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EDITORS' CHOICE | CRITICAL CARE

Wireless monitoring in the ICU

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Science Translational Medicine 25 Mar 2020:
Vol. 12, Issue 536, eabb2779
DOI: 10.1126/scitranslmed.abb2779

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Abstract

Monitoring of critically ill children can be improved by a soft, flexible wireless device that generates accurate, comprehensive, and continuous data.

Careful monitoring of patients in an intensive care setting is complex and involves multiple wired sensors including electrocardiography leads, pulse oximeter, and blood pressure cuff. An intraarterial catheter for continuous blood pressure monitoring frequently is required but poses serious risks. Monitoring of critically ill infants is even more complicated, particularly regarding the need for frequent positional changes for holding, feeding, and diapering, including the skin-to-skin contact with a parent associated with improved outcomes. These activities are severely hampered by wired sensors, and these positional changes may introduce artifacts in the measurements.

Chung and colleagues reported the development of a wireless pair of noninvasive skin-adherent biosensors, one attached to the torso and the other to the foot or hand; these biosensors allow continuous monitoring of blood oxygenation, heart rate, temperature, respiratory rate, and electrocardiography, but also continuous measurement of other parameters, including systolic blood pressure, body orientation, activity, vocalization, and specialized cardiac parameters, none of which are available from noninvasive standard monitoring devices. These outputs compare very well against gold-standard measurements using U.S. Food and Drug Administration–approved devices and have less potential for artifact generated by motion or ambient sound. These measurements are wirelessly transmitted to generate a real-time graphical display within 10 m of the device. The device allows multiple approaches to power management, including wireless recharging of a fully enclosed battery; removable battery options allow for autoclaving of the device for sterilization. The device is soft and highly flexible, and the torso biosensor can be placed on the chest or back, allowing further flexibility. Both sensors have been tested in >50 neonates without any skin adverse events and with negligible heat generation.

This device has promising preliminary clinical data that demonstrate its accuracy, high performance, and versatility, and it appears very close to widespread dissemination. Further testing will be critical to ensure that it reliably compares with gold-standard approaches across a broad range of clinical situations before it can completely replace current monitoring modalities. However, this device and others that likely will follow seem poised to revolutionize the intensive monitoring of critically ill children and also will have applicability to adult patients.

Highlighted Article

H. U. Chung, A. Y. Rwei, A. Hourlier-Fargette, S. Xu, K. Lee, E. C. Dunne, Z. Xie, C. Liu, A. Carlini, D. H. Kim, D. Ryu, E. Kulikova, J. Cao, I. C. Odland, K. B. Fields, B. Hopkins, A. Banks, C. Ogle, D. Grande, J. B. Park, J. Kim, M. Irie, H. Jang, J. Lee, Y. Park, J. Kim, H. H. Jo, H. Hahm, R. Avila, Y. Xu, M. Namkoong, J. W. Kwak, E. Suen, M. A. Paulus, R. J. Kim, B. V. Parsons, K. A. Human, S. S. Kim, M. Patel, W. Reuther, H. S. Kim, S. H. Lee, J. D. Leedle, Y. Yun, S. Rigali, T. Son, I. Jung, H. Arafa, V. R. Soundararajan, A. Ollech, A. Shukla, A. Bradley, M. Schau, C. M. Rand, L. E.

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Marsha Z. L. Adams, L. Huang, A. Hamvas, A. S. Paller, D. E. Weese-Mayer, J. Y. Lee, J. A. Rogers, Skin-interfaced biosensors for advanced wireless physiological monitoring in neonatal and pediatric intensive-care units. *Nat. Med.* **26**, 418–429 (2020). Google Scholar

Science Translational Medicine
Vol 12, Issue 536
25 March 2020
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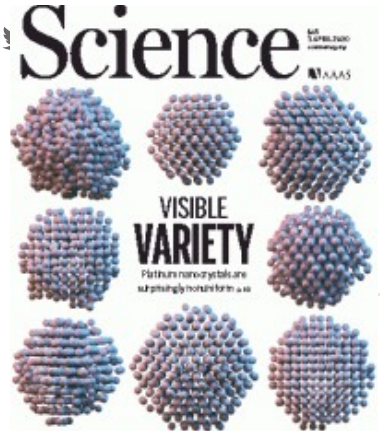

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