



Role of Telemedicine in Screening, Diagnosis, and Management of Obstructive Sleep Apnea

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ABSTRACT

Introduction: Obstructive sleep apnoea (OSA) is a common medical condition that is linked to severe clinical complications, morbidity, and mortality with an added burden of expensive medical treatment. Although there has been a recent increase in public awareness of sleep disorders, OSA is still a sleep condition that is not properly identified. The field of sleep medicine is still in its infancy in India. The technology of information and communication may provide efficient management possibilities of OSA through telemedicine.

Aim/Objectives: To provide an integrated, technologically advanced and a practical telemedicine platform that maintains high standards of health care while being simpler and affordable for patients with OSA to use.

Methods: At Apollo Telehealth, the “Good Nidra” OSA treatment program offers personalized care with home-based screening, diagnosis and management using cutting-edge telemedicine-based technologies that are practical and affordable. This program integrates CPAP equipment with remote patient monitoring features to enhance treatment. Expert support staff including sleep technicians, sleep coaches, and counsellors guide patients throughout the program. The goal is to widen the role and impact of telemedicine and reduce the burden of sleep apnoea on the community.

Results: From March 2022 to February 2023 patients at primary care visits, with OSA symptoms and signs were identified and they were consulted by specialist doctors through telemedicine and tested using the STOP-BANG questionnaire. Out of the 2107 total screened individuals, 525 Teleconsultations took place and were diagnosed with OSA.

Conclusion: Telemedicine has filled the much-needed gap of screening diagnosing and management of OSA by effectively and efficiently integrating specialised and focused care. This paradigm apart from reaching a greater number of patients, may also be applied to widen the usage of telemedicine and telehealth in various other medical disciplines that are frequently neglected or given insufficient care while treating individuals.

Key Words: Telemedicine, Obstructive Sleep Apnoea, Continuous Positive Airway Pressure (CPAP), Telemonitoring, Out of Hospital Management, Specialised and Focused Care

INTRODUCTION

Obstructive sleep apnoea (OSA) is a breathing disorder during sleep that has implications beyond disrupted sleep. The clinical symptoms of OSA are classified into nighttime symptoms and daytime symptoms. Loud snoring, choking or gasping for air during sleep, fragmented and disturbed sleep and waking up with dry mouth are some of the night symptoms whereas early morning headaches, daytime sleepiness, poor concentration, mood changes like irritability and fall-

ing asleep during routine activities are some of the daytime symptoms. It is becoming more widely acknowledged as a separate risk factor for perioperative, cardiac, and neurological morbidities. Yet a sizable section of our population continues to go without a diagnosis for this condition.¹ If left untreated, OSA is linked to a lower quality of life, as well as a higher risk of metabolic, cardiovascular, and cerebrovascular illnesses as well as car accidents.² To determine the frequency of apnoeic and hypopnea occurrences, an overnight polysomnography (PSG) is typically necessary for

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OSA diagnosis. Traditionally, a facility-based, standardised PSG is used to measure sleep time, sleep phases, respiratory effort, airflow, heart rhythm, oximetry, and limb movements. The average number of breathing disturbances per hour is known as the apnoea-hypopnea index (AHI). AHI of 5 or higher with associated symptoms (such as excessive daytime drowsiness, exhaustion, or decreased cognition) is typically used to identify OSA syndrome, as is an AHI of 15 or higher, regardless of related symptoms. The gold standard for treating OSA is still the CPAP machine. It creates a pneumatic splint using pressure to keep the airway open. Numerous improvements in CPAP-related technology and other treatment choices have resulted from subpar patient adherence to CPAP therapy. Although using a CPAP machine can reduce morbidity and mortality, managing comorbid diseases such as OSA requires regular monitoring to guarantee adherence.¹

Consequently, patients with OSA pose a significant burden on healthcare resources. Greater awareness of sleep disorders, especially OSA, in professional areas and social media over recent years have meant that the demands for sleep care have increased exponentially. However, the response by healthcare services has been inadequate, leading to saturated sleep units with long waiting times, especially in tertiary care. Given this situation, a major change is urgently needed in the way we approach sleep medicine. Given that OSA is such a prevalent and chronic disease, all care levels must be involved in its management, and there is a need for patient contact, interaction, and management to change. This could be achieved by exploiting the advantages offered by information and communication technologies (ICTs). Such technologies could help to reduce the burden on care providers, offer patients closer monitoring without the need to attend hospital, and reduce health costs. Telemedicine could be a particularly good option for providing personalized and cost-effective health care.

93% of Indians lack adequate sleep, and 65% of them could benefit from sleep apnoea treatment. Apollo Telehealth (ATH) formally introduced ATH Good Nidra in February 2022, a cutting-edge telemedicine platform created especially for the field of sleep medicine. With this accomplishment, a new era in sleep medicine has begun. Through ATH Good Nidra, the potential now exists for any patient in any state or country including those in the most remote rural areas and underserved urban communities to receive quality care from a specialist sleep medicine physician and the sleep team at ATH.

In addition to improving patient access to high quality sleep care, telemedicine provides unprecedented convenience that will enhance the patient experience of care. By connecting with a sleep specialist through live, web-based video visits instead of traveling to the sleep centre, patients can save valuable time and money.

MATERIAL AND METHODS

TELEDIAGNOSIS OF OSA THROUGH TELEMEDICINE

Polysomnography (PSG), the “gold standard” diagnostic procedure for diagnosing OSA, is scarce, complex, costly, and resource intensive. The high expense of attended in-lab PSG (such as devices, expenses for upkeep, personnel expenses, and hospitalization) has drawn more attention in the literature as a result. Getting high-quality sleep recordings outside of the sleep lab is the primary objective of sleep telemedicine. House (or unsupervised) polysomnography (PSG) eliminates the requirement for patients to wait on lengthy in-lab PSG waiting lists.³ PSG in the sleep lab is still the reference method for OSA diagnostics⁴ but, due to the growing number of patients suffering from OSA, we have observed a shift to the use of easier and less expensive diagnostic tools which are portable as well such as HST, OST, polygraphy etc., that offer limited sleep studies. The American Academy of Sleep Medicine (AASM) recently endorsed the use of telemedicine in conjunction with a technically sufficient sleep study device for determining the presence of OSA in uncomplicated adult individuals appearing with signs and symptoms indicating an elevated risk of moderate-to-severe OSA.⁵

Telemedicine has been used in the context of sleep recording at ATHS for two purposes. The first is to make home sleep study recordings quickly available for analysis, using Telemedicine for data transmission. The positive results have allowed healthcare providers to enhance accessibility to sleep tests to a larger population.⁶ The second context for the use of Telemedicine is management of sleep disorders such as OSA by CPAP trials and CPAP therapy by intermittent or continuous remote supervision.

TELECONSULTATION FOLLOWING OSA DIAGNOSIS

Newly diagnosed OSA patients can receive consultations using telemedicine to explain the diagnosis and treatment options. In this situation, TM can offer in-person interactions between a physician and a patient, frequently via video or audio consultation. After telemonitored polygraphy, patients are coordinated to receive either a video or audio teleconsultation to receive the results of their sleep study. It is followed by a home trial with an automated positive airway pressure (APAP) device for the patient's requiring CPAP, and the data are telematically transmitted.

Continual positive airway pressure (CPAP) is the preferred treatment for OSA and is often administered through a mask to the patient's nose during sleep. This pressure is conveyed to the pharynx area, preventing upper airway blockage. Compliance with CPAP therapy is critical to ensuring its effectiveness in treating OSA patients.⁷

Fulltime sleep experts' team of general physicians, Internal medicine specialists, sleep technicians and sleep therapists are available at ATH round the clock for the clients seeking sleep health services. Questionnaires are used and administered to the clients during the screening to understand their sleep state and establish the next step of the session. These Questionnaires are administered only after the client's consent. The most frequently used ones during ATH's tele screening sessions are the Stop bang questionnaire. The STOP-Bang questionnaire was created as an OSA screening tool, and it includes four self-reportable parameters (STOP: snoring, tiredness, observed apnoea, and high blood pressure) and four demographic parameters (Bang: body mass index [BMI; calculated as weight in kilogrammes divided by height in metres squared], age, neck circumference, and gender). Several scientific research studies have discovered that the STOP-Bang questionnaire has adequate sensitivity and diagnostic accuracy for detecting moderate to severe obstructive sleep apnoea across geographic regions.⁸ (Figure 1) demonstrates the process flow of the patient in the sleep management program, this begins with patients who have a suspicion of having OSA are tested for the illness. Patients are referred for a sleep study if OSA is verified in order to assess the condition's severity and the most effective course of action. While individuals with moderate or severe OSA will require treatment with CPAP therapy, lifestyle modification, or surgery, patients with mild OSA may be able to control their symptoms by making small changes to their daily routine. In order to reap the full benefits of CPAP therapy, patients must utilise the machine on a daily basis. To be sure that patients receiving therapy for OSA are responding to it, frequent monitoring is necessary. Post diagnosis sleep counsellors and health coaches get involved and they conduct many tele counselling sessions which deal with a detailed introduction, confidence-building, and setting up sleep health goals. Further sessions are planned accordingly which are majorly follow-ups, goals trackers and guidance. The quality of the sleep health usually improves for patients who undergo successful OSA therapy, and they are continued to be monitored on regular basis by the sleep health team with regular follow ups and goal trackers.

Apollo Telehealth (ATH) a division of Apollo hospitals, the world leader in telemedicine with an expertise of more than 20 years is probably the oldest and largest network of multi-disciplinary telemedicine infrastructure in South Asia, benefitting both urban and rural populations by facilitating uninterrupted access to high-quality healthcare.⁹

Promotion of sleep health has positive consequences on many important chronic conditions, such as heart diseases, obesity, mental wellness, and neurodegenerative disease. It is an underutilized public health opportunity.¹⁰ At ATH the focus is on cultivating & supporting the patients to overcome challenges, understand and recognize areas of growth & focus on a greater

sense of well-being and healthy living without depending on drugs and pharmacological therapy which have their own adverse effects. ATH has been able to create a positive perception of the service among the clients to improve their sleep health. The management of OSA in ATH features remote CPAP trials and therapy and therapy compliance monitoring alongwith diet plan involving telemedicine and tele counselling sessions with doctors, nutritionists, counsellors, health coach and physiotherapists. The concept of sleep health provides a positive holistic framing of multiple sleep characteristics, including sleep duration, continuity, timing, alertness, and satisfaction.

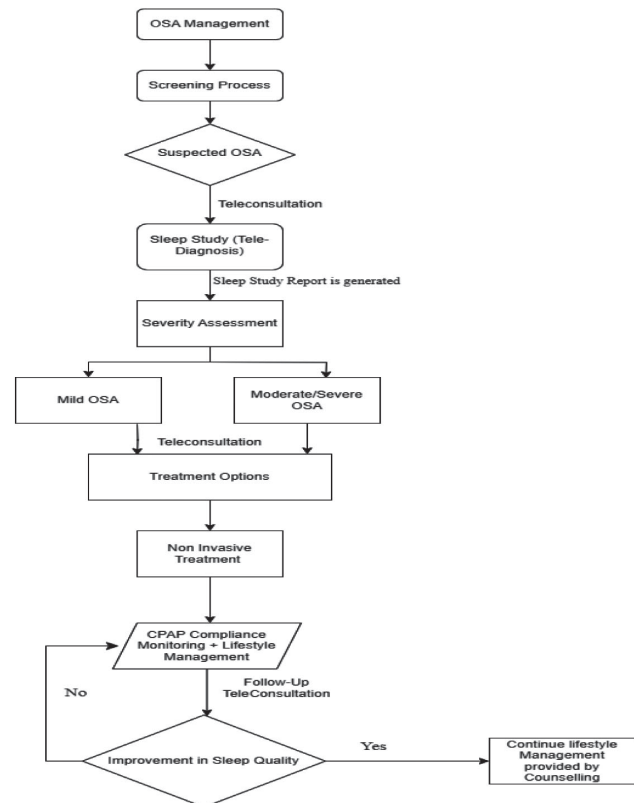


Figure 1: Good Nidra patient flow process.

RESULTS

The participants data of teleconsultations were presented for the study from March 2022 to February 2023. Patients with OSA symptoms and signs were identified and tested using the STOP-BANG questionnaire. Out of the 2107 total screened individuals, 525 Teleconsultations took place and 265 were then diagnosed with OSA. The demographic characteristics as shown in the (Table 1) shows that the participants were aged 40.7 ± 11.78 years and 85% were male patients, with an average BMI of 28.33 ± 3.63 kg/m². The age distribution showed that the majority of participants were between the age group of 32 to 40 years, accounting for 35% (n=184) of the sample. Regarding lifestyle factors, 4% (n=20) of participants reported being current smokers, while 35% (n=185)

reported alcohol use. Co-occurring conditions were reported by 8% (n=40) of participants, with hypertension being the most common at 6% (n=34), followed by diabetes mellitus at 3% (n=14) and dyslipidaemia at 1% (n=3). Snoring was reported by 2% (n=11) of participants, while 9% (n=49) reported experiencing insomnia. A diagnosis of obstructive sleep apnoea (OSA) was reported by 50% (n=265) of participants, while 18% (n=92) had received a diagnosis of sleep apnoea. Furthermore, 8% (n=42) of participants had been diagnosed with a sleep disorder. These findings provide an overview of the demographic and clinical characteristics of the study sample.

Table 1: Patient Demographic Details.

Demographic Details	n=525	
Gender		
Female	77	15%
Male	448	85%
14-22	18	3%
23-31	108	21%
32-40	184	35%
41-49	107	20%
50-58	60	11%
59-67	40	8%
68-76	5	1%
77-85	3	1%
Mean Age	M=40.07	SD=11.78
BMI	M=28.33	SD=3.63
Smoking Status	20	4%
Alcohol use Status	185	35%
Co-Occurring Status	40	8%
Hypertension	34	6%
Diabetes mellitus	14	3%
Dyslipidaemia	3	1%
Snoring	11	2%
Insomnia	49	9%
OSA Diagnosis	265	50%
Sleep Apnea Diagnosis	92	18%
Sleep Disorder Diagnosis	42	8%

DISCUSSION

Sleep study devices are diagnostic medical tools that help medical providers deliver high quality, patient-centred care for select adult patients who are suspected to have OSA.¹¹ Diagnosis of OSA is based on a patient's medical history, symptoms from a medical evaluation, and findings from polysomnography (PSG). The correct evaluation and care of OSA can enhance personal health, advance public safety, and minimize total healthcare expenses. The study findings

support the continued use of telehealth services for identification, diagnosis and management of OSA as it seems to improve initial and chronic care access, time to diagnosis and treatment, between-visit care, e-communications and e-education, workflows, costs, and therapy outcomes. In summary, the results demonstrate a larger shift towards telehealth use which provides an encouraging outlook for the use of tele counselling and tele sleep health services in the post COVID-19 pandemic era.

Telemedicine easily bridges this particular gap where a licensed physician/specialist can tele consult a patient with symptoms of OSA, diagnose with tele monitored devices and manage the patients at home with tele monitoring and tele follow ups to further avoid the occurrence of life-threatening clinical complications. The cost saved by the patients is evident from the¹²⁻¹⁴ studies which represent that virtual teleconsultation is beneficial than hospital visit, this is in the form of no travel cost and lower medical costs.

The Good Nidra program of ATHS has reduced the frequency of hospital admissions, enhanced patient quality of life, and decreased healthcare expenses. The programme is not flawless, though. It does not reach everyone who may benefit from it, and it is unable to address every aspect of the hidden illness burden.

We recommend that these kinds of programmes be expanded to reach more individuals and should be adapted to address other health variables that contribute to the hidden disease burden of Obstructive Sleep Apnoea. This study also signifies the role of individuals and private-public organisations to support OSA tele management programmes and other such telehealth measures that can assist people with chronic diseases and live healthier and happier lives. This study also highlights the expected role of politicians, social media influencers, celebrities, healthcare professionals, and the general public in spreading awareness regarding OSA and decreasing the morbidity and mortality due to it.

CONCLUSION

Good sleep is essential to good health. The notion of sleep health works in harmony with other health care goals including empowering people and communities, enhancing population health, and decreasing on medical expenses. Given the high prevalence of OSA in the population, it is rational to assume that telemedicine should be promoted so as to reach the huge proportion of patients who could profit from this less expensive and more accessible medical technology. The cumulative effect of research findings supports this conclusion. Since adopting the clinical approach for the diagnosis of OSA is expensive from a merely institutional perspective, decision-makers should design health policies to stimulate the roll out of telemedicine based on individual and public

health. The adoption of this screening and diagnostic tool may increase the efficiency of healthcare processes if taking into account the direct and indirect costs incurred by patients as well as those of healthcare providers, as shown by study results from a patient and societal perspective.

Health is dependent on sleep. The discipline of sleep medicine might benefit from a combination of Telemedicine with sleep diagnosis and management as we move into new research and healthcare environments. This integration of TM and sleep therapeutics will advance our science and promote the health of our patients and the entire population.

Our findings suggest the adoption of this telemedicine-based approach as a helpful tool for the screening and diagnosis of OSA and management of these patients receiving CPAP treatment, which is a clinical and socioeconomic issue. In conclusion, this study shows promising benefits from a motivational intervention provided via telemedicine. Telemedicine intervention is a potent technique for screening and diagnosing OSA and, as a result, increasing the clinical arena of CPAP-based OSA treatment.

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Transparency Statement

The Authors affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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