Sleep apnoea management in Europe during the COVID-19 pandemic: data from the European Sleep Apnoea Database (ESADA)

To the Editor:

Sleep disordered breathing (SDB) is highly prevalent, with a male to female predominance of two to one, and is more common in middle-aged and elderly subjects [1]. Affected patients often present with comorbidities such as obesity, cardiovascular disease (systemic hypertension, heart failure, atrial fibrillation) and diabetes mellitus type II [2]. The strong overlap between the profile for SDB patients and the identified risk factors for adverse outcomes of coronavirus disease 2019 (COVID-19) infection, which include age, male sex and cardiometabolic comorbidity [3], suggest that SDB patients may benefit from effective therapy if confronted with COVID-19 infection [4].

The COVID-19 pandemic has fundamentally changed the operation of healthcare systems around the globe. Resources have understandably been shifted from elective care to acute management of severely ill patients with life-threatening COVID-19 infection [5]. According to current recommendations, sleep medicine services are advised to reduce in-house services, and to provide medical care by remote contact using phone, video calls and telemedicine solutions [6–9].

In the current study, we assessed the impact of the COVID-19 pandemic on the management of SDB patients in Europe. We approached the centres of the European Sleep Apnoea Database (ESADA) cohort, a well-established network of sleep centres in 19 European countries [2], and a subsample of accredited sleep centres of the German Sleep Society (DGSM). The aim was to analyse how recommendations from expert organisations were applied across various European regions, and whether specific mitigation strategies were already in practice.

A purpose-built questionnaire addressed information about changes in clinical routines imposed during the COVID-19 pandemic compared with routine practices. Specifically, details on the diagnosis of SDB, the procedures for titration of positive airway pressure (PAP) treatment, and the follow-up of PAP treatment were addressed. One question sought the estimated proportion of staff still active in the sleep service during the pandemic compared with beforehand (0–100%, for both "physicians" and "nurses/technicians"). Finally, access to regional or national COVID-19-related guidelines for patients with SDB and for caregivers in sleep medicine services was evaluated. Actual numbers of confirmed COVID-19-infected inhabitants and reported COVID-19 deaths were computed per million inhabitants for each country based on information provided by the Johns Hopkins University COVID-19 statistics website (https://coronavirus.jhu.edu/map.html; 12 April 2020).

Data were provided by 25 of 29 ESADA centres and 15 of 283 DGSM-accredited sleep centres (table 1). Most centres were linked to a pulmonary department and all bar one were hospital based. In 31 of the total 40 participating centres, patients were unable to physically attend because of sleep centre or travel restrictions.

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This study identified an 80% shutdown of sleep apnoea management throughout Europe. Most services have been limited to phone-based follow-up and the management of high-priority cases. Mitigation strategies appear to be insufficiently exploited. https://bit.ly/2KWf3IY

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TABLE 1 Characteristics of the participating sleep centres

Number of centres	
Total	40
European Sleep Apnoea Database	25
German Sleep Society	15
Distribution across Europe	
Regions	5
Countries	15
Region of centres	
North	3
West	2
Central	22
South	10
East	3
Clinical affiliation of centres	
Pulmonary department	22
Other department[#]	18
Patient spectrum of centres	
Entire spectrum of sleep/wake disorders	32
Focus on sleep disordered breathing	8

[#]: neurology (n=1); ear, nose and throat (n=3); cardiology (n=1); independent unit at hospital (n=12); independent unit outside a hospital (n=1).

TABLE 2 Change of activities during the COVID-19 pandemic compared with prior to the pandemic

	Prior	During
Sleep apnoea diagnostic procedures		
Polysomnography in lab	92.5	20.0
Polygraphy at home	87.5	32.5
Telemedicine-based	30.0	27.5
CPAP treatment start procedures		
In-lab titration	90.0	17.5
Ambulatory titration	55.0	22.5[#]
Telemedicine-based APAP titration	32.5	32.5
Regularly use telemedicine n	6	4
Bi-level PAP treatment start procedures		
In-lab titration	87.5	17.5
Ambulatory titration	40.0	17.5
Telemedicine-based titration	20.0	12.5
Regularly use telemedicine n	4	3
Follow-up routines for PAP treatment		
In-lab follow-up	82.5	7.5
Ambulatory titration	92.5	17.5[#]
Distance follow-up		
Phone calls	70	75.0
Telemonitoring	50.0	57.5
Regularly use telemonitoring n	7	12
Started telemonitoring n		8
Stopped telemonitoring n		4

Data are presented as %, unless otherwise stated. All questions asked whether activities were performed regularly or rarely. CPAP: continuous positive airway pressure; APAP: automatic positive airway pressure; PAP: positive airway pressure. [#]: all rarely.

Diagnostic routines were changed substantially by the pandemic. Prior to the pandemic, laboratory-based polysomnography was performed "rarely or regularly" in 92.5% of centres, but this was only performed in 20% of centres during the pandemic ($p<0.001$; table 2). Conversely, telemedicine-based sleep apnoea diagnosis was used in 30.0% of centres prior to the pandemic and this number was only marginally reduced to 27.5% during the pandemic. From the 10 centres regularly using telemedicine-based diagnosis,

three stopped the service during the pandemic, four maintained the level of use, and three increased use from rarely to regularly. Only two centres started this routine during the pandemic.

Prior to the pandemic, laboratory-based continuous positive airway pressure (CPAP) or bi-level PAP titration and initiation were practised in almost all centres but less than one fifth of centres continued this routine during the pandemic ($p<0.001$; table 2). In the 13 centres already practising telemedicine-based CPAP titration, four stopped the service, one reduced the use, six maintained the level of use, and two increased the use from rarely to regularly. Four centres started this routine during the pandemic.

Prior to the pandemic, 39 centres reported regular follow-up procedures in patients with SDB. This service continued in 36 centres during the pandemic but the mode of follow-up had changed (table 2). Specifically, three centres offered in-laboratory and seven centres performed ambulatory follow-up sleep recordings in selected patients. 30 centres provided follow-up by phone or video calls. Out of the nine centres without phone access, two practised telemedicine follow-up and four centres provided the support *via* home care providers. The remaining three centres offered no access to follow-up during the pandemic. Telemedicine-based follow-up was practised by a minority of centres.

Staffing levels in the sleep medicine service were reduced to 25% (interquartile range (IQR) 40%) for physicians and to 19% (IQR 28%) for nurses/technicians, compared to pre-pandemic levels. Staffing reductions varied across European regions, being least in northern and most in the southern and central parts of Europe. However, there was no association identified between remaining staff and numbers of infected individuals or numbers of deaths relating to COVID-19 infection in each country. In addition, national recommendations or guidelines for patients with SDB were available in 45% of centres (0% in eastern, 39% in central, 60% in southern and 100% in northern and western European centres). Only 28% of centres had guidelines for sleep service personnel.

This descriptive report highlights several important findings. First, sleep medicine services have been reduced by almost 80% during the first 1–2 months of the COVID-19 pandemic in Europe. Secondly, more comprehensive sleep studies using polysomnography or in-laboratory PAP titrations have been completely interrupted or practised only to a very limited extent in highly selected patient groups. Thirdly, commencement of treatment for SDB by various types of PAP therapy is equally reduced in the vast majority of centres and countries. Fourthly, patient follow-up is mainly managed by phone-based patient contacts. Fifthly, the full potential of mitigation strategies available by telemedicine has not been explored.

The sharp reduction in sleep medicine services in this study was expected and corresponds to the practice in other areas of medicine [3]. Prevention of virus spread at the sleep centres, such as by PAP-induced aerosol spread [10], as well as quarantine restrictions are plausible explanations for this decline. Nonetheless, we identified sizeable variations within and between countries in the lockdown of sleep medicine services. Rather unexpectedly, the use of telemedicine and other innovative technical solutions, including disposable diagnostic tools and non-contact sleep surveillance for sleep apnoea diagnosis, were not reported to any major extent. Uncertainty relating to data protection laws and inadequate practical experience are believed to limit dissemination of such new technology.

There is a medical need for the continued management of SDB patients. Most clinical case series regarding severely affected COVID-19 patients report clinical features including male predominance, obesity and cardiometabolic disorders [3], all of which are strongly associated with SDB. Furthermore, there are as yet unexplored potential mechanistic links between an imbalance of the angiotensin II receptor and angiotensin II converting enzyme (ACE2) and severe COVID-19 infections, which may also apply in SDB [11, 12].

In conclusion, our findings suggest that the sleep medicine community needs to collaborate in developing strategies for care of patients with both suspected and established SDB during major events such as the COVID-19 pandemic. Activities need to focus on the recognition of severe cases of SDB and how to initiate treatment in already identified severe cases. The potential of new technologies that enable remote monitoring to optimise treatment may be more frequently applied during times of restricted healthcare resources, in order to obtain better management of severely affected COVID-19 patients.

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The following accredited sleep centres of the German Sleep Society (DGSM) participated in the study: Sleep Centre, Neurological Dept, University Hospital, Aachen (J. Schiefer); Sleep Centre, Krankenhaus Bad Arolsen, Arolsen (W. Knüppel); Competence Centre for Sleep Medicine, Charité Universitätsmedizin Berlin, Campus Benjamin Franklin, Berlin (H. Danker-Hopfe); Florence-Nightingale Krankenhaus, Kaiserswerther Diakonie, Düsseldorf (M. Minuth); Sleep Centre, Pulmonary Medicine, Kliniken Essen Mitte, Essen (G. Nilius); Zentrum für Schlafmedizin Frankfurt, Frankfurt (H. Schneider); Klinikum Garmisch-Partenkirchen, Garmisch (R. Püschel); Krankenhaus Martha-Maria Halle, Halle (S. Schädlich); Sleep Centre, Medizinischen Hochschule, Hannover (K. Meyer); Thoraxklinik Heidelberg, University Hospital, Heidelberg (A. Benz); Sleep Centre, Pediatric Hospital St Marien, Landshut (B. Schneider); Sleep Centre, Suedharz Klinikum, Nordhausen (J. Büntzel); Sleep Centre at Sana Klinik Oldenburg, Oldenburg (I. Koper); Sleep Centre, Kreisklinik Trostberg, Trostberg (R. Koch); Sleep Centre, ENT Dept, University Hospital, Ulm (J. Lindemann).

All data are available for data sharing after de-identification of the study centre. Requests for data sharing can be sent to the first author. The original questionnaire, the analysis plan and the study protocol are available. The request for data can be forwarded after publication of the research letter.

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