

FROM THE EDITORS' DESK

The Ethics of Technology for Population Health

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In a recent TED talk, futurist Maurice Conti suggested that we are entering a new age of man. From the hunter-gatherer age (several millennia), to the industrial age (several hundred years), to the information age (several decades), Conti proposes that we are now entering the “Augmented Age.” In this augmented age, humans and machines will periodically merge directly and indirectly as neural interfaces allow us to interact with our physical, electronic, and virtual world more easily. While Conti is not suggesting that we will all become connected cyborgs, he does suggest that our fundamental relationship with technology and information will evolve, seamlessly. He suggests that these integrative technologies will be adopted in the same manner that society has adopted smartphones and now demands instant (free) Wi-Fi connections.

Where are we now? This winter, the massive halls of the Consumer Electronic Show in Las Vegas were filled with consumer devices that promised better health, an easier life, and a more connected world—for those who could afford it. For instance, non-invasive blood sugar monitors coupled with wireless insulin pumps...that didn't seem quite ready for prime time (at least to this medical observer). Blood pressure cuffs with HIPAA-compliant data systems sending information wirelessly to mid-level providers. Sensor-filled shoes and clothing that send stride, respiratory, and other biometric data to smartphones to prevent injury during workouts. Devices to customize hearing beyond current auditory augmentation for hearing loss. Virtual reality and augmented reality devices that not only play immersive video games, but also help train people for team-based or multi-step procedural tasks. These consumer devices have been made possible by recent major advances in materials science, computational science, robotics, and neuroengineering.

Yet proof-of-concept devices already exist for Conti's “futuristic” class of machines, which will allow people to “do by thinking,” controlling computers remotely with their minds. Here, neural interfaces pick up on biological signals and encode them into actionable data for robots and computers. From a healthcare perspective, these types of devices will eventually

restore mobility to the disabled, and may allow people to more carefully control their medical conditions. For instance, devices may connect eye movements to control house functions, making the lives of the disabled simpler. Eventually, these technologies will merge with other biometric and personal monitoring, reminding people about their total caloric intake or when their rheumatoid arthritis is likely to flare, or sending a driverless car to pick them up for their medical appointments. Potentially, these devices could feed into a connected economy of information and technology that could be both empowering and privacy-eroding. From my discussions with neuroscientists and neuroengineers, these technologies are a mere decade or so away from more widespread use.

These near-future technologies carry with them a host of ethical questions that healthcare providers will have to address with their patients:

1. How will access to these technologies affect population-based healthcare disparities?
2. Will these technologies actually improve quality of life, or will they erode groups and isolate individuals?
3. What will the connected economy mean for personal privacy, especially around stigmatizing medical conditions?
4. How will enabling technologies be paid for by insurance or other groups?
5. What happens when these technologies get “hacked” or data is lost?
6. What happens to a connected society during power outages or natural disasters?
7. How will these technologies affect specific groups whose identity may revolve around adapting to their disabilities, such as the hearing-impaired communities?
8. Where will man end and machine start? And in this near-future world, will this distinction even matter?

As these enabling technologies develop, *JGIM* will help shape the discussion about their impact on population health. *JGIM*'s special focus on the science of healthcare delivery and healthcare disparities will allow it to anticipate and respond to emerging issues affecting the health of the public.

In the current issue, we explore a variety of innovations currently affecting public health.

Richman et al.¹ explore the impact of Connecticut's legislation mandating that physicians notify women undergoing mammography if they have dense breasts and a potential need for supplemental screening with MRI or ultrasound. This

study is especially important, as supplemental screening might pick up more early invasive cancers, but may also lead to many more false positives, resulting in unnecessary invasive diagnostic studies. In examining over 25,000 women in states affected by this legislation (vs. control states), Richman found a small (<2%) increase in diagnosis of localized invasive breast cancer in women living in Connecticut (individual-level comparison only), with no difference in regional or metastatic breast cancer diagnosis. Whether this earlier detection will reduce mortality, increase over-testing, or mitigate cancer-related sequelae is still unknown.

Through examination of 16 practices in two accountable care organizations, Shortell et al.² examine the impact of a patient-centered culture on outcomes for patients with diabetes and cardiovascular disease. The authors surveyed staff and providers at all 16 sites regarding local culture and patient care coordination, and surveyed over 2000 patients regarding their personal health-related outcomes. A strong patient-centered clinical culture was found to be positively associated with better physical functioning (odds ratio 1.85) and less depression (OR 1.51). Importantly, they found that one patient characteristic—patient activation—was even more strongly associated with better physical health (OR 2.56) and social functioning (OR 4.12) and with less depression (OR 2.26).

D'Onofrio et al.³ share the results of a randomized controlled trial to improve addiction treatment through an emergency department-initiated buprenorphine/naloxone prescription, with 10-week follow-up in primary care clinics versus addiction referral or a brief educational intervention. They found a short-term reduction in illicit opioid use but no change in longer-term outcomes once the program was finished (and people returned to their normal lives)—pointing the way for more sustained activities to help maintain adherence.

Finally, Holliday et al.⁴ discuss how patients and physicians perceive online physician ranking information derived from

online websites. Specifically, they find that patients are much more trusting and accepting of online physician rating data from independent websites than from physicians, while physicians are more likely to have confidence in health system survey data. Groups differed regarding the value of having physician ratings openly shared online.

This issue of *JGIM* provides an in-depth look at issues relevant to healthcare in our current healthcare marketplace. As new technologies reshape our medical and healthcare environment, *JGIM* will provide a forum in which to keenly assess their impact and value.

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Compliance with ethical standards:

Conflict of interest: The author no personal or financial conflicts to declare.

REFERENCES

1. Richman I, Asch SM, Bendavid E, Bhattacharya J, Owens DK. Breast density notification legislation and breast cancer stage at diagnosis: early evidence from the SEER registry. *J Gen Intern Med*. 2017. doi:10.1007/s11606-016-3904-y.
2. Shortell SM, Poon BY, Ramsay PP, et al. A multilevel analysis of patient engagement and patient-reported outcomes in primary care practices of accountable care organizations. *J Gen Intern Med*. 2017. doi:10.1007/s11606-016-3980-z.
3. D'Onofrio G, Chawarski MC, O'Connor PG, et al. Emergency department-initiated buprenorphine for opioid dependence with continuation in primary care: outcomes during and after intervention. *J Gen Intern Med*. 2017. doi:10.1007/s11606-017-3993-2.
4. Holliday AM, Kachalia A, Meyer GS, Sequist TD. Physician and patient views on public physician rating websites: a cross-sectional study. *J Gen Intern Med*. 2017. doi:10.1007/s11606-017-3982-5.