

# Virtual Mentor

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## From the editor

### Ethics in the age of medical device technologies

The infiltration of technology into all aspects of daily living was both rapid and pervasive during the latter part of the 20th century, and it changed the world in which we live. Medicine was not immune to this extraordinary revolution [1]. CT, PET and MRI scanners are now found in many hospitals around the country and have become important imaging modalities for most specialties.

Once-incredible advances in robotics are making their way into surgical practice [2]. Insights into the human genome and concurrent developments of gene-chip and nanoscale devices herald an era of personalized and personality-changing medicine [3]. At a more prosaic level, electronic thermometers and automatic blood pressure cuffs are now found in many doctors' offices.

Compared to the other branches of technology that promise to revolutionize medicine in the foreseeable future, namely, biochemical and information technology, medical device technology has deep ties with the medical fraternity. Physicians have driven the development of numerous devices to aid their practice in the past [4, 5]. Indeed, one of the defining aspects of the bond between the patient and physician, the stethoscope, was invented by a doctor.

The increased use of medical devices in all aspects of medicine has presented ethical challenges. Like the interaction between doctors and pharmaceutical companies, relations between physicians, hospitals and medical device corporations are necessary but fraught with ethical dilemmas. These dilemmas arise in educational settings, where doctors learn from company representatives how to use new devices, and in research ventures where physicians collaborate with companies. Because many medical devices are designed to prolong life in cases where pharmaceutical treatments have failed, they are frequently offered to extremely sick people. Hence their development must proceed in a highly supervised and transparent way.

At the other end of the spectrum, advances in diagnostic technologies allow doctors to find disease earlier and with greater acuity, sometimes preventing manifestations of complex disease. These technologies promise a new era of preventive medicine [6]. It is important to temper the public's and physicians' excitement about the potential of such technologies with accurate information for patients and proper use by physicians [7].

Recent innovations in medical science and engineering have led to great speculation about the advances that lie ahead [8]. With increased research into devices that blur the line between man and machine, medicine has the potential to redefine the concept of the self. Neuroprosthetics and other implants can alleviate the plight of many people with disabilities and may ultimately affect a wider public. The ethical ramifications of these technologies are likely to be hashed out not only in the medical arena but in society at large.

While it is probably true that all doctors, scientists and engineers design and implement medical devices with only good intentions, the rapid pace of their development and integration into medical practice and other areas of health care makes it impossible to anticipate all the possible consequences that may result from their use [9]. The stethoscope, for example, has come to symbolize the connection between the patient and doctor, while the use of newer devices are viewed as detracting from the intimate bond between the two parties. Use of heroic devices able to prolong the lives of patients who would otherwise die have transformed end-of-life decision making.

This edition of *Virtual Mentor* highlights some of the ethical issues that have arisen from the recent proliferation of medical devices and offers a glimpse at the ethical hurdles that can be expected from the expansion of medical technologies. The integration of biochemically inspired, information-related and device technology will drive the future of medicine. While it is not possible to cover all the questions raised by all devices currently in the market, we hope that the analyses presented here stimulate awareness of the ramifications of this whirlwind change and provide guidance in the face of the revolution that will impact not only our profession but all aspects of our lives for years to come.

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