed that improving the self-efficacy of OSA patients might help to improve compliance with CPAP treatment. Lai *et al.* (10) also found that the better the adherence to CPAP treatment, the greater the improvements in patients' treatment self-efficacy. Moreover, spouse involvement has been reported to be an important determinant of male patients' CPAP treatment within the first six months after treatment initiation (11).

Methods

The study conforms to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) statement (see Supplementary).

Research subjects

Convenience sampling was used to select patients who received a diagnosis of OSA between May 1 and Dec 30, 2017 at the Sleep Respiration Monitoring Centre of Ningbo First Hospital, Zhejiang Province, China. The inclusion criteria for this study were as follows: (I) diagnosed with OSA; (II) treated in the emergency wards, otorhinolaryngology wards, respiratory wards, and outpatient clinic of the study hospital; (III) treated with a home ventilator; (IV) aged ≥18 years; and (V) capable of communicating normally. The exclusion criterion was being unwilling to participate in the study.

Assessment tools

Self-efficacy Measure for Sleep Apnoea (SEMSA)
Weaver *et al.* (4), from the University of Pennsylvania in the United States, developed the SEMSA to evaluate social cognitive factors related to CPAP therapy among OSA patients. This scale contains 26 items, including eight items related to disease risk perception (all rated on a scale

ranging from 1 point for 'very low' to 4 points for 'very high') and nine items each for outcome expectation and self-efficacy (each rated on a scale ranging from 1 point for 'completely incorrect' to 4 points for 'very correct'). These three subscale scores are independent of each other and cannot be added. The subscale score is calculated as the average of all item scores within that subscale. Higher scores indicate higher disease risk perception, outcome expectation, and self-efficacy. The Chinese version of the SEMSA combines items 2 and 6 from the original version to better suit a Chinese context; thus, the total number of items in the Chinese version of the SEMSA is 25 (including seven items for disease risk perception). The Cronbach's α coefficient of the original scale was 0.92, and the coefficients of the three subscales were all greater than 0.85. The Cronbach's α coefficient of the Chinese version was 0.886, and the coefficients of the three subscales were between 0.701 and 0.895, with the highest being that of the self-efficacy dimension (0.895); the split-half reliability coefficient was 0.851.

Perceived Social Support from Family (PSS-Fa) Scale
The PSS-Fa scale was designed by Procidano and Heller (12) in USA. It consists of 15 items, each answered with 'yes' or 'no'. An answer of 'yes' is given 1 point and an answer of 'no' is given 0 points, so the total score ranges from 0 to 15. Higher scores indicate higher family support. Participants' level of family support can be classified into three levels depending on their total score: low (0–5 points), medium (6–10 points), and high (11–15 points). The Cronbach's α coefficient in this study was 0.711.

Data collection methods

With the approval of the hospital's ethics committee (2019-R071), we explained the purpose of this investigation to potential participants. After obtaining their consent, we administered the questionnaires using a unified set of procedures. The questionnaires were collected on the spot to avoid the possibility of missing items. A total of 120 questionnaires were distributed, and 112 valid questionnaires were recovered (effective recovery rate: 93.33%).

Statistical methods

The data were input into Microsoft Excel and then imported to SPSS Statistics 22.0 (SPSS version 22.0; IBM

Table 1 General information of obstructive sleep apnoea patients (n=112)

Dimension	Mean	Standard deviation	Minimum	Maximum
Age	43.16	10.59	20.00	67.0
Body mass index	29.46	4.45	23.03	50.5
Neck circumference	29.96	3.80	23.00	43.6
Treatment duration (months)	33.71	7.32	23.00	45.0
Apnoea hypopnea index	58.32	17.34	5.80	107.0
Lowest oxygen saturation	53.79	14.42	31.00	79.0
Average blood oxygen saturation	90.09	4.12	71.00	96.0
Snoring index	762.15	403.29	9.60	1,618.7

Table 2 Scores on all subscales of Self-efficacy Measure for Sleep Apnoea (SEMSA) among 112 patients with obstructive sleep apnoea/hypopnea syndrome

Dimension	Mean	Standard deviation	Minimum	Maximum
Disease risk perception	2.61	0.31	1.6	3.3
Outcome expectation	2.44	0.17	1.9	2.8
Self-efficacy	2.55	0.13	2.2	2.8

Corp., Armonk, NY, USA) software for analysis, after they had been double-checked for accuracy. Participants' general characteristics, SEMSA score, and PSS-Fa score were described in terms of frequencies, percentages, and means ± standard deviations. Pearson correlation analysis was used to determine the correlation between self-efficacy and family support.

Results

Participants

This study recruited 112 participants including 99 males (88.4%) and 13 females (11.6%). More information regarding participants is shown in *Table 1*.

SEMSA scores

The average scores for disease risk perception, outcome expectation, and self-efficacy were 2.61±0.31, 2.44±0.17, and 2.55±0.13, respectively (*Table 2* and *Figure 1*).

Family support scores

The mean total score of the PSS-Fa was 10.15±2.73 (range,
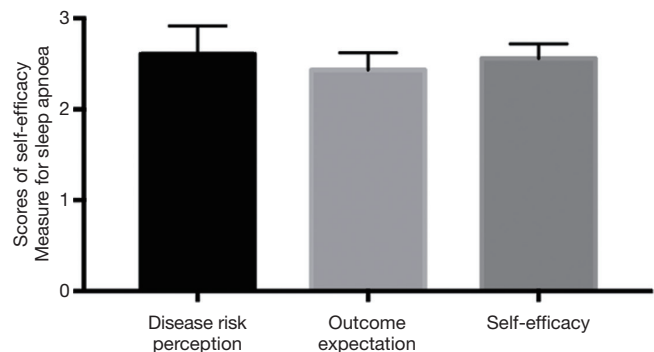
Figure 1 Scores on all subscales of Self-efficacy Measure for Sleep Apnoea (SEMSA) among 112 patients with obstructive sleep apnoea/hypopnea syndrome.

3–15). Among them, 12 cases were defined as having low support levels (10.7%), 51 cases as having medium support levels (45.5%), and 49 cases as having high support levels (43.8%) (*Table 3*).

### Correlation between self-efficacy and family support

A Pearson correlation analysis was used to compare and examine the associations of the three subscales of the

Table 3 Levels of family support among 112 patients with obstructive sleep apnoea/hypopnea syndrome

Group	Number	Mean ± standard deviation	Percentage (%)
High family support	49	12.47±1.24	43.8
Medium family support	51	9.27±1.00	45.5
Low family support	12	4.42±0.67	10.7
Total score	112	10.15±2.73	100.0

Table 4 Correlation analysis of self-efficacy and family support of patients with obstructive sleep apnoea-hypopnea syndrome (n=112)

Item	Family support (r)	P
Disease risk perception	0.154	0.105
Outcome expectation	0.305	0.001
Self-efficacy	0.261	0.005
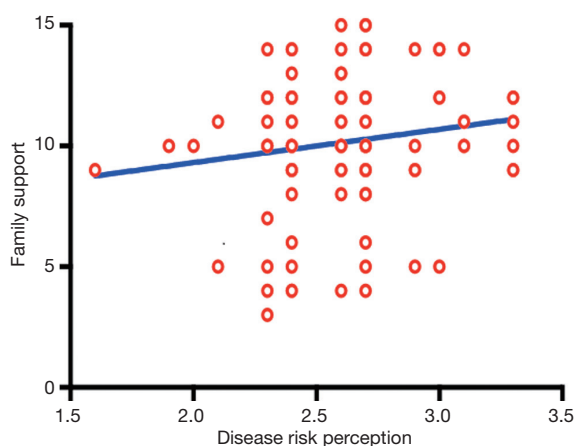
Figure 2 Correlation between disease risk perception and the total score of the Perceived Social Support from Family Scale among obstructive sleep apnoea patients treated with continuous positive airway pressure.
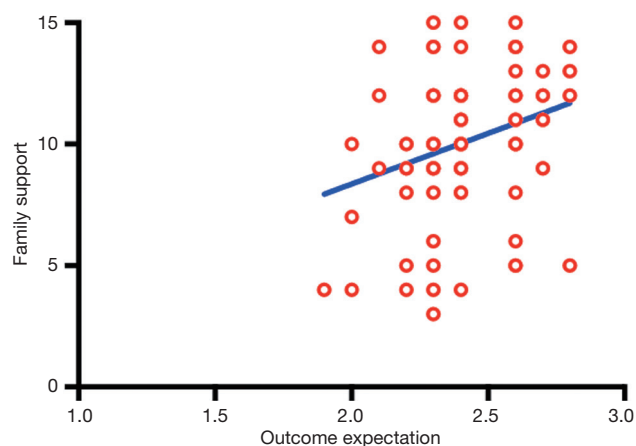
Figure 3 Correlation between outcome expectation and the total score of the Perceived Social Support from Family Scale among obstructive sleep apnoea patients treated with continuous positive airway pressure.

SEMSA (disease risk perception, outcome expectation, and self-efficacy) and the total score of the PSS-Fa among patients with OSA. The results showed that the outcome expectation scores (P<0.01) and self-efficacy scores (P<0.01) were positively correlated with family support level, as shown in *Table 4* and *Figures 2-4*.

Discussion

In this study, the subscale scores of the SEMSA were lower than those reported by Sawyer *et al.* (13). A possible reason

for this discrepancy is that patients in the latter study were newly diagnosed with OSA and different underlying diseases.

Our results further showed that patients' outcome expectation and self-efficacy scores were significantly and positively correlated with the level of family support (P<0.01). This finding is consistent with the results of Puspasari *et al.* (14), who found that family support was positively correlated with the self-efficacy of adolescent mothers. No harm/side effects of family support were found in this study. Taken together, these findings indicate that the
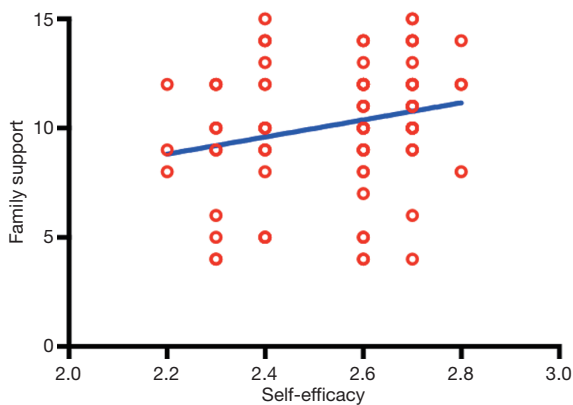
Figure 4 Correlation between self-efficacy and the total score of the Perceived Social Support from Family Scale among obstructive sleep apnoea patients treated with continuous positive airway pressure.

higher the level of family support, the higher the patient's self-efficacy for CPAP treatment.

Family support may also increase treatment compliance in OSA patients. This is supported by Hu *et al.* (15) who found a positive correlation between family social support and medication compliance among hypertension patients. Moreover, in her interview study, Luyster asserted that spousal support may be an effective strategy for improving patients' CPAP compliance (16). Batool-Anwar *et al.* (11) reported that marriage is an important determining factor in the first six months of CPAP therapy among male patients with OSA. Thus, spousal factors can be considered as the initial motivation for patients to start CPAP therapy.

According to past literature and the results of this study, family support should be considered an important contributor to the self-efficacy of patients with OSA and it may be beneficial to the management of these patients' treatment. Numerous studies have been conducted on how to improve CPAP treatment compliance (9,10,17), but our results suggest that further research is necessary. Particularly, interventions should be designed to effectively engage patients' families or partners to optimize CPAP adherence (18).

A previous study showed that 85.5% of nurses perceive themselves to have inadequate fundamental knowledge of health education and feel ill-equipped to provide family support interventions (19). If nursing departments strengthen the on-the-job training of nurses in family support interventions, this may be conducive to more

effective communication with patients and relatives, which, in turn, could improve patients' utilization of family support. After such training, nurses could instruct patients' families in obtaining more knowledge of the disease and its rehabilitation and lead them to enthusiastically participate in the implementation of patients' rehabilitation.

When OSA patients are admitted to the hospital, nurses should establish a good relationship with patients and their families, comprehensively evaluate the quality of life and family support of patients, and strive to establish stable, trustworthy, and cooperative relations with all family members as soon as possible. This is close to the result of Broström *et al.* (20). Before discharge, nurses, patients, and patients' families should determine a self-care plan for patients that will be enacted after discharge. These plans are often based on patients' family conditions and require family members to work with patients. Nurses should provide telephone counselling on patients' health problems and provide continuing care for patients through applications such as WeChat. Moreover, they can hold regular seminars on self-management of CPAP to improve patients' knowledge of self-care. Family members should assist patients in recording their SPO_2 daily as well as evaluate and summarize the effect of treatment.

Due to limited human and material resources, this study only investigated the self-efficacy and family support of OSA patients during CPAP treatment; it did not comprehensively study other relevant factors such as CPAP treatment compliance and family intimacy. Future research should investigate these factors in detail. Further, although the results of our study could provide some suggestions for CPAP treatment-related education for OSA patients, we did not carry out such education or training for patients and their family members. In the future, such education programs should be developed and their efficacy should be examined.

Relevance to clinical practice

Family support, as an important part of patients' social support, is closely related to patients' self-efficacy. It is suggested that clinical nurses should attach importance to and obtain the support of patients' family members, partners, and other people who have a close relationship with patients when carrying out health education for OSA patients. Family members play an important role of supervision, encouragement, and support in the long-term self-management of OSA patients.

Conclusions

In summary, the self-efficacy of OSA patients undergoing CPAP treatment is closely related to their family support. Improving the family support of OSA patients undergoing CPAP treatment can play a role in enhancing their treatment-related self-efficacy. Future CPAP treatment-related health education programs for OSA patients should emphasize the importance of participation of patients' family members.

Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/apm-19-310). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics committee of Ningbo First Hospital (2019-R071). Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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STROBE Statement—Checklist of items that should be included in reports of cross-sectional studies

	Item No.	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding
		(b) Describe any methods used to examine subgroups and interactions
		(c) Explain how missing data were addressed
		(d) If applicable, describe analytical methods taking account of sampling strategy
		(e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(b) Report category boundaries when continuous variables were categorized
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*, give information separately for exposed and unexposed groups. Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of *PLoS Medicine* at http://www.plosmedicine.org/, *Annals of Internal Medicine* at http://www.annals.org/, and *Epidemiology* at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.