Sleep Goal Index (SGI) – A new success outcome criteria on 618 OSA patients

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ABSTRACT

Introduction: Sleep-Goal Index (SGI) comprises of Blood Pressure, AHI (number of apnoea and hypopnea events per hour), T90 (duration of oxygen below 90% and BMI (body mass index). This study aims to demonstrate SGI as a holistic, comprehensive and practical measurement of treatment outcomes in OSA (obstructive sleep apnoea) management.

Materials and Methods: A prospective 10-center clinical trial of 618 OSA patients, who underwent nose, palate and/or tongue surgery. Pre- and post-operative data were analyzed and compared with the Sher's criteria (AHI reduction 50% and <20) and the Sleep Goal Index.

Results: There were 514 males and 104 females, mean age of 45.8±13.1 years. Mean snore VAS improved from 7.6±1.9 to 2.8±2.1 (p<0.001), mean Epworth score (ESS) improved from 11.5±4.8 to 5.4±3.5 (p<0.001), mean BMI decreased from 28.6±4.8 to 27.3±5.3 (p<0.001), gross weight decreased from 82.4±14.2kg to 78.1±13.3kg (p<0.001). Mean AHI decreased 37.4±25.7 to 16.4±14.6 (p<0.001), mean LSAT improved 74.5±18.4% to 85.4±7.6% (p<0.001), and mean T90 (time spent <90%) decreased from 27.7±8.9 minutes to 9.7±2.1 minutes (p<0.001). Mean SBP decreased from 130.4±19.4 to 121.1±14.6mmHg, mean DBP decreased from 84.7±13.4 to 79.5±12.3mmHg. The overall success rate (Sher's criteria) was 55.7%. Based on McNemar's test, comparing Sher's criteria and SGI (4 parameters – BP, BMI, T90, AHI), it was demonstrated that fulfilling any 2 out of 4 SGI parameters would be just as sensitive as Sher's criteria, whilst being more holistic and representative of the patients' oxidative stress. From McNemar's test, the overall duo-paired combination and permutations of these 4 SGI parameters ranged from 41.8% to 60.9%.

Discussion: AHI as a single parameter to measure OSA treatment success can be unreliable. The SGI is a holistic, comprehensive, easily measured and better patient appreciated measurement index reflecting true end-organ function/improvement.

KEYWORDS:
OSA, sleep apnea, surgical outcomes, success rate, AHI, Sleep Goal Index

INTRODUCTION

Obstructive sleep apnoea (OSA) is a common sleep disorder that affects 9% of middle age men and 3% of women in North America.[1] This upper airway disorder causes recurrent hypoxic events during sleep and has been shown to affect the patient's neuro-cardiovascular system, resulting in strokes, heart attacks, arrythmias, and even sudden cardiac death. Some studies estimate that 93% of females and 82% of males with moderate to severe OSA remain undiagnosed.[2] Many scientific studies have shown strong correlation and causation between OSA and hypertension,[3] cardiovascular diseases,[4] and congestive heart failure.[5]

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It is widely accepted that the level 1, overnight full polysomnography is the gold standard test for OSA, the foreign sleeping environment makes it difficult for the patient to sleep. Traditionally, the severity of the OSA is classified based on the number of apnoea and hypopnea events per hour (AHI). The effectiveness of any intervention for OSA has been based on a specific arbitrarily proposed 50% reduction in pre-operative AHI and an AHI below 20 (known as the Sher's success criteria).[6]

The over-reliance on the AHI has resulted in inconsistencies of measurement being reported. There is discordance between AHI used to denote outcomes/success of therapy and real-world clinical outcomes like, quality of life (QoL), patient perception of disease, daytime tiredness, snoring, cardiovascular measures (e.g., blood pressure, oxygen saturation), and/or survival.[7]

A fundamental issue of AHI is the basic definition of hypopnoea varies from one sleep laboratory to another sleep laboratory system. Other variables include the monitoring system (thermistors versus transducers), the subjective scoring of each epoch by the sleep technologist, the intrinsic human sleep night-to-night variability[8-11] and the usage of different sleep monitoring system/laboratory/equipment[12] pre-operative and post-operatively.

This parameter AHI is not intuitively informative to the patient; no patient would seek a consultation with a sleep specialist complaining that "my AHI is high". Too much weightage has been given to this single parameter (AHI) that is well known for its variability. Patients are more concerned and affected by "real tangible" issues like loud snoring, daytime sleepiness, uncontrolled hypertension, obesity, high glucose levels; these are the effects of OSA as a systemic disease affecting end-organs, manifesting as these patient related symptoms or complaints. Hence, we propose measuring, assessing and utilizing these end-organ effects of OSA in assess outcomes of intervention.

We had proposed the SLEEP-GOAL outcome parameters previously with good acceptance amongst sleep specialists13. The SLEEP-GOAL success criteria is more holistic, comprehensive and inclusive of patient' complaints compared to AHI alone. We present a more compendious version of the Sleep-Goal outcome parameters known as the Sleep-Goal Index (SGI) comprising of the Blood Pressure, Gross Weight (BMI), Oxygen Time Spent below 90% (T90), and AHI.

MATERIALS AND METHODS

Study Design

This was a non-randomised prospective ten-centre (10) clinical trial of consecutive OSA patients who consulted the sleep/ENT clinic for snoring and/or symptoms of OSA. These patients met the inclusion criteria, and subsequently underwent upper airway surgery, in the form of either nose, palate and/or tongue surgery, single or multi-level surgery. Patients were recruited from ten tertiary clinical centres from ten countries from June 2016 to December 2023 (however, due to the pandemic, patient recruitment was very low from 2020 to 2022).

Patient Selection

All patients had comprehensive clinical assessment including a physical examination, naso-endoscopy, and an overnight polysomnography pre- and post-surgery. Parameters included the time spent oxygen saturation below 90% (T90), AHI, gross weight/BMI, systolic (SBP) and diastolic blood pressure (DBP). Patients completed the Epworth Sleepiness Scale (ESS) and a visual analogue scale (VAS) for snoring pre- and post-surgery. Quality of Life (QoL) was assessed using at least one of the following instruments the 36-Item Short Form Survey (SF36), the Functional Outcomes of Sleep Questionnaire (FOSQ10), Sleep Apnea Quality of Life Index (SAQLI), and/or the Pittsburgh Sleep Quality Index (PSQI) questionnaires.

Clinical examination included neck circumference, body-mass index (BMI), and blood pressure (pre- and post-operative); an endoscopic assessment of the nasal cavity, posterior nasal space, oropharyngeal area, soft palatal redundancy, uvula size and thickness, tonsillar size and Mallampati grade. Flexible naso-endoscopy was performed for all patients and collapse during a Mueller's manoeuvre was graded for the soft palate, lateral pharyngeal walls and base of tongue. Blood pressure measurements recorded were pre-operative average blood pressure readings at the clinic on two to four separate occasions and/or blood pressure readings at home on four separate occasions. The blood pressure measurements, BMI, gross weight calculations, and polysomnographic measurements were all done after a minimum of 6 months post-operatively, onwards. All patients had pre-operative and post-operative sleep test done in the same respective centres with the same level of study done. All patients had a level 1 sleep test done.

Inclusion criteria were patients >18 years old, AHI >5, all Friedman stage, all Mallampati grades, all multi-level collapse, all BMI, and all combinations of nose surgery alone, nose with palate surgery and/or nose with palate and tongue surgery. All patients were offered continuous positive airway pressure (CPAP) therapy, and those patients who chose CPAP were subsequently excluded from the study. We excluded patients who had previous upper airway surgery and/or had any pillar implants or hypoglossal nerve implant inserted previously. The study protocol and methodology were reviewed and approved by the hospital Ethics Committee/Institutional Review Board of their respective countries.

Study Intervention

All patients enrolled had either nasal, palatal and/or tongue surgery performed as a single level or multilevel surgery. Nasal surgery included either functional endoscopic sinus surgery, septoplasty, turbinate reduction and/or turbinoplasty. Palate surgery performed was either uvulopalatopharyngoplasty, anterior palatoplasty, z-plasty, uvulo-palatal flap, barbed phayngoplasty and/or the expansion sphincter pharyngoplasty. Tongue surgeries included radiofrequency tongue base ablation, midline tongue glossectomy, or tongue base coblator channelling. Surgeries were decided by surgeon discretion, best practices, highest standard of care and the anatomy of the patient. Post-operatively, patients were on soft liquid diet for 2 weeks duration (due to the palate surgery), with subsequent dietary and nutritional counselling for every patient (in order to encourage weight reduction and a holistic health program).

Outcome Measures

Sleep-Goal Index

The SLEEP-GOAL[13] outcome measures published in 2020, relates closely with the end-organ effects/parameters of the OSA patient (Table I). It reflects the cardiovascular and neuro-cognitive effects of the OSA disease process, oxidative stress and the OSA disease load. Based on the medical evidence on these parameters, Pang et al[13] had assigned SLEE as minor criteria and PGOAL as the major criteria. Successful improvement post treatment is denoted by :-

S = Snoring – VAS reduction by 50%
L = sleep Latency – increase by 50% time latency
E = ESS – a reduction of 50% and < 10
E = Execution time – an improvement by 50%
P = blood Pressure – reduction of either SBP or DBP by 7mmHg or both by 5mmHg
G = Gross weight / BMI – reduction of GW by 8% or drop in BMI by 2 points
O = Oxygenation (time spent < 90%) – improvement by 50%
A = AHI – reduction by 50%
L = Life quality (QOL) score – improvement by 50%

The Sleep-Goal Index (SGI) is the more condensed and concise use of the main major criteria of the Sleep-Goal parameters, it consists of blood pressure, gross weight/BMI, time spent oxygen saturation <90%, and AHI.

P = blood Pressure – reduction of either SBP or DBP by 7mmHg or both by 5mmHg
G = Gross weight / BMI – reduction of GW by 8% or drop in BMI by 2 points
O = Oxygenation (time spent < 90%) – improvement by 50%
A = AHI – reduction by 50%

Statistical Analysis

All analyses were performed using SPSS 28.0 with statistical significance set at $p<0.05$. Descriptive statistics for numerical variables were presented as mean±sd and frequency (%) for categorical variables. The comparison of pre-operative and post-operative variables were compared using Paired T test. The McNemar's Tests were performed to compare the discriminant capabilities of the various Sleep Goal Indexes with the traditional Sher's Criteria.

Ethical approval

Ethical approval: This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. There were no recognisable data or patient/human profiles within the article.

RESULTS

The 618 OSA patients were recruited from the ten tertiary clinical centres in ten countries. There were 514 males and 104 females, mean age of 45.8±13.1 years. The overall mean snore VAS based on bed partner rating improved from pre-operative 7.6±1.9 to post-operative 2.8±2.1 ($p<0.001$). The mean daytime sleepiness Epworth score (ESS) improved from pre-operative 11.5±4.8 to post-operative 5.4±3.5 ($p<0.001$). The mean BMI had decreased from a pre-operative value of 28.6±4.8 to 27.3±5.3 post-operatively ($p<0.001$), the range of height was 1.50 metres to 1.98 metres, and the mean weight was 81.9±14.3kg. The mean gross weight decreased from pre-operative 82.4±14.2kg to a post-operative mean gross weight of 78.1±13.3kg ($p<0.001$). The mean pre-operative AHI decreased from 37.4±25.7 to post-operative AHI 16.4±14.6 ($p<0.001$), while the mean pre-operative LSAT increased from pre-operative 74.5±18.4% to post-operative 85.4±7.6% ($p<0.001$), and mean T90 (oxygen time spent / duration <90%) decreased from a high pre-operative duration of 27.7±8.9 minutes to an impressive lower duration of 9.7±2.1 minutes, post-operative ($p<0.001$). The mean SBP decreased from pre-operative 130.4±19.4 to a post-operative 121.1±14.6mmHg, and the mean DBP decreased from pre-operative 84.7±13.4 to post-operative 79.5±12.3mmHg ($p<0.001$).

The overall success rate for these 618 OSA patients (based on Sher's criteria) was 55.7%. Based on McNemar's test, comparing Sher's criteria and the Sleep-Goal Index (SGI) (4 parameters – blood pressure, gross weight, BMI, time spent oxygen <90%, T90, AHI), it was demonstrated that fulfilling any 2 out of 4 SGI parameters would be just as sensitive as the Sher's criteria, whilst being more holistic and representative of the patients' end-organ effects and oxidative stress (Table II) and real-world experience. For the purpose of simplicity and comparison in this paper, we assign the SGI parameters into (A) blood pressure, (B) gross weight reduction, BMI, (C) T90 – time spent / oxygen duration below 90%, and (D) AHI. Out of the 618 OSA patients, 36.7% of the patients had reduction of either SBP or DBP by 7mmHg or both by 5mmHg, 25.9% had reduced their gross weight by 8% or reduced their BMI by 2 points, 52.2% reduced the oxygen duration below 90% by half (T90), and 59.0% reduced the AHI by half.

Referring to Table II, we note that the overall success rates (rate that fulfils the criteria stipulated by the SGI), in paired combinations that fulfilled the respective SGI criteria, were as follows – A and B – 41.8%, A and C – 56.2%, A and D – 55.8%, B and C – 54.5%, B and D – 56.7%, C and D – 60.9% (all of which were very similar and close to Sher's criteria of a success rate of 55.7%, indicating that any of these 2 out of the 4 SGI parameters combined, would be as sensitive as the Sher's criteria).

In the column "Success Met by Sher but Missed by SGI", the percentage of 618 patients who met the Sher's criteria but were missed by the SGI criteria pairs are as follows: A and B – 1.0%, A and C – 1.0%, A and D – 0.0%, B and C – 2.0%, B and D – 0.0%, C and D – 0.0% ($p<0.001$). This data illustrated that the SGI criteria pairs included 98-99.0% of all the patients who also satisfied the Sher's criteria.

In the column "Success Met by SGI but Missed by Sher's", the percentage of 618 patients who met the SGI criteria pairs but were missed by the Sher's criteria were as follows: A and B – 26.3%, A and C – 34.7%, A and D – 26.3%, B and C – 29.4%,

Table I: Sleep Goal Index criteria

SLEEP GOAL INDEX – SGI
A. reduction of either SBP or DBP by 7mmHg or both combined by 5mmHg
B. reduction of gross weight by 8% or a BMI drop by 2 points
C. a reduction of 50% of the Oxygen duration below 90%
D. AHI reduction of 50% (from pre-op)

Table II: Comparison of the SLEEP GOAL INDEX to Sher's criteria (using the McNemar's test)

Method	Both Yes & Yes Success Met	Success met by Sher but Missed by SGI	Success met by SGI but Missed by Sher	p-value
Sher criteria	55.7%	-	-	-
A	36.7%	19.1%	21.9%	0.329
B	25.9%	29.5%	11.0%	< 0.001
C	52.2%	5.3%	25.4%	< 0.001
D	59.0%	10.0%	10.9%	< 0.001
A X B	41.8%	1.0%	26.3%	0.001
A X C	56.2%	1.0%	34.7%	< 0.001
A X D	55.8%	0.0%	26.3%	< 0.001
B X C	54.5%	2.0%	29.4%	< 0.001
B X D	56.7%	0.0%	17.0%	< 0.001
C X D	60.9%	0.0%	27.1%	< 0.001

Any 2 out of the 4 parameters is as stringent as the Sher's Criteria.

B and D – 17.0%, C and D – 27.1% (p<0.001). We note that the Sher's criteria were not in concordance with a fair number of patients (17.0% to 34.7%) who were noted to have had a successful outcome based on the criteria of SGI combination pairs.

DISCUSSION

Sher's success criteria were arbitrarily based on a single parameter of AHI as the sole success rate indicator of treatment has been used since 1996. Pang et al[13] had illustrated the short-comings of the AHI and the close association between OSA and with blood pressure, gross weight, BMI, quality of life (QOL), hypoxemia (T90), neuro-cognitive and the cardio-vascular systems. The Pang et al[13] discussion had detailed the reasons for the utilisation of the SLEEP-GOAL as a suitable outcome measure and to illustrate the inadequacies of the single parameter of AHI. Pang et al[13] had also explained the inaccuracies for some of the parameters, for example, Epworth Sleepiness Scale (ESS) can vary from night to night, and week to week, depending on the duration of the sleep that particular night/day/week; moreover, the commonest cause of high ESS is sleep deprivation and not OSA. With this background, we wish to discuss the advantages of using the SGI criteria pairs as a measure of treatment outcome as follows.

The Reliable or "Liable" AHI

The level 1 overnight in-hospital polysomnogram is cumbersome, uncomfortable, resource intensive, costly, with long waiting lists and intense labour requirements. It has several issues of inconsistency:

Firstly, night-to-night variability affects the pre-operative and post-operative AHI results. Chediak et al8 reported that 32% of their patients had a difference of AHI≥10 in two consecutive nights of PSG. Levendowski et al[10] reported a weak correlation (r=0.44) between overall AHI from the two PSG studies conducted approximately 40 days. However, Stepnowsky et al[11] demonstrated in 1091 patients that the night-to-night Pearson correlation coefficients ranged between 0.88 and 0.90 for each pair of nights. Secondly, the in-lab overnight polysomnogram and the home-based test would also affect AHI results. The patient should have the identical sleep test performed pre-operative and post-operative.

Thirdly, the different definitions of hypopnea in the laboratory systems and the criteria based on a 4% desaturation are different sleep laboratories. Hypopnea is usually defined as reduction in ventilation of at least 50% that results in a decrease in arterial saturation of 4% or more due to partial airway obstruction. Some sleep centres define hypopnea as clinically significant when there is a ≥30% reduction in nasal airflow lasting for 10 seconds or longer with an associated ≥4% oxygen desaturation and/or if these result in an arousal. Medicare's definition strictly follows ⌑ 5% or more of oxygen desaturation. Finally, different monitoring equipment during the sleep test affects sensitivity of airflow detection; e.g., nasal thermistors versus nasal airflow pressure sensors.

OSA and Blood Pressure

Patients with OSA are "non-dippers", after a period of suffering from OSA; normal patients have a typical 10-20% dip in nocturnal blood pressure.[14-16] Scientific research has shown the strong association between OSA and neuro-cardiovascular effects, like increased risk of stroke, heart failure, arrhythmias, and myocardial infarction.[16-18] Patients with OSA have a higher incidence of hypertension, as high as 1.5 to 2.7 times.[18-20], and treatment of these OSA patients with CPAP have consistently and reliably shown a decrease in blood pressure, likely due to the improvement of vascular function.[21,22] The significance of a blood pressure reading is easily understood by a patient.

Gross Weight / BMI and OSA

Obese and OSA patients have higher oxidative metabolic changes/stress and are more prone to diabetes, hypertension, hypercholesterolaemia and obstructive sleep apnea.[23] It is also known that patients with OSA may not be obese.[23] Simplistically, the anatomy of the upper airway is essentially a balance between the soft tissues and its skeletal framework. Studies have also showed that in Asian patients a cranio-facial restriction (small jaw, retrognathia) is commonly associated with OSA (making gross weight a better reflection compared to BMI), compared to Caucasian patients where fat deposition is common.[23] Research also demonstrate that a BMI>40 is also a predictor of poorer surgical outcomes,[24] and that obesity is significantly associated with fat deposition in the posterior tongue.[25] Kim et al., had recently showed that the tongue fat percentage was higher in OSA patients compared to normal (matched BMI) subjects (42% versus 24%).[26] Parapharyngeal fat pads have also been shown to be enlarged in apneics and to contribute to airway narrowing.[27] Sleep specialist appreciate that a reduction in BMI would not only reduce the overall oxidative metabolic stress but also, inadvertently also increase the upper airway space in totality.

Sleep Goal Index (SGI)

The AHI is a not an intuitively informative concept, patients do not complain of a raised AHI. Patients are bothered by real life clinical symptoms like excessive sleepiness, loud snoring, poor memory/concentration, irritability and loss of libido; or its systemic disease like high blood pressure and cardiovascular morbidity, yet, such parameters are underutilised and unaccounted for in evaluating treatment outcomes. Consider patient A with AHI of 95 who, after treatment, has a post-operative AHI 21; this patient would likely experience clinical symptomatic improvement with decrease in oxidative stress level, even though he would have been classified as a "failure" based on Sher's AHI criteria. Consider another patient B, with pre-operative AHI 35, and post-operatively AHI < 14, this is considered a "successful" AHI outcome (based on Sher's AHI criteria) even though the impact might be minimal, compared to patient A. Intuitively, patient A benefitted significantly more than patient B.

From our data, the overall success rate for these 618 OSA patients (based on Sher's criteria) was fairly low at 55.7%. We anticipated this lower success rate, as our data included OSA patients who had all forms of upper airway surgery, including nose surgery alone (a single surgical modality not expected to show much improvement in AHI). This discordance was intentionally planned so that the SGI could be tested and compared to the Sher's criteria for both surgical "success" and "failures".

SGI is compared with Sher's criteria using the McNemar's test. The Sleep-Goal Index (SGI) utilizes 4 more holistic parameters – blood pressure, gross weight, BMI, oxygen time spent / duration <90%, (T90) and AHI. Based on these 4 parameters, it was noted that fulfilling any 2 out of 4 SGI parameters would be just as sensitive as the Sher's criteria, with additionally being more holistic and representative of the patients' end-organ effects and oxidative stress (Table II).

The overall success rates of various SGI pairs that fulfilled SGI criteria as "success" (under the column "both yes & yes success met") , were as follows – A and B – 41.8%, A and C – 56.2%, A and D – 55.8%, B and C – 54.5%, B and D – 56.7%, C and D – 60.9% (all of which were very similar and close to Sher's criteria of a success rate of 55.7%, indicating that any of these 2 out of the 4 SGI parameters combined, would be as sensitive as Sher's criteria), with reference to Table I.

With reference to Table II and the column "Success Met by Sher but Missed by SGI", we note that the percentage of these 618 patients who met the Sher's criteria but was missed by the SGI criteria was: A and B – 1.0%, A and C – 1.0%, A and D – 0.0%, B and C – 2.0%, B and D – 0.0%, C and D – 0.0% ($p<0.001$). From this table, we can conclude that the SGI criteria included 98-99.0% of all the patients who also satisfied the Sher's criteria.

With reference to Table II and the column "Success Met by SGI but Missed by Sher", we note that the percentage of these 618 patients who met the SGI criteria but was missed by the Sher's criteria were as follows, A and B – 26.3%, A and C – 34.7%, A and D – 26.3%, B and C – 29.4%, B and D – 17.0%, C and D – 27.1% ($p<0.001$). We note that the Sher's criteria is not comprehensive and did not encompass the patients who had benefited from surgery, as Sher's criteria only used one parameter, AHI. Hence, Sher's criteria had missed between 17.0% to 34.7% of patients whose treatment outcomes were successful on the SGI by 2 out of 4 parameters, and who had actually benefited from surgery.

Hence, based on these validated parameters of the SGI, we propose that any patient who meets the criteria of 2 out of these 4 SGI parameters, would be deemed as clinical success for that respective intervention. In addition, we also illustrated that had we utilized the old Sher's criteria to these 618 patients, the patients who had encouraging post-intervention results in terms of blood pressure decrease, BMI/gross weight reduction, and significance reductions in the duration below 90% oxygen saturations (T90) would have been mis-classified as failures.

We acknowledge and recognize some possible limitations and short comings of this study. This includes that fact that the numbers are not large, and some centres may have had patients that were lost to follow up and as with multi-centre studies, the surgeon performing the procedure, might have a slightly different technique and may contribute to the slight difference in success rates. However, we noted that the objective of the paper was not to compare success rates of the various procedures or techniques, but to compare the two different methods of evaluating success rate, namely Sher criteria and the SGI. Furthermore, surgical techniques that are employed by each surgeon might differ; however, this paper's objective was not to analyse the success rates of techniques but the type of outcome measures used. In addition, the method and device used for assessing sleep may vary. The device software may have slightly different definitions of hypopnea and oxygen desaturation definitions in each country. This is the objective of this study, to illustrate the over-reliance of the AHI which in turn has wide variability.

We also noted a few other limitations. Firstly, different centres practise different pre-operative protocols. Some centres use DISE routinely, where other centres might not. The inclusion of pre-operative DISE might also affect the success rates and surgical outcome.

Finally, we are comparing SGI to Sher's criteria, demonstrating that because SGI has 4 parameters instead of only one very unreliable parameter AHI (as we had discussed), SGI would intuitively be more holistic and non-inferior to the AHI. However, the disclaimer is that this work may not have demonstrated that SGI is superior. However, instinctively, all sleep physicians are aware of the pitfalls of the AHI, and are also aware of that the SGI provides a more holistic approach through blood pressure, gross weight, BMI and oxygen levels, compared to only one AHI parameter alone.

CONCLUSION

The SGI parameters are easy to measure, consistent and reproducible. The SGI is realistic and holistic for OSA patients undergoing treatment for OSA. The patient’s treatment outcome could already be measurable by 2 out of the 4, SGI criteria. We would like to propose the use of Sleep Goal Index as a treatment outcome measure as it is holistic, comprehensive, easily measured and better patient-appreciated as a treatment outcome measure.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

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