Are New Technologies Being Introduced and Adopted Appropriately in Orthopedic Practice?

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Orthopedic surgeons are barraged, virtually on a daily basis, with information concerning new technologies; this may include different implants, instrumentation and surgical techniques, local and systemic biological therapies, and other devices. This information originates from numerous sources and stakeholders, including journal and media advertisements, device manufacturers, conferences, medical associations, payers, government agencies, hospitals, colleagues, and patients. Indeed, direct-to-patient advertising has already altered the conversation between surgeons and patients. Patients commonly arrive in clinic with preconceived ideas (and comments such as, “I have done my research and . . . .”) regarding what they want done at surgery, the surgical approach, and their specific choice of implant. Whereas a robust conversation between surgeon and patient may foster an engaging two-way decision-making process, patients often are confused and misinformed by material they have seen or gathered. Furthermore, to remain relevant and viable in a highly competitive marketplace, surgeons may feel pressured into adopting new technologies requested by patients or presented by implant representatives.

The above discussion begs the more general question: How should new technologies be introduced into orthopedic practice? This subject continues to generate much discussion, given ongoing proposed changes in our health care system, constant emphasis on the practice of evidence-based, cost-effective medicine, and the realization that some new technologies have had questionable or, in some cases, negative consequences. Some examples include metal-on-metal total hip arthroplasty, excessive modularity of implants, computer-assisted surgery, and the use of BMP-2 and platelet-rich plasma. These technologies all have their proponents and detractors. How is the practicing orthopedic surgeon able to judge all this information and make sensible decisions?

There is no question that we have seen some spectacularly successful innovations in orthopedics and related specialties in recent years. Some of these include cephalomedullary and locked intramedullary nails, modern spinal instrumentation, highly cross-linked polyethylene in total hip arthroplasty, multimodal control of pain, and disease-modifying anti-rheumatic drugs. Other innovations, still on the horizon, may have remarkable, even paradigm-changing potential to alter how we practice orthopedics. Some of these include biological engineering of musculoskeletal tissues, robotics, 3-dimensional printing technologies, and nanoantibiotics.

Several research groups and committees have provided sage insight into how we should think of introducing new technologies into surgical specialties and into orthopedics in particular. The “innovation cycle” has many stakeholders with a vested interest in the safety, efficacy, and cost-effectiveness of introducing a new product into surgical practice. Almost 25 years ago, Professor Rik Huiskes emphasized that it is the surgeon who should take a clear leadership role and responsibility to systematically review the preclinical data (biomechani-
cal, computational, biological, animal studies, and so on) and clinical trials prior to introducing any new technology for use in patients. Once the preclinical and regulatory criteria are met, a stepwise introduction of new technologies, on a limited basis, to high-volume clinical centers with the appropriate infrastructure for detailed analysis of outcomes follows logically.^{24-26} Ongoing postmarket analysis and surveillance measures using databases and registries are important tools to help ensure that implants and biologies function appropriately, without adverse consequences.^{21,24-26} Partnerships that include all relevant parties must be developed so that new technologies can be introduced to hospitals and surgeons, who become suitably trained in the safe and effective use of these new tools.^{27} Potential bias and conflicts of interest must be transparent and recognized.^{28-30}

All participants interested in technological innovation in orthopedics must continue to place patients’ interests first and foremost.^{31} Surgeons must have the trust and confidence of their patients, who depend on surgeons to practice their profession with the highest degree of knowledge, integrity, and compassion. The safe, efficacious, and cost-effective use of novel devices and biologies furthers this important goal.

**References**


