

System unveiled for regulating anesthesia via computer

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A system has been unveiled for regulating anesthesia via computer. Credit: Albino Méndez et al.

A team of researchers from the Canary Islands has developed a technique for automatically controlling anaesthesia during surgical operations. The new system detects the hypnotic state of the patient at all times and supplies the most appropriate dose of anaesthetic.

"This is an efficient control technique which regulates [anaesthesia](#) in operating theatres by computer, with the aim of adapting the dose of the drug administered according to the individual characteristics of each patient", Juan Albino Méndez, lead author of the study and a researcher in the Anaesthesia Control Group at the University of La Laguna (ULL),

tells SINC.

The group has developed an IT tool together with the team of anaesthetists from the University Hospital of the Canary Islands, in order to facilitate the work of these health professionals. The new system, which has been published in *Computer Methods in Biomechanics and Biomedical Engineering*, keeps the patient in the desired hypnotic state throughout the operation.

The system uses sensors and a monitor to record the patient's encephalogram (EEG) and bispectral index (BIS), a parameter without units that measures hypnotic state and relates this to the patient's level of consciousness.

The BIS value fluctuates between 100 (maximum possible state of alertness) and 0 (lack of cortical electrical activity, the state of deepest unconsciousness). This research focuses on the BIS region involved in general anaesthesia, between 40 and 60.

Dose-calculating algorithms

The data are processed by a computer with specific control software, which can control the pump that injects the [anaesthetic](#) in order to regulate the amount given. The IT application is based on adaptive PID (Proportional Integral Derivative) algorithms, a control-loop feedback mechanism that automatically controls the right dose according to the measured and desired values.

In order to validate the technique, the researchers successfully carried out simulations using various models they developed themselves, and also tested it on 15 volunteer patients, aged between 30 and 60, at the University Hospital of the Canary Islands.

"The first results obtained, both in surgery and in the simulations, show that the system operates very satisfactorily, and has surgical applications with well-founded expectations of success", says Albino Méndez.

The scientists hope that the method will help to improve anaesthetic-dosing performance during operations and will improve patient recovery times, as well as reducing the costs of operations.

The study was carried out using a commonly-used anaesthetic, propofol, but it could have been done on others, such as isoflurane. The technique also has applications for regulating other physiological variables, such as blood glucose levels, temperature or blood pressure.

The immediate challenges for the team, aside from further developing the algorithmic part of the system, are to incorporate analgesia and muscle relaxation variables into the platform in order to provide anaesthetists with a comprehensive tool.

More information: Juan Albino Méndez, Santiago Torres, José Antonio Rebozo y Héctor Rebozo. "Adaptive computer control of anesthesia in humans". *Computer Methods in Biomechanics and Biomedical Engineering* 12 (6): 727-734, Dec 2009.

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