

Cognition-Guided Surgery – A New Paradigm

Some of the smartest brains of our generation are working on an extensive digitalization and cross-linking in all areas of life in order to present individualized and context sensitive advertising. In contrast to this, the surgical field has yet to be digitized as it is widely analog. Crucial for the success of surgical treatments is the individual experience of the surgeon. Although much new information is available and many technical procedures for diagnostic and therapy are being developed and an increasing number of clinical trials are published, the possibilities and information are an overwhelming challenge for surgeons. Thus, a large amount of therapeutic potential stays unappropriated and yearly one million surgical patients worldwide suffer from complications. The vision of “Cognition-Guided Surgery” is the Cognitive Surgical Assistant CoSA, a technical-cognitive system which thinks along the lines of a human assistant, interacts with the surgeon in a natural way and gains expert knowledge while supporting the surgeon. CoSA registers a wide variety of information along the surgical treatment path including laboratory, imaging and medical devices (perception). The gathered information is linked and stored (knowledge base). From the surgical knowledge CoSA can conduct the patient’s condition, functional tissue characteristics and a prognosis relevant for the course of treatment (interpretation). For example, CoSA generates a context sensitive guiding of the camera in minimally invasive surgery or can make a treatment proposal in liver surgery (action). Subsequently, the actions are evaluated based on success of treatment. This know-how is then fed back to the knowledge base and is available for the next operation. By using new technologies and artificial intelligence “Cognition-Guided Surgery” marks a paradigm shift: it enhances surgical capabilities to find the optimal treatment for each patient and carries it out in the best possible quality, all for the benefit of each individual patient.