



## Defense Health Agency (DHA) Clinical Communities Speaker Series

### August 2021 CCSS: Exploration of Innovations in Health Care

#### S05: Digital Surgery – Telementoring and Beyond Resource List

[Augmented and virtual reality in surgery – the digital surgical environment: applications, limitations and legal pitfalls](#) (2016) discusses the continual enhancements of the surgical environment due to the digital age. Multiple innovations are being explored as options for technologies in the surgical environment. Augmented reality and virtual reality are more widely accessible, related to anatomy, intraoperative surgery and post-operative rehabilitation. The options will have great potential in the field of surgery. New innovations will continue to broaden the accessibility and refine the visual displays related to virtual and augmented reality. The authors of this article predict that the digital surgical environment will change rapidly and drastically.

In the article [Telesurgery: Past, Present, and Future](#) (2018) the authors review how wireless networking and robotic technology have allowed surgeons to operate on patients who are distantly located. In an environment where we currently face a shortage of surgeons, this technology also addresses geographical barriers, financial burdens and long-distance travel complications. This article discusses the current trend of telesurgery's innovative developments and its future. The first telesurgery took place in 2001, when a surgical team in New York, USA successfully completed a laparoscopic cholecystectomy on a patient in Strasbourg, France. Enhancements have since been made in visual displays, however limitations have been in the latency time of the technology. Latency time is the time delay in transferring multi-sensory information, including auditory, visual and tactile feedback, between the two locations. This article calls for further optimization of visual display, latency time and haptic feedback technology, to further explore this exciting new realm of medicine.

As noted in the previous articles the first telerobotic surgery in 2001 took place. The article [Telesurgery and Robotics: An Improved and Efficient Era](#) (2021) discusses why further development of remote surgery has been limited due to concerns regarding components of the network system, such as time-lag, global networking problems and legal issues. The future transformation of robotic surgery will be impacted by new technologies such as the fifth-generation (5G) internet, artificial intelligence, haptic feedback technology, 3-dimensional (3D) printing, and nanotechnology. Telerobotic spinal surgeries took place on 12 patients in six hospitals across China in 2019. This new pattern of “one-to-many” remote surgery was explored with these clinical series.

[Telerobotic Spinal Surgery Based on 5G Network: The First 12 Cases](#) (2020) is a study regarding the aforementioned surgical clinical series that took place in China. The objective of this study was to assess the efficacy and feasibility of 5G wireless systems for telerobotic spinal surgery. Twelve patients with spinal disorders were treated with telerobotic spinal surgery, in which sixty-two pedicle screws were implanted. All of the post-operative recovery was uneventful, and all of the patients had substantial relief from their symptoms. Two of the procedures were in the “one-to-many” 5g remote orthopedic format. The initial iteration took place in June 2019, when one-to-two simultaneous surgeries took place. Later in August 2019, the one-to-three simultaneous surgery took place.



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