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EDITORIALS

New and unproved medical devices

Enthusiasts need educating about the clinical, ethical, and legal implications of choices supported by limited data

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There is a well established nomenclature for describing the uptake of new technologies.[1] "Innovators" adopt a novel approach the fastest; they are often mavericks and have personalities that feature a high tolerance for risk. "Early adopters" are the next to take up the new technology. Their behavior, which is only slightly more circumspect, has been described as self conscious experimentation.[2] Together, these professionals are one standard deviation greater than average in terms of speed of adoption than their peers and make up about 16% of the relevant population.[2]

In a linked paper (doi:10.1136/bmj.f6956), Kynaston-Pearson and colleagues show that innovation research would have accurately predicted the proportion of orthopedic surgeons in England and Wales at the vanguard of using new technology.[3] The authors examined the National Joint Registry of England and Wales to identify the range of prostheses used in total hip arthroplasty in 2011, and they found that about half of the 261 brands in the database had been on the market for fewer than three years. After conducting a systematic review of the literature, they found that about half of these recently introduced brands had no published evidence of clinical effectiveness. These 57 brands accounted for nearly 8% of all hip implants put in place during that time in England and Wales.

Not all studies of new medical products are published, but the real problem is that there is little chance in this case that the evaluations have been done. The characteristics of medical device regulation encourage orthopedic surgeons to use unproved and inherently risky new technology in total hip arthroplasty. The United Kingdom and other European nations do not require promising new medical devices to show benefits in controlled testing before routine use. Instead, new devices are studied in small numbers of patients to see whether they appear to be safe and perform as expected. The difference is crucial. A left atrial appendage exclusion device, for example, can be approved in the European Union after showing that it can be deployed in the heart as intended. By contrast, in the United States, the Food and Drug Administration has the authority to ensure that new high risk devices are first tested for effectiveness and safety.[4] As a result, the left atrial appendage device might be approved only if it reduces risk of stroke—the main reason for its use in the first place.

However, the FDA's authority to demand rigorous evidence before new medical devices can be used in American patients applies only to the small fraction of products classified as conferring high risk. Moderate risk devices, such as prostheses used in hip reconstruction, can be cleared through the 510(k) program, in which manufacturers show that the new product has "substantial equivalence" to a device already on the market. Formal effectiveness trials are rarely done. Manufacturers in the US have used the 510(k) pathway to make strings of iterative changes to existing devices, with each new product deemed "substantially equivalent" to a predecessor, such that hip implants available in 2012 were approved through linkage back to implants produced nearly three decades before.[5]

Even if only a small fraction of physicians choose to use the most recently approved medical devices, the public health implications can be great if these devices confer incremental risk without clear incremental benefit to patients. Kynaston-Pearson and colleagues found that the earliest adopting orthopedic surgeons carried out more than 10 000 hip implantations in 2011. These results undermine claims that patients outside the US are denied early access to such devices because centralized funders cover only well studied interventions.[6] Lack of centralized oversight of reimbursement for new medical devices in the US can lead even more physicians to adopt new products with an insufficient evidence base. For example, nearly two thirds of implantable cardioverter defibrillators used in the US are the most current model made by the manufacturer.[7] Although being an early adopter can be positive when the product is transformative and evidence based, many of these models have not been studied in clinical trials.[8]

The fact that some physicians are drawn to use untested new technologies instead of better studied existing products, even in the absence of convincing evidence of clinical advantage, raises important ethical questions relevant for reform of medical device regulation, currently under way on both sides of the Atlantic. Legislators in the EU and US continue to give regulators greater leeway to approve new treatments on the basis

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of limited data. For example, the European Parliament has supported draft regulations to strengthen oversight of Notified Bodies, the private entities that certify medical devices, but not replace them with a centralized Europe-wide regulatory agency or require rigorous evidence of effectiveness for new high risk devices. As Kynaston-Pearson and colleagues suggest, new products could be phased in, starting with centers with the capacity to engage in ongoing clinical trials of the products. In the US, the government can approve "coverage with evidence development" for new products with the requirement that their safety and effectiveness be studied once they are in use.[9]

The ability of manufacturers to promote devices or drugs that are authorized by regulators for widespread use but that do not have rigorous preapproval data should also be restricted. The medical products industry often targets early adopting physicians with substantial promotional resources,[10] and some physicians receive royalties in relation to devices that they implant or have shares in the companies involved.[11] In a recent case in Oregon, the US Department of Justice successfully sued two interventional cardiologists who had not informed patients that they received "training" payments from the manufacturer for each device they implanted. These payment were alleged to lead the cardiologists to select the manufacturer's device over other alternatives.[12] In place of widespread industry led promotion, physicians who adopt new technologies that have little or no evidence of superiority over existing products need to be educated about the implications of their choices. They should also ensure that their patients know about the benefits and risks of the new—but often unproved—medical devices that they are receiving.

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1 Rogers EM. Diffusion of innovation. 4th ed. Free Press, 1995.
2 Berwick DM. Disseminating innovations in health care. *JAMA* 2003;289:1969-75.
3 Kynaston-Pearson F, Ashmore AM, Malak TT, Rombach I, Taylor A, Beard D, et al. Primary hip replacement prostheses and their evidence base: systematic review of literature. *BMJ* 2013;347:f6956.
4 Avorn J. Powerful medicines: the benefits, risks, and costs of prescription drugs. Knopf, 2005.
5 Ardaugh BM, Graves SE, Redberg RF. The 510(k) ancestry of a metal-on-metal hip implant. *N Engl J Med* 2013;368:97-100.
6 Basu S, Hassenplug JC. Patient access to medical devices—a comparison of US and European review processes. *N Engl J Med* 2012;367:485-8.
7 Lampert R, Wang Y, Curtis JP. Variation among hospitals in selection of higher-cost, "higher-tech," implantable cardioverter-defibrillators: data from the National Cardiovascular Data Registry (NCDR) Implantable Cardioverter/Defibrillator (ICD) Registry. *Am Heart J* 2013;1651015-23.
8 Rome BN, Kramer DB, Kesselheim AS. FDA approval of cardiac implantable electrical devices via original and supplement pre-market approval pathways, 1979-2012. *JAMA* [forthcoming].
9 Neumann PJ, Chambers J. Medicare's reset on "coverage with evidence development." *Health Affairs Blog* 2013. http://healthaffairs.org/blog/2013/04/01/medicares-reset-on-coverage-with-evidence-development/.
10 Fugh-Berman A, Ahari S. Following the script: how drug reps make friends and influence doctors. *PLoS Med* 2007;4:e150.
11 Abelson R. Whistle-blower suit says device maker generously rewards doctors. *New York Times* 2006. www.nytimes.com/2006/01/24/business/24device.html?pagewanted=all&_r=0.
12 Budnick N. Groundbreaking Oregon DOJ cases target doctors' failure to inform patients about device payments. *Oregonian* 2013. www.oregonlive.com/health/index.ssf/2013/08/groundbreaking_oregon_doj_case.html#incart_river.

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