



## ■ EDITORIAL

# COVID-19: new challenges, risks, and the future provision of care in spinal services

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The current COVID-19 pandemic poses unprecedented challenges. The COVID-19 virus belongs to the family of coronaviridae. Mankind has not previously been exposed to this particular strain, hence there is no natural immunity to it. The impact of the pandemic on spinal surgery is uncertain because the viral mechanisms of COVID-19 infection are poorly understood, and its clinical course unpredictable. The UK lagged behind other major European countries temporally in its exposure to the disease, but the pattern of diffusion, severity, and mortality has followed those of Italy, Spain, and France.<sup>1-3</sup>

Our tertiary spinal surgery unit started preparing for a surge in COVID-19 cases over a month ago. Since then, we have learnt several lessons which we feel are worth sharing with other spinal surgeons who are currently dealing with the outbreak, or who will be doing so shortly.

Well before the World Health Organization (WHO) declared COVID-19 a pandemic, our unit in Oxford, UK, foresaw a series of disruptions to our elective practice and planned for them using a three-fold approach: first, coordination with other units across our hospital trust; second, the pragmatic use of various digital health technologies; and third, understanding that common sense and risk aversion are the most pragmatic approach to tackling the current lack of evidence about the best way to manage patients. We believe this approach is replicable across various public healthcare systems and applicable to any university hospital that acts as a hub for a large region.

The days when elective interventions were cancelled due to lack of beds or the need for post-operative intensive care monitoring have long gone. Our hospital treats all COVID-19 patients from our region. Predicting that our elective spinal practice would be rapidly disrupted, we triaged all patients who were awaiting surgery over the succeeding four months. Following the American College of Surgeons guidelines for the triaging of orthopaedic patients, previous experience from China and Singapore, and the Rothman Institute guidelines,<sup>4,7</sup> we adopted a system of colour coding to identify patients who could not be deferred (red), those requiring strict monitoring (amber), and those who could simply be cancelled and rescheduled in the future (green).

Service provision was optimized to ensure that patients needing emergency intervention could be treated promptly, despite the growing competition between specialities for the limited time available in our operating theatres.

Also to be considered was the risk to the patient of hospital-acquired COVID-19 infection: early reports from China estimated that the risk was approximately 40%.<sup>8</sup> Hence we felt the need to include this when consenting our patients and to discuss it thoroughly, both with them and their next of kin.

Spinal surgeons are themselves at risk of becoming infected during any clinical activity, as well as in theatre. The incidence of spinal surgeons infected by COVID-19 in the Wuhan region of China varied between 1.5% and 20.7% depending on where they worked.<sup>7,9</sup> It is well known that the aerosols generated by drilling, irrigation, or the use of bipolar diathermy contain a high viral load, so we trained all our consultants, fellows, and junior trainees in the appropriate use of personal protection equipment (PPE). We also had to consider how to minimize the burden of PPE, which can make surgical procedures more difficult, as masks tend to fog visors, preventing the use of a microscope or surgical loupes. Furthermore, the hospital trust organized simulations to address the process of donning and doffing PPE, new protocols for workflow around the operating theatre complex, and new ways of coordinating the activities of staff. The whole spinal team was involved at a very early stage in this process and guidelines were in place by the beginning of March 2020.

Virtual meetings to improve the quality of referrals from district hospitals to our tertiary centre were held, first, to agree consultant to consultant communication with sharing of essential information on patients' clinical condition, prognosis and COVID-19 status, and second, to standardize investigation protocols to account for turnaround times for MRI and contrast-enhanced CT, and the indications for CT myelography.

To limit all unnecessary contact, a rapid consensus was sought about the selection criteria for outpatient face-to-face consultation in preference to digital platforms. To standardize clinical assessment, we relied on self-reporting scales (e.g. the modified Japanese Orthopaedic

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Association (mJOA) and Nurick scales)<sup>10,11</sup> and questionnaires (e.g. the Oswestry Disability Index (ODI) and EuroQuality of Life 5 Dimension (EQ-5D) score)<sup>12</sup> to follow-up the clinical and psychological condition of each patient. Such an approach ensured compliance with the principles of patient-reported outcome measures and, given their validity, were more reliable when consulting remotely.<sup>13,14</sup>

As testified by feedback forms collected anonymously online, patients were very appreciative of this form of consultation, which shielded them from contact with healthcare professionals. Of note, such appreciation started to emerge well before lockdown measures were put in place by the government, and also before the high rate of death among healthcare professionals became public knowledge.

During the first four weeks of the outbreak, we started to notice that a high proportion of patients who needed emergency surgery became infected within a few days of their admission to hospital, as had previously been reported.<sup>15</sup> Clearly, we do not yet know how these hospital-acquired infections may affect their recovery. Given the difficulties in evaluating surgical performance objectively in the presence of confounding factors, we decided to assess the two different cohorts of patients, those treated before and after the start of COVID-19 outbreak, in separate morbidity and mortality meetings. In doing so, we decided that a root cause analysis process would help to identify risk factors, optimize our safety protocols and identify the real impact of COVID-19 on peri-operative and postoperative complications. It will also give us early information about how to improve patient management when COVID-19 reaches its peak.

Behavioural sciences suggest that different types of dominating cultures exist in different healthcare systems: these cultures reflect the values and beliefs of different societies, with respect to how matters are managed, and services delivered.<sup>16</sup> Every hospital has its own subculture, which is rooted in the specifics of its regional context, as well as many more micro-cultures, which differ between specific professional groups. Micro-cultures are the result of different training and the organisational and clinical priorities of the various medical and surgical specialities. One good example is the divide between the peculiarities of spine surgeons and those of intensive care doctors. These assumptions were tested by COVID-19, which obliged many hospitals to redesign their internal structure to address the acute management of critically ill patients with the severe pulmonary form of this disease. Whereas according to behavioural theory, the redeployment of doctors and nurses in critical areas should have led to the emergence of those differences, potentially escalating toward dangerous clashes, preliminary reports from hospitals in Singapore and the USA, as well as our own experience, are proving these assumptions to be wrong.<sup>17,18</sup> The spinal department in Oxford joined forces with the physiotherapy service and participated in the creation of a proning team to be redeployed to the various intensive care units in our hospital. This allowed us to use our expertise in the proning of patients, a strategy that improved their breathing and reduced the thromboembolic risk.<sup>19</sup> Our personal experience shows that micro-cultural barriers are easily overcome whenever common goals are mutually agreed and shared

among different groups of professionals. In fact, the ability to view problems from different perspectives resulted in better decisions about patients/staff safety and practicality.

As the current forecasts are predicting that COVID-19 will continue to spread through the course of the year, we should start preparing for the long-term, profound effects that this pandemic will have on the future provision of spinal services. This may entail the rotation of small spinal teams to ensure capacity and the ability to cope with sick leave of the members who may have to be quarantined.

If the issues discussed in this article are not addressed promptly, the impact of COVID-19 will be very significant on our personal and professional lives. To paraphrase Theodore Roosevelt, we would urge the community of spinal surgeons to “do what you can, with what you have, where you are. Right now!” This is the best way to start improving matters.



### Take home message

- The COVID-19 pandemic has required medical professionals to adopt new approaches in the delivery of healthcare.
- Co-ordination among different specialists and healthcare managers is needed to ensure appropriate triaging of patients requiring spinal surgery, and to support effective redeployment of spine surgeons in other units where required.
- A pragmatic use of various digital health technologies can allow overcoming of the disruption to provision of care in spinal services caused by COVID-19-related lockdown measures.
- Patient-reported outcome measures might represent useful tools to standardize clinical assessment when consulting remotely.

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### References

1. **Mavragani A.** Tracking COVID-19 in Europe: an infodemiology study. 2020. Apr 2. (Epub ahead of print).
2. **Boccia S, Ricciardi W, Ioannidis JPA.** What other countries can learn from Italy during the COVID-19 Pandemic. *JAMA Intern Med.* 2020. Apr 7. (Epub ahead of print).
3. **Yuan J, Li M, Lv G, Lu ZK.** Monitoring transmissibility and mortality of COVID-19 in Europe. *Int J Infect Dis.* 2020. Mar 28. (Epub ahead of print).
4. **No authors listed.** COVID 19 Guidelines for Triage of Orthopaedic Patients. American College of Surgeons (ACS). 24 March 2020. <https://www.facs.org/covid-19/clinical-guidance/elective-case/orthopaedics> (date last accessed 20 April 2020).
5. **Donnelly CJ III, Shenoy K, Vaccaro AR, Schroeder GD, Kepler CK.** Triaging spine surgery in the COVID-19 Era. *Clin Spine Surg.* 2020;33(4):129–130. Mar 31. (Epub ahead of print).
6. **Chang Liang Z, Wang W, Murphy D, Po Hui JH.** Novel coronavirus and orthopaedic surgery: early experiences from singapore. *J Bone Joint Surg Am.* 2020. Mar 20. (Epub ahead of print).
7. **Wang D, Hu B, Hu C, et al.** Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA.* 2020. Feb 7. (Epub ahead of print).
8. **Chu J, Yang N, Wei Y, et al.** Clinical characteristics of 54 medical staff with COVID-19: A retrospective study in a single center in Wuhan, China. *J Med Virol.* 2020. Mar 29. (Epub ahead of print).
9. **Guo X, Wang J, Hu D, et al.** Survey of COVID-19 disease among orthopaedic surgeons in Wuhan, People's Republic of China. *J Bone Joint Surg Am.* 2020:1. Apr 8. (Epub ahead of print).
10. **Tetreault L, Palubiski LM, Kryshtalskyj M, et al.** Significant predictors of outcome following surgery for the treatment of degenerative cervical myelopathy: a systematic review of the literature. *Neurosurg Clin N Am.* 2018;29(1):115–127.
11. **Ganau M, Holly LT, Mizuno J, Fehlings MG.** Future directions and new technologies for the management of degenerative cervical myelopathy. *Neurosurg Clin N Am.* 2018;29(1):185–193.

12. **Garg A, Pathak H, Churyukanov MV, Uppin RB, Slobodin TM.** Low back pain: critical assessment of various scales. *Eur Spine J.* 2020;29(3):503–518.
13. **Lurie N, Carr BG.** The role of telehealth in the medical response to disasters. *JAMA Intern Med.* 2018;178(6):745–746.
14. **Zou J, Yu H, Song D, Niu J, Yang H.** Advice on standardized diagnosis and treatment for spinal diseases during the coronavirus disease 2019 Pandemic. *Asian Spine J.* 2020;14(2):258–263.
15. **Lei S, Jiang F, Su W, et al.** Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. *EClinicalMedicine.* 2020;5:100331.
16. **Davis R, Campbell R, Hildon Z, Hobbs L, Michie S.** Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychol Rev.* 2015;9(3):323–344.
17. **Liang ZC, Ooi SBS.** COVID-19: A Singapore orthopedic resident's musings in the emergency department. *Acad Emerg Med.* 2020;27(4):349–350.
18. **Sarpong NO, Forrester LA, Levine WN.** What's important: redeployment of the orthopaedic surgeon during the COVID-19 pandemic: perspectives from the trenches. *J Bone Joint Surg Am.* 2020. Apr 14. (Epub ahead of print).
19. **Scholten EL, Beitler JR, Prisk GK, Malhotra A.** Treatment of ARDS with prone positioning. *Chest.* 2017;151(1):215–224.

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