2. Li Y, Chen D, Wang H, Wang Z, Song F, Li H, Ling L, Shen Z, Hu C, Peng J, Li W, Xing W, Pan J, Liang H, Zhou Q, Cai J, He Z, Peng S, Zeng W, Zuo Z: Intravenous *versus* volatile anesthetic effects on postoperative cognition in elderly patients undergoing laparoscopic abdominal surgery. Anesthesiology 2021; 134:381–94

(Accepted for publication June 17, 2021.)

Avatar Models and Radar Plots: The Future of Intraoperative Anesthesia Monitoring

To the Editor:

Various diagrams facilitate the understanding of many concepts within anesthesia, such as the anesthetic triangle model, which describes a drug's effect on narcosis, analgesia, and neuromuscular relaxation, leading to the common knowledge that anesthesia is not complete until all three components have been reached.[1] As anesthesiologists, we strive to ensure that our patients maintain homeostasis throughout surgical procedures, often using multiple different monitoring strategies such as electrocardiograms, arterial lines, and pulse oximetry, among various other tools. However, the use of multiple monitors can lead to an abundance of information and a relative feeling of sensory overload, which has been a topic of attention in previous studies that highlight that an increased amount of information displayed on monitors can reduce the ability of users to detect unexpected changes, even when they are in plain sight.[2,3]

Many studies have identified problems with patient monitoring due to at-a-glance monitoring, inattentional blindness, and alarm fatigue, all of which can lead to avoidable errors in patient care.[4] As a result, advances have been made with revolutionary monitors such as Visual Patient technology, which has the intended purpose of allowing the physician to quickly assess a problem with little cognitive effort in order to rapidly find a solution.[4] A study done by Roche *et al.* confirmed that conventional monitoring plus the Visual Patient avatar is noninferior to conventional monitoring alone.[5] Similarly, the University of Michigan (Ann Arbor, Michigan) developed a multifunction decision support display that extracts, analyzes, and presents more than 250 pieces of data *via* a one-monitor organ system view, along with color coding to indicate normal and abnormal situations.[6]

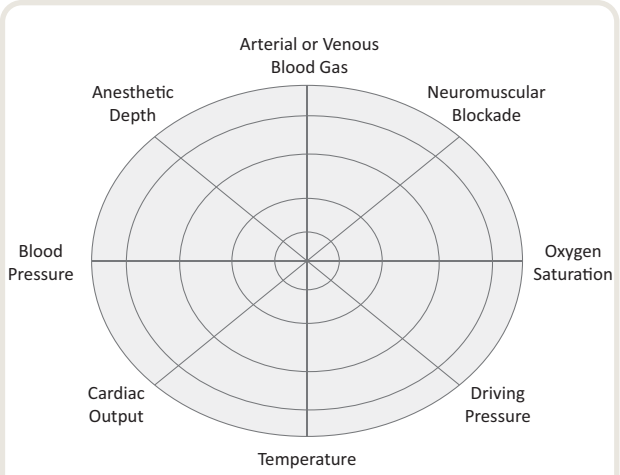

Fig. 1. A sample anesthetic radar plot showing eight possible determinants.

With this in mind, we would like to offer a similar simplified model known as a radar or star plot, which provides a thorough and simple way to understand visual graphics. We believe that this model can be extrapolated to the operating room by using data from the various invasive and noninvasive monitoring devices—similar to previously discussed models—to yield an anesthetic radar plot that the anesthesiologist can quickly interpret. A sample of the radar plot model can be seen in figure 1, which shows eight possible determinants for the model, all of which have underlying subdeterminants. For example, in the event that oxygen saturation and driving pressure are altered, the anesthesiologist's attention will quickly be driven to the ventilator to evaluate the subdeterminants of factors such as positive end-expiratory pressure, plateau pressure, and peak airway pressure, along with additional color coding to understand the severity of compromise. This approach was created with the goal of encouraging the scientific community and our colleagues around the world to undertake further research in a global effort to simplify adequate patient monitorization, support current revolutionary monitoring technology, and advance efforts in perfecting perioperative patient care strategies.

Acknowledgments

The authors would like to acknowledge the Anesthesiology and Critical Care Interest Group - Universidad El Bosque and Group of Basic and Clinical Investigations (GIBACUS) - Universidad del Sinú.

Competing Interests

The authors declare no competing interests.

Byron Rosero-Britton, M.D., Sebastian Amaya. San José Clinic of Cúcuta, Cúcuta, Colombia (B.R.). byronrb@gmail.com

DOI: 10.1097/ALN.0000000000003884

References

1. Young TM: The anaesthetic triangle. Anaesthesia 1957; 12:473–5
2. Mack A, Pappas Z, Silverman M, Gay R: What we see: Inattention and the capture of attention by meaning. Conscious Cogn 2002; 11:488–506
3. Simons DJ: Attentional capture and inattentional blindness. Trends Cogn Sci 2000; 4:147–55
4. Tscholl DW, Rössler J, Said S, Kaserer A, Spahn DR, Nöthiger CB: Situation awareness-oriented patient monitoring with visual patient technology: A qualitative review of the primary research. Sensors (Basel) 2020; 20:E2112
5. Roche TR, Said S, Braun J, Maas EJC, Machado C, Grande B, Kolbe M, Spahn DR, Nöthiger CB, Tscholl DW: Avatar-based patient monitoring in critical anaesthesia events: A randomised high-fidelity simulation study. Br J Anaesth 2021; 126:1046–54
6. Tremper KK, Mace JJ, Gombert JM, Tremper TT, Adams JF, Bagian JP: Design of a novel multifunction decision support display for anesthesia care: AlertWatch® OR. BMC Anesthesiol2018; 18:16

Accepted for publication June 15, 2021. Published online first on July 6, 2021.)