iTIVA Anesthesia

Sociedad Columbiana de Anestesiología y Reanimación. © 2014 David E. Ramírez MD
iTunes App Store (iOS) US \$9.99 or Google Play Store (Android) US \$9.99

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Received: 22 June 2015 / Revised: 25 June 2015 / Accepted: 13 July 2015 / Published online: 13 August 2015
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Unlike their colleagues in Europe, North American anesthesiologists who practice total intravenous anesthesia (TIVA) are typically relegated to administer these drugs using fixed infusion schemes. To date, devices for target-controlled infusion (TCI) have not been approved by the Canadian and United States regulatory authorities and thus have not been made commercially available. Use of medical applications (apps) as cognitive aids has increased considerably. In 2013, Ramirez and Calvache presented an abstract¹ describing the development of an app that simulates TCI employing a number of published pharmacologic models, including Minto, Rigby-Jones, Gepts, Shafer, Marsh, Schnider, Cortinez, and Paedfusor, among others. This app, iTIVA Anesthesia, was developed as a possible alternative to TCI pumps for use with basic volumetric infusion pumps.

The app, which we have used for both pediatric and adult patients, is available for download for iOS and Android devices and is offered free and unrestricted for ten uses, after which a wait time of one second is added for each subsequent use. Upon purchasing the app, the user has access to the completely unrestricted version.

The user can choose from two different modes, simulation or TCI. In the simulation mode, the user enters the drugs being used (both bolus and infusions), and the app then provides a graph depicting the plasma and effect-site concentrations over time. The data can be

entered retrospectively or in real time. In the TCI mode, the user selects the desired plasma concentrations and the app then determines the required infusion rates for the medications selected based on the model and patient characteristics. The app provides a list of suggested target concentrations. Thus, a user can plan and provide an anesthetic based on the calculated infusion schemes determined by the app (i.e., volumetric $\text{mL}\cdot\text{hr}^{-1}$ or drug specific $\mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$). Both modes allow for graphic display of the likelihood of awareness and response to intubation and incision. There is also a function to predict the time to awakening by calculating the length of time to reach a specific effect-site concentration.

Having used this app for some time, we find the simulation mode to be most helpful. By charting the course of an anesthetic for a given patient, we are able to visualize known pharmacokinetics. Often this has aided us in reducing the infusion rates to maintain a given target concentration, resulting in a shorter time to awakening. Nevertheless, we consider the app to be useful only when it is used as an adjunct tool in conjunction with monitoring physiologic variables, patients' responses, and processed electroencephalographic data (i.e., bispectral index monitoring). It also serves as a useful teaching aid in learning about TIVA and TCI. The developer has incorporated multiple known models for TCI into the app to best adjust for patient characteristics (e.g., pediatric, elderly, and obese patients). When selecting a TCI model, the app provides a description of the model as well as the reference to the original publication.

While the TCI mode might seem intuitively most useful, we found it to be impractical to apply in the busy operating room environment. Unlike a real TCI pump, it is easy to

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imagine users getting distracted and preoccupied with the app while simultaneously managing the anesthetic. Nevertheless, it may still be practical when two anesthesia providers are present. The same holds true for “real time” in simulation mode. In our own practice, we find the recommended target concentrations for propofol to be somewhat underdosed while the suggestions for remifentanyl and sufentanyl are surprisingly generous.

This app does take some time to learn. In addition, it appears that a non-English speaker wrote the help manual, which can sometimes lead to confusion with instructions that often lack clarity. Indeed, users may gain more understanding by simple trial and error. The creator does provide an iTIVA video tutorial on YouTubeTM. Unfortunately, the audio is in Spanish and there are no English subtitles. A practical feature of the app is a section that lists physiologic variables, medications, airway equipment, and fluids based on patient age. This, however, is available only in the TCI mode.

Canadian anesthesiologists who lack access to actual TCI devices may consider this app as a poor man’s alternative. We fully agree with the developer’s disclaimer that this app “is not designed to handle intravenous drugs for individual patients. Its use is limited to educational purposes to demonstrate pharmacokinetic principles when performing intravenous anesthesia.” Overall, we find it enhances our understanding of TCI and aids in teaching pharmacokinetic principles. We like to use the app as an adjunct in our daily work and suggest that it is worth giving it a try.

Conflicts of interest None declared.

Reference

1. Ramirez E Sr, Calvache JA. Development of an interactive mobile application based simulator for total intravenous anesthesia. American Society of Anesthesiology 2013: A1263 (abstract).