

# Smart Surgery

## Helping surgeons make better real-time decisions

Smart surgery brings us a new era of intelligent medical technology that provides surgeons with real-time information and improves decision making.

### User Interface

**Presenting data to surgeons and surgical staff.** Includes overlay on existing displays, customised specialised displays and augmented reality displays in the field of view. Clarity of actionable data is key in the Smart Surgical setting. The User Interface needs to be able to present context specific information that changes based on the surgical workflow. To ensure consistent interpretation and provide clinician in-loop information for example through image overlay on surgical consoles, visualisation tools and haptics. AR tools are increasingly providing richer, context specific information.



### Sensing

**Sensing technologies capturing data from the surgeon and the patient to inform decision making in theatre and the OR.** Surgical tool-based sensors, imaging systems, patient condition monitoring, position sensing and voice as a user interface combine with manual inputs to provide an information rich surgical environment. Imaging systems provide additional data from the surgical field allowing identification of critical structures, discrimination of tumour tissue and assessment of physiological parameters.



### Data Management

**Aggregating and managing data efficiently.** This can be either 'top down' (central, local or cloud-based EMR) or 'bottom up', (personal health record, maintained by the individual). Data Management is predominately local to the surgical setting, and will increasingly take advantage of cloud computing infrastructure as a service.



### Analytics

**Making complex datasets actionable.** Analytics can abstract complex aggregated data to help surgical staff to rapidly absorb relevant information and act upon it. Real-time data from the Sensing can be combined with pre-determined intelligence, such as rules-based algorithms and safety limit parameters. Analytics could also be undertaken remotely via cloud computing using Machine Learning to provide assistive guidance to the surgical staff. Analytics is key to presenting actionable data to the User Interface simply and dynamically.



### Connectivity

**A range of wireless connectivity choices combine with both physical wires and interfaces to enable the elements of the end-to-end system to talk to each other.** The surgical staff need always on, pairing free, high integrity connectivity, often in a dense radio environment which is heavily regulated.

