

2020, <http://dx.doi.org/10.1056/NEJMp2005492> [Epub ahead of print].

6. Froes F. And now for something completely different: from 2019-nCoV and COVID-19 to 2020-nMan. *Pulmonology*. 2020;26:114–5, <http://dx.doi.org/10.1016/j.pulmoe.2020.02.010>.
7. Silva AAM. On the possibility of interrupting the coronavirus (COVID-19) epidemic based on the best available scientific evidence. *Rev Bras Epidemiol*. 2020;23:e200021, <http://dx.doi.org/10.1590/1980-549720200021>.

F.A. L. Marson^{a,b,*}, M.M. Ortega^{a,b}

^a *Laboratory of Cell and Molecular Tumor Biology and Bioactive Compounds, São Francisco University, Bragança Paulista, São Paulo, Brazil*

^b *Laboratory of Human and Medical Genetics, São Francisco University, Bragança Paulista, São Paulo, Brazil*

Corresponding author.

E-mail addresses: fernandolimamarson@hotmail.com, fernando.marson@usf.edu.br (F.A.L. Marson).

Available online 27 April 2020

<https://doi.org/10.1016/j.pulmoe.2020.04.008>
2531-0437/

© 2020 Sociedade Portuguesa de Pneumologia. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Sleep labs, lung function tests and COVID-19 pandemic – Only emergencies allowed!



Respiratory tract infections remain the top cause of morbidity and mortality worldwide from infectious diseases.¹ In January 2020, a novel coronavirus was identified, from the respiratory tract secretions of patients in China,^{2–4} due to whole-genome sequencing. The disease was named COVID-19 (Corona-Virus Disease-2019) by the World Health Organization (WHO).⁴ Afterwards, different investigation and research was undertaken and evidence was provided on human-to-human transmission in community, household and hospital settings.^{5,6} Guidelines and recommendations were developed worldwide about prevention, diagnosis, control and management of COVID-19.

Public health measures targeting community infection control remain of primary importance and are still the only ones capable of buying time, flattening the infection incidence curve and causing a dramatic change in the course of the outbreak. Mankind has to make sustained and responsible changes in behaviour.⁷ There still remain many unanswered questions concerning infection control measures inside the hospitals and clinics. In epidemic or pandemic situations like the one we are living through, sleep labs can configure increased risk of infection for patients and health care professionals and to the best of our knowledge, guidelines in this field are lacking.

Furthermore, patients under nocturnal ventilatory support including non invasive ventilation (NIV) combine an intrinsic high risk for respiratory infections and related complications and a very high potential risk of infection for care givers because of the high burden of droplets created by the ventilators (8). In fact, NIV using a vented mask in patients with acute respiratory failure can disseminate large droplets up to a distance of 1 m.⁸

Polysomnography level I (PSG I), the gold standard for sleep disorders breathing (SDB) diagnosis, takes place in sleep labs worldwide, using specific beds and under direct supervision of a sleep technician. Also PSG level II (domiciliary unsupervised) and PSG level III (domiciliary cardio respiratory study) are commonly performed. All these diagnostic approaches carry infection risks and

in a pandemic situation, especially in the mitigation or suppression phases/strategies, sleep labs should no longer be working on diagnosis.

The belts used to fix the equipment to patients pyjamas or to patients' underwear are made of textile fibres which disable its disinfection. Also the manufacturers of the polysomnographers do not recommend them to be sanitized due to possible damage. So, this equipment is not safe to use in hospital or in patients' homes. Testing to clarify what kind of disinfection this equipment does resist without losing capability, and most of all, development of equipment that can be effectively disinfected in cases of respiratory infection due to highly contagious microorganisms are urgently needed.

At this point in this pandemic, sleep labs should avoid performing polysomnographies unless for hospitalized, acutely ill patients with a high probability of sleep disordered breathing that will impact negatively on the underlying disease(s). The equipment used in infected patients should undergo a quarantine period according to the material used by its manufacturer.

The working team of a sleep lab consisting of physicians, sleep technicians and respiratory physiotherapists or respiratory nurses should receive training in updated clinical knowledge of the COVID-19 pandemic, prevention tools and guidelines from the government, scientific societies and national authorities. Updates on this information should be provided as needed. Measures of prevention, protection and screening have been shown to be efficient in other settings.⁹

The healthcare team should respect some recommendations:

- check body temperature on arrival and departure to/from the sleep lab
- inform team leader if patient is presenting with *de novo* respiratory symptoms or in contact with a case
- use personal protective equipment (facial mask and gloves)
- use full personal protective equipment when dealing with confirmed cases of infection (protective gown, gloves, facial mask, goggles and cover boots)
- perform hand hygiene on arrival and departure from sleep lab and whenever needed

Medical doctors working in sleep labs have another great task and responsibility on their hands, that is the follow up of long term ventilated patients due to SDB and due to overlap of SDB and respiratory/pulmonary diseases. Keeping them free from respiratory exacerbations and away from health care resources must be a main objective.

Consequently, for those patients already diagnosed with SDB and under ventilatory support some approaches have to be initiated. Telemedicine is an interesting tool for following up patients who live far away from the health care structures, moreover these programmes can be of great value in public health emergencies, climate disasters and pandemic scenarios.¹⁰ No telemedicine programme can be created overnight, but in patients who are chronically ventilated the medical community already have the technology allowing telehealth. Recent developments in modem-equipped ventilators software allow patients to be closely monitored,¹¹ providing data on compliance, leaks as well as residual apnea-hypopnea index. Also remote adjustment of ventilator parameters,¹² according to patient need and comfort, is possible, allowing prompt interventions, avoiding ineffective therapies and lack of adherence.^{11,12} Furthermore, there are specific telemedicine applications designed for respiratory diseases,¹³ offering a variety of possible evaluable parameters.

Patients under NIV infected by SARS-CoV-2 should be changed to non-vented masks, provided with filter in the circuit, and then the mask and humidifiers should be quickly retrieved, either if managed at home or in hospital. Also, after recovery, the ventilator equipment should go for a quarantine period of not less than 30 days as the virus can be viable for a long period in plastic.

There remain many uncertainties about the possibility of virus transmission when testing pulmonary function and the data are in evolution. Because of the potential for coughing and droplet formation, these procedures should be limited to spirometry, oximetry and arterial blood gases only if essential for immediate treatment decisions (for example in urgent preoperative circumstances). Measures to protect both the staff and the patients should be put in place.^{14,15} Personal protective equipment (long sleeved impermeable gowns, gloves, cover boots, mask, goggles and cap) that limits droplets acquisition should be used and the testing space has to be sanitized, including wiping down surfaces with appropriate cleaning materials.^{14,15}

COVID-19 is a disease caused by a novel virus from the *coronaviridae* family, and at present it is a major global human threat which has become a pandemic. In these situations doctors should avoid unnecessary procedures that put patients and health care professionals at risk of infection and it is important especially that they adapt their clinical routine to be safe and efficient and postpone every non emergency diagnostic or therapeutic procedure.

Conflicts of interest

The author has no conflicts of interest to declare.

References

1. WHO. Global Health Observatory. Mortality and global health estimates; 2020. https://www.who.int/gho/mortality-burden_disease/en/ [accessed 03.04.20].
2. Hui DS, Azhar E, Madani TA, Ntoume F, Kock R, Dar O, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health: the latest 2019 novel coronavirus outbreak in Wuhan, China. *Int J Infect Dis.* 2020;91:264–6.
3. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med.* 2020;382:727–33.
4. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med.* 2020;382:1199–207.
5. Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet.* 2020;395:565–74.
6. Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of family cluster. *Lancet.* 2020;385:514–23.
7. Froes F. And now for something completely different: from 2019-nCoV and COVID-19 to 2020-nMan. *Pulmonology.* 2020; 26:114–5.
8. Simonds AK, Hanak A, Chatwin M, Morrell MJ, Hall A, Parker KH, et al. Evaluation of droplet dispersion during non-invasive ventilation, oxygen therapy, nebuliser treatment and chest physiotherapy in clinical practice: implications for management of pandemic influenza and other airborne infections. *Health Technol Assess.* 2010;14:131–72.
9. Basile C, Combe C, Pizzarelli F, Covic A, Davenport A, Kanbay M, et al. Recommendations for the prevention, mitigation and containment of the emerging SARS-CoV-2 (COVID-19) pandemic in haemodialysis centres. *Nephrol Dial Transplant.* 2020. <http://dx.doi.org/10.1093/ndt/gfaa069>, pii: gfaa069 [Epub ahead of print].
10. Lurie N, Carr BG. The role of telehealth in the medical response to disasters. *JAMA Intern Med.* 2018;178:745–6.
11. Mansell SK, Cutts S, Hackney I, Wood MJ, Hawksworth K, Creer D, et al. Using domiciliary non-invasive ventilator data downloads to inform clinical decision-making to optimise ventilation delivery and patient compliance. *BMJ Open Respir Res.* 2018;5:e000238.
12. Borel JC, Palot A, Patout M. Technological advances in home non-invasive ventilation monitoring: reliability of data and effect on patient outcomes. *Respirology.* 2019; 24:1143–51.
13. Ambrosino N, Fracchiac C. The role of telemedicine in patients with respiratory diseases. *Expert Rev Resp Med.* 2017;11:893–900.
14. McCormack MC, Kaminsky D. ATS proficiency standards for pulmonary function testing committee. *Am J Respir Crit Care Med.* 2017;196:1463–72.
15. Sociedade Portuguesa de Pneumologia. www.sppneumologia.pt [accessed 03.04.20].

M. Drummond

Hospital São João, Porto, Portugal

E-mail address: marta.drummond@gmail.com

7 April 2020 8 April 2020

<https://doi.org/10.1016/j.pulmoe.2020.04.002>

2531-0437/

© 2020 Sociedade Portuguesa de Pneumologia. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).