# An evaluation of heart failure clinicians’ knowledge, attitudes and clinical practice in the diagnosis and treatment of Obstructive Sleep Apnoea

# Abstract

**Background:** Obstructive Sleep Apnoea (OSA) is a public health problem that remains under recognised. Despite OSA being associated with the incidence and progression of heart failure (HF), clinician awareness is lacking within and across clinical specialities.

**Research Objective:** To evaluate heart failure clinicians’ knowledge, attitudes and clinical practice in the diagnosis and treatment of OSA.

**Methods:** Web-based, cross-sectional survey, utilising the modified OSAKA questionnaire among HF clinicians in the UK.

**Results:** The survey was completed by 102 HF clinicians. Of 37, the median knowledge scores were 29 (78%; IQR, 26-31), 26 (70%; IQR, 22-28) and 18 (49%; IQR, 16.5-23.5) for doctors, nurses and pharmacists respectively. The majority of doctors and nurses felt that OSA was important, however, confidence in the identification and management of OSA was low across all three HF groups.

**Conclusion:** There is a knowledge deficit regarding the diagnosis and treatment of OSA among HF clinicians.

**Keywords**

obstructive sleep apnoea; heart failure, knowledge, attitudes; clinical practice

**Key points**

* Despite a growing evidence base, OSA remains under diagnosed and under treated.
* OSA is prevalent in patients with CHF and associated with poor outcomes with concomitant economic implications.
* Barriers to the diagnosis and management of OSA are multiple, including limited understanding among heart failure clinicians
* The survey results demonstrate a knowledge deficit regarding the diagnosis and treatment of OSA, and variable practice among heart failure clinicians in the UK.

**Reflective questions:**

* What are the risk factors for OSA?
* Is it important to screen for OSA in HF patients?
* What is the role of health care professionals in the identification, diagnosis and treatment of OSA?

## Introduction

Obstructive sleep apnoea (OSA) is prevalent in patients with co-existing cardiovascular, cerebrovascular and metabolic disease and represents a significant, yet under-recognised public health problem (McNicholas *et al.*, 2015). OSA is characterised by repeated interruption in breathing due to upper airway collapse during sleep, resulting in episodes of hypoxaemia-re-oxygenation, exaggerated negative intrathoracic pressure changes, oxidative stress and systemic inflammation (Kasai and Bradley, 2011). Consequently, if left untreated, patients are at increased risk of cardio-metabolic complications, including hypertension, heart failure (HF), and diabetes (Shahar *et al*., 2001; Pepperell *et al.,* 2002; Bradley and Floras, 2009; Drager *et al*., 2013, Ayas *et al*., 2016).

Despite a growing evidence base, OSA remains under diagnosed and under treated with negative impact on the individual patient and on health care systems, with consequent economic implications (Morsy *et al.*, 2019). Furthermore, reported healthcare usage is higher in patients with OSA in the 7-10 years prior to diagnosis (Ronald *et al.,* 1998).

There are multiple barriers to the diagnosis and management of OSA (Kapur *et al.,* 2002; Konecny *et al.*, 2010, Malaweera *et al.,* 2015, Bakhia *et al.*, 2017) (**Figure 1**). These are multifaceted and associated with both patients and health care professionals.

Indeed, clinicians play a key role in the recognition of OSA and should have a high index of suspicion for OSA in at-risk patient groups. However, there are a number of reports documenting lack of awareness amongst clinicians across clinical specialities, notably for patients with HF who share many of the salient risk factors for OSA (Chung *et al.,* 2001; Southwell *et al.,* 2008; Wang *et al.*, 2012; Chérrez Ojeda *et al.*, 2013; Corso *et al.,* 2017; Solanki *et al.,* 2019). OSA contributes substantially to the development and progression of HF and should therefore be considered as a modifiable co-morbidity by the multidisciplinary clinical team working in the management of HF. Paramount to this is identifying any gaps in the knowledge and confidence of these very clinicians (Kasai & Bradley, 2011).

In recognition of the importance of OSA in the incidence and progression of HF, strategies to improve the detection, diagnosis and treatment of clinically significant OSA are required. However, we remain unaware of the extent of the knowledge deficit among HF clinicians. To date, there is no evidence pertaining to the level of understanding of OSA among HF clinicians in the UK. Results from the study will offer an opportunity to identify gaps in clinician knowledge, confidence and their experiences in daily practice, whilst establishing priorities for educational strategies to ultimately impact on patient outcomes.The aim of this survey study was therefore to evaluate HF clinicians’ knowledge, attitudes and clinical practices in relation to the diagnosis and treatment of OSA.

## Materials and Methods

### Study Design

A web-based (Jisc Online survey), cross-sectional survey study was conducted among HF clinicians (doctors, nurses and pharmacists) from England, Scotland and Wales (March 2018 -January 2019). The study was approved by the Health Research Authority and the East Midlands-Leicester South Ethics Committee (REC 17/EM/0400).

### Study Participants

Study participants included clinicians with an interest and expertise in the active management of patients with HF. Medical consultants, trainees, associate specialists, general practitioners with specialist interest, nurses and pharmacists were eligible to participate.

Non-probability, convenience sampling was utilised to recruit participants for the survey.

To ensure a maximum response rate, we took a pragmatic approach to the sample size for this exploratory analysis. No formal sample size nor randomisation were employed; instead, non-probability sampling was used.

The survey was promoted in the British Cardiovascular Society members’ newsletter, distributed through the membership of the British Association for Nursing in Cardiovascular Care, HF Pharmacist Group, Scottish HF Specialist Nurse Forum, the Pumping Marvellous Foundation Facebook page for HF nurses, on the webpage and in the first newsletter of the British Society for HF Nurses Forum.

The latest version of the participant information sheet was embedded in the email invitation. The letter of invitation explained the purpose and the rationale for the study. It confirmed that participation was voluntary and that participants were free to withdraw at any time. Participants were also free to choose not to respond to specific questions. To minimise the risk of potential breach, survey responses were encrypted to ensure secure data transmission. Following data export, electronic databases had restricted access, were password protected and contained no personal identifiers. Completion and submission of the survey were accepted as implied consent. No incentive, financial or otherwise, was offered for the completion of the survey.

### Data Collection

The web based survey included the Modified Obstructive Sleep Apnoea Knowledge and Attitudes (OSAKA) questionnaire, an adaptation of the validated OSAKA questionnaire, developed to assess physicians’ knowledge and attitudes about OSA (Southwell *et al*., 2008, Schotland & Jeffe, 2003) (**Appendix 1**).

The knowledge component of the questionnaire included questions on epidemiology, pathophysiology, symptoms, diagnosis and treatment domains and consisted of 22 statements (true, false, don’t know responses), two multiple choice questions on prevalence (selecting one correct answer per question), one question on known risk factors for OSA and one question on conditions associated with OSA. The attitude and confidence questions consisted of six questions based on a five-point Likert scale (Southwell *et al.*, 2008). In addition, we obtained demographic information and information regarding diagnostic methods for OSA used by HF clinicians in clinical practice.

### Data Analysis

Data were analysed using descriptive statistics. HF clinicians were divided into three groups; doctors, nurses and clinical pharmacists. The knowledge scores for all groups were not normally distributed and thus reported as median and interquartile range (IQR).

A total knowledge score was calculated for each respondent and summed per group. The maximum overall knowledge score is 37, allocated as follows: 1) One point for each correct answer for the 22 knowledge statements; 2) One point for each correctly identified as a risk factor and one point each for those correctly identified as not being a risk factor (6 points); 3) One point for each correctly identified associated condition and one point each for those correctly identified as not being associated with OSA (7 points); 4) One point for each of the correct answers to the prevalence questions (2 points).

All data were analysed using MS Excel and STATA 16 (STATA Statistical Software: Release 16. College Station, TX: StataCorp LLC. StataCorp.).

## Results

One hundred and two HF clinicians (doctors n=32, nurses n=62, pharmacists n=8), completed the web based survey. The majority of respondents were HF specialist nurses (56%) and medical consultants (20%) with 70% working in Specialist HF Services (**Table 1)**.

### Knowledge

***Doctors***

From a maximum knowledge score of 37, the number of correct answers provided by doctors, ranged from 21 to 35 (57-95%), with a score of 18 recorded as an outlier, and a median of 29 (IQR, 26-31)(78%; IQR 70-84%) (**Table 2**).

No question was answered correctly by all doctors. For the epidemiology, pathophysiology and symptom domains, >74% of doctors provided correct responses. In contrast, 67% provided correct responses in the diagnosis domain, and only 57% in the treatment domain.

The highest percentage of correct responses (97%) were recorded for the association between untreated OSA and incidence of motor vehicle accidents (question 13). In contrast, the lowest percentage of correct responses (19%) were recorded for the use of laser-assisted uvuloplasty for severe OSA, also generating the highest number of “don’t know” responses (53%).

All respondents correctly identified obesity as a risk factor for OSA. Ninety four percent of doctors correctly identified male sex as a risk factor for OSA whilst only 66% correctly selected age and family. More than 91% percent of doctors were aware that cardiac arrhythmias and CHF were associated with OSA.

***Nurses***

The number of correct answers provided by the nurses, ranged from 15 to 35 (41-95%) with a score of 11 recorded as an outlier, and a median of 26 (IQR, 22-28) (70%; 59-76%) (Table 2).

No question was answered correctly by all the nurses. For the epidemiology, pathophysiology and symptom domains, 68-72% of nurses provided correct responses. Sixty one percent provided correct responses in the diagnosis domain, and only 46% in the treatment domain.

The highest percentage of correct responses (94%) was recorded for the statement “alcohol at bedtime improves OSA” (question 12). Similarly to the doctors, the lowest percentage of correct responses (15%) was recorded for the use of laser-assisted uvuloplasty of severe OSA. Additionally, this question also generated the highest number of “don’t know” responses (71%). Sixty one percent of nurses provided “don’t know” responses to the statement “uvulopalatopharyngoplasty is curative for the majority of patients with OSA”.

Between 26% and 61% of nurses provided “don’t know” responses to four of the seven questions in the treatment domain. This is consistent with the low average percentage of correct responses (46%) in this domain (**Table 3)**

Eighty two percent of nurses correctly identified male sex as a risk factor for OSA. Seventy three percent correctly selected family history, whilst only 53% correctly selected age as a risk factor. Eighty four percent of nurses were aware that CHF was associated with OSA; in contrast, only 55% were aware of the association with cardiac arrhythmias.

***Pharmacists***

The number of correct answers provided by the pharmacists ranged from 15-25 (41-68%) with a median of 18 (IQR, 16.5-23.5) (49%; 45-64%).

No question was answered correctly by all the pharmacists. The highest percentage of correct responses (88%) was recorded for the statement on higher mortality in patients with Cheyne-Stokes and CHF (question 22). None of the pharmacists correctly responded to the use of laser-assisted uvuloplasty of severe OSA, with all selecting a “don’t know” response to this question. The average percentage correct responses was low (33%-54%) across all five domains, with the lowest average seen in the treatment domain.

Seventy five percent of pharmacists correctly identified male sex and family history as risk factors for OSA, whilst only 13% correctly selected age. Seventy five percent of pharmacists were aware that CHF was associated with OSA and 50% with cardiac arrhythmias.

### Attitudes

***Doctors, Nurses and Pharmacists***

**Figure 2** illustrates the views on the importance of OSA compared to other chronic conditions. Fifty six percent of doctors, 37% of nurses and 63% of pharmacists felt that Diabetes Mellitus was the most important clinical condition, when compared to hypertension, degenerative joint disease, OSA and Asthma. Thirty eight percent of pharmacists felt that OSA was the least important clinical condition. Forty four percent of doctors and 42% of nurses rated OSA as the third most important clinical condition, after diabetes and hypertension. None of the doctors, and 18% of the nurses, felt OSA to be the most important of these conditions.

A total of 63% of doctors and 77% of nurses felt that it was at least very important to identify patients at risk of OSA in contrast to 25% of pharmacists. (**Figure 3)**.

### Confidence

***Doctors, Nurses and Pharmacists***

Sixty six percent of doctors felt confident to identify patients at risk of OSA, in contrast to 36% of nurses and none of the pharmacists (**Figure 4**). Twenty five percent of doctors felt confident to manage patients with OSA, whilst only 19% felt confident to manage patients on CPAP. Twelve percent of nurses felt confident to manage patients with OSA , whereas no pharmacist did.

### Clinical Practice

***Doctors, Nurses and Pharmacists***

Ninety seven percent of doctors and nurses used clinical history to assess patients’ risk of OSA, in contrast to 50% of pharmacists. Ninety one percent of doctors and 77% of nurses consider bed partner observations, in contrast to 38% of pharmacists, when assessing a patient for OSA. Forty one percent of doctors, 44% of nurses and only 13% of pharmacists consider sequalae, such as hypertension (**Figure 5)**.

Of the 31% of doctors who use screening questionnaires in clinical practice, 25% use the ESS and 6% the STOP-Bang questionnaire. Of the 44% or nurses who use screening questionnaires, 27% use the ESS, 2% use the Berlin questionnaire and the STOP-Bang questionnaire respectively, 2% use a combination of the Berlin questionnaire and the ESS and 11% use a combination of the STOP-Bang questionnaire and the ESS (**Figure 6**).

Of the 64% of pharmacists who indicated that they use screening questionnaire, 38% use the ESS, 1% use the STOP-Bang questionnaire and 25% use as combination of the ESS and the STOP-Bang questionnaire.

To confirm a diagnosis of OSA, participants (47% doctors, 32% nurses, 63% pharmacists), indicated that they will refer patients at risk of OSA to a Sleep Service for further investigation (**Figure 7**).

## Discussion

Doctors, nurses and clinical pharmacists are core members of the HF multi-disciplinary team, with a pivotal role in the diagnosis and management of HF (National Institute for Health and Care Excellence [NICE], 2018a). HF treatment strategies comprise the initiation and optimisation of evidence-based medication and device therapy, but also the recognition and management of comorbidities that may exacerbate HF symptoms with a subsequent impact on patient quality of life (European Society of Cardiology [ESC], 2016).

Consistent evidence from observational studies suggest that untreated moderate-severe OSA in HF is associated with increased cardiovascular morbidity and mortality (Wang *et al.,* 2007). Additionally, data from small trials showed that the treatment of OSA with CPAP (recognised treatment for moderate-severe OSA) improved intermediate cardiac end points, including blood pressure, ejection fraction and arrhythmias (NICE, 2008; Drager *et al.*, 2017). Recent data from the Sleep Apnea cardioVascular Endpoints (SAVE) trial reported that CPAP treatment improved patient reported outcomes and health-related quality of life in HF (McEvoy *et al.*, 2016).

These are essential components to the improvement of patient well-being and disease management and paramount that HF clinicians have the necessary awareness to enable them to identify patients at risk of OSA. This survey study sought to evaluate HF clinicians’ knowledge, attitudes and clinical practices in relation to the diagnosis and treatment of OSA.

Our results suggest knowledge deficit of OSA among HF doctors, nurses and pharmacists. Despite relatively high median knowledge scores, these data demonstrate a knowledge deficit of between 22-51% across clinical groups. Interestingly, none of the doctors, nurses or pharmacists answered all questions correctly.

Across all three clinical groups, the largest knowledge deficit was reported in the treatment domain (doctors: 43%; nurses: 54%; pharmacists 67%).

In comparison to previous studies in different clinical specialties, the median knowledge scores for the doctors (78%) and nurses (70%) were similar to the score (76%) reported for cardiologists in the United States (US), but marginally higher than those reported for anaesthetists (62%-66%) and primary care physicians (60%-69%) (Southwell *et al.,* 2008; Wang *et al.*, 2012; Corso *et al.,* 2017; Solanki *et al.,* 2019; Chung *et al.,* 2001; Chérrez Ojeda *et al.*, 2013). Scores for medical students (42% and 59%) were much lower, but in a similar range to the pharmacists (49%) in our study (Ozoh *et al.,* 2015).

A high proportion of HF doctors and nurses felt that OSA as a clinical condition was of high importance and that we should identify patients with the condition. As such, they ranked OSA as the third most important clinical condition, relative to diabetes mellitus, hypertension, degenerative joint disease and asthma.

In contrast, in previous reports as many as 90% of anaesthetists, 78% of cardiologists and 72% of primary care physicians, felt that OSA was important (Wang *et al.*, 2012; Corso *et al.,* 2017; Solanki *et al.,* 2019; Southwell *et al.,* 2008; Chung *et al.,* 2001; Chérrez Ojeda *et al.*, 2013).

Despite knowledge scores of at least 70% and recognising the importance of OSA, the majority of doctors and nurses were lacking confidence to manage patients with OSA and on CPAP treatment. Furthermore, pharmacists had a very low knowledge score and as such rated the condition as low importance and also lacked confidence in all areas.

Confidence levels in the doctors’ group were comparable to US cardiologists, anaesthetists and primary care physicians. In contrast, nurses and pharmacists reported much lower confidence levels (*Southwell et al*., 2008, Wang *et al*., 2012, Corso *et al.,* 2017, Chérrez Ojeda et al., 2013; Ozoh *et al.,* 2017, Ozoh *et al.,* 2015, Chérrez Ojeda *et al.*, 2018).

The majority of doctors, nurses and pharmacists reported that they will refer patients to a sleep service for suspected OSA. Overall, these findings suggest some variability in clinical practice among HF clinicians. Current National Institute of Clinical Excellence (NICE) guidelines provide “evidence-based recommendations on continuous positive airway pressure for treating obstructive sleep apnoea/hypopnoea syndrome in adults” (NICE, 2008). Specific NICE guidelines for Sleep Disordered Breathing with a focus on the identification, diagnosis, management and monitoring of patients with sleep disordered breathing, are under development (NICE, 2018b)It is anticipated that this guideline will reduce variability in clinical practice.

Of the clinicians who reported the use of a screening questionnaire, the ESS was most commonly used, alone or in conjunction with the STOP-Bang questionnaire. The ESS was developed to assess excessive daytime sleepiness, a symptom that can present in a number of conditions including narcolepsy and indeed OSA (Johns, 1992). However, the use of the ESS for the screening of patients with possible OSA are limited in patients with chronic HF. Firstly, a large proportion of patients with chronic HF are older adults. Onen and colleagues (2013) found that many of the ESS items were not relevant to older adults and as such, it may underestimate the sleepiness burden in this patient group. Furthermore, patients with HF often report less subjective daytime sleepiness or indeed atypical symptoms, therefore rendering absence of sleepiness and therefore the use of the ESS an unreliable measure to rule out OSA in this patient group (Arzt *et al.*, 2013).

Several clinicians used the STOP-Bang questionnaire, an easy to use, self-completion screening questionnaire, to identify individuals at risk of OSA. However, this questionnaire has not been validated in the HF population with many of the diagnostic validation studies conducted in sleep clinic populations. Due to the high probability of sleep disorders in this patient group, the ability to extrapolate the utility of the STOP-bang questionnaire is limited, requiring further studies in an unselected HF population.

Despite reports dating back to 2001, there appears to be an ongoing knowledge deficit amongst clinicians across clinical specialities, suggesting limited impact of previous educational strategies (Chung *et al.,* 2001). As such, overall self-reported confidence levels are low, affecting clinicians’ ability to identify and manage patients with OSA. Under diagnosis and under treatment of OSA are likely to be further affected by a lack of clinical guidelines to support the identification and diagnosis of patients with possible OSA.

Our study highlighted the need for upskilling of HF clinicians in the management of OSA, a condition of symptomatic and prognostic significance to patients with HF. To increase OSA literacy, focused educational strategies should be woven into the learning opportunities that exist for the clinical workforce to maximise reach whilst not increasing time burden. Simple fact sheets, workshops or online materials pertaining to OSA aetiology, signs and symptoms, treatments and patient benefit could be accessed for example during structured professional clinical supervision or provided as accredited clinical education.

Our study suffers from the limitations inherent in all survey-based reports. Recognised limitations of the study include the use of a non-probability sampling approach due to cost and time-efficiency, which may be limited by under representation of the population and the relatively small sample size may further affect the generalisability of the survey results. A key strength of the survey is our use of a validated questionnaire.

In conclusion, our results demonstrate a knowledge deficit in the diagnosis and treatment of OSA, and variable practice among HF clinicians in the UK. That this is a sustained issue with little apparent improvement over time, suggests the need for focused educational initiatives, clinical practice guidelines and validated screening tools to enable clinicians to identify patients at risk of OSA.

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