McSleepy, da Vinci, Kepler Intubation System *et al.*

Sir,

I would like to congratulate the authors of the article, "Robotic invasion of operation theatre and associated anaesthetic issues: A review,"[1] printed in the February 2011 issue of your esteemed journal.

I believe that "McSleepy" deserves more than a passing reference that it received in the article. McGill University Health Centre (MUHC) performed the world's first totally automated administration of an anaesthetic in May 2008. Nicknamed "McSleepy," the new system developed by the researchers administers drugs for general anaesthesia and monitors their separate effects completely automatically, with no manual intervention.[2]

McSleepy can be thought of as a sort of humanoid anaesthesiologist that thinks like an anaesthesiologist, analyses biological information and constantly adapts its own behaviour, even monitoring and recognising malfunction.

The anaesthetic technique was used on a patient who underwent a partial nephrectomy, over a period of 3 h and 30 min. To manipulate the various components of general anaesthesia, the automated system measures three separate parameters displayed on a new integrated monitor of anaesthesia (IMA™): Depth of hypnosis via electroencephalogram (EEG) analysis, pain via a new pain score, called Analgoscore™, and muscle relaxation via phonomyography™, all developed by Intelligent Technologies in Anaesthesia Group (ITAG). The system then administers the appropriate drugs using conventional infusion pumps, controlled by a laptop computer on which McSleepy is installed.[2]

Using these three separate parameters and complex algorithms, the automated system calculates faster and more precisely than a human can the appropriate drug doses for any given moment of anaesthesia. McSleepy assists the anaesthesiologist in the same way an automatic transmission assists people when driving. As such, anaesthesiologists can focus more on other aspects of direct patient care. An additional feature is that the system can communicate with personal digital assistants (PDAs), making distant monitoring and anaesthetic control possible. In addition, this technology can be easily incorporated into modern medical teaching programs such as simulation centres and web-based learning platforms. Finally, McSleepy met da Vinci on 19 October 2010 at MUHC. The DaVinci surgical robot,[3] which lets surgeons work from remote locations, and the anaesthesia robot, nicknamed McSleepy, combined to perform the first all-robotic surgery and anaesthesia on a prostatectomy patient at the Montreal General Hospital.[2,4]

Surgical robots could be used for "teleanesthesia." A series of simulations to evaluate the feasibility of performing robot-assisted regional anaesthesia procedures using an existing surgical robot, called the da Vinci system, were performed by Dr. Tighe and colleagues. Consisting of four robotic arms with a high-definition stereoscopic camera, the da Vinci system is used to perform various types of robot-assisted surgical procedures.

The procedures were not performed in actual patients, but rather using an ultrasound "phantom" that simulated what the anaesthesiologist would see when performing ultrasound-guided procedures. The anaesthesiologist was in the operating room but facing away from the robotic arms and simulated "patient," as he or she performed the procedure using the da Vinci system's operator console.

After initial placement of the ultrasound probe, the

anaesthesiologist was able to successfully carry out a simulated nerve block procedure, including identifying nerve structures, picking up the needle, positioning it at targeted nerve, and performing the injection.

The robotic system was then used to attempt a more technically advanced regional anaesthesia procedure: Placing a perineural catheter for continuous nerve block. Most of the steps of this procedure were successfully performed by the da Vinci operator.

There were some important limitations in performing the simulated procedures, including the fact that some steps had to be performed manually. The "multimillion dollar price tag" cost of the da Vinci system is another practical obstacle (the da Vinci debut made our hospital poorer by 9 crore rupees, but soon proved to be a boon for both the surgeons and the patients~the anaesthesiologists should also take a cue!).

Nevertheless, the simulation proved that robotic-assisted regional anaesthesia is feasible using existing clinical equipment. Further research will be needed to advance this concept, including studies to "optimise robotic interfaces with other nerve block equipment."

As reported in Science Daily (15 April 2011), researchers have introduced the first intubation robot operated by remote control. The robotic system – named The Kepler Intubation System (KIS), developed by Dr. Thomas M. Hemmerling, MUHC specialist and McGill University Professor of Anaesthesia and his team – may facilitate the intubation procedure and reduce some complications associated with airway management. The world's first robotic intubation in a patient was performed at the Montreal General Hospital in April 2011 by Dr. Hemmerling. The KIS allows us to operate a robotically mounted video laryngoscope using a joystick from a remote workstation.[5]

High-tech equipment has revolutionised the way surgery is done, allowing the surgeon to perform with higher precision and with almost no physical effort. KIS can assist the anaesthesiologist's arms and hands to perform manual tasks with less force, higher precision and safety. KIS means to anaesthesia what da Vinci means to surgery.

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