

Innovation Reports

**EDAFMIS**

(ITEA 2 ~ 07011)

Improved imaging, decision making and communications speed minimally invasive surgery

**HiPiP**

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High performance computing advances cut healthcare costs

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# Improved imaging, decision making and communications speed minimally invasive surgery

The results of the ITEA 2 EDAFMIS project ensure that information technology (IT) solutions can play a major role in the modern operating theatre, especially to meet the growing demand for minimally invasive surgery. Enabling interoperability of equipment, improving real-time imaging technology, simplifying communications with colleagues outside the operating theatre and enabling fast access to expert information allows doctors to work faster, enabling patients to go home earlier and get back to work sooner, as well as helping avoid medical errors.

Modern operating theatres require teams of healthcare professionals to deal with many different instruments during an operation. Equipment includes that for making images, measuring a patient's vital signs such as blood pressure, administering drugs and anaesthetics, and holding and manipulating surgical instruments, as well as providing access to a patient's records.

However, current systems in the operating theatre are stand-alone and not interoperable. Part of the personnel is there just to operate the diverse equipment and provide information exchange. Each has to follow a strict protocol to ensure a correct and flawless process. Moreover, some – such as anaesthetists – are only needed for part of an operation. So they

will often work on several operations at the same time – having to enter and leave the operating theatre frequently, involving repeated sterilising. All this is time consuming and leads to errors which can be harmful or even fatal to the patient.

EDAFMIS has therefore developed a new generation of medical operation support systems. This software for a novel generation of systems for imaging and intervention enables easy interoperability and user interaction. It provides a minimal operation cockpit which supports automation and navigation in the operating theatre. A 3D multi-modal user interface supports interaction, both with systems incorporating medical know-how and with the systems acquiring and processing patient data.

**REPLACING OPEN SURGERY**

The current trend in clinical care is to replace many open surgery procedures by minimal invasive operations which introduce instruments into a patient through a small opening. This improves the success of the procedure, speeds recovery and improves the well-being of the patient.

However, for such operations, the equipment has to work well together – requiring automation support. Equipment is also needed to support navigation of catheters and devices through the patient's body where they cannot be seen directly, acting rather like a GPS navigation system. The use of virtual teams would also optimise the availability for personnel that do not need to be present all of the time.

The problem is that surgical operations have not been well supported by IT. There are too many independent systems trying to communicate with each other. And surgeons have not had access to modern IT solutions such as decision-support systems. EDAFMIS brought together a group of healthcare equipment companies in the Netherlands with a major computer software company in Turkey to change this.

EDAFMIS focused particularly on decision support during planning of the treatment and during the operation itself. The latter involved two different elements:

1. Decision support by measuring all kinds of signals from the patient's body and relating them to already-published knowledge. If there is some reason to warn the surgeon, then some form of alarm can be given; and
2. Support for navigation of all types of instruments within the body with the focus on minimally invasive surgery where the surgeon cannot see the instruments yet needs to ensure they are in the right spot in the body. This requires some form of imaging and navigation, involving real-time image enhancement based on earlier images together with images made during the operation.

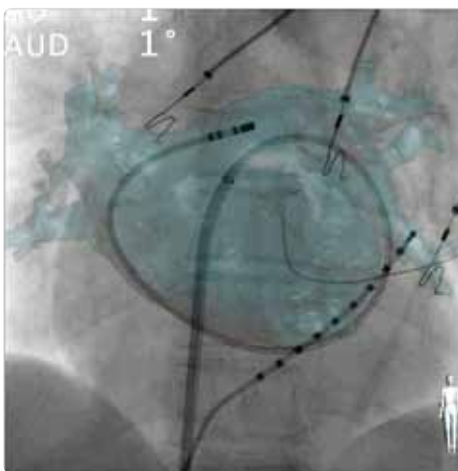
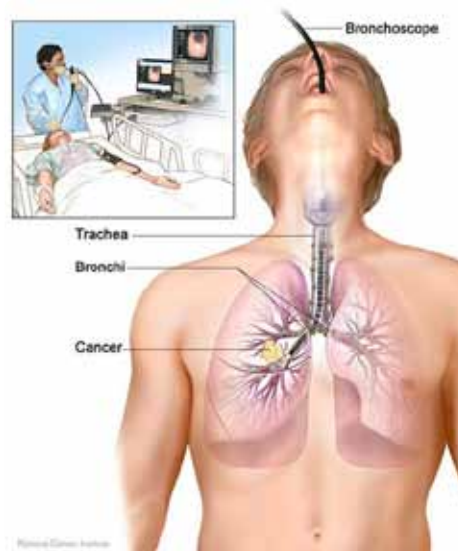
#### IMPROVING COMMUNICATIONS

The ITEA 2 project also worked on improving collaboration during operations – for example, minimising the number of times that people not needed all the time but only for short periods have to enter the operating theatre. The answer is virtual support from outside the operating theatre.

While this was not totally achieved, the first steps were made to obtaining second opinion when not totally sure of an action without the colleague having to come from another part of the hospital and the necessary sterilisation delay. It involves connection via a wireless network to an iPad tablet computer so that the colleague can see images of what is happening in the operating theatre and can exchange annotations and words in real time. The result is faster operations which is good for the patient and for the throughput of the hospital. While the system is not yet totally automated, it much improves planning and working together.

Other innovations included:

- Advanced imaging – mapping 3D images on 2D images, using different colours to aid navigation. The problem is that X-rays do not see enough – mainly showing the bones rather than soft tissue.



- Work focused on improving visualisation of soft tissues based on combining images made before the treatment and during the operation, presenting them in real time to enable the surgeon to work with them;
- Developing decision-support systems for use during the operation that connect to worldwide accessible databases with evidence-based

medicine so that the relevant rules can be applied during treatment. The rules used still need to be selected in the planning stage because there are so many but it can help apply the right ones in practice; and

- Validation of real-time connection and collaboration with personnel outside the operating theatre.

#### ENSURING FAST EXPLOITATION

A particular benefit has been fast exploitation of results with several products well on the way to commercialisation. Philips will be launching an advanced system for navigation in heart operations in May 2012 with three buyers already lined up – universities in Berlin in Germany and in Boston and Chicago in the USA. This offers electrophysiology procedures for treating electrical problems in the heart – particularly irregular heart beats. And a Philips internal start-up is studying the market and developing its first application for oncology-directed products based of EDAFMIS results.

Product lifecycle management software and systems company Sopheon is keen to use the decision-support tool developed for use during operations to get an enormous amount of information from external sources, showing several ways to get the right information out of it either in the same type of requirement or in other non-healthcare areas.

Mobile services specialist Mobilera has developed an iPad application in collaboration with several hospitals in Turkey which will buy them for internal co-operation later in 2012. And electronic health record company ZorgGemak is now enhancing record handling to deal with real-time data in the operating theatre while offering the connection between the operating theatre and the external world on iPad and other systems.

#### TAKING A GLOBAL LEAD

The major outcome of this ITEA 2 project is a marked improvement in quality and speed of treatment in operating theatres. First time right avoids medical errors – currently some €80 billion is spent annually on new operations to correct such errors. Moreover, Europe is in the global lead both in navigation for minimally-invasive surgery and in offering a validated iPad application for these types of use.

#### MORE INFORMATION:

[www.edafmis.eu](http://www.edafmis.eu)