British Sleep Society
British Paediatric Sleep Society
UK Multidisciplinary Sleep Professionals

Better Sleep for All

THE HOOT

November 2020 | Edition 10

In this issue of *The Hoot*

President's Update

Dear Member,

I am delighted to bring you the Autumn issue of the HOOT. It has been a year unlike any other and all of us, as well as the Society, have faced challenges unimaginable a year ago. However, this has not stopped us from developing more content for you and provide a firework of upcoming events, most of them for free. I will also talk to you about all the other exciting decisions that are currently going on to shape the future of our Society.

Education

Following out successful webinar in collaboration with the OSA Alliance earlier this year year we hosted the virtual SATA Day (10th October); and there was a significant interest in what was an informative and thought-provoking event. In October, we also had the free Clinical Update Sleep: 'A Virtual Briefing', which had range of interesting speakers who presented original data from the BSS on the "Impact of COVID-19 Lockdown on Sleep" (16th October 2020). Furthermore, we will engage with the RSM Sleep Section in 'Debates about Sleep' (16th November, 2020) and, finally, conclude the year with the 'BSS/Jazz Narcolepsy Day' on the 4th December. As always, you can review all upcoming events on our webpage, or why not follow us on twitter?

BSS Strategy

You will by now have received the draft version of the BSS Strategy for the next 5-year period which is out for public consultation and also available on the membership area of the BSS webpage. We will discuss feedback and include any required amendments before having a 'soft launch' of the BSS Strategy in December. We are planning to run the 'hard launch' with the World Sleep Day in March 2021, so please listen for further announcements.

Executive Committee Election

Elections have taken place to find a new member for the Executive Committee, we had a close of the polls on 30th September. There was one place available and we had multiple applicants with highly competitive applications. But there can only be one winner and I am pleased to announce that the newly elected Executive Committee member is Michelle Miller who is a Reader of Biochemical Medicine at the Warwick Medical School. Congratulations! We look forward to working with Michelle in the coming years to shape the BSS agenda.

BSS/BSDSM

We were also pleased to welcome Aditi Desai as the BSDSM president and representative on the Executive Committee of the BSS. All signatures have been delivered to the Memorandum of Understanding and the BSDSM are now a fully integrated committee of the BSS, please review their webpage and activities. We are planning further educational events with our new partners to bring to you exciting and innovative methods in the diagnosis and therapy of sleep disorders.

BSS Scientific Conference 2021

It will be difficult to start the planning for our next BSS biennial scientific conference under the current circumstances and uncertainties during the pandemic. To give you an update, we have started to plan ahead and will commence with the programme, develop a draft with parallel streams for adult, paediatric and dental sleep as a focus. We will work on the format so that it could be delivered virtual, face-to-face, or as a hybrid event. Once we are clearer what the public guidance for face-to-face events will be in 2021 we will select and announce the location; this should be possible in early 2021 – finger crossed. However, please save the date for the conference at the end of October or beginning of November 2021! And if you want to help with the programme, please, let us know.

I now would like to wish you and your loved ones a healthy period through to December, please keep in mind all the precautions that we have heard a thousand times and will hear many more times before they are not required any longer. I keep my fingers crossed that a vaccination may bring an end to all that we have endured this year, but in the meantime we must accept that non-vaccination measures seem to be the best way forward to keep us safe. Last, but not least, I want to say thank you to Rachel and our team who have gone the extra mile to fill the HOOT with many interesting stories. Enjoy!

Joerg Steier

BSS President

Editor's Note

Dear BSS Members,

Welcome to the last Hoot of 2020. I think we can all agree this has been a very unexpected year. However, despite the enormous challenges posed by COVID -19, we have seen a number of possitive changes over the past 6 months. We have seen some amazing collaborative working, an increased use of technology to bring people closer together, with webinars and video calls to discuss best practice and delivery of conferences or teaching that would have otherwise been cancelled and we have seen some incredible examples of innovative and patient-focused practice. We have all learned a lot in 2020 and as we continue in uncertain times, we can nevertheless say that we are certainly more prepared than we were 12 months ago to weather this storm.

Here at the BSS, we have been involved in delivering a number of webinars over the year including the FENS Symposium, Preparing the response to the COVID-19 Pandemic, the OSA Alliance Virtual Roundtable, a Paediatric sleep webinar, COVID 19 and Sleep and more recently the SATA day virtual meeting.

We have been continuing to work hard to continue supporting and delivering these meetings which we hope you are enjoying. We are regularly updating the website with news and upcoming conferences, so please keep an eye on the website and Twitter @BritishSleepSoc https://www.sleepsociety.org.uk/events/

In addition to the BPSS joining the society we are also excited to announce the British Society of Dental Sleep Medicine are now a fully integrated committee of the BSS and we welcome Dr Aditi Desai to the Executive committee. For further information on the BSDSM visit their website https://bsdsm.org.uk/

We are excited to have both the BPSS and BSDSM as part of the BSS and look forward to sharing a broader range of information to reflect our membership base.

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We would love to hear from you so if you have any content you would like to share for our Spring Edition of the Hoot please contact admin@sleepsociety.org.uk

We hope you enjoy this edition and keep safe over the winter period, remembering "Hands, Face, Space".

Best Wishes,

Rachel Pickersgill

Editor

BSS Membership

Student Membership Category
Full or part-time student registered in higher education or further education institution. Please note you will be required to provide evidence upon application (Student card or Letter from your institute).

Entry Level/ Early Years Membership Category
Up to and including band 5 for allied health professionals, post-doctoral researchers up to and including 3 years after PhD. This category also includes Foundation Year 1 Doctors. Please note you will be required to provide evidence upon application (Proof of Phd Certificate/Letter of on going research).

Standard Membership Category
All other

For more information on membership please visit: www.sleepsociety.org.uk

In Memoriam: Professor Sir Neil James Douglas

Renata L Riha and Thomas W Mackay

Professor Sir Neil James Douglas, one of the pioneers in clinical sleep medicine, passed away on 23rd August, 2020. For many of us who were inspired by him to practice in the area, this news was met with great sadness.

Neil retired in 2012, which seemed too early, considering the lifetime of accumulated experience and the contributions to the field that he had made. However, he did enjoy the last 7 years of his life doing the things he loved best, fishing, sailing, travelling and constructing his own cottage in Perthshire; spending time with those closest to him.

Being a relatively young discipline, Sleep Medicine is still not accepted or recognised for its full worth by either by academic institutions or clinical services. However, things have improved considerably over the last two decades thanks to outstanding pioneers in the field, such as Neil.

In 1973, Neil graduated from the University of Edinburgh with distinction in medicine, therapeutics and surgery. He had been a pre-clinical scholar at the University of St Andrews. His interests lay in respiratory physiology and he had the good fortune to work with Professor David Flenley in Edinburgh who encouraged a generation of outstanding academics to start working in the area. Neil went on to undertake ground-breaking in Denver, Colorado, at a time when respiratory sleep was in its infancy. His research contributed to the understanding and recognition of obstructive sleep apnoea/hypopnoea syndrome as a major public health hazard and morbidity which carries a high disease burden with it if left untreated. As recognition for his work, he became professor of respiratory and sleep medicine at the University of Edinburgh, as well as continuing to work as an honorary consultant physician at the Royal Infirmary of Edinburgh.

When Neil established the Scottish National Sleep Centre in 1983 in Edinburgh, he had a fight on his hands both academically and in establishing this vital sub-specialty clinically. It was, however, a war that he steadily won, and which was eminently suited to his tremendous energy, intelligence, sometimes coruscating wit, organisational talent and steely determination. He had a long and distinguished academic career, notable also for the number of researchers who were drawn to work with him from all over the world and who all contributed in their own ways to establishing the Sleep Centre in Edinburgh as a centre of excellence. Edinburgh became the most highly cited centre in the world for sleep apnoea/hypopnoea syndrome and the second most highly cited centre in clinical sleep medicine.

Though fundamentally shy and very private, Neil was in his element at conferences, participating in debates and always questioning the status quo. Many of us will remember feeling somewhat intimidated by this worthiest of opponents, when questioned publicly about a blind-spot in our research or an angle we may have failed to consider. However, he was always fair and never personal in his criticism, thus contributing to the kind of intellectual debate that advances any field and questions every paradigm, whether false or true.

An editor, author, co-author, Neil's contributions to medicine were numerous. He also worked hard with others in the UK to establish guidelines for the investigation and management of sleep disordered breathing (SIGN guidelines published 2003), establish untreated sleepiness as a public health hazard and to raise the profile of sleep medicine. He was one of the driving forces behind the formation of the British Sleep Society in 1989, of which he was inaugural co-Chair.

In Memoriam: Professor Sir Neil James Douglas

In the mid-1990s, the NHS at long last took over the running of the clinical side of the Department of Sleep Medicine, with the Sleep Research Unit remaining part of the University of Edinburgh. With funding forever an issue and with limited support, Neil started to channel his organisational talents and vision towards the Royal College of Physicians of Edinburgh with which he had been involved for over 30 years. He became Vice-President (2000 – 2003) and then was elected to President of the College from 2004 – 2010. Hereafter, he became Chair of the Academy of Medical Royal Colleges until his retirement (2009 – 2012).

Apart from his time spent at the RCPE, he was appointed in 2007 by the then Health Secretary of Great Britain, Patricia Hewitt, to chair the Medical Training Application Service Review Group. This came about when the Government's instigation of an online system to select doctors for specialty training seriously foundered, resulting in a protest march through London of over 10,000 junior doctors, hundreds of whom subsequently emigrated to practice abroad.

With his strong belief in medical leadership, and in his role at the Academy of Medical Royal Colleges, Neil was instrumental in creating the Faculty of Medical Leadership and Management of which he was founding chair from 2011-2017.

In 2009, Sir Neil was made Knight Bachelor for his services to the medical profession in the New Year's Honours.

Throughout his dealings with others, Neil was always forthright and honest – a trait not much in evidence in our complex world. He gave praise where praise was due, and was exceptionally time-efficient, mercurial and organised. I suspect these qualities, his ability to grasp the nub of a problem quickly and incisively and his incredible energy allowed him to achieve more than many of us would aspire to in several lifetimes. He was inherently kind and often worked behind the scenes to help others out, sympathetic to their concerns. He was modest and no lover of effusive shows of gratitude or emotion. Common sense and wise counsel were his great strengths. When he made it clear that he believed in you, there was no greater encouragement and when his sense of humour was piqued, it was a joy to be around him. It was an honour and a privilege to work with him.

Sir Neil was diagnosed with a rare form of lung cancer approximately 15 months ago and bore his illness with tremendous fortitude. He died at his cottage in Perthshire with his family by his side, far too soon.

New BSS Executive Committee Member

Michelle Miller

Dr Miller is a Reader in Biochemical Medicine at the University of Warwick. She is a leader of the 'Sleep, Health and Society' research programme, an international programme of the research and teaching of cardiovascular disease underlying biochemical mechanisms. Her research spans a number of inter-connecting disciplines which include biochemistry, genetics, epidemiology and population health science and her publications include more than 50 that are related to sleep. She co-edited one of the first 'epidemiology' textbooks entirely devoted to sleep: 'Sleep, Health and Society, from aetiology to public health'. Oxford University Press; 2nd Ed 2018. She is particularly interested in inflammatory mechanisms and their relationship to metabolic abnormalities and cardiovascular risk in individuals of different ethnic origins. Her work has been included in sleep policy documents and has had vast coverage in newspapers and magazines, with interviews on TV and radio. She has been involved in a number of public engagement activities. She leads the Sleep Medicine module for undergraduate medical students at the University of Warwick and is an academic lead for Post Graduate Research. She is a Fellow of the Faculty of Public Health (FFPH), the American Heart Association (FAHA) and the British Hypertension Society (FBHS) and a member of the Academy of Medical Educators (MAcadMEd), the European Sleep Research Society and the executive committee of the British Sleep Society.

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British Sleep Society Strategic Plan

"Healthy Sleep for All"

2020-2025

President's Statement

Everything we do at the British Sleep Society is to promote "Healthy Sleep for All". We support patients and multidisciplinary healthcare professionals alike to drive educational, research and clinical standards. We promote our mission by establishing inclusive values and priorities for the Society that will help us to achieve our vision to further public health and diminish health inequalities. Our strategic plan is ambitious and will help us to better align with national and international partners and provide relevant guidance to anyone with interest in Sleep to identify with our Society.

Professor Joerg Steier,
President

2020 Executive Committee

Prof. Joerg Steier **President**

Dr Tim Quinnell	Immediate Past President	**Dr Simon Durrant**	Treasurer
Dr Alanna Hare	Secretary	**Dr Omi Narayan**	BPSS Sub-Committee Chair
Dr Lizzie Hill	Education Sub-Committee Chair	**Dr Anna Weighall**	Communications Sub-Committee Chair
Prof. Jason Ellis	Research Sub-Committee Chair	**Dr Alison McMillan**	Clinical Practice
Rachel Pickersgill	'The Hoot' Editor	**Dr Ari Manuel**	Membership
Dr Stephen Emegbo	RCCP Liaison	**Dr Victoria Cooper**	ARTP Liaison
Sakina Dastagir	BPSS	**Alex Perkins**	Strategy Task Force

Overview of the Strategic Plan

This document outlines the proposed components of the BSS Strategic Plan. The plan is intended to guide the development and activity of the society for the next five years. The strategy consists of four interrelated levels, this includes our Mission, Vision, Values, and Priorities (Figure 1):

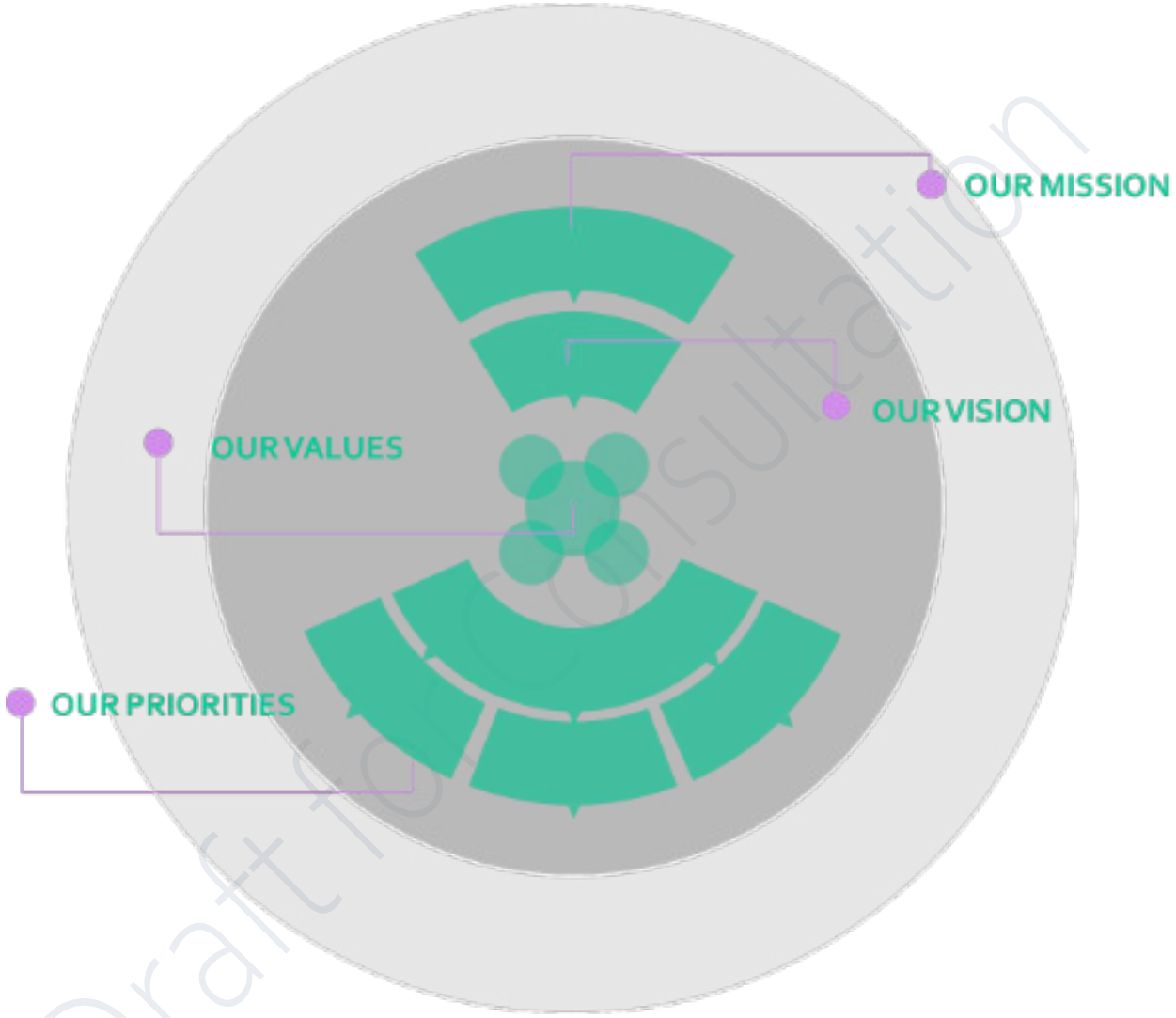

Figure 1 - Overview of the Strategic Plan

Our Mission & Vision

Our Mission statement sets out who we are as an organisation and what we do. Our Vision statement explains what we seek to achieve together over the next five years. Together these statements define our purpose and outlook (Figure 2).

Figure 2 – Our Mission and Vision

Our Values

The Values of the British Sleep Society are the guiding principles that apply to all our activity. They serve as the benchmark we will use to achieving the Vision of the Society. Our Values are (Figure 3):

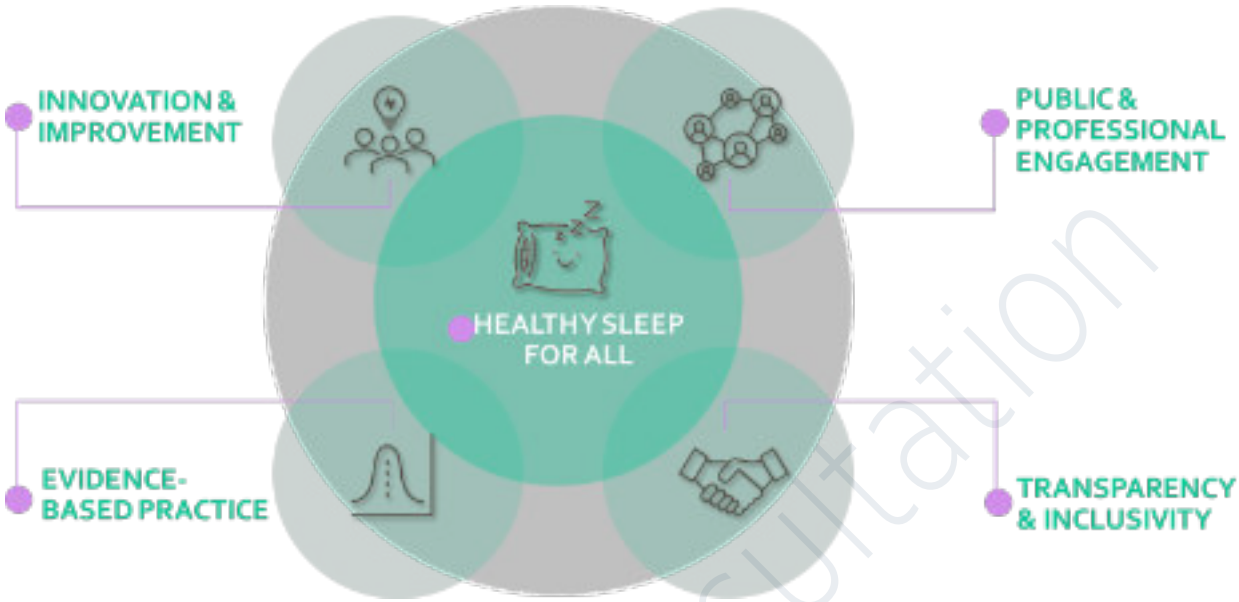

Figure 3 – Our Values

Healthy Sleep for All

Understanding, and promoting the benefit of healthy sleep for all is at the heart of our activity as clinicians, researchers, and educators.

Evidence-Based Practice

We believe in the rigorous generation, evaluation, and application of evidence in our professional practice. We hold on to this principle even when it contradicts our own interests as individuals, or as a society.

Transparency and Inclusivity

We will strive to create a culture that is diverse, tolerant, and open to different perspectives. We will help others to build their own voice and find ways for everyone to be heard. We will speak openly and will be accountable to others for our words and actions.

Public and Professional Engagement

Our strength lies in our ability to grow together. We will help members to build networks and share their work with others. As a society we will seek to work with members of the public, other organisations, and decision makers. In doing this we will ensure that our vision and values inform policy and public life.

Innovation and Improvement

We will seek to improve the quality standards to which we aspire as practitioners, and to help others in the application of those standards. We will find innovative ways to operate as a society, and to encourage innovation in the practice of our members. We will learn from each other and will share our successes.

Our Strategic Priorities

Our Strategic Priorities define the way the British Sleep Society will operate. They serve as a focus for the way we will organise our activities. Our priorities are (Figure 4):

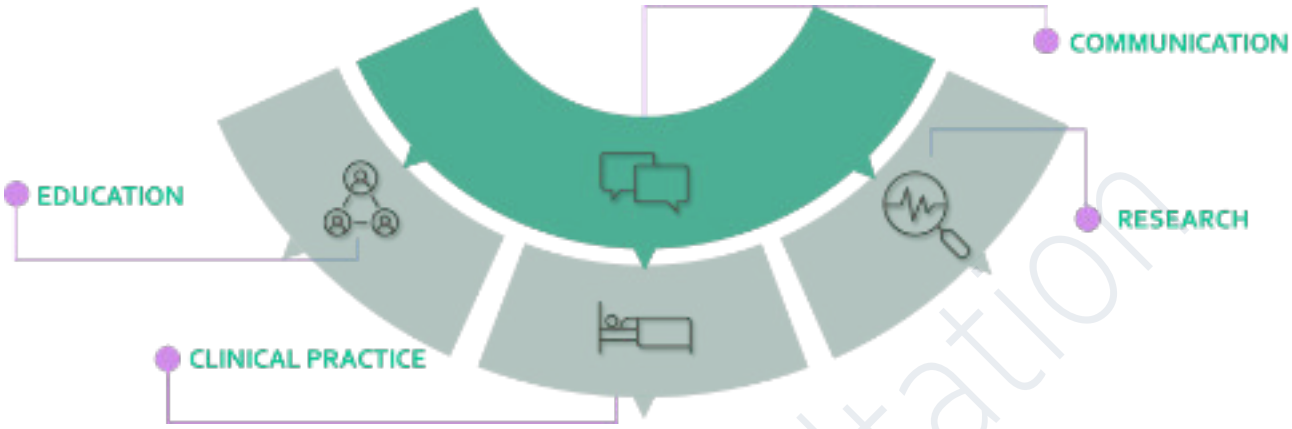

Figure 4 – Our Strategic Priorities

Education

We recognise the need to continuously build our own skills and knowledge, and to teach what we know. We will ensure sleep health professionals can excel in their work by improving access to, and quality of education in sleep science.

Clinical Practice

Members of the public deserve access to safe, timely and effective support for sleep conditions. As an organisation we will support members to provide the best clinical care, and we will be active in setting the standards for that care.

Research

As the foundation of our practice, sleep science research needs to be carried out with the utmost rigour and integrity. We will help members to build the skills, and relationships to be active and effective members of the research community and will help them to disseminate their research.

Communication

To ensure that we have a diverse, engaged, and vibrant community we must be able to communicate our Vision. We need to find ways to build dialogue with our members, as well as with external stakeholders and member of the public. The way we work together is our strength, and this strategic priority cuts across all that we do.

Acknowledgements

The BSS Strategic Plan was co-produced by the Executive Committee in a task force led by Prof. Joerg Steier and Alex Perkins.

Following consultation period with the membership this strategic plan is due to be reviewed by the end of 2025.

British Sleep Society

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Sleeping pillow icon in figure 3 made available by Smashicons from www.flaticon.com

Editorial of Sleep Section

British Sleep Society: the COVID-19 pandemic response

Joerg Steier[1,2,3], Simon Durrant[1,4], Alanna Hare[1,5]; on behalf of the BSS Executive Committee

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British Sleep Society (BSS) webinar

The current pandemic caused by a novel coronavirus, named COVID-19, holds the entire world to ransom. A proportion of the infected patients become critically ill, with millions being infected and hundreds of thousands who have died so far. In some countries, national lockdown restrictions are being slowly lifted, but the World Health Organization (WHO) still registers increasing numbers of confirmed COVID-19 infections across its membership states.

Against this background, the BSS brought together doctors from the respiratory and critical care response teams in Wuhan, China and London, UK in a webinar to exchange their knowledge and expertise and discuss current best practice in the management of patients with COVID-19. Following their presentations, sleep experts from the Executive Committee of the BSS discussed the impact of the pandemic and lockdown on sleep and shared practical advice regarding sleep health.

Respiratory and critical care response to the COVID-19 pandemic

Professor Fengming Luo and Dr. Wanhong Yin from the West China Hospital of Sichuan University, China were involved in the direct respiratory and critical care response team during the outbreak of the pandemic in Wuhan. They gave an overview about the logistics, the medical and infrastructure measures taken and the difficulties that they had to overcome facing this novel virus. During the outbreak, it became clear that the virus did not only affect the lungs, but also the cardiovascular, renal and neurological systems. The Chinese workforce developed protocols for the use of personal-protective-equipment (PPE; *Figure 1*), prevention of infection, clinical practice and testing-and-tracing.

Professor Nicholas Hart from Guy's & St Thomas' NHS Foundation Trust (GSTT) in London then spoke about the NHS Response to COVID-19 in the London area. Prof. Hart is the Clinical Director for Pulmonary, Adult Critical Care and Sleep (PACCS) and as such was involved in the South London Respiratory and Critical Care Network planning during the COVID-19 pandemic, the area most hit by the pandemic in the UK (1). The first patient with COVID-19 at GSTT was admitted to intensive care on the 3rd March 2020 and, following a better understanding of the disease, triggered a comprehensive integration between acute medicine, anaesthesia, infectious diseases, respiratory and critical care that allowed for a rapid expansion of hospital capacity (*Figure 2*). Surgical elective interventions were reduced and a planned expansion of the critical care area to 234 critical care beds was initiated. The redeployment of staff required training of some 1,550 clinical and many more non-clinical staff, accessing education and online training and videos; this included 245 junior and senior doctors and 473 nurses. Critical Care, Respiratory, Thrombosis and Renal Pathways were established, 'lines' and 'intubation' teams, as well as 'proning' teams started to work non-stop. Virtual communication 'lifelines', were initiated with families and next of kin to allow to them to virtually "visit" their loved ones via videocalls. Ventilator and equipment procurement were coordinated for South London and data analytics support was provided centrally.

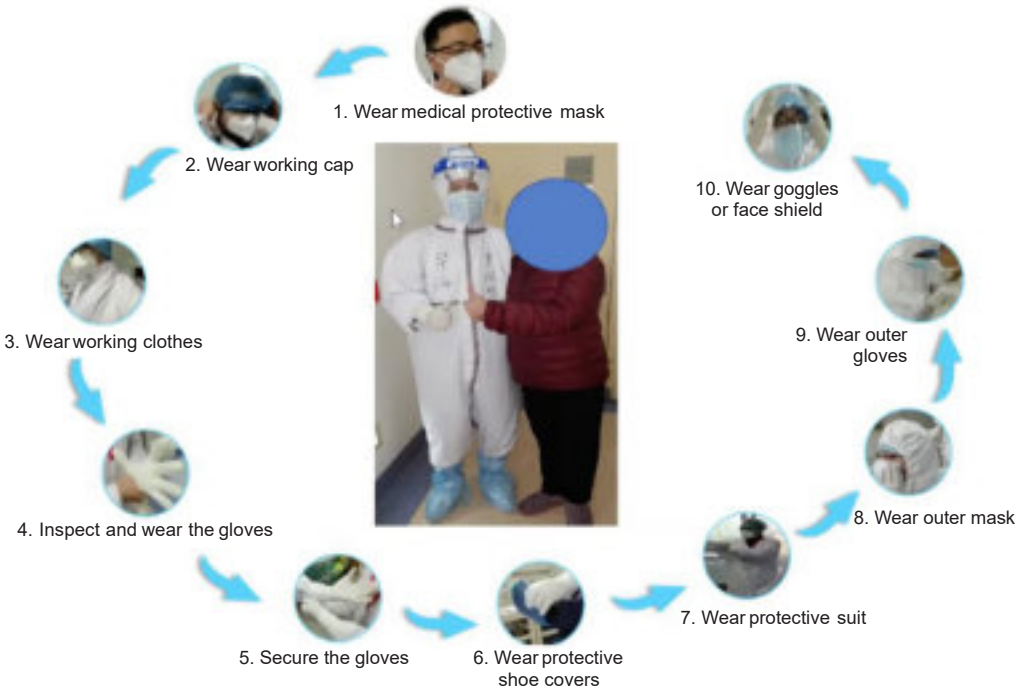

Figure 1 "Donning" procedure of the Chinese Wuhan responseteam.

South London saw the peak of the first wave in the first half of April with steadily declining numbers of critically ill patients thereafter. Critical care bed capacity was not breached: at the peak there were 130 patients at any given time under the care of GSTT. This compares to a planned critical care bed capacity of 99 beds for the winter season with influenza.

Pathophysiology

Profs Luo, Yin and Hart described how, in the first week of the infection, patients typically experience a viral pneumonia, with subsequent weeks causing an increased drive to breathe, acute lung injury, acute cardiac and skeletal muscle injury, possible kidney and liver injury and intestinal involvement. There is some suggestion of two phenotypes of acute respiratory distress syndrome (ARDS): type 'L' describes patients with low elastance, high compliance and low V/Q ratio; type 'H' includes patients with high elastance and low compliance (<30 mL/H_2O) and high right-to-left shunt (2). Neural respiratory drive was generally high due to the increased work of breathing, high transpulmonary pressures and shearing forces, and this was complicated by worsening pulmonary oedema and, over time, developing fibrotic changes. Closing capacity of the airway was often reached, particularly in obesity, with microtrauma worsening the oedema with every breath. An increased positive end-expiratory ventilation pressure (PEEP) during ventilation was found to be helpful to avoid this and recruit lung volumes. Pulmonary vessels were exposed to significant hypoxic vasoconstriction, due to the Euler-Liljestrand effect, and acute pulmonary hypertension developed.

Post-critical care follow up

Prof. Hart explained that in patients who were discharged from critical care at GSTT, about 50% of patients underwent regular post critical care rehabilitation, 25% required complex respiratory and 25% complex renal support; 70% of tracheostomised patients survived, about 10% of tracheostomised patients died, and 30% had weaned successfully by the time of the webinar. Post critical care follow up at 4–6 weeks included 1,136 patients with a mortality of 19%, 7% of the patients still remaining inpatients at that time. However, half of the patients in the follow up clinics had returned to their pre-COVID-19 baseline. The most common pathologies identified at

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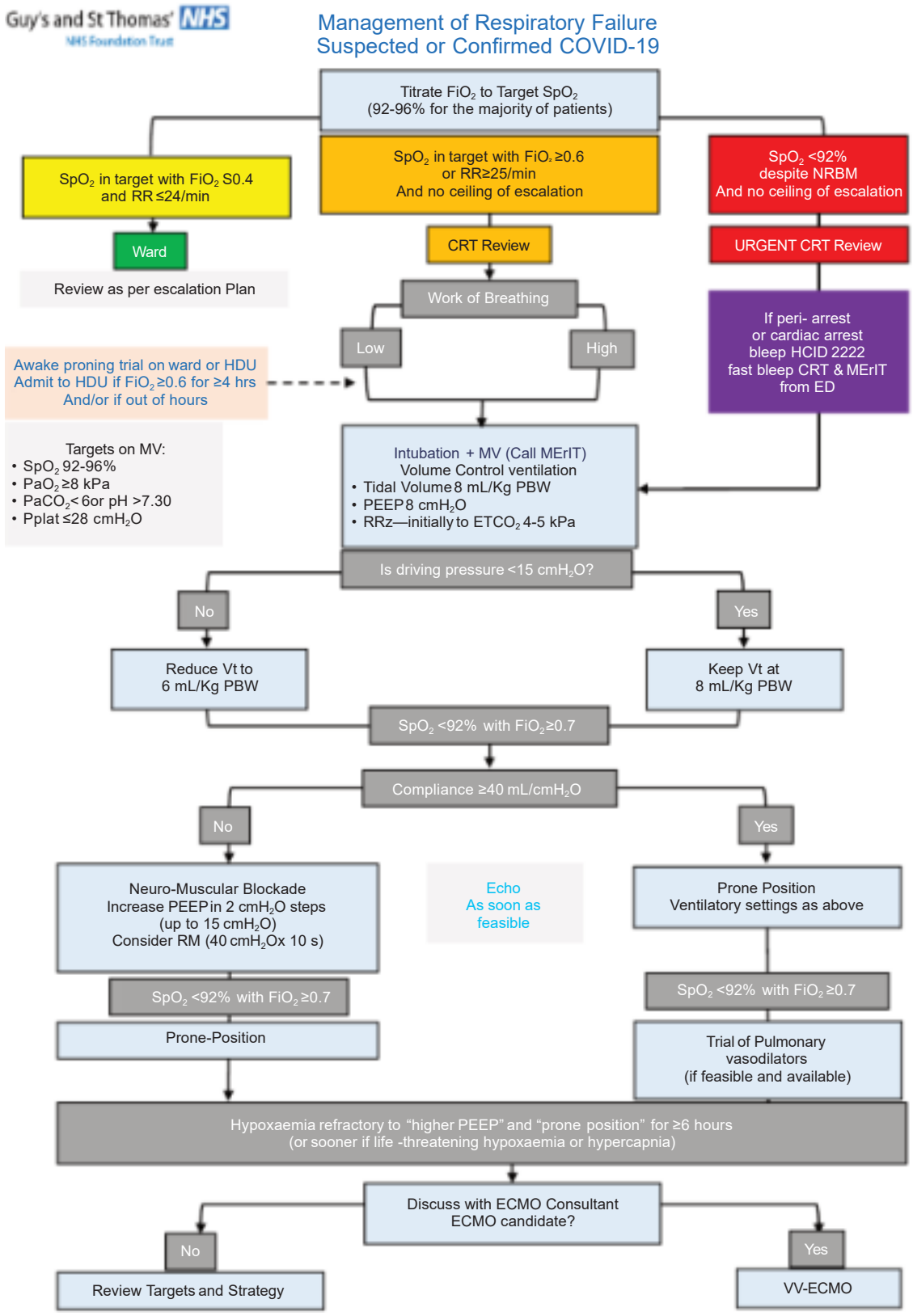

Figure 2 Respiratory and critical care treatment algorithm at Guy's & St Thomas' NHS Foundation Trust, London, UK.

follow up included interstitial lung disease(ILD), including organising pneumonia, cardiac and neuropsychiatric issues.

Insomnia during COVID-19

In the second part of the webinar, the focus was on the impact of COVID-19 on sleep and Professor Jason Ellis spoke on insomnia during the pandemic. Referencing surveys of the public exploring the mental health and sleep impacts of COVID-19 from both China (3) and Italy (4), Professor Ellis opened by noting that the published data suggest that the public worldwide has experienced a major mental health burden as a result of the pandemic. In both papers, a significant proportion of respondents reported that their sleep quality had been affected as a result of the pandemic, with 57% of respondents in the Italian survey reporting poor sleep quality, as well as high levels of anxiety and distress. Both papers found that younger participants were more likely to report sleep disturbance, whilst the Italian study also found that female sex, fear of contact with cases of COVID-19 and uncertainty around COVID-19 infection increased the likelihood of impaired sleep.

Professor Ellis proposed a diagnostic for acute insomnia comprised of a "trigger" to the sleep disturbance, which could be any life event or train of life events, resulting in a significant reduction in quality of life, coupled with distress at the current situation. The sleep disturbance should occur for at least 3 nights per week and last between 3 days and 3 months (following which the disorder is better characterised as chronic insomnia). The severity of acute insomnia can be subjectively assessed by the patient as mild, moderate or severe, or quantitively as a sleep onset latency and/or wake after sleep onset greater than or equal to 30 minutes (5).

Moving to management, Professor Ellis asked "can we circumvent the transition from acute to chronic insomnia with a 'single-shot' of CBT-I?". Although cognitive behavioural therapy for insomnia (CBT-I) is well-established for the treatment of chronic insomnia, it has been less well-studied in acute insomnia. In addition, access to CBT-I is challenging in many areas and countries and is often considered too burdensome to perform in primary care where, one might argue, it is most likely to be beneficial. In a community-based pragmatic parallel group randomized controlled trial, forty adults with acute insomnia were given either a single 60- to 70-minute session of CBT-I (n=20), with an accompanying self-help pamphlet, or were wait listed as the control group (n=20) (6). All subjects were offered a full individual course of CBT-I on completion of the study, regardless of group allocation.

The major components of the "single shot" CBT-I were sleep hygiene advice and sleep education to identify and address sleep related dysfunctional thinking; the principles and practice of sleep restriction and a pamphlet advising on the principles of stimulus control, cognitive control, and the use of imagery distraction techniques.

At follow-up, there was a significant difference in Insomnia Severity Index (ISI) scores between those in the CBT-I group and those in the control group [$t(38) = 2.24$, $P<0.05$]. Using the criteria of an ISI score <10 being indicative of insomnia remission, at follow-up 12 of 20 participants (60%) in the treatment group had remitted compared to 3 of 20 (15%) in the control group. This difference in cases at follow-up was significant ($\chi^2=8.64$, df =1, $P<0.003$), indicating that this brief CBT-I intervention is sufficient to elicit significant improvements in sleep in individuals with acute insomnia. In a further study, the authors showed that "single shot" group treatment is as efficacious as individual treatment (7).

Concluding, Professor Ellis acknowledged that the COVID-19 pandemic has had a significant impact on individuals' sleep worldwide and, in the face of an increasing incidence of acute insomnia, we must look for effective treatment strategies which can be rapidly deployed, with a view to circumventing progression to chronic insomnia and its attendant impacts on individuals' mental health. "Single shot" CBT-I may provide a pragmatic solution in these challenging times.

BSS statement on sleep-related advice during the COVID-19 pandemic

The last talk in the webinar, delivered by Dr. Simon Durrant, Treasurer of the BSS, focused on another key part of the response to the pandemic from a sleep perspective: the release of the COVID-19 Statement on sleep during the pandemic by the BSS on 17th April 2020. The decision to release a statement was taken in light of increasing evidence of COVID-19-related sleep problems, together with uncertainty over whether or not patients with obstructive sleep apnoea (OSA) should continue with CPAP treatment during the pandemic (8,9). The talk reflected the four parts of the statement, which first outlines general government advice on hygiene and what to do in the event of an infection, before moving on to advice specific to sleep.

Clarity around treatment for OSA is especially important during the pandemic due to the additional problems

patients with existing breathing disorders may experience should they contract COVID-19. The BSS position had previously been agreed as a signatory to the OSA Alliance statement (10), which suggestscontinuing with treatment in the absenceof infection but temporarily stopping if infected, unless self-isolation in a different bedroom can be ensured and the treatment does not worsen symptoms. In all cases,communication (remotely) with service providers is recommended.

There have been increasing anecdotal reports of insomnia during the lockdown, which is perhaps not surprising in view of the effects of the pandemic: lockdown with reduced exercise opportunity, increased alcohol sales, more electronic device usage and heightened stress and anxiety around both the pandemic and concerns over jobs and livelihoods. Obtaining sufficient daily exercise is important for sleep quality as well as general health so it is important that any statement contains this. Similarly, alcohol consumption may shorten sleep onset latency, but does so at the expense of greater time awake after sleep onset and shortened REM sleep duration leading to standard advice to avoid alcohol consumption in the hours leading up to bedtime (11).

One key characteristic of the global lockdownhas been a substantial increase in the use of electronic devices for communication. This has had many benefits but brings with it the risk of increasedblue light exposureduring the evening, leading to suppression of melatonin production and problems with sleep. Part of the statement focuses on this and suggestsusing low blue light mode and filters where possible.

Stress and anxiety play a large part in many—perhaps even most—casesof insomnia and in the current situation these are both greatly heightened. The last part of the BSS statement addressesthese underlying causesand their impact on sleep quality. Modern therapeutic techniques combined with innovative technology are here to yield two potential solutions. Mindfulness aims to help people take a step back and reconnect with their thoughts and feelings more reflectively and appsare freely available to help with this, including programmes targeting sleep specifically. Meanwhile, CBT-I is available through electronic delivery aswell asdirectly by a therapist and has proven effectiveness in treating insomnia (12). The European CBT-I Academy have released more detailed advice for sleep in the context of COVID-19 (13).

The BSS statement is designed to be helpful by addressing sleep problems and underlying causesspecific to the current pandemic. If we can help people to sleep better, with the known benefitsfor immune function, we might yet help to improve quality of life in the general population.

Take-home messages

The unprecedented challenge of COVID-19 has forced clinicians acrossthe world to redeploy whole workforces, rapidly expand critical care bed capacity, develop new working practices and institute strict infection control measuresacrossentire hospitals within a matter of days(14). This has had to take place against a background of developing understanding about the pathophysiology of this complex infection, which involves multiple organ systems and in particular targets the respiratory system,resulting in a form of acute respiratory failure which has been striking in the variability of its presentation.

In addition to the millions who have experiencedthe direct physical effects of the infection, there are more individuals who have experienced indirect effects of the pandemic lockdown, which has led to widespread anxieties about personal and family members' health, finances and job security. These anxieties frequently affect individuals' sleep quality and quantity, with resultant impacts on daytime functioning and physical and mental health. The BSS have started a National Early Detection Screening survey (NEDS) for sleep associatedproblems. To date, 611 participants have submitted a response and of those, about ¾ noticed that their sleephad changedduring the pandemic lockdown. More than half of the respondents experienced disrupted sleep,more than forty percent had difficulties falling or staying asleep,while about a quarter felt excessively sleepy or developed nightmares. Sleep hygiene advice, self-management resources (online) and guidance around sleep routines can improve these problems; the BSS hastherefore published its statement on sleep-related advice during the COVID-19 pandemic containing guidance for the general population (15).

The BSS was honoured to play its part in bringing expertise and the global medical community together to share their knowledge and experience and further the understanding of this complex infection and its impacts on society.

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BSS Task Force on Early Detection Screening Executive Summary

843 middle-aged, predominantly white and overweight/obese participants of which 2/3 were female.

- **69.4% experienced changes in their sleep pattern during the pandemic lockdown**
- **65.2% reported an impact on their mental health**
- 45.6% felt sleepier, 44.7% had refreshing sleep
- 33.9% needed to self-isolate
- 25.9% drank more alcohol during the lockdown

Sleep symptoms reported included:

- **42.3% '*disrupted sleep*'**
- 35.2% '*falling asleep unintentionally*'
- 30.9% '*difficulties falling asleep*', 30.8% '*difficulties staying asleep*'

Patients with suspected COVID-19 had more **nightmares and abnormal sleep rhythms**.
Sleep related alterations were associated with impact on mental health.

British Sleep Society
British Paediatric Sleep Society
UK Multidisciplinary Sleep Professionals

Original Article

Impact of the novel coronavirus (COVID-19) pandemic on sleep

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Contributions: (I) Conception and design: L Pérez-Carbonell, IJ Meurling, A Weighall, J Ellis, S Durrant, A Hare, J Steier; (II) Administrative support: L Pérez-Carbonell, IJ Meurling, D Wassermann, V Gnoni, G Leschziner, J Ellis, S Durrant, A Hare, J Steier; (III) Provision of study materials or patients: L Pérez-Carbonell, IJ Meurling, D Wassermann, V Gnoni, G Leschziner, J Ellis, S Durrant, A Hare, J Steier; (IV) Collection and assembly of data: L Pérez-Carbonell, IJ Meurling, J Ellis, S Durrant, A Hare, J Steier; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: The COVID-19 pandemic has led to significant changes in daily routines and lifestyle worldwide and mental health issues have emerged as a consequence. We aimed to assess the presence of sleep disturbances during the lockdown in the general population.

Methods: Cross-sectional, online survey-based study on adults living through the COVID-19 pandemic. The questionnaire included demographics and specific questions assessing the impact of the pandemic/lockdown on sleep, daytime functioning and mental health in the general population. Identification of sleep pattern changes and specific sleep-related symptoms was the primary outcome, and secondary outcomes involved identifying sleep disturbances for predefined cohorts (participants reporting impact on mental health, self-isolation, keyworker status, suspected COVID-19 or ongoing COVID-19 symptoms).

Results: In total, 843 participants were included in the analysis. The majority were female (67.4%), middle aged [52 years (40–63 years)], white (92.2%) and overweight to obese [BMI 29.4 kg/m^2 (24.1–35.5 kg/m^2)]; 69.4% reported a change in their sleep pattern, less than half (44.7%) had refreshing sleep, and 45.6% were sleepier than before the lockdown; 33.9% had to self-isolate, 65.2% reported an impact on their mental health and 25.9% were drinking more alcohol during the lockdown. More frequently reported observations specific to sleep were 'disrupted sleep' (42.3%), 'falling asleep unintentionally' (35.2%), 'difficulties falling'/'staying asleep' (30.9% and 30.8%, respectively) and 'later bedtimes' (30.0%). Respondents with suspected COVID-19 had more nightmares and abnormal sleep rhythms. An impact on mental health was strongly associated with sleep-related alterations.

Conclusions: Sleep disturbances have affected a substantial proportion of the general population during the COVID-19 pandemic lockdown. These are significantly associated with a self-assessed impact on mental health, but may also be related to suspected COVID-19 status, changes in habits and self-isolation.

Keywords: Insomnia; virus; mental health; survey; sleep disruption

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Introduction

In December 2019, an outbreak of the novel strain severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in China, and rapidly spread worldwide. The new condition was named coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO) and was declared a pandemic on the 11th of March 2020 (1). Millions of cases were confirmed with hundreds of thousands of deaths. This unprecedented situation and the finding that the virus was highly contagious (person-to-person transmission) (2), required the adoption of non-vaccination public health measures aiming to reduce further spreading of SARS-CoV-2 (2). These measures included track-and-tracing, self-isolation, quarantine, social distancing and community containment, as well as nationwide lockdowns (3). Lockdown measures were implemented in many countries, including the UK, leading to significant social and lifestyle changes. In addition to any direct effects of COVID-19 on people's health the lockdown had an impact on the perception of confinement, caused worries about livelihood, family or friends, and had indirect effects on the health and wellbeing of non-infected people. The psychological consequences of isolation in epidemics or during quarantine have previously been addressed (4,5), however, with scarce focus on their effects on sleep (6).

In the current pandemic, the effects of isolation have been described in cohorts from China and Italy (7,8), with poor quality sleep and comorbid psychological disturbances being identified as significant issues (9-11). We therefore hypothesised that the COVID-19 pandemic and the public lockdown significantly impacted on sleep in the general population. We compared suspected COVID-19 with non-COVID-19, and tested whether there was an association with mental health impact. In order to survey current sleep problems, the British Sleep Society (BSS) initiated the National Early Detection Screening for the COVID-19 pandemic.

We present this article in accordance with the "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE) reporting checklist (available at http://dx.doi.org/10.21037/jtd-cus-2020-015).

Methods

Study design

The BSS Research and Executive Committee approved this prospective, cross-sectional, survey-based study. The UKRI/MRC and the NHS Health Research Authority (HRA) confirmed that ethical approval was not required owing to the screening survey design (https://cdn.amegroups.cn/static/application/04712039f3b0c07e77f3c779c14d1a17/JTD-CUS-2020-015-1.pdf). The study conformed to the provisions of the Declaration of Helsinki (as revised in 2003). An online survey was available to the general public from May 12th to June 2nd, 2020 (https://cdn.amegroups.cn/static/application/1778ae9dd49ffd9dfb1da63b65421e93/JTD-CUS-2020-015-2.pdf). Eligible participants were adults aged 18 years or older, living through the 2020 COVID-19 pandemic and under national lockdown regulations. Subjects required literacy and access to the Internet. Participants were excluded if they were not living under national lockdown regulations or were underage.

Questionnaire items

Respondents were asked to answer multiple choice questions or provide a free-text response regarding baseline characteristics, and the impact of the pandemic/lockdown including COVID-19 infection history, self-isolation, key-working, mental health, alcohol and sleep medication use, and a sleep profile (current quality/quantity, change in sleep pattern and specific sleep symptoms) (https://cdn.amegroups.cn/static/application/1778ae9dd49ffd9dfb1da63b65421e93/JTD-CUS-2020-015-2.pdf; Supplementary material).

A total of 24 different sleep symptoms were grouped into six sleep symptom categories for analysis (*Table S1*): (I) insomnia/disrupted sleep, (II) daytime symptoms, (III) abnormal behaviours in sleep, (IV) sleep-disordered breathing, (V) restless legs, (VI) sleep phase disturbance.

Primary and secondary outcomes

The primary outcomes were to identify sleep disturbances related to the COVID-19 pandemic lockdown in the general population. Secondary outcomes included subgroup analyses for pre-defined cohorts within the population: reported suspected COVID-19, self-isolation, keyworker and mental health impact.

Statistical analysis

Continuous variables were presented as median [interquartile range, IQR], due to non-normally distributed data. Mann-Whitney U and Chi-squared analyses were

Table 1 Baseline characteristics of total study participants (n=843)

Characteristics	Category	N	% or range
Gender	Female	568	67.4%
	Male	266	31.6%
	Prefer not to say	3	0.4%
	Other	6	0.7%
Age (years)		52	40–63
Age	10–19	5	0.6%
	20–29	40	4.7%
	30–39	154	18.3%
	40–49	190	22.5%
	50–59	189	22.4%
	60–69	182	21.6%
	70–79	81	9.6%
	80–89	2	0.2%
Ethnicity	White	778	92.2%
	Black	11	1.3%
	Asian	32	3.8%
	Other	23	2.7%
Weight (kg)		83.5	69.0–101.6
Height (cm)		167	160–175
BMI (kg/m^2)		29.4	24.1–35.5

Data presented as count (percentage) or median [interquartile range].

performed for comparison of continuous and categorical variables, respectively, in *a priori* subgroup comparison. A main-effects multiple logistic regression was used to identify the strength of association between the six symptom categories or a reported sleep pattern change and factors relating to the pandemic. Further multiple logistic regression modelling was reported as odds ratios where significant associations were found between sleep symptoms and pandemic-related factors (Supplementary material).

'Yes' and 'maybe' responses regarding COVID-19 infection were grouped into 'suspected COVID-19' for analysis due to global limited availability of polymerase chain reaction (PCR) swab testing. "Don't know" answers were not included in the modelling as they were non-binary.

Data were collected on Google Forms (accessed online May 2020, Google Ireland Limited, Dublin, Ireland) and analysed with SPSS version 24 (IBM Corporation, New York, USA) and Prism version 8 (GraphPad Software, San Diego, California, USA). A P value of ≤0.05 was considered statistically significant. Missing data were not imputed.

Results

Demographics and descriptive characteristics

844 participants completed the online survey, one underage participant was excluded, and 843 datasets were included in the final analysis. Respondents were mostly female (67.4%), middle aged [52 years (40–63 years)], predominantly white (92.2%), and overweight to obese [BMI 29.4 kg/m^2 (24.1–35.5 kg/m^2)] (*Table1*).

A proportion of 21.1% of respondents had suspected COVID-19 and 286 participants (33.9%) had to self-isolate. 550 participants (65.2%) reported an impact of the pandemic on their mental health. 296 participants (35.1%)

were keyworkers; 219 participants (25.9%) reported drinking more alcohol during the pandemic (*TableS2*).

Impact on sleep

Less than half of the participants (47.5%) felt satisfied with their current sleep quantity or felt refreshed from sleep (44.7%), with 27.0% reporting to sleep 6–7 [5; 8] hours; 585 participants (69.4%) noticed a change in their sleep pattern during the pandemic, 45.6% felt sleepier than before the lockdown and 7.4% reported the use of sleep medication during the lockdown compared to 5.2% before the lockdown (*TableS3*); 264 (31.3%) participants reported sleep restriction, with <6 hours of sleep. These were older [55 years (42–64 years) *vs.* 50 (39–62 years), P=0.007), had higher BMI [31.3 (25.7–37.6) *vs.* 28.3 (23.6–34.4) kg/m^2, P<0.001], and were more likely to report shielding due to vulnerability (31.1% *vs.* 22.8%, P=0.038), disability (30.3% *vs.* 20.0%, P=0.001) and an impact on their mental health (71.2% *vs.* 62.5%, P=0.049) (*TableS4*).

The most commonly reported specific sleep symptoms were disrupted sleep (42.3%), falling asleep unintentionally (35.2%), difficulty falling and staying asleep (30.9% and 30.8%, respectively) and going to bed later (30.0%) (*Table2*). Regarding 'other' symptoms, a small number of respondents stated that their sleep had improved (1.9%) (*TableS5*).

Effect of self-isolation and keyworker status

A positive answer to household self-isolation status question was assumed to report the participants self-isolating themselves. Five cases were excluded from keyworker group comparison due to "don't know" responses.

Participants who self-isolated reported significantly more insomnia/disrupted sleep (60.8% *vs.* 51.7%, P=0.012), daytime symptoms (53.8% *vs.* 46.0%, P=0.030), abnormal behaviours in sleep (27.3% *vs.* 20.1%, P=0.018) and restless legs (23.4% *vs.* 16.2%, P=0.01) (*Table 3*); specifically, these reported more sleep disruption (49.3% *vs.* 38.8%, P=0.003), nightmares (24.1% *vs.* 16.5%, P=0.008), abnormal movements of the limbs/trunk (8% *vs.* 3.1%, P=0.001), restless legs (18.2% *vs.* 11.1%, P=0.005), falling asleep unintentionally (40.6% *vs.* 32.5%, P=0.02) and abnormal sleep rhythm (9.1% *vs.* 4.8%, P=0.016) (*TableS6*). Keyworkers described significantly fewer sleep-related and daytime disturbances than others, namely choking/gasping at night (1.7% *vs.* 5.4%, P=0.010), daytime naps (14.9% *vs.* 23.7%, P=0.003), falls/injuries (0.3% *vs.* 2.2%, P=0.035) and getting up later (17.6% *vs.* 23.8%, P=0.035) (*TableS7*).

SuspectedCOVID-19 status

The most reported COVID-19 infection symptoms in the total study participants were dry cough and breathlessness (4.5% each), followed by headache (3.7%) and muscle pain (3.6%) (*Table S8*). Participants with suspected COVID-19 had significantly more nightmares (25.8% *vs.* 17.3%, P=0.010) and abnormal sleep rhythm (11.2% *vs.* 5.0%, P=0.002) (*TableS9*). Ongoing COVID-19 symptoms were associated with sleep disruption (OR 2.810, 95% CI, 1.632 to 4.867, P<0.001) (*Figure1*).

Mental health

Forty "don't know" responses were excluded from mental health impact group comparison. Participants reporting an impact of the pandemic on their mental health also had significantly more sleep symptoms {5 [2–7] *vs.* 0 [0–3], P<0.001} and were more concerned about their sleep {6 [5–8] *vs.* 4 [1–6] out of 10 points, P<0.001} (*Table 3*). A multiple logistic regression analysis demonstrated that reported mental health impact was a predictor of sleep pattern change during the pandemic (β=0.969, 95% CI, 0.663 to 1.281, P<0.001, *TableS10*). In a further regression analysis, an impact on mental health was significantly predicted by the presence of difficulty falling asleep (OR 3.600, 95% CI, 2.317 to 5.752, P<0.001), sleep disruption (OR 2.523, 95% CI, 1.696 to 3.794, P<0.001), excessive sleepiness (OR 3.488, 95% CI, 2.050 to 6.264, P<0.001), falling asleep unintentionally (OR 3.810, 95% CI, 2.588 to 5.726, P<0.001) and nightmares (OR 7.005, 95% CI, 3.951 to 13.600, P<0.001) (*Figure 2*). An impact on mental health was associated with both increased alcohol intake (OR 1.529, 95% CI, 1.074 to 2.203, P=0.02) and sleep medication use (OR 1.634, 95% CI, 1.036 to 2.644, P=0.039).

Predictors of a change in sleep pattern

A multiple logistic regression model including 'change in sleep pattern' as the categorical outcome variable with baseline demographics and pandemic-related factors as predictor variables was performed (*Table S10*). No co-linearity was found between predictor variables. A change in sleep pattern was overall most strongly associated with reported sleep medication use during the pandemic (β=1.276, 95% CI, 0.140 to 2.578, P=0.039), ongoing

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Table 2 Reported specific sleep symptoms and within categories by total study participants (n=843)

Variables	N	% or range
Number of sleep symptoms	3	0–6
Insomnia/disrupted sleep	462	54.8%
Disrupted sleep	357	42.3%
Difficulty falling asleep	261	30.9%
Difficulty staying sleep	260	30.8%
Sleep phase disturbance	440	52.3%
Going to bed later	253	30.0%
Getting up later	183	21.7%
Getting up earlier	133	15.8%
Going to bed earlier	104	12.3%
Abnormal sleep rhythm (advanced/delayed)	53	6.3%
Daytime symptoms	410	48.6%
Falling asleep unintentionally	297	35.2%
Daytime naps	173	20.5%
Excessive sleepiness	168	19.9%
Falls/injuries	13	1.5%
Sleep-disordered breathing	223	26.5%
Morning headaches	179	21.2%
Breathlessness during the night	47	5.6%
Choking/gasping at night	34	4.0%
Breath-holding	30	3.6%
Abnormal behaviours in sleep	190	22.5%
Nightmares	161	19.1%
Sleep talking	27	3.2%
Sleep paralysis	22	2.6%
Sleepwalking	6	0.7%
Eating while asleep	6	0.7%
Restless legs	157	18.6%
Restless legs	114	13.5%
Cramps	51	6.0%
Abnormal movements (limbs or trunk)	40	4.7%
How concerned are you about your sleep? (0–10)	6	4–7

Data presented as count (percentage) or median [interquartile range].

Table 3 Sleep symptom categories reported by study participants within subgroups

Groups	Category	No		Yes		χ^2 or MWU	P value
		N	% or range	N	% or range		
Suspected COVID-19	Number of sleep symptoms	3	0–6	4	0–6	56,821	0.406
	Insomnia/disrupted sleep	354	53.2%	108	60.7%	3.139	0.076
	Daytime symptoms	320	48.0%	90	50.6%	0.335	0.563
	Abnormal behaviours in sleep	143	21.5%	47	26.4%	1.932	0.165
	Sleep-disordered breathing	181	27.2%	42	23.6%	0.947	0.330
	Restless legs	125	18.8%	32	18.0%	0.062	0.803
	Sleep phase disturbance	353	53.1%	88	49.4%	0.748	0.387
	How concerned are you about your sleep? (0–10)	6	4–7	6	4–8	21330	0.326
Self-isolation	Number of sleep symptoms	3	0–6	4	1–7	70,651	0.006
	Insomnia/disrupted sleep	288	51.7%	174	60.8%	6.365	0.012
	Daytime symptoms	256	46.0%	154	53.8%	4.704	0.030
	Abnormal behaviours in sleep	112	20.1%	78	27.3%	5.557	0.018
	Sleep-disordered breathing	143	25.7%	80	28.0%	0.513	0.474
	Restless legs	90	16.2%	67	23.4%	6.588	0.010
	Sleep phase disturbance	291	52.2%	150	52.4%	0.003	0.955
	How concerned are you about your sleep? (0–10)	6	4–7	6	4–8	26965	0.115
Keyworkers	Number of sleep symptoms	3	0–6	3	0–6	74,972	0.123
	Insomnia/disrupted sleep	292	54.0%	166	56.1%	0.686	0.558
	Daytime symptoms	273	50.5%	134	45.3%	2.069	0.151
	Abnormal behaviours in sleep	131	24.2%	56	18.9%	5.683	0.079
	Sleep-disordered breathing	157	29.0%	64	21.6%	5.530	0.020
	Restless legs	109	20.1%	48	16.2%	3.334	0.164
	Sleep phase disturbance	291	53.8%	147	49.7%	1.319	0.253
	How concerned are you about your sleep? (0–10)	6	4–7	6	4–7	27,592	0.369
Mental health	Number of sleep symptoms	0	0–3	5	2–7	34,296	<0.001
	Insomnia/disrupted sleep	72	28.3%	377	68.4%	118.238	<0.001
	Daytime symptoms	60	23.6%	338	61.3%	104.778	<0.001
	Abnormal behaviours in sleep	16	6.3%	170	30.9%	63.810	<0.001
	Sleep-disordered breathing	34	13.4%	181	32.8%	34.783	<0.001
	Restless legs	23	9.1%	127	23.0%	22.599	<0.001
	Sleep phase disturbance	89	35.0%	336	61.1%	49.360	<0.001
	How concerned are you about your sleep? (0–10)	4	1–6	6	5–8	11,789	<0.001

Suspected COVID-19: no (n=665), yes (n=178); self-isolation: no (n=557), yes n=286; keyworkers: no (n=541), yes n=296; mental health: no (n=254), yes (n=549). Data presented as count (percentage) and median [interquartile range]. χ^2 = Chi-squared values presented for categorical variables. MWU = Mann-Whitney U values presented for scale variables.

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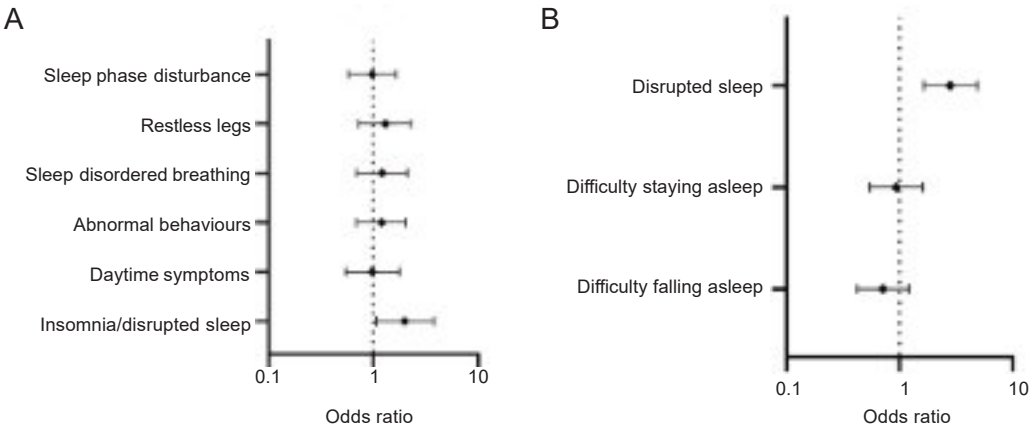

Figure 1 Forest plot displaying associations between ongoing COVID-19 symptoms and reported sleep symptoms (for all sleep symptom categories and specific symptoms within insomnia/disrupted sleep category). (A) Odds ratios for sleep symptom categories. (B) Odds ratios for specific sleep symptoms within insomnia/disrupted sleep category.

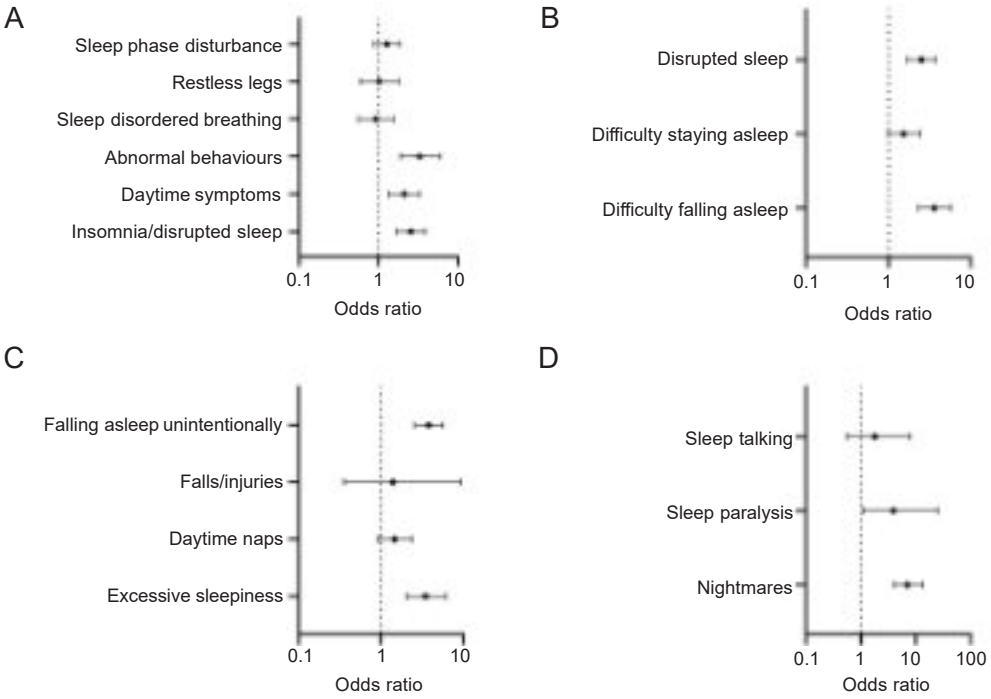

Figure 2 Forest plots displaying significant associations between mental health impact and sleep symptoms (by symptom category, and specific sleep symptoms reported within insomnia/disrupted sleep, daytime symptoms and abnormal behaviours in sleep categories). (A) Odds ratios for the six sleep symptom categories. (B) Odds ratios for insomnia/disrupted sleep. (C) Odds ratios for daytime symptoms. (D) Odds ratios for abnormal behaviours in sleep. Sleepwalking and eating while sleeping excluded due to perfect separation.

Impact of the COVID-19 Pandemic on Sleep

COVID-19 symptoms (β=1.124, 95% CI, 0.368 to 1.937, P=0.005) and reported mental health impact (β=0.969, 95% CI, 0.663 to 1.281, P<0.001), displaying a negative association with age (β=−0.026, 95% CI, −0.040 to −0.012, P<0.001), male gender (β=−0.350, 95% CI, −0.658 to −0.040, P=0.026) and general health rating (β=−0.244, 95% CI, −0.343 to −0.149, P<0.001) (Tjur's R^2=0.177, adjusted R^2=0.165).

Association between sleep symptom categories and pandemic factors

Insomnia/disrupted sleep was significantly associated with mental health impact (OR 2.435, 95% CI, 1.821 to 3.281, P<0.001), ongoing COVID-19 symptoms (OR 2.232, 95% CI, 1.159 to 4.385, P=0.018) and sleep medication use during the pandemic (OR 5.933, 95% CI, 2.142 to 20.030, P=0.002). Daytime symptoms were significantly associated with an impact on mental health (OR 2.332, 95% CI, 1.741 to 3.145, P<0.001) and sleep medication use during the pandemic (OR 3.450, 95% CI, 1.425 to 9.285, P=0.009). Abnormal behaviours in sleep were significantly associated with mental health impact (OR 2.198, 95% CI, 1.522 to 3.212, P<0.001) and reported disability (OR 1.504, 95% CI, 1.002 to 2.253, P=0.048). Sleep-disordered breathing was significantly associated with ongoing COVID-19 symptoms (OR 3.405, 95% CI, 1.610 to 7.450, P=0.002) and an impact on mental health (OR 1.725, 95% CI, 1.232 to 2.430, P=0.002). Restless legs symptoms were significantly associated with ongoing COVID-19 symptoms (OR 2.530, 95% CI, 1.143 to 5.388, P=0.024), an impact on mental health (OR 1.933, 95% CI, 1.318 to 2.862, P=0.001) and reported disability (OR 1.566, 95% CI, 1.029 to 2.364, P=0.034). Sleep phase disturbance was significantly associated with an impact on mental health (OR 1.669, 95% CI, 1.254 to 2.212, P<0.001), increased alcohol intake (OR 1.510, 95% CI, 1.080 to 2.121, P=0.017) and sleep medication use during the pandemic (OR 2.553, 95% CI, 1.084 to 6.713, P=0.041) (*Figure3*).

Discussion

Summary of main findings

The pandemic lockdown had a major impact on the population. The majority of respondents described an altered sleep pattern and almost half of the studied population felt sleepier than prior to the lockdown. Reported problems included dozing off unintentionally in the day, disrupted sleep, difficulties falling/staying asleep and later bedtimes. Over a quarter of all respondents reported an increased alcohol intake during the lockdown. Furthermore, those self-isolating reported more insomnia/disrupted sleep, daytime symptoms, abnormal behaviours in sleep and symptoms of restless legs compared to those not self-isolating. Keyworkers reported fewer sleep alterations than others. In those with suspected COVID-19, nightmares and abnormal sleep rhythm were more common. A reported impact on mental health was most strongly associated with more difficulties falling asleep, sleep disruption, nightmares and daytime sleepiness. A change in sleep pattern was associated with medication use, ongoing COVID-19 symptoms and mental health impact, and it was negatively associated with age, male gender and general health.

Assessing lockdown impact on sleep and clinical significance of findings

Home confinement and isolation procedures have required modifications in lifestyle, leading to the loss of daily routines and habits. Resultant issues such as work, family and financial problems, limited exposure to natural light, and restricted opportunities to exercise may have negative effects on sleep (5). Insufficient sunlight, physical inactivity, dietary changes, weight gain, increased digital screen time, as well as the risk of alcohol use and developing addictions, are associated with prolonged lockdown (12). Additionally, sleep deprivation may lead to immunological alterations and it would therefore seem pertinent to consider the effects of altered sleep on COVID-19 susceptibility (13). Notably, almost a third of participants in our study reported sleeping less than 6 hours, and these were of older age, had higher BMI, reported more vulnerability/disability and mental health impact during the pandemic compared to respondents getting more than 6 hours of sleep.

Reported change in sleep pattern and specific sleep symptoms

Less than half of our study participants were feeling refreshed or felt that they were sleeping enough during the pandemic, and almost half of them felt sleepier than before the lockdown (*Table S3*). The most commonly reported specific sleep symptoms included disrupted sleep, difficulty falling and staying asleep, later bedtimes and falling asleep unintentionally in the day (*Table2*). A majority

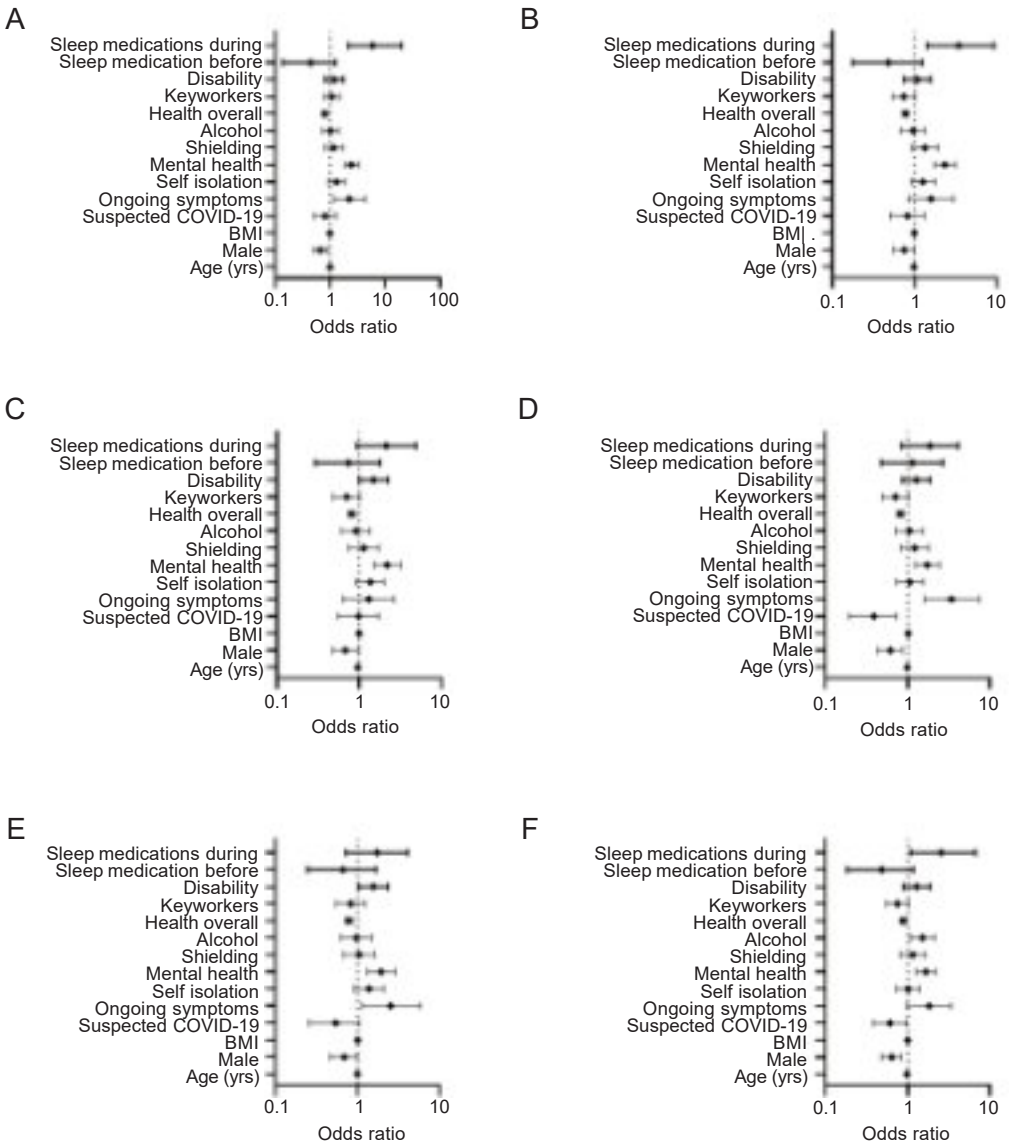

Figure 3 Forest plots displaying association of each sleep symptom category (insomnia/disrupted sleep, daytime sleepiness, abnormal behaviours in sleep, sleep-disordered breathing, restless legs, sleep phase disturbance) with demographics and pandemic-related factors. (A) Odds ratios for insomnia/disrupted sleep. (B) Odds ratios for daytime symptoms. (C) Odds ratios for abnormal behaviours in sleep. (D) Odds ratios for sleep-disordered breathing. (E) Odds ratios for restless legs symptoms. (F) Odds ratios for sleep phase disturbance.

of respondents reported a change in sleep pattern, and this was predicted by the presence of ongoing COVID-19 symptoms, mental health impact, sleep medication use in the pandemic, younger age and worse general health rating (*Table S10*). Similarly, a recent Italian survey including young adults demonstrated a significantly delayed bed and rise times during lockdown, spending overall more time in bed, but reporting a poor sleep quality (8). Also, an increased prevalence of insomnia during the outbreak was found in a Chinese survey-based study (9). Of note, a UK survey showed that half of the respondents experienced more disturbed sleep than usual; 39% of the participants reported sleeping fewer hours than before the lockdown; and 29% reported sleeping longer hours but still felt less rested (14). Consistent with our findings, only a minority of respondents reported improved sleep during the lockdown (14).

Effect of alcohol

Although frequently used by people who suffer from insomnia to try and help sleep (15), alcohol actually disrupts sleep architecture, possibly exacerbates sleep pathologies (such as sleep-disordered breathing and NREM parasomnias), and worsens daytime sleepiness (16). Almost 26% of our study population reported increased alcohol intake during the lockdown (*Table S2*). This is in line with previous evidence showing that, despite the decrease in social gathering, only a third of drinkers have reduced or stopped their alcohol intake, while 21% drink more frequently (17). Stress further contributes to alcohol seeking behaviour (18), and alcohol is also used to alleviate negative emotions (19). In our study, the presence of a sleep phase disturbance was predicted by an increased alcohol intake, reported mental health impact and sleep medication use during the pandemic (*Figure 3*).

Impact on mental health

The potential effect of mood alterations on sleep is relevant in the pandemic. The link between sleep and mood disturbances has previously been demonstrated in circumstances similar to the current lockdown (4 ,5). Confinement and quarantine have negative psychological consequences (4,5), which can have an impact on sleep. Worsened insomnia symptoms and psychological reactions attributed to the outbreak were demonstrated in the general population using online questionnaires reflecting the situation prior to and following the lockdown (9). Insomnia was associated with being female, mental illness, increased severity of anxiety and depression, COVID-19-related stress and prolonged time in bed (9). In a Chinese study the prevalence of insomnia was at 26%, and over 20% of patients with pre-existing mental health conditions reported a deterioration of these (11). Stronger changes in sleep quality in those with higher scores of depression, anxiety and stress were reported as well. Additionally, a longitudinal study investigating whether sleep quality depends on the social situation found an association between social isolation and poor sleep quality in older adults (20). Of note, over 65% of the population involved in our study reported an impact of the pandemic or lockdown on their mental health (*Table S2*), and this cohort reported more sleep-related symptoms and concerns about their sleep (*Table 3*). Importantly, an impact on mental health was one of the significant predictors for a reported change in sleep pattern (*Table S10*). On regression analysis, reported mental health impact was significantly associated with difficulties falling asleep, disrupted sleep, daytime sleepiness and nightmares (*Figure 2*).

Self-isolation status, keyworkers and sleep

Compared to those who did not self-isolate, self-isolators more frequently reported disrupted sleep, nightmares, abnormal movements, restless legs, falling asleep unintentionally and abnormal sleep rhythm (*Table S6*). Higher rates of difficulties to fall asleep or early awakenings in medically isolated versus self- or non-isolated individuals in the outbreak have been previously demonstrated (7).

A subgroup of the population that deserves special attention in the current circumstances are keyworkers. Healthcare workers account for a proportion of these; they have not only suffered the stress of being directly involved in the care of patients, but also faced the consequences of working long hours during the pandemic. Sleep disruption, poor quality of sleep, insomnia, and mood disturbances have all been reported in healthcare workers under pandemic circumstances (21-23). Although our study did not find an association between sleep disturbances and keyworker status, notably this group also included non-healthcare workers (postal workers, truck driver, police officer and others) (*Table S7*). Possibly keyworkers, considered as a wider group, experienced fewer changes in their routines during the lockdown, as they were allowed to leave the house to continue working.

Suspected COVID-19

There may be additional factors affecting sleep directly when considering individuals who suspect they have had COVID-19. Pre-existing sleep disorders, such as obstructive sleep apnoea, may also be present in COVID-19 patients (24), and might further impact on sleep quality and shortness of breath following the infection. In our study, the presence of symptoms associated with sleep-disordered breathing was significantly associated with ongoing COVID-19 symptoms (*Figure 3*).

Furthermore, potential neuropathogenic mechanisms of SARS-CoV-2 and a range of neurological symptoms have been reported in patients with COVID-19 (25). It could be hypothesised that involvement of structures controlling sleep-wake cycles in the central nervous system play a role in the presence of sleep-related symptoms in COVID-19 patients. We found a significant association between the presence of ongoing COVID-19 symptoms and insomnia/disrupted sleep (*Figure 3*). Moreover, participants with suspected COVID-19 had a higher frequency of nightmares

and abnormal sleep rhythm (*Table S9*). Additionally, our regression analysis showed that restless legs symptoms were significantly associated with ongoing COVID-19 symptoms, mental health impact, and disability (*Figure 3*).

Limitations to the study

A selection bias may be expected in the study, as subjects with affected sleep may have been more interested in completing the survey. Also, as the survey was widely distributed among the population, this could have included subjects living in different countries, with different levels of lockdown measures. Additionally, the self-reported status with regards to having suspected COVID-19 was subjective and affirmatory responses did not require positive formal testing. Moreover, no formal objective assessments of specific sleep disorders were undertaken. Finally, there was limited diversity in the respondents' ethnicity which did not permit assessing the impact of the pandemic on sleep in ethnic minorities.

Despite these limitations, and although it is clear that public health measures are required in such unprecedented circumstances, the potential effects of confinement and isolation on sleep should be screened for, and support needs to be provided for adequate management of sleep disturbances (6). Early identification of sleep disturbances and associated impact on mental health is crucial for timely intervention and support (26,27). Future studies could include formal assessments of subjective and objective measurements of sleep disorders, with more specific focus on subgroups according to infection, keyworker status and ethnicity.

Conclusions

Altered sleep patterns and specific sleep-related symptoms are common in the general population during the pandemic lockdown. These are mainly associated with mental health impact, self-isolation, suspected COVID-19 infection and ongoing symptoms. The potential consequences of the lockdown on sleep should not be overlooked, as they can have an impact on the future wellbeing of society. Sleep issues may be addressed early with appropriate guidance and/or counselling to avoid the longer-term impact of these on a public health scale.

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Footnote

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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 BSS Research and Executive Committee approved this prospective, cross-sectional, survey-based study. The UKRI/MRC and the NHS Health Research Authority (HRA) confirmed that ethical approval was not required owing to the

screening survey design (https://cdn.amegroups.cn/static/application/04712039f3b0c07e77f3c779c14d1a17/JTD-CUS-2020-015-1.pdf). The study conformed to the provisions of the Declaration of Helsinki (as revised in 2003).

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Supplementary

Methods

Study design

Following internal discussionsin the research committee, the BSS undertook a prospective, cross-sectional, survey-basedstudy that wasconducted from May 12th, 2020 to June 2nd, 2020, available to the general public. The survey was advertised via the BSSwebpage,social media, NHS hospital trusts and specialist society and patient charities networks. The survey wassubmitted to the UKRI/MRC and the NHS Health ResearchAuthority (HRA) 'is it research?' tool, confirming that ethical approval wasnot required (http://www.hra-decisiontools.org.uk/research/result7.html; outcome of assessmentin https://cdn.amegroups.cn/static/application/04712039f3b0c07e77f3c779c14d1a17/JTD-CUS-2020-015-1.pdf; 09/05/2020). It wasapproved internally by the BSS Researchand Executive Committees (11/05/2020; BSS-NEDS-SURVEY_V1-0; Appendix 2) and distributed via Google Forms on an open domain on May 12th, 2020. Data collection stopped on June 2nd, 2020. Eligible participants were adults aged 18 years,or older, living through the 2020 COVID-19 pandemic and under national lockdown regulations. Due to the nature of the survey, subjects required literacy and accessto the Internet. Participants were excluded if they were not living under national lockdown regulations or were underage.

Questionnaire items

Participants were askedto read an introduction preceding the questionnaire items outlining the nature and purpose of the survey and the interested bodies (BSS). Following an item reduction phasesinvolving specialists from all participating affiliations, respondents were askedto answer multiple choice questions,including "yes", "no", "don't know" and context- specific answers,or provide a free-text responseto "other, pleasespecify".

The following demographicswere collected:

- Age (years);
- Gender (male/female/X/prefer not to say/other);
- Ethnicity (White/Black/Asian/other);
- Height (m);
- Weight (kg);
- Body-mass-index (BMI), calculated by weight (kg)/height (m^2);
- Keyworker status(yes/no);
- Disability (yes/no/don't know);
- Need to shield due to vulnerability status (yes/no/don't know).

Specific questions to assessthe impact of the pandemic/lockdown related to the following:

- SuspectedCOVID-19 history [yes/no/maybe (possibly, but they had no test)];
- Ongoing COVID-19 symptoms(tick all that apply: no/dry cough/sore throat/headache/fever/breathlessness/shortnessof breath/chest pain/muscle pain/leg pain/loss of smell/skin rash/other);
- Self-isolation history in household(yes/no);
- Impact of the pandemic on mental health (yes/no/don't know);
- Currently feeling refreshed from sleep(yes/no/undecided);
- Current feeling of sleeping enough(yes/no);
- Current sleepquantity (tick all that apply: lessthan 4 hours/4–5 hours/5–6 hours/6–7 hours/7–8 hours/8–9 hours/9–10 hours/10–11 hours/11–12 hours/more than 12 hours);
- Changein sleeppattern during the pandemic(yes/no);
- Specific sleep symptoms (tick all that apply: difficulties falling asleep/difficulties staying asleep/excessivesleepiness/disrupted sleep/nightmares/sleep paralysis (unable to move when waking)/sleepwalking/talking in your sleep/eating while asleep/abnormal movements (e.g., limbs or trunk)/breathlessness/shortnessof breath during the night/breath holding/choking/gasping at night/night sweats/morning headache/restlesslegs/periodic limb movements/napsrequired by daytime/falls/injuries/falling asleepunintentionally/cramps/abnormal sleep rhythm (advanced/delayed)/going to bed earlier/going to bed later/getting up earlier/getting up later/other);
- Daytime symptoms of fatigue and/or sleepiness compared to before the lockdown (yes/no/undecided);
- Concern regarding sleep disturbance [rating on a scalefrom '0' (worst) to '10' (best)];
- Increasedalcohol intake (yes/no/prefer not to say);
- Increased sleep medication usebefore and during the lockdown (yes/no/prefer not to say);
- Current rate of general health [scalefrom '0' (worst) to '10' (best)].
- Overweight wasdefined asBMI of 25–29.9 kg/m^2 and obesity wasdefined asBMI ≥30 kg/m^2.

Impact of the COVID-19 Pandemic on Sleep

A total of 24 different sleep symptoms were grouped into six sleep symptom categories for analysis (*Table S1*):

(I) Insomnia/disrupted sleep;
(II) Daytime symptoms;
(III) Abnormal behaviours in sleep;
(IV) Sleep-disordered breathing;
(V) Restless legs;
(VI) Sleep phase disturbance.

Online links were provided for official guidance from the BSS regarding sleep and from the UK government regarding COVID-19. Participants were advised to contact the helplines provided (111/999) if they required urgent or emergent medical care

Primary and secondary outcomes

The primary outcomes were to identify sleep disturbances and specific sleep symptoms related to the COVID-19 pandemic lockdown in the general population. Secondary outcomes included subgroup analyses for pre-defined cohorts within the population: suspected COVID-19, self-isolation, keyworkers and those reporting an impact on mental health.

Statistical analysis

Continuous variables including demographics and scale ratings were presented as median [interquartile range, IQR], due to non-normally distributed data and Mann-Whitney U analysis was performed for comparison. Chi-squared analysis was performed to compare categorical variables. Group comparisons were made based on suspected COVID-19 vs non- infected, self-isolation, keyworker status and impact on mental health due to the COVID-19 pandemic.

A multiple logistic regression model including 'change in sleep pattern' as the categorical outcome variable with 'age', 'male gender', 'BMI', 'suspected COVID-19', 'ongoing COVID-19 symptoms', 'self-isolation', 'impact on mental health', 'shielding due to vulnerability', 'alcohol use', 'global general health rating', 'keyworking', 'disability', 'sleep medication before' and 'sleep medication during', as predictor variables, was performed.

These variables were chosen due to their nature as either baseline demographics or pandemic- related factors.

A main-effects multiple logistic regression model was used to identify the strength of association and odds ratios with 95% CI between the six different symptom categories (insomnia/disrupted sleep, daytime symptoms, abnormal behaviours in sleep, sleep-disordered breathing, restless legs and sleep phase disturbance) and factors relating to the COVID-19 pandemic. Where significant associations were found, further multiple logistic regression modelling was performed and reported as odds ratios between sleep symptoms and factors relating to the COVID-19 pandemic.

'Yes' and 'maybe' responses regarding COVID-19 infection were grouped into 'suspected COVID-19' for analysis due to the limited availability of polymerase chain reaction (PCR) swab testing to the general public and the small sample size of confirmed infected participants. "Don't know" answers were not included in the modelling as they were non- binary.

Data were collected on Google Forms (accessed online May 2020, Google Ireland Limited, Dublin, Ireland) and exported using MS Excel (Microsoft, Version 2004, Seattle, WA, USA). Data were then imported into IBM SPSS version 24 (IBM Corporation, New York, USA) and Prism version 8 (GraphPad Software, San Diego, California, USA) for further analysis. A P value of ≤ 0.05 was considered statistically significant. Missing data were not included in the analysis based on case-by-case decision.

Impact of the COVID-19 Pandemic on Sleep

Table S1 Grouping of 24 specific sleepsymptoms into six categories

Category	Symptom
Insomnia/disrupted sleep	Difficulty falling asleep
	Difficulty staying asleep
	Disrupted sleep
Daytime symptoms	Falling asleep unintentionally
	Daytime naps
	Excessive daytime sleepiness
	Falls/injuries
Abnormal behaviours in sleep	Nightmares
	Sleepwalking
	Sleep talking
	Eating while asleep
	Sleep paralysis
Sleep-disordered breathing	Morning headaches
	Breathlessness
	Choking/gasping at night
	Breath-holding
Restless legs	Restless legs
	Cramps
	Abnormal movements (trunk or limbs)
Sleep phase disturbance	Abnormal sleep rhythm (advanced or delayed)
	Going to bed earlier
	Going to bed later
	Getting up earlier
	Getting up later

Impact of the COVID-19 Pandemic on Sleep

Table S2 Health and social factors during the pandemic on total study participants (n=843)

Factors	Category	N	% or range
Have you been infected with the COVID-19 virus?	Yes	16	1.9%
	Maybe	162	19.2%
Do you have ongoing symptoms?		84	10.0%
Has anyone in your household/family been infected by the COVID-19 virus?	Yes	18	2.1%
	Maybe	164	19.5%
Have you or someone in your household needed to self-isolate?		286	33.9%
Have you needed to shield as a vulnerable person?	Yes	214	25.4%
	Maybe	30	3.6%
Have you felt that the COVID-19 pandemic or the lockdown have had an impact on your mental health?	Yes	550	65.2%
	Maybe	39	4.6%
Do you belong to any key worker group (e.g., NHS, public transport, post office, teacher, truck driver, and others)?		296	35.1%
Do you have any disability?		196	23.3%
Do you drink more alcohol than before the lockdown?		219	25.9%
How would you rate your health currently? (0–10)		7	5–8

Data presented as count (percentage) or median [interquartile range].

Impact of the COVID-19 Pandemic on Sleep

Table S3 General sleep-related information of total study participants (n=843)

Variables	Category	N	% or range
Do you currently feel refreshed from sleep?		377	44.7%
Do you currently feel you sleep for long enough?		401	47.5%
How long do you currently sleep? (hours)		6–7	5–8
How long do you currently sleep?	<4 hours	19	2.3%
	4–5 hours	76	9.0%
	5–6 hours	169	20.0%
	6–7 hours	228	27.0%
	7–8 hours	226	26.8%
	8–9 hours	94	11.2%
	9–10 hours	18	2.1%
	10–11 hours	8	0.9%
	11–12 hours	3	0.4%
	>12 hours	2	0.2%
Have you noticed a change in your sleep pattern during the COVID-19 pandemic?		585	69.4%
Do you currently feel sleepier than before the lockdown?	Yes	384	45.6%
	Undecided	142	16.8%
Are you more easily fatigued or worn out when exercising compared to before the lockdown?	Yes	388	46.0%
	Undecided	127	15.1%
Are you concerned about your sleep during the pandemic?		347	41.2%
How concerned are you about your sleep? (0–10)		6	4–7
Are you concerned about the sleep of someone in your family/ household?		244	28.9%
Did you take sleeping pills during the lockdown?		62	7.4%
Did you already take sleeping pills before the lockdown?		44	5.2%
Do you take any other sleep-related medication?		73	8.7%

Data presented as count (percentage) and median [interquartile range].

Impact of the COVID-19 Pandemic on Sleep

Table S4 Characteristics of participants with reported sleep restriction (<6 hours of sleep per night)

Characteristics	Sleep restriction (<6 hours of sleep)					
	No (n=619)		Yes (n=224)		χ^2 or MWU	P value
	N	% or range	N	% or range		
Age (years)	50	39–62	55	42–64	67,586	0.007
Gender						
Female	384	66.3%	184	69.7%	2.218	0.528
Male	190	32.8%	76	28.8%		
Prefer not to say	2	0.3%	1	0.4%		
Other	3	0.5%	3	1.1%		
BMI (kg/m^2)	28.3	23.6–34.3	31.3	25.7–37.6	59,954	<0.001
Suspected COVID-19	125	21.6%	53	20.1%	0.249	0.618
Do you have ongoing symptoms?	62	10.7%	22	8.3%	1.140	0.286
Have you or someone in your household needed to self-isolate?	196	33.9%	90	34.1%	0.005	0.946
Have you needed to shield as a vulnerable person?	132	22.8%	82	31.1%	6.552	0.038
Have you felt that the COVID-19 pandemic or the lockdown have had an impact on your mental health?	362	62.5%	188	71.2%	6.041	0.049
Do you belong to any key worker group (e.g., NHS, public transport, post office, teacher, truck driver, and others)?	219	37.8%	77	29.2%	5.967	0.051
Do you have any disability?	116	20.0%	80	30.3%	14.696	0.001
Do you drink more alcohol than before the lockdown?	159	27.5%	60	22.7%	2.114	0.348
Did you take sleeping pills during the lockdown?	35	6.0%	27	10.2%	4.655	0.031
Did you already take sleeping pills before the lockdown?	26	4.5%	18	6.8%	3.313	0.191

Data presented as count (percentage) and median [interquartile range]. χ^2 = Chi-squared values presented for categorical variables. MWU = Mann-Whitney U values presented for scale variables.

Impact of the COVID-19 Pandemic on Sleep

Table S5 Other sleep symptoms reported by total study participants (n=843)

Variables	Number
Sleep improvement	16
Vivid dreams	13
Anxiety	7
Anxiety/panic	6
Work related sleep restriction	5
Childcare-related sleep restriction	4
Tachycardia/palpitations	3
Bruxism/tooth-grinding	3
Improved PAP adherence	2
Worsened sleep apnoea symptoms	2
Restless sleep	2
Emotional	2
Snoring	1
Electrified arousal	1
Skipping sleep	1
TV sleep restriction	1
Nocturia	1
Hayfever	1
Lucid dreaming	1
Grief	1
Myalgia	1
Dry mouth	1
Coughing	1
Weight gain	1
Headache	1
Supermarket hours	1
Throat burning	1
Fingers tingling	1

Data presented as counts. PAP, positive airway pressure.

Impact of the COVID-19 Pandemic on Sleep

Table S6 Specific sleep symptoms reported by self-isolators versus non self-isolators

Variables	Have you or someone in your household needed to self-isolate?				χ^2	P value
	No (n=557)		Yes (n=286)			
	N	%	N	%		
Difficulty falling asleep	162	29.1%	99	34.6%	2.705	0.100
Difficulty staying sleep	164	29.3%	97	33.9%	1.917	0.166
Excessive sleepiness	111	19.9%	57	19.9%	0.000	0.999
Disrupted sleep	216	38.8%	141	49.3%	8.568	0.003
Nightmares	92	16.5%	69	24.1%	7.081	0.008
Sleep paralysis	13	2.3%	9	3.1%	0.491	0.483
Sleepwalking	5	0.9%	1	0.3%	0.803	0.370
Sleep talking	16	2.9%	11	3.8%	0.578	0.447
Eating while asleep	3	0.5%	3	1.0%	0.696	0.404
Abnormal movements (limbs or trunk)	17	3.1%	23	8.0%	10.410	0.001
Breathlessness during the night	30	5.4%	17	5.9%	1.112	0.738
Breath-holding	18	3.2%	12	4.2%	0.512	0.474
Choking/gasping at night	20	3.6%	14	4.9%	0.831	0.362
Night sweats	72	12.9%	50	17.5%	3.169	0.075
Morning headaches	118	21.1%	61	21.3%	0.002	0.951
Restless legs	62	11.1%	52	18.2%	8.033	0.005
Daytime naps	98	17.6%	75	26.2%	8.628	0.003
Falls/injuries	6	1.1%	7	2.4%	2.337	0.126
Falling asleep unintentionally	181	32.5%	116	40.6%	5.385	0.020
Cramps	31	5.6%	20	7.0%	0.677	0.410
Abnormal sleep rhythm (advanced/ delayed)	27	4.8%	26	9.1%	5.776	0.016
Going to bed earlier	65	11.7%	39	13.6%	0.676	0.411
Going to bed later	173	31.1%	80	28.0%	0.857	0.354
Getting up earlier	81	14.5%	52	18.2%	1.884	0.170
Getting up later	130	23.3%	53	18.5%	2.570	0.109

Data presented as count (percentage). χ^2 = Chi-squared values.

Impact of the COVID-19 Pandemic on Sleep

Table S7 Specific sleepsymptoms reported by keyworkers versusnon-keyworkers

Variables	Do you belong to any keyworker group (e.g., NHS, public transport, post office, teacher, truck driver, and others)?				χ^2	P value
	No (n=541)		Yes (n=296)			
	N	%	N	%		
Difficulty falling asleep	165	30.5%	94	31.8%	0.157	0.707
Difficulty staying sleep	170	31.4%	88	29.7%	0.275	0.612
Excessive sleepiness	117	21.6%	48	16.2%	6.934	0.060
Disrupted sleep	225	41.6%	128	43.2%	1.678	0.643
Nightmares	109	20.1%	49	16.6%	5.334	0.204
Sleep paralysis	15	2.8%	6	2.0%	5.117	0.510
Sleepwalking	4	0.7%	2	0.7%	0.054	0.917
Sleep talking	17	3.1%	9	3.0%	3.540	0.935
Eating while asleep	4	0.7%	2	0.7%	0.054	0.917
Abnormal movements (limbs or trunk)	30	5.5%	10	3.4%	2.289	0.160
Breathlessness during the night	35	6.5%	11	3.7%	4.167	0.095
Breath-holding	21	3.9%	9	3.0%	0.617	0.531
Choking/gasping at night	29	5.4%	5	1.7%	6.916	0.010
Night sweats	80	14.8%	41	13.9%	0.159	0.713
Morning headaches	122	22.6%	55	18.6%	2.332	0.179
Restless legs	80	14.8%	34	11.5%	2.728	0.183
Daytime naps	128	23.7%	44	14.9%	9.129	0.003
Falls/injuries	12	2.2%	1	0.3%	4.550	0.035
Falling asleep unintentionally	192	35.5%	103	34.8%	0.050	0.841
Cramps	36	6.7%	15	5.1%	1.237	0.359
Abnormal sleep rhythm (advanced/ delayed)	32	5.9%	19	6.4%	7.585	0.771
Going to bed earlier	67	12.4%	37	12.5%	0.853	0.961
Going to bed later	172	31.8%	79	26.7%	2.404	0.123
Getting up earlier	85	15.7%	47	15.9%	0.008	0.950
Getting up later	129	23.8%	52	17.6%	4.916	0.035

Data presented as count (percentage). χ^2 = Chi-squared values. “Don’t know” responses excluded from analysis (n=6).

Impact of the COVID-19 Pandemic on Sleep

Table S8 Reported symptoms of COVID-19 infection in participants with suspected COVID-19 status (n=178)

Variables	N	%
Dry cough	38	4.5%
Breathlessness	38	4.5%
Headache	31	3.7%
Muscle pain	30	3.6%
Other	23	2.7%
Sore throat	21	2.5%
Leg pain	20	2.4%
Chest pain	18	2.1%
Loss of smell	14	1.7%
Fever	11	1.3%
Skin rash	6	0.7%

Data presented as count (percentage).

Impact of the COVID-19 Pandemic on Sleep

Table S9 Specific sleep symptoms reported by suspected COVID-19 versus non-suspected COVID-19

Variables	Suspected COVID-19				χ^2	P value
	No (n=665)		Yes (n=178)			
	N	%	N	%		
Difficulty falling asleep	206	31.0%	55	30.9%	0.000	0.984
Difficulty staying sleep	204	30.7%	56	31.5%	0.040	0.841
Excessive sleepiness	131	19.7%	37	20.8%	0.104	0.747
Disrupted sleep	271	40.8%	86	48.3%	3.289	0.070
Nightmares	115	17.3%	46	25.8%	6.643	0.010
Sleep paralysis	17	2.6%	5	2.8%	0.035	0.851
Sleepwalking	4	0.6%	2	1.1%	0.542	0.462
Sleep talking	21	3.2%	6	3.4%	0.021	0.883
Eating while asleep	3	0.5%	3	1.7%	3.027	0.082
Abnormal movements (limbs or trunk)	28	4.2%	12	6.7%	1.990	0.158
Breathlessness during the night	40	6.0%	7	3.9%	1.157	0.282
Breath-holding	27	4.1%	3	1.7%	2.307	0.129
Choking/gasping at night	28	4.2%	6	3.4%	0.256	0.613
Night sweats	95	14.3%	27	15.2%	0.088	0.766
Morning headaches	146	22.0%	33	18.5%	0.979	0.322
Restless legs	89	13.4%	25	14.0%	0.053	0.819
Daytime naps	133	20.0%	40	22.5%	0.526	0.468
Falls/injuries	8	1.2%	5	2.8%	2.385	0.122
Falling asleep unintentionally	233	35.0%	64	36.0%	0.052	0.820
Cramps	39	5.9%	12	6.7%	0.190	0.663
Abnormal sleep rhythm (advanced/delayed)	33	5.0%	20	11.2%	9.380	0.002
Going to bed earlier	81	12.2%	23	12.9%	0.071	0.789
Going to bed later	201	30.2%	52	29.2%	0.068	0.794
Getting up earlier	101	15.2%	32	18.0%	0.822	0.365
Getting up later	153	23.0%	30	16.9%	3.128	0.738

Data presented as count (percentage). χ^2 = Chi-squared values.

Impact of the COVID-19 Pandemic on Sleep

Table S10 Multiple logistic regression to assessassociationof 'change in sleep pattern' with demographics and pandemic-related factors (Tjur's R^2=0.177, adjusted R^2=0.165)

Variables	β co-efficient	95% confidence intervals	P value
Age (years)	−0.026	−0.040 to −0.012	<0.001
Male	−0.350	−0.658 to −0.040	0.026
BMI	−0.011	−0.030 to 0.007	0.235
Suspected COVID-19	−0.355	−0.851 to 0.145	0.161
Ongoing COVID-19 symptoms	1.124	0.368 to 1.937	0.005
Self-isolation	0.232	−0.141 to 0.609	0.226
Mental health impact	0.969	0.663 to 1.281	<0.001
Shielding	0.0178	−0.387 to 0.428	0.932
Increased alcohol	0.297	−0.090 to 0.694	0.137
General health rating	−0.244	−0.343 to −0.149	<0.001
Keyworkers	−0.153	−0.513 to 0.209	0.405
Disability	0.148	−0.284 to 0.598	0.509
Sleep medication before	−0.626	−1.817 to 0.515	0.287
Sleep medication during	1.276	0.140 to 2.578	0.039

British Sleep Society
British Paediatric Sleep Society
UK Multidisciplinary Sleep Professionals

Report Service Evaluation

"Impact of COVID-19 on UK Sleep Services"

BSS Research Committee

Executive Summary

- **National Audit** with 46% responder rate, 81% of those confirmed UK location with England, Wales and Scotland represented.
- More than three quarters of respondents represent **larger sleep centres** with more than 40 patients per month, mostly adult services but 27% of respondents see children as well.
- The majority of responding services are seeing **respiratory and non-respiratory** referrals; 37% had 11+ personnel.
- The **negative impact of the COVID-19 Pandemic on services was -75%.**
- This is largely due to **32% of staff being redeployed** at the height of the pandemic, **38% were home based** (working) and **16% furloughed or off sick**.
- The highest negative impact was reported in terms of **personnel** (61.8%), **environment** (61.6%) and **patient care** (69.5%).
- **Future needs** identified mostly the need for PPE, increased CPAP capacity and IT support or provision.
- **Innovation** experienced during the pandemic included **telephone and virtual consultations, drive in services and remote monitoring**.
- The perceived impact was mostly on **In-Person services**, while IT and virtual consultations were starting up; in some cases this remained future planning.
- **Specific COVID-19 Sleep Clinics** could be considered due to specific impact of the disease and the mental health during the lockdown on Sleep.

Aims and Method

The British Sleep Society (BSS), Research Committee, undertook a national audit of sleep service provision in order to determine the impact of COVID-19. The audit was advertised through the BSS website and social media platforms and through a mass emailing to all members. The audit was available from May 2020 to September 2020. The aim was not only to examine the impact of COVID-19 on the provision of services but also to identify any areas of service innovation and anticipated future needs. The audit comprised four topic areas; two forced choice quantitative response areas (***about the service and impact on service***) and two open-ended qualitative response areas (***innovation and future needs***).

The first part of the audit asked respondents to provide information regarding their service in terms of location, typical number of patients seen per month, size of service in terms of personnel and specialities (both in terms of age and range of conditions seen).

The second part of the audit examined the impact of COVID-19 on service provision. This was examined as an estimated overall impact and then specifically focused on the areas of impact. The first part of the qualitative aspect of the audit asked about perceived needs; '*Moving forward, what, if any, new procedures do you feel you will need to put in place (e.g. post COVID-19 symptom clinics, PPE, IT)?*' Finally, respondents were asked about innovation to an existing service; '*Have you identified any new ways of working that have been beneficial to your service offering?*' A free-text response box, with no word limit, was provided and respondents could identify more than one area of need or innovation for the last two questions.

The quantitative parts of the audit were analysed using descriptives (e.g. percentages of individuals or represented services) and the open-ended qualitative response areas of the audit were analysed using quantitative thematic analysis.

Results

Of the 183 respondents who logged on to the survey 86 (47%) completed 100% of the first two quantitative topic areas and were included in the results section.

About the Services

70 of the 86 respondents (81.4%) reported their location in the UK (1 was outside the UK, 1 was a national organisation and 11 did not respond). The majority of respondents were from England (63 respondents and 48 services represented). All 9 geographical regions of England were represented by at least one service (note several people completed the evaluation for the same service):

- London (9 services represented)
- East of England (2 services represented)
- East Midlands (5 services represented)
- Yorkshire and Humber (5 services represented)
- North East (2 services represented)
- North West (4 services represented)
- West Midlands (8 services represented)
- South West (8 services represented)

Scotland had 2 respondents (2 services represented) and Wales had 8 respondents (3 services represented). There were no responses recorded from individuals, or services, in Northern Ireland.

Scale of Service Provision *(each service is only represented once)*

The majority of respondents worked in larger services with almost three quarters reporting seeing at least 40 patients per month and having a team of at least 11 personnel. The make up of the services audited was predominately aimed at Sleep-Disordered Breathing (SDB) and adult services, but 27.5% of the services audited saw children. Additionally, the majority of services also managed other sleep disorders including Insomnia, Parasomnias and Sleep Related Movement Disorders.

- 0-10 patients per month = 1.8% of sample
- 11-20 patients per month = 9.1% of sample
- 21-30 patients per month = 10.1% of sample
- 31-40 patients per month = 4.6% of sample
- 40+ patients per month = 74.4% of sample

Number of Personnel *(each service is only represented once)*

- 1 person = 3.9% of sample
- 2-4 personnel = 19.2% of sample
- 5-7 personnel = 26.9% of sample
- 8-10 personnel = 12.8% of sample
- 11+ personnel = 37.2% of sample

Range of Services *(each service is only represented once)*

- Adult = 72.5% of sample
- Child = 17.5% of sample
- Both = 10.0% of sample

Areas of Impact currently and at height of crisis

At the time of completing the audit, respondents on average suggested 31.6% (range 0-86%) of personnel in their service had been redeployed, 38.2% (range 0-94%) were home based working and 16.23% (0-84%) of had been furloughed or off sick. At the height of the crisis it was reported that services were negatively impacted in terms of personnel (61.8%), environment (61.6%) and patient care (69.5%).

Future Needs

Of the 86 respondents, 53 (61.6%) responded to this part of the audit. From the results of the thematic analysis 14 areas of anticipated "*needs*" were identified (Table 1).

Table 1: Anticipated Future Needs

Future Needs	Number of Individuals Suggesting
Increased / Appropriate PPE	28
Increased capacity for remote CPAP delivery	17
Enhanced IT provision	19
Changes to existing space	7
Increased capacity for drive in Drop off clinics	5
Increased patient education	5
Creation of specific post COVID clinics	4
New SOPs	4
Capacity to pre-screen patients for COVID	3
Reduced face to face patient numbers	3
Additional capacity for quarantining equipment	2
Increased virtual clinical linkage between services	2
Staggered patient clinics	2
Increased workforce	1

PPE: personal protective equipment; CPAP: continuous positive airway pressure; IT:information technology; SOP: standard operating procedures.

Innovation and Extension Strategies

Of the 86 respondents, 51 (59.3%) completed this part of the audit. From the results of the thematic analysis, 8 areas of **innovation and extension** of existing services were identified (Table 2).

Table 2: Innovation Strategies

Innovation Strategy / Extension of Existing Service	Number of Services using Strategy
Virtual Appointments	
Telephone	18
Online	17
Dedicated email for existing patients	2
Dedicated phone line for existing patients	1
Drive in - through - pick ups	9
Posting equipment	3
Face to face with PPE / Social distancing (not switching on equipment)	4
Structural Changes	
Changing shift patterns to manage 'out of hours'	1
Changing location outside a hospital setting	2
Remote monitoring for CPAP and / or sleep studies	15
Psychoeducation & Support	
YouTube videos of equipment use	1
Embed self-help organisational links to email etc.	2
Audit and re-evaluation of waiting lists	1

Discussion

The aim of the present audit was to determine the **impact of COVID-19 on sleep service provision** throughout the United Kingdom. Moreover, a secondary aim was to determine anticipated future needs and areas of innovation. A good representation of services in England, Wales and Scotland were observed and all regions of England were represented by at least one service.

The results suggest a **significant impact of COVID-19 upon service provision** both at the height of the crisis and at the time of completing the audit. The finding that the estimated **negative impact** on service provision at the time of the audit was over **75%** is interesting, especially considering the levels of perceived impact at the height of the crisis were slightly lower in each of the three domains assessed (personnel, environment and patient care). One interpretation is that the initial impact to services, during the height of the crisis, created a backlog in provision accompanied by new ways of working which could have a sustained impact.

As might be expected the most highly endorsed impacts related to what would traditionally be seen as **in-person provision** (assessment, diagnosis and management). That said, the finding that over 59% of those completing the audit did identify at least one area of **innovation and/or extension** to existing services section is **encouraging**. Moreover, these areas of innovation were predominately focused in this area (e.g. virtual appointments).

Comparing the responses to the anticipated needs and the areas of innovation introduces some interesting differences between services. Where some respondents suggested, as part of their **innovation or extension strategies**, the ability to conduct remote CPAP monitoring or have drive-in appointments, these were highlighted by others, as a **future needs**. Whilst tentative, this may underscore differences at the level of service or indeed trust.

The final observation is that a few services identified, going forward, **the need for COVID-19 specific clinics**. Considering it is becoming apparent that one of the long-term effects of contracting COVID-19 is poorer sleep and higher levels of daytime fatigue, these initiatives seem warranted.

Professor Jason Ellis
Rachel Pickersgill
Alexander Perkins
Professor Joerg Steier
on behalf of the BSS Research and Executive Committees

BPSS News Physiologists Corner - The pandemic and sleep, two physiologists' perspective

Physiologists corner - the pandemic and sleep, two physiologists' perspective

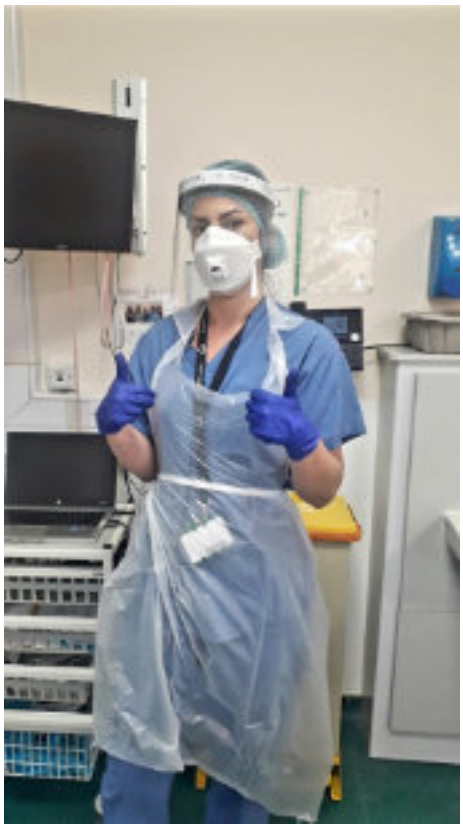
COVID-19 has become almost a daily conversation now amongst people across the globe (especially in the field of healthcare). Having come across from Ireland in 2019 to work in paediatric respiratory and sleep, I could never have anticipated I would be joining at such a transformational time for the NHS.

As the COVID cases began to dramatically increase in March of this year, everything began to change from our office space, to the number of patients tested, to the way in which we conducted our tests. Prior to Covid, we had four patients per night on our sleep ward along with the odd sleep study on one of the other wards. With the sudden subsequent shutting down of our sleep service, it was time to put a plan in place. This came in the way of home sleep study kits.

In a nutshell these kits observe the children's oxygen levels, airflow and respiratory movement, thus allowing us to observe any sleep disordered breathing events that may occur. These compact portable kits have since become a success and have massively helped to keep the sleep service at the royal Brompton alive. I was heavily involved, in helping implement this service, particularly in the beginning when it first took off. This included the calling of patients to organise appointments, boxing up all our kits and sending them out and back via courier (a lot of gloves, alcohol wipes and sanitizers were used in the process!).

In addition to sending these home study kits out via courier we also set up a one stop clinic service a few months back where the parent would come into a clinic setting and we as physiologists would give them a brief run through of the device, what it does, how to apply it etc. They would then bring the kit home and return it to us the following day. The feedback from the parents has so far been fantastic with regards to our home kit devices!

This rapid shift in our sleep service has been nothing short of a success and we are busier than ever, which is never a bad thing! At the beginning I felt quite anxious and overwhelmed with this sudden change in our lifestyles both on both personal and work level, however as the days and months go on, I have learned to overcome this and accept that for the time being, this is the new norm. During these unprecedented times it is important that we keep our heads up and continue in the world of sleep diagnostics to the best of our ability.



Siobhan Kenny

Paediatric Sleep and Respiratory Physiologist

Children's sleep and ventilation unit

Royal Brompton Hospital

BPSS News Physiologists Corner - The pandemic and sleep, two physiologists' perspective

Working at The Royal Brompton paediatric sleep unit for the last two years, has been a rewarding but challenging job. Being able to work closely with families and children of all disabilities and ages has been such a fulfilling experience; and has certainly improved my knowledge and skill set for the role.

Over the last eight months of working in the sleep unit, I was initially redeployed to the adult sleep and ventilation team during the pandemic. This experience brought on its own challenges and different experiences. Having very little knowledge on how to set up and use non-invasive ventilation as a junior sleep physiologist, I was given a crash course in learning how to set up CPAP and NIV devices and making tracheostomy and non-vented circuits for the COVID-19 patients. Having never worked with adult patients, nights or 24-hour rota before was tough and at times quite exhausting.

After spending three months working on the COVID wards, I came back to my paediatric sleep team. During this time, my work colleagues had already set up a new home study service, delivering and sending out a variety of sleep equipment to the homes of our paediatric population. Originally, this was a few cardiorespiratory kits a week, but it has now blossomed and expanded into eight home cardiorespiratory and O2CO2 studies a week, on top of a busy and bustling service within the unit. My role within this new service has been to support and educate parents and carers alike on how to use the equipment, by supplying instructional sheets, one stop clinic appointments and useful video links to set up the sleep equipment. On top of this, my colleagues and I also provide an on-call service for parents and carers to ring when problems arise with the equipment. I have been heavily involved in running our home study service and this has brought a new dimension into my role, in addition to the day to day inhouse work schedules.

Having the opportunity to work on the COVID wards and work with a wide range of health care and allied health professionals is an experience I will never forget and will be truly grateful for. Having now both worked with adults and paediatrics as a population, I do find that I am very thankful for the job role that I am in as a sleep and respiratory physiologist. Being given the opportunity to be able to work freely in both areas and utilising my new knowledge and skillset from working within the adult team, I feel more fulfilled and enriched for the experience.

Hannah Williams

Paediatric Sleep and Respiratory Physiologist

Children’s sleep and ventilation unit

Royal Brompton Hospital

British Paediatric Sleep Society

British Society of Dental Sleep Medicine

British Society of Dental Sleep Medicine

This is the first newsletter from the President of the British Society of Dental Sleep Medicine.

Until recently the primary focus of the BSDSM was to provide a wealth of information on

- snoring and obstructive sleep apnoea (OSA).
- advise on treatment options for the public, patients and healthcare professionals.
- promote discussion on dental sleep medicine.
- offer dental sleep medicine courses and qualifications.

While this has been true for several years since the society's inception over 15 years ago, it no longer holds true in its completeness. Over the last few years, it had become apparent that the practice of Dental Sleep Medicine (DSM) could not grow without the necessary medical engagement, recognising that we were dealing with a complicated medical disease that could be managed with dental intervention. Hence the journey began to reach out to sleep specialists and general practitioners in order to raise awareness that the dental professionals were ready to embrace its pivotal role in helping manage these patients. In addition to this, since 2018, the practice of Dental Sleep Medicine has been broadened in that it now covers a wider group of disorders of which sleep apnoea, snoring and UARS are but a few. The main focus of DSM is the provision of oral appliance therapy to help manage the burden of this debilitating disease not only on the State and every healthcare system in the world but to enhance the quality of life of those with the disorder and their families.

There has never been a greater need for both the Dental and Medical World of Sleep to work together since oral health is so synonymous with overall health as stated by David Satcher in his 2000 report, "Oral Health in America", where he states "***we must recognise that oral health and general health are inseparable."*** *How can they be separable? The body is one!*

We are therefore delighted and proud to announce this merger between the BSS and BSDSM.
This collaboration will give the Dental Sleep Medicine arena greater visibility and opportunity to engage with a multidisciplinary team to further enhance what we can achieve for our patients health outcomes.

With Sleep being an integral part of every individuals life, young or old, we are further excited to be collaborating with BPSS in order to seek help and guidance for our younger patients. The role of Myofunctional Science is gathering pace globally and we are excited to include that as part of the overall treatment strategy of children and adults alike. There is much work to be done and we very much look forward to engaging with the BSS and BPSS to become leaders in evidence based multidisciplinary teaching courses in the area of sleep disordered breathing disorders, Sleep Bruxism, Orofacial Pain and TMD as well as oral moistening disorders, GORD and mandibular hyper mobility disorders such as Dystonia. This broadening of the subject of Dental Sleep Medicine is attributed to Lavigne and his team in 2018 for the AADSM.

British Society of Dental Sleep Medicine

We will continue to help our members follow guidelines and good practice to screen and treat patients with these disorders while working within their scope of practice through Continuing Education to keep up to date with latest research and development while providing access to published articles.

We encourage our members to promote multidisciplinary teamwork to include allied healthcare workers as well as specialty sleep physicians.

The BSDSM vision is to encourage physicians to work with trained dentists to bring about screening and assessment in general dental practice and refer to these trained dentists for provision of oral appliance therapy where indicated. We hope that physicians will have confidence in the Society's training programs to refer to these dentists for treatment of these various disorders with the knowledge that their patients will be well looked after.

Finally, I would like to thank all those serving on the committees of these Societies who have made this merger a success after much effort over several years.

Here is looking to the future of UK Sleep Services with great enthusiasm and excitement.

Aditi Desai

President
British Society of Dental Sleep Medicine

BSDSM

British Society of Dental Sleep Medicine

BSS Collin Sullivan Award Winner

The Report of the 2017 winner

The BSS Colin Sullivan Research Award funded our study on “Inflammation in children with neuromuscular disorders and sleep disordered breathing” and the results were published in Sleep Medicine in Aug 2020. Children with neuromuscular conditions can develop sleep disordered breathing: they may experience dips in their oxygen levels or have raised carbon dioxide levels because of under breathing due to their weakness. We studied 23 children with neuromuscular disease, and found that those with sleep disordered breathing had increased levels of certain markers of inflammation. Patients with dips in oxygen levels overnight had higher blood and breath IL-6 levels compared with those who had normal oxygen levels. Patients with raised carbon dioxide overnight had higher blood ICAM-1 and VCAM-1 levels. The higher the carbon dioxide levels, the higher the ICAM-1 and VCAM-1 levels.

Whilst links between dips in oxygen levels and inflammation are well known, links between elevated carbon dioxide levels and inflammation are not and this is an exciting new area of research which we hope to explore in the future. The study also raises several interesting questions which will be fascinating to look into: Some of the inflammatory markers (IL-6, VCAM-1 and ICAM-1) are known to play a role in clogging of the arteries (atherosclerosis). Could these patients be at increased risk of cardiovascular morbidity and could early treatment prevent this? ICAM-1 also helps influenza virus enter lung cells and binds rhinovirus, a virus which causes the common cold. Could its raised levels make patients more prone to catching viral chest infections? We are very grateful to the BSS Colin Sullivan Research Award without whom this research would not have been possible.

Hui-Leng Tan

Consultant
Department of Paediatric Respiratory Medicine
Royal Brompton Hospital, London, UK

Cardiff Sleep Physiology team introduce new drive through Sleep Apnoea Clinic – Updated September 2020

A version of this article has also been published in ARTP Inspire Newsletter

A team of Respiratory and Sleep Physiologists at Cardiff and Vale Health board have speedily introduced an innovative drive through sleep apnoea clinic in response to the challenge of servicing ongoing healthcare needs in the midst of the Covid-19 outbreak.

The team usually run an outpatient service within the Lung Function and Sleep Apnoea Department based at University Hospital Llandough, Cardiff. However, when the pandemic entered crisis stage, all team members were pulled from their roles to train the Clinical Staff of COVID-19 wards in **Continuous Positive Airway Pressure (**CPAP) therapy. **CPAP devices are non-**invasive ventilators **and are the most commonly used treatment options for people experiencing sleep related breathing problems. The treatment is commonly prescribed to address Obstructive Sleep** Apnoea (OSA) – a condition where breathing starts and stops during sleep.

As the demand for COVID-19 CPAP on the wards reduced in the Cardiff and Vale locality, the health board attempted to re-introduce outpatient services in a safe way for both patient and Physiologist.

Therefore, the team pioneered the idea of a 'Drive-In' Zone for outpatients who are on the waiting list for a Sleep Apnoea Test and CPAP Treatment. This involved telephone appointments followed a drive through clinic for Sleep Diagnostics and CPAP Therapy initiation for patients diagnosed with OSA.

As of 1st May 2020, there were 1003 patients on the waiting list for Sleep Apnoea Diagnostics and a further 77 waiting for CPAP Therapy initiation and the service was halted due to only urgent cases being seen in outpatients during the COVID-19 pandemic. There was a projected waiting list of 48 weeks for diagnostics and 28 weeks for CPAP, which would only increase due to the closure of the service to new non-urgent patients.

Within the first week, the small team of Respiratory and Sleep Physiologists (4.0 WTE) had carried out 159 telephone consultations and 71 new patients had been seen within the drive-in area to collect their equipment.

After a short trial phase, a second drive-in bay was secured to enable us to increase capacity. The feedback has been overwhelmingly positive; many commenting that they were expecting to wait upwards of a year following the pandemic.

As of 1st September 2020, the service has completed a mega 1370 telephone consultations. The breakdown is as follows:

<u>Sleep Diagnostics:</u>

1074 new patients have completed a sleep study (overnight oximetry or multi-channel sleep study) including a telephone consultation with a Senior Physiologist, followed by collection of equipment in the drive-in zone. This includes the entirety of the backlog of 1003 patients and an additional 69 referrals received since May. Waiting times have reduced from 48 weeks to 7 weeks.

Cardiff Sleep Physiology team introduce new drive through Sleep Apnoea Clinic – Updated September 2020

CPAP Initiation:

296 new patients have been set up on CPAP therapy, including an explanation of their sleep study results and CPAP during a telephone consultation with a Senior Physiologist, followed by collection of their mask and CPAP machine in the drive-in zone. This includes the entirety of the backlog of 79 patients and an additional 217 patients with moderate-severe OSA diagnosed through 'drive-through' sleep diagnostics. Waiting times have reduced from 28 weeks to 10 weeks.

"We feel really proud of the team and pleased that this innovative solution was introduced so quickly and smoothly to ensure patient care of the highest quality can continue to be delivered during these uncertain times."

- *Lois Attewell, Clinical Lead (Respiratory and Sleep) and Hannah Hunt, Unit Manager.*

MSc in Sleep Medicine, a Report by a Student and Member of the BSS

MSc in Sleep Medicine

I was really fortunate to be a student in the first cohort of Oxford University's online Sleep Medicine course. For a few years I have wanted to do a high quality educational course on sleep medicine, but I was limited in my options as many courses required me to take time off work and move to a different city. Such options where impossible for a person with an established busy medical career and a family with two young children. Can you imagine my excitement when I learned about the plans of Oxford University to organise an online postgraduate diploma and MSc course in sleep medicine. This opportunity was perfect for me as I could enroll in an excellent educational course without needing to take a break from my career and without having to depart from my family for months at a time.

In our cohort there were student from 13 countries with a wide variety of backgrounds including physiologists, respiratory and ENT physicians, psychiatrists and psychologists, occupational doctors and physician assistants. Despite our different clinical backgrounds, we were all truly united by our passion for studying sleep and appreciation of the clinical importance of sleep. All our tutors, lecturers, and professors were equally enthusiastic and highly committed to the course.

The postgraduate diploma course comprised of eight modules which comprehensively covered all aspects of sleep medicine: from the science and biology of sleep to the social aspects of sleep. The lecture material was pre-recorded by leading professionals in the fields and we could watch these lectures at our own pace, re-watching them as many times as required to solidify the new information. The MSc course additionally included research modules and required a dissertation at the end of the course.

Each week we had an interactive web-based seminar via Zoom which felt like being in a proper classroom with a tutor. We were provided with a variety of learning experiences which included: journal clubs, academic debates, presenting critical reviews, analysing academic papers and clinical cases. A large emphasis during the course was placed on critical essay writing skills. I graduated from medical school in the mid-nineties and back then essay writing was not something that we did, and so I had to rapidly develop these new skills. Out tutors were very understanding and provided regular detailed constructive feedback and encouraged us to be more creative and original in our thinking and writing.

The highlight of the course must have been the residential course in Oxford. As a matriculated student you are given a student card and have free access to all the beautiful colleges and libraries, some of which are hidden from the public. And of course you get 10% off all your favorite high street brands!

MSc in Sleep Medicine, a Report by a Student and Member of the BSS

How the course benefited me professionally and personally

After completing the MSc in Sleep Medicine I had an opportunity for a long-desired sideways career change. I am not ashamed to say that after 20 years of working in general adult psychiatry I started to feel burned out from the routine clinical work with ever-increasing demands and workload. I wanted to feel excitement in my clinical work again, so I made one of the most difficult decisions in my medical career: I resigned from my old work in the NHS and instead expanded my private clinical work. I had been thinking about this decision for five years. It was scary to even consider departing from the NHS and for a long time I did not feel confident I could do this, however during my course at Oxford I met many ambitious enthusiastic professionals, independent thinkers, and found my confidence to start independent practice.

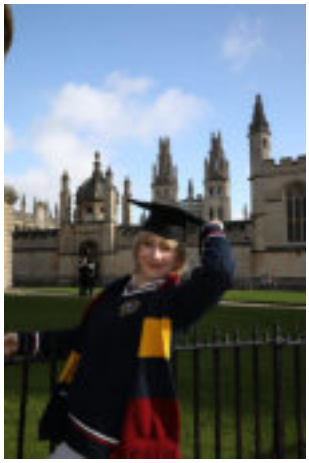
I started running private mental health and sleep clinics in Aberdeen. I was able to apply all my new knowledge and skills of diagnosing and treating sleep disorders directly into my clinical practice. I now routinely treat people with chronic insomnia and circadian rhythm disorders. I also include detailed assessment and treatment of sleep disorders in patients who are referred for reasons of clinical depression and anxiety. Every clinician would know that the majority of patients with clinical depression and anxiety also have a long-standing difficulty with sleep. I feel I can offer my patients with sleep disturbances a holistic assessment and provide evidence based help including pharmacological treatment, cognitive behavioral therapy, and light therapy. With this new approach I feel my clinical work is more meaningful, structured, and goal-directed. It is exceptionally rewarding for a clinician to see improvements in patients. I feel like having a little celebration every time a patient starts sleeping better, enjoys their sleep, and reports an overall improved quality of life.

I have been taken an active part in the educational events for medical professionals including general practitioners, psychiatrists, mental health nurses, as well as presenting at the Society of Occupational Medicine and the Scottish Sleep Forum. I aim to increase awareness of sleep disorders, to provide tools for screening and to give medical professionals evidence-based recommendations for assessment and management of sleep disorders at the primary care level.

I have also started my own sleep wellness company, dedicated to helping people to achieve a better sleep quality leading to improved personal and occupational performance. It is a true joy and pleasure to share latest evidence-based information on science of sleep and development of healthy sleep habits with the member of public who are always appreciative and grateful.

Olga Runcie,

Consultant Psychiatrist



Your Newsletter Needs You!

Your newsletter needs you!

Contributions Welcome

Would you like to see your name in print? Are you planning to develop your writing, or write for the first time? Maybe you're looking to enhance your CV or increase your visibility within the Society? Would you'd like to share your work with a multidisciplinary sleep audience? Or are you an experienced sleep professional seeking to guide and inspire others in the field?

Whatever the reason, we want **YOU** to write for the BSS Newsletter

We welcome the following pieces relating to any aspect of sleep:

- News items
- Short articles (400-800 words)
- Article – 3000 words (max)
- Comment/letter – 800 words (max)
- Longer articles (800-3,000 words)
- Comment or letter (800 words max)
- Reviews of books, TV programmes, films, apps etc.
- Conference and meeting reviews
- Public engagement pieces

Articles can be scientific, clinical, review, opinion, popular science or humour - anything considered. Authors welcomed from any background, discipline, grade or level of experience.

If you'd like to send an article or just want some further information, please email admin@sleepsociety.org.uk

Sleep Courses

The Webinar is chaired by members of the BSS Executive Committee Dr. Ari Manuel, Dr. Alanna Hare, Dr. Lizzie Hill & Dr. Simon Durrant.

For more information please click here

BSS National Narcolepsy Update
Sponsored by Jazz Pharmaceuticals

13.15-16.30 (GMT)

Friday 4th December 2020

Time	Topic	Speaker
13.15-13.20	BSS Welcome Scope: 1st Session	BSS - Prof. Joerg Steier Chairs – Dr. Ari Manuel & Dr. Alanna Hare
13.20-13.40	Narcolepsy – The Patient Perspective	Matt O'Neil – Chair of Narcolepsy UK
13.40-14.10	Narcolepsy – a multifaceted disease	Prof. Matthew Walker, UCLH, London
14.10-14.45	Narcolepsy Differential Diagnosis & Misdiagnosis Diagnostic Challenges Case studies	Dr. Guy Leschziner, GSTT, London
14.45-15.05	The Narcolepsy Nurse in Practice – service & patient perspectives	Sr. Margaret Docherty, Glasgow
15.05-15.10	Interlude Scope: 2nd Session	 Chairs – Dr. Lizzie Hill & Dr. Simon Durrant
15.10-15.40	Narcolepsy Best Practices, service challenges and learnings during Covid 19	Dr. Kirstie Anderson, Royal Victoria Hospital, Newcastle
15.40 -16.10	Narcolepsy Research Past and Present. Research Databases	Prof. Emmanuel Mignot, Centre for Narcolepsy, Stanford Medicine
16.10-16.20	Research Vignette - Symptomatic Narcolepsy in Neuromyelitis Optica Spectrum Disorder, and Future Research	Dr. Kariem Elhadd, The Walton Centre
16.20-16.30	BSS round up Chair's Closing Remarks	BSS roundup Chairs

This meeting has been initiated and funded by Jazz Pharmaceuticals, and co-organised with the BSS.

The agenda and speakers have been proposed by the narcolepsy clinical and academic community.

The ARTP has a range of Sleep Qualifications available:

ARTP CPAP Accreditation

Who is this certificate aimed at?

The target audience for this certificate of accreditation is Band 4-6 working in sleep departments.

Aim and format of the program:

To provide a competence based assessment for the initiation, monitoring and ongoing support of patients treated with CPAP.

Candidates will be required to complete a portfolio of evidence, consisting of 4 sections, within 6 months.

On registration for the certificate, you will be sent your registration number and guidelines for completion of the portfolio.

Overnight Pulse Oximetry Certificate

Who is this certificate aimed at?

The target audience for this certificate of accreditation is Band 2-4 working in sleep departments.

Aim and format of the program:

To provide a competence based assessment for the performance and analysis of Overnight Pulse Oximetry.

The portfolio consists 4 sections which will be completed in 6 months.

On registration for the certificate, you will be sent your registration number and guidelines for completion of the portfolio.

Pulse Oximetry and Polygraphy Practitioner

Who is this certificate aimed at?

The target audience for this certificate of accreditation is Band 2-4 working in sleep departments.

Aim and format of the program:

- To understand the referral pathway for sleep investigations
- To understand how the equipment works and the advantages and disadvantages of the investigation, including need for quality assurance measures
- To understand the influence of external parameters and the effects of these on the results
- To understand the causes and mechanisms of obstructive sleep apnoea and central sleep apnoea.

To register for any of the above certificates, please email the ARTP Administrator at admin@artp.org.uk for an application form.

Royal Society of Medicine

Current controversies in sleep medicine
Monday 16 November 2020

1:00pm to 5:00pm

Join us for a unique webinar experience that will be conducted in a debate setting, with a speaker for and against the motion, providing the audience an opportunity to ask questions and cast their votes. This interactive webinar will address the most common forms of sleep disorders seen routinely within the NHS, provide support with tackling areas of difficult decision making, and explore recent scientific advances.

Find out more >>

Sleep Courses and Conferences

Current controversies in sleep medicine
16th November 2020
https://www.sleepsociety.org.uk/bss-rsm-sleep-symposium/

BSS National Narcolepsy Update
4th December 2020
https://www.sleepsociety.org.uk/bss-national-narcolepsy-update-webinar/

International Sleep Medicine Course 2021
8th - 11th February 2021
https://www.sleepsociety.org.uk/international-sleep-medicine-course-ismc/

5th Clinical Update Sleep™: International Conference 2021
19th March 2021
https://www.sleepsociety.org.uk/event/5th-clinical-update-sleep-international-conference-2021/

World Sleep 2021
10th - 15th September 2021
Rio De Janeiro, Brazil
https://worldsleepsociety.org/worldsleepcongress/w orldsleep2021/

Please note that any future sleep course that may be of interest to our members can be submitted for review and inclusion in the BSS event calendar and / or BSS endorsement to our head office admin@sleepsociety.org.uk.
We look forward to hearing from you.

British Sleep Society
British Paediatric Sleep Society
UK Multidisciplinary Sleep Professionals

BSS Executive Committee

Prof Joerg Steier
President

Dr Simon Durrant
Treasurer

Dr Alanna Hare
Secretary

Dr Tim Quinnell - Past President 2013-2017

Aditi Desai

BSDSM

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Dr Stephen Emegbo - Professional: Allied Health Professional (RCCP)

Dr Omi Narayan
BPSS

Sakina Dastagir
BPSS

Dr Ari Manuel - Membership

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Alex Perkins
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