Telemedicine and digital management in repair and regeneration after nerve injury and in nervous system diseases

To the editor,

We read with interest the article, “Facilitating transparency in spinal cord injury studies using data standards and ontologies” by Professor Vance P. Lemmon, University of Miami, USA (Lemmon et al., 2014) and would like to add to the discussion on digital management in spinal cord injury. We have analyzed the advancements in the treatment of spinal cord injury, traumatic brain injury and peripheral nerve injury. Encouraging outcomes have been achieved in the area of regulating axon growth in vivo and in vitro. However, such a large amount of information neither provides in-depth insight for other scholars nor provides detailed therapeutic protocols for clinical studies. A scientific consensus that there is a lack of unified standards for experimental design and reporting has gradually formed. Because of a lack of reporting standards, the commonly accepted definition of key words even makes data collection and bioinformatic analysis of neural plasticity and regeneration difficult. This short article described attemptable protocols for the use of digital management and unified databases in spinal cord injury and axon regeneration. A set of unified standards for experimental design and reporting needs to be established for studying spinal cord injury. This set of unified standards facilitates in-depth bioinformatic analysis, and benefits digital management for data backup and future comparative analysis in this field.

Digital medicine is a multidisciplinary subject that has arisen with the merging of medicine and new digital technologies, and covers medicine, mathematics, informatics, electronics and mechanical engineering. It can be used for basic research and clinical studies, and for treatment of various diseases (Wang et al., 2008). Recently, the combined application of digital medicine technology and telemedicine has greatly promoted the development of medicine and, in particular, has played an important role in repair and regeneration after nerve injury.

At the end of the 1950s, the American scholar Wittson first used video conferencing technology in medicine (Martin-khan et al., 2012). In the same year, Jutra and other scholars developed remote health monitoring (Spinsante et al., 2012; Takahashi et al., 2012). Thereafter, American scholars constantly used communication and electronic technology in medicine and the term “telemedicine” emerged. This telemedicine project includes tele-diagnosis systems, tele-consultation systems, tele-education systems and tele-health systems (Dimmick et al., 2003; Wong et al., 2012). Telemedicine is widely used in departments of neurology, neurosurgery, imaging, pathology, dermatology, cardiology and endoscopy.

The clinical therapeutic efficacy and reliability of telemedicine in repair and regeneration after nerve injury and in nervous system diseases deserve to be investigated. Riedel et al. (1998) performed an observational study and then evaluated the efficiency of telemedicine in managing patients during neurosurgical operations. Patients were examined by on-site physicians under the guidance of remote physicians using telemedicine technology. The examination data, the evaluation report, and suggestions were recorded on a standard datasheet. Telemedicine is an effective method for providing high quality evaluation and management of patients during neurosurgical operations.

There is an increasing number of articles in SCI-indexed journals on the application of telemedicine in repair and regeneration after nerve injury, and in nervous system diseases. There were 181 articles relating to the use of telemedicine in repair and regeneration after nerve injury and in nervous system diseases published in SCI-indexed journals between January 2008 and December 2013. These articles were statistically and quantitatively analyzed from multiple perspectives.

Among the 181 articles, 32 articles were published in 2008, 20 in 2009, 35 in 2010, 32 in 2011, 37 in 2012 and 38 in 2013. These data also suggest that the application of telemedicine in repair and regeneration after nerve injury and in nervous system disease has tended to be stable over the past 5 years.

Among the journals the articles were published in, Stroke published the greatest number of articles (n = 24), accounting for 13.26% of all of the identified articles. Nervenheilkunde published 9 articles (4.972%), Neurology and Journal of Stroke and Cerebrovascular Diseases each published 8 articles (4.42%), and several other journals each published very few articles on telemedicine. This analysis of the journals publishing research on the use of telemedicine in repair and regeneration after nerve injury and in nervous system diseases can help scholars interested in this research field know which journals to read and submit their papers to.

With respect to country, among the 181 included articles, nearly half of authors came from the United States (n = 89; 49.171%), followed by Germany (n = 30; 16.575%) and Canada (n = 19; 10.497%); no other country was the country of origin of ≥ 10 articles. No Asian countries appeared in the top 10 countries of origin of articles on telemedicine in repair and regeneration after nerve injury and in nervous system diseases in SCI-indexed journals. This indicates that Asian countries have no preponderance in the application of telemedicine in these fields, and that progress should be made in this field.

The National Institutes of Health (NIH), Boehringer Ingelheim, and the Arizona Department of Health Services each provided financial assistance for 5 articles (2.762%), while other institutes provide little financial assistance. These data suggest that the included 181 articles received little financial assistance.

We also retrieved information from ClinicalTrials.gov,
a Web-based clinical trials registry that provides patients, their family members, health care professionals, researchers, and the public with easy access to information on publicly and privately supported clinical studies on a wide range of diseases and conditions. The Web site was developed by the National Library of Medicine and the U.S. Food and Drug Administration at the National Institutes of Health, and has operated since February 2000. In recent 10 years, 396 telemedicine projects have been registered, of which 83 involve neuroscience studies. Among these 83 registered projects, telemedicine was used in the treatment of Parkinson’s disease, Alzheimer’s disease, spinal cord injury, stroke, cerebral infarction and cerebral ischemia. The conventional methods used in telemedicine mainly include computer location and remote control, telephone, videophone, wireless monitoring and a remote rehabilitation service.

We performed a bibliometric analysis of retrieved publications relating to telemedicine in repair and regeneration after nerve injury and in nervous system diseases, published in SCI-indexed journal during the period 2008–2013. This bibliometric analysis reveals study tendencies in this field from multiple perspectives. We hope it will provide valuable evidence for the application of telemedicine and the construction of digital management programs.

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