

Wearable Technology for the Validation of Surgical Systems and Surgical Assistance

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Abstract

Advances in sensors, internet of things and artificial intelligence are allowing wearable technology to constantly evolve, making it possible to have increasingly compact and versatile devices with clinically relevant and promising functionalities in the field of surgery. In this sense, wearable technology has been used in various fields of clinical and preclinical application such as the evaluation of the surgeon's ergonomic conditions, the interaction with the patient or the quality of the intervention, as well as surgical planning and assistance during the intervention. In this work we will present different types of wearable technologies for their application in the validation of surgical devices in minimally invasive surgery, and their application in assisting the surgical process. Within these technologies we will show electrodermal activity and electrocardiography devices to monitor the surgeon's physiological state, and electromyography and motion analysis systems to study his/her ergonomics during the surgical practice. Apart from these systems, the introduction of extended reality technology (virtual, augmented, and mixed reality) has fostered the emergence of new immersive and interactive tools to assist in the planning of complex surgical procedures, surgical support and telementoring. As we can see, the application of wearable technology has a high impact on the validation of surgical systems in minimally invasive surgery, including laparoscopic surgery, microsurgery, and surgical robotics, as well as in the assistance of the surgical process, with the consequent benefit in the quality of patient care.

Keywords: Wearable; Minimally Invasive Surgery; Ergonomics; Surgical Assistance; Augmented Reality

