



Reflections on the future of telemedicine and virtual spinal clinics in the post COVID-19 era

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1. Background

Within a very short period of time, the Covid-19 pandemic changed the way medicine and surgery has been practiced across the globe. The widespread restrictions in mobility and the requirements for social distancing necessitated the development of new ways to clinically assess patients. One such change was the rapid reorganisation in outpatient clinics so that face-to-face appointments switched to virtual clinics and telemedicine. Consultations were conducted either via telephone alone or video. A recent large international survey involving 902 spinal surgeons showed that European and North American colleagues swiftly adopted telemedicine as a response to the Covid-19 pandemic (Swiatek et al., 2021). As the pandemic seems to have evolved over the last couple of years, we have observed the numbers of Covid-19 patients remaining high, but with a significant reduction in illness severity and the need for hospitalisation. We are gradually returning to a more normal *modus operandi* and face-to-face outpatient services have increasingly been resuming.

What emerges now is the possibility of a new reality: is the shift to virtual spine surgery outpatient practice here to stay? Do virtual clinics have a role in the post-pandemic period? Might they have any advantages over traditional clinics? Arguably, virtual clinics could be acceptable if one could show that they are not inferior to face-to-face clinics. Especially in the field of spinal surgery, this question is very important given the traditional reliance on physical examination. In a large international study, participating spinal surgeons showed confidence in virtual clinics that were specifically based on communication (for example, history taking and radiological reviews). However, concerns were raised with regards to physical examination; and recommendations made for the need of developing a method of accurate and reliable virtual physical examination (Lovecchio et al., 2021).

2. What do surgeons think about virtual clinics?

In an attempt to answer these questions, we narratively reviewed the recent relevant literature. In the first study of its kind, Hobson et al. assessed the experience of telemedicine in four Northern American institutions between the early (March–April 2020) period of lockdown. They included 128 virtual spinal clinics; the mean patient age was 55 years old (standard deviation 14.9). New patient clinics comprised 58%, pre-operative clinics 20%, and 22% were for post-operative patients. An interesting outcome from this study was the relatively high surgeon's confidence in diagnosis and planning (79% and 84% respectively) (Hobson et al., 2021). European and African spinal surgeons showed a preference for phone-based virtual consultations, whereas North and South American colleagues preferred video calls. Importantly, the vast majority of clinicians (>80%) felt that virtual clinics were easy to use and almost all (95%) felt that at least one face-to-face clinic consultation is essential especially prior to surgery (Riew et al., 2021b). However, this should not be a reason to delay surgery (Donnally et al., 2021). Factors related to technology, for example limited or no access to the internet, might be a significant factor why telemedicine might not be appropriate in certain parts of the world (Mungmunpantipantip and Wiwanitkit, 2022).

Another international study, involving 485 spine surgeons, assessed the perception of virtual clinics in spinal practice and the main challenges involved; 39% of participants reported that the main challenge was the limited ability to perform a physical examination, followed by concerns of medico-legal implications (19%). Surprisingly, only 9% of participants reported problems with technology (Riew et al., 2021a).

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Table 1
Qualitative evidence for patient and physician satisfaction with virtual spinal clinics.

Author/Reference	Participants	Findings
Hobson et al. (2021)	128 outpatient visits 346 patients	Relatively high surgeon's confidence in diagnosis and planning (79% and 84% respectively) Median patient satisfaction 94% 37% showed a preference for virtual clinics vs face-to-face
Lightsey et al. (2022)	139 patients	Patients rated face-to-face clinics significantly higher than virtual clinics; this preference was significant only for first time appointments
Maurer et al. (2021)	164 patients	81% preferred face-to-face clinic appointments Those patients living the furthest distance away reporting the highest preference for virtual clinics
Piche et al. (2021)	Systematic review	a reliable examination for low back pain is possible with virtual assessment, and with high patient satisfaction
Riew et al. (2021a)	485 spine surgeons	In 39% the main concern: the limited ability to perform a physical examination In 19%: medico-legal implications
Riew et al. (2021b)	485 spine surgeons	European & African spinal surgeons showed a preference for phone-based virtual consultations North & South American colleagues preferred video calls >80% felt that virtual clinics were easy to use and 95% at least one face-to-face clinic consultation is essential especially prior to surgery
Satin et al. (2020)	772 patients	88% of patients were satisfied with virtual spinal clinics 45% would prefer them over face-to-face clinics

Table 2
Comparative studies between virtual and traditional face-to-face spinal clinics.

Author/Reference	Participants	Findings
Crawford et al. (2021)	87 patients	79–94% plans made in virtual clinics were accurate The plan for intervention changed in 11/87 (12.6%) patients
Goyal et al. (2020)	21 healthy controls vs 20 patients	Virtual neurological examination for spinal patients showed comparable results to a face-to-face examination, and with high patient satisfaction
Jansen et al. (2021)	43 patients	Good correlation found between the findings of a basic spinal examination performed via video and a face-to-face examination

3. What do patients think?

The patient-doctor encounter is a dialogue and it is crucial to know how patients themselves perceive virtual clinics. Hobson et al. (2021) reported that the median patient satisfaction was exceptionally high (94%), with patients showing a clear preference for video clinics compared to only telephone (Hobson et al., 2021). A retrospective questionnaire-based survey involving 346 patients showed that 95% were “satisfied or very satisfied” with virtual clinics, with 62% suggesting that it was “the same or better” than the face-to-face clinics they had experienced in the past. While 52% of patients had to take time off work to attend a face-to-face clinic, only 7% did so for attending a virtual clinic. Over a third (37%) showed a preference for virtual clinics vs face-to-face. Importantly, 37% of responders would happily proceed to surgery and 73% would proceed with a minor procedure based only on a virtual clinic assessment (Greven et al., 2021). Similarly, others have

reported that 88% of patients were satisfied with virtual spinal clinics; and that 45% would prefer them over face-to-face clinics (Satin et al., 2020).

Further evidence comes from both quantitative and qualitative methods, which assessed the perceptions of 139 patients receiving spinal telemedicine care. The key finding was that patients rated face-to-face clinics significantly higher than virtual clinics. However, this preference was significant only for first time appointments (Lightsey et al., 2022).

The distance from clinic seems to be an important factor in a patient's preference. For example, in a north American survey involving 164 spinal patients, 81% of patients preferred face-to-face clinic appointments as opposed to virtual clinics, with those patients living the furthest distance away reporting the highest preference for virtual clinics (Maurer et al., 2021).

From a patient's perspective (Table 1), the emerging picture regarding virtual clinics is that:

- virtual clinics are well received, with a large proportion of patients feeling satisfied that virtual clinics are at least at the same level as face-to-face clinics.
- preference to face-to-face clinics was significant only for first time appointments.
- the majority of patients who would require spinal surgery would prefer to have a pre-procedure consultation that was face-to-face rather than virtual.

4. Assessing the concerns about virtual clinics

Do we have any objective evidence that virtual clinics could replace face-to-face clinics without any compromise in the quality of clinical care? The major concern is the issue of physical examination. One way to assess the clinical adequacy of virtual clinics versus face-to-face clinics would be to assess if plans made between the two modes of clinics would be different (see Table 2). Crawford et al. (2021) addressed exactly that. They examined if the plans to perform a spinal intervention formulated during a virtual teleconference clinic would be altered once the same patients attended a face-to-face appointment. Interestingly, the plan for intervention changed in 11/87 (12.6%) patients; the authors concluded that 79–94% plans made in virtual clinics were accurate (Crawford et al., 2021). In another study, plans generated during preoperative virtual clinics did not change when the same patients had face-to-face assessments (Lightsey et al., 2021). And in a study involving 43 patients, there was good correlation between the findings of a basic spinal examination performed via video and a face-to-face examination (Jansen et al., 2021). In a prospective comparison, virtual neurological examination for spinal patients showed comparable results to a face-to-face examination, and with high patient satisfaction (Goyal et al., 2020).

Synthesising evidence, a recent systematic review found that a reliable examination for low back pain is possible with virtual assessment, and with high patient satisfaction (Piche et al., 2021).

In this context, there is an ongoing attempt to improve methods so as to virtually score upper and lower limb physical examinations and improve its reliability (Iyer et al., 2021) (Satin and Lieberman, 2021). Moreover, efforts have been made to increase the effectiveness and clinical reliability of virtual physical assessments. For example, a Singaporean study presented a series of practical steps to successfully set up a virtual spinal clinic (Liu et al., 2021), specifically emphasising the importance of a mechanism for preselecting suitable patients for virtual clinics and ensuring availability of appropriate imaging modalities prior to the virtual appointment. Another point raised was the importance of ensuring availability of assessment tools, such as dermatomal charts that could be shown to patients and which the surgeons can mark (eg using different colours to represent pain and numbness) the distribution of pain or other symptoms; analogue pain scale; leaflets; and spinal models that can be used to explain and discuss spinal pathologies and treatment options. Also recommended were standardised clerking templates, that

allow the gathering of essential and important information and reduce the chance of errors due to the nature of the virtual consultation. The final point raised by the authors refers to the importance of the availability of appropriate technology to allow videoconferencing and to ensure privacy and security of virtual consultations.

Taking into account all the above and accepting a technological standard with sufficient network capabilities offers the best chance of providing a safe and efficient virtual spinal consultation to patients (Liu et al., 2021). Using structured virtual physical examination techniques has also been reported by others (Pujalte et al., 2021) (Wessell et al., 2021) (Sardar et al., 2021), clearly showing this is an area of ongoing refinement and evolution.

Virtual clinics seem to be adequately placed for communication-based consultations. A systematic review study supports the notion that virtual clinics may be an important adjunct to traditional face-to-face clinics, especially for certain communication-based consultations (for example patient education) (Kolcun et al., 2020).

As with spinal surgery itself, patient selection is an important factor in deciding who is a suitable candidate for a virtual clinic (Franco et al., 2021). For example, virtual clinics might be ideal for follow up patients who live far away from the hospital or who might have significant mobility restrictions.

Last but certainly not least is a concern shared by 20% of spinal surgeons regarding the medico-legal aspect of virtual clinics (Riew et al., 2021a). Arguably, the inherent limitations of virtual clinics might increase the risk of errors and subsequent medico-legal action against hospitals and clinicians. It is therefore necessary that the law and insurance policies are adapted so that the practice of telemedicine is supported (Perez-Roman et al., 2022).

5. Conclusions

So where do we stand now that Covid-19 related measures seem to have relaxed—should virtual clinics stay, or should they go? Our narrative review allows some useful conclusions. Firstly, the majority of both patients and surgeons have shown a substantial level of satisfaction with virtual clinics. Secondly, the majority of spinal surgeons' concerns was centred around the fact that physical examination is limited in a virtual environment. Third, this concern can be addressed by having the first appointment and/or a pre-surgical appointment as face-to-face, thereby allowing a thorough physical examination. Fourth, there seems to be a preference for video virtual clinics rather than telephone alone, but this may vary with populations and demographics. Fifth, when a physical examination cannot be performed in a face-to-face clinic, then structured charts for a virtual examination could be used. Sixth, virtual clinics might be ideal for follow up patients who live far away from the hospital or who might have significant mobility restrictions.

While the landscape is still evolving, it seems that virtual clinics and telemedicine will continue to play a role in spinal services. It is advisable that the limitations of virtual clinics are discussed upfront with a patient and his/her family, and that these are documented appropriately. Ultimately, healthcare professional bodies would be well placed to develop guidelines or even protocols for the protection of both the patients and the clinicians alike if virtual clinics are going to be an integral part of the new normality.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Nektarios K. Mazarakis*

*Royal College of Surgeons of Ireland and Department of Neurosurgery,
Beaumont Hospital, Dublin, Ireland*

Christos Koutsarnakis, Spyridon Komaitis, Evangelos Drosos

*Department of Neurosurgery, Evaggelismos Hospital, Ipsilantou 45-47,
Athens, Greece*

Andreas K. Demetriades
*Department of Neurosurgery, Royal Infirmary Edinburgh, Little France Cres,
EH16 4SA, Edinburgh, Scotland, United Kingdom*

* Corresponding author.

E-mail address: nm1@doctors.org.uk (N.K. Mazarakis).