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40TH ANNIVERSARY

MED-MAL MATTERS

Acute mental or emotional stress is a significant factor affecting the performance of pilots, soldiers and elite athletes and all of these fields have developed specific training to ameliorate the effects of stress. As the *American Journal of Surgery* has observed, surgery is a “safety critical domain” yet the effect of stress on surgeons is rarely acknowledged, much less studied.

Though cognitive performance, judgment and decision-making are crucial to safe surgery, past research has mostly involved the development or assessment of technical skills or qualitative assessments of stress during surgery. Researchers from Columbia and Stanford Universities, however, using advances in wearable technology, have developed a method to observe and measure the effect of stress on surgical performance and the results, though not surprising, are scary.

The study, which was reported in the *British Journal of Surgery*, was headed by Peter Dupont Grantcharov, a master’s student at Columbia University’s Data Science Institute. The idea was to measure quantitatively the connection between acute intra-operative mental stress and surgical performance. To that end, Grantcharov asked Stanford surgeon Homero Rivas to wear a Hexoskin Smart Shirt under his scrubs while he operated. The wireless Hexoskin offers intrinsic sensors that capture heart rate and rhythm data along with acceleration and breathing data.

Pursuant to the protocol, Rivas was filmed performing 19 laparoscopic procedures, including gastric bypass and sleeve gastrectomies. The mean duration of the surgeries was only about 96 minutes. Rivas’ physiological data was also captured. Heart-rate variability was used as a proxy for mental stress. Recordings of the procedures were assessed blindly and independently by a single observer using a previously validated surgical performance tool. The observer identified and tallied each surgical “error” and “event.”

An error was defined as an unintended deviation from a technical task completion, while an event was defined as “any deviation that causes injury to the patient or poses a risk of harm.” Only events were used as an outcome measure, how-



NO SCRUBS

Wearable tech has moved into the operating room

By **THOMAS A. DEMETRIO** and **KENNETH T. LUMB**

ever, because they occur less commonly and have a more direct relationship to patient harm. Examples of events include bowel tears from grasper slips, bleeding caused by needle punctures to blood vessels and burns from inadvertent contact with uninvolved structures by electrocautery or other energy devices.

Finally, data from the Hexoskin sensors were synchronized with the video recordings to determine whether there was any correlation between acute surgeon stress and surgical mistakes that caused patient harm or posed a risk of patient harm. The answer was a resounding yes: Rivas made up to 66 percent more mistakes that could cause patient harm when he was experiencing acute stress.

One might assume that the stressors leading to harm involved intra-operative complications or other surgical emergencies, but, according to Grantcharov, the relevant stressors apparently ranged from periodic alarms and equipment malfunctions to simple distractions like side conversations or people walking in and out of the op-

erating room.

According to the authors, the study demonstrates a direct relationship between acute mental stress and patient harm in the operating room with a “clear association between the occurrence of events and the level of stress experienced.”

As any malpractice lawyer knows, however, the surgical literature is replete with case reports and other articles calling these types of events “recognized” or “known” surgical complications with the implication that they are not negligent because we don’t know why they happen. Perhaps now we know differently. ^{CL}

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