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## Medical Apps: Public and Academic Perspectives

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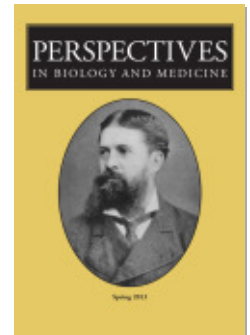
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## Medical Apps: Public and Academic Perspectives

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# MEDICAL APPS

## *public and academic perspectives*

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WILLIAM H. KRIEGER

**ABSTRACT** Medical apps have featured in popular websites and mainstream news media in recent months. However, there has been almost no mention of these tools in journals focusing on relevant ethical or social issues, including conflict of interest, the role of politics in science, and technological oversight. This essay examines the role that these philosophical issues might play in answering both public and academic questions about these pieces of emergent technology.

RELATIVELY NEW AND NOW UBIQUITOUS, smartphones and tablet computers are changing our lives by asking us to rethink the ways that we conduct business, form and maintain relationships, and read books and magazines. In the same capacity, mobile devices are redefining how health care is administered, monitored, and delivered through specialized technologies called *medical apps* (*applications*). In general, apps are pieces of software that can be installed and run on a variety of hardware platforms, including smartphones, tablets, laptops, and desktop computers. Medical apps, in particular, refer to a wide variety of software that focuses on health care (loosely defined). Whether these apps target the health-care provider or the health consumer, their development, existence, and rapid acceptance by the health-care industry engender and engage a number of

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ethical issues, including conflict of interest, the role of politics in medicine, and questions concerning the oversight of these new technologies. These issues impact large segments of our populations, as medical apps are one of the fastest-growing sectors of the app market. For instance, according to *MobiHealthNews*, based on 18 months of data from Apple, as of 2012 there were over 13,000 medical apps on the market (Dolan 2011).

### IS THERE AN APP FOR THAT?

Targeting a wide range of users, from physicians and medical students to non-professionals, medical apps serve a number of purposes and provide a range of services. Some apps extend existing information sources such as the *Merck Manual*, by digitizing content and providing the user with instant, on-demand access to medical and pharmaceutical information from a variety of sources. This supply chain for apps is not limited to referencing information on diseases, prescriptions, and the like, however. Health consumers have a variety of concerns with the intricacies of the new health landscape, and the app market has responded. The increasing complexity of health care given recent legislation, including the 2009 Affordable Care Act, has caused considerable confusion for consumers entering the health-care market.

Most recently, the Hackovate Health Innovation Competition offered a \$15,000 prize to a developer who could design an app that would “improve the nation’s health system and help people navigate the complexities of the Affordable Care Act” (Gordon 2013). Finalist entries focused on price shopping for comparable health services, health-oriented peer-to-peer interaction, health claims analysis, and a tool to allow people with chronic medical conditions to avoid repeated ER visits. Although, as referenced by Hatch (2011), there are problems looking solely at readmissions as a measure of medical care quality, repeat visits are a real concern for medical insurance companies and hospitals because of the high cost associated with each readmission. By providing these recidivist patients instead with home-based therapies, tutorials, and health care information, the goal is to improve their health while bringing ER costs down. This competition was supported by a wide variety of sponsors, including tax services and investment firms, health-care groups, legal services, technology companies, invention and innovation groups, local government, and coffee roasters, and it was open to individuals and groups interested in health care from any perspective.

Other apps are designed to give health advice and support based on feedback entered by the individual or via GPS data and Bluetooth-enabled or hard-wired sensors. Nike+ and similar apps measure progress during a run, calories burned, and heart rate. Some of these apps record this information and make specific recommendations tailored to the individual, or, in the case of apps like Endomondo, they go further, allowing the individual to share their progress online or to

“compete” with friends using the same software. A final type of app can play an active role in traditional medical care, whether as an interface for a doctor using a tablet or laptop computer to collect medical data during an examination, or as a conduit for an individual’s medical information. The latter kinds of apps can send a wide variety of medical data to health-care professionals and data collection centers, either collected automatically from wearable devices such as web-enabled glucose monitors, pacemakers, and the like, or from input into smartphones and tablets.

Since medical apps are one of the largest categories of applications in the iTunes app store, over the past couple of years there has been an increasing amount of attention paid to medical apps by mainstream media. Perhaps unsurprisingly, the tone of the popular journal and news articles ranges from balanced questions about the future of this technology to hyperbolic predictions that apps will lead to the salvation or demise of modern medicine. The content, if not the tone, of these questions would seem relevant to researchers in medicine and biotechnology, but some questions also resonate with philosophers, particularly those specializing in practical ethics and in social philosophy, including conflict of interest (COI) and risk analysis. Regrettably, little material on COI or risk from any of these fields has been mentioned in popular debates online, on television, or in print.

The purpose of this article is to begin to close this communication gap, showing how popular discomfort with medical apps might connect with academic thought on interest, privacy, and oversight. To do so, I will focus on how questions surrounding conflicts of interest should impact the trust that professionals and lay end users have with medical apps. Next, I will examine the impact that social and political change has on these apps as medical tools, before exploring our options for taking control of this new technology. The paper closes with a call for public and academic circles to focus on these issues together.

### CONFLICT OF INTEREST

As far back as 2000, the *Lancet* set the stage for current debates about medical apps. When editor Marilyn Larkin (2000) looked to the future of medicine, these “killer apps” were just out of reach. While Larkin focused on problems with security, implementation, compatibility, and the like—problems that continue to make headlines today—technology experts felt that web-based solutions to the current, inefficient model of medical care were still years away. When Larkin’s article was written, well before the rise of the smartphone, *apps* referred to traditional computer applications. Regardless, the issues perfectly presage current debates about everything from apps to electronic medical records.

Interestingly, one of Larkin’s premises was the need to “learn from our earlier mistakes.” While this article quotes a number of experts and cites a variety of data on reasons for caution, questions surrounding interest, proper oversight, and the

like—issues that are commonplace in discussions of other pieces of emergent health-care technology—are largely absent from the conversation about medical apps. Perhaps more troubling is the fact that the health-care industry is aware of these issues, and that advertisers and marketing professionals have been experimenting with different app delivery systems in order to better capture our attention (and dollars). For instance, there are now data on the effectiveness of “branded apps” that clearly link interest and branding to purchasing decisions. Bellman et al. (2011) show that building apps effectively can forge powerful connections between user and brand: “Apps with an informational creative style, which focuses attention on the user, and therefore encouraged personal connections with the brand, were more effective at shifting purchase intention. In contrast, experiential, game-like apps were less successful because they focused attention on the phone” (p. 199). Although the authors of this study do not focus on medical apps in particular, medical app makers have had opportunities to connect their products with medical professionals and health-conscious people for some time and with little to no oversight. Further, the Bellman study seems to be in accord with a growing number of commercials sponsored by pharmaceutical companies on television that use empathy to forge a connection to people, and that encourage them not only to self-diagnose for physical and mental illnesses based on generic symptoms, but to ask physicians for prescriptions for specific drugs to treat these illnesses.

Apps are not the first industry-sponsored medical resource. Interested groups have used a wide variety of methods to try to make direct connections between their companies, their products, and the medical establishment and reference information they rely on. For instance, the *Merck Manual of Diagnosis and Therapy*, now available as an app, was first published in 1899. Now in its 19th edition, it has been one of the most important medical reference books for doctors for over a century. Other medical resources, educational products, and even conference programs are full of ads from interested companies. However, like the *Merck Manual* (and unlike many branded materials in other industries), medical apps have been able to shield themselves from questions surrounding conflict of interest. That is not to say that medical apps are free from critique. Medical apps continue to garner a lot of controversy in medical and nonmedical circles. However, the fact that nobody seems concerned about branded apps is puzzling.

If medical apps were only marketed to medical professionals, then the fact that nonprofessionals do not understand COI in this context would be understandable (and, in fact, might provide another good reason to count on health professionals when seeking health advice). However, on the one hand, medical apps are increasingly being targeted at nonprofessionals, and on the other hand, this strange lapse in COI sensitivity is not limited to the public’s perception of medical apps. Far worse, a number of medical schools, including Georgetown University (2013) and Stanford School of Medicine (2013), provide their students with lists of sanctioned medical apps. These institutions provide critical reviews

of multiple pieces of software, discussing the pluses and minuses of each, but one thing that they do not analyze is whether particular apps might be subject to conflicts of interest. Granted, mere verification or disclosure of potential conflicts of interest may not be especially effective in eliminating bias—and, in fact, good arguments can be made that reliance on disclosure injects a false sense of security on the part of the reader—but other persuasive reasons for disclosure of app authorship, such as whether medical professionals or other qualified individuals were involved in the creation of the app, still exist. In fact, one industry article, clearly comfortable that there will be no pushback, goes as far as expressing shock at those physicians who refuse to use these apps in medical schools, or worse, do not let their students use their apps as a part of their education (*Medical App Journal* 2012). The authors argue that these (few) recalcitrant doctors need to allow students to take advantage of medical apps, and that this shift will change the face of medicine. When apps are mentioned as being potentially dangerous, physician users are berated for relying on memory aids instead of experience (replacing understanding borne of internalizing and contextualizing large amounts of material with shallow knowledge), or for spending less time looking at their patients than they spend looking at their screens (Hafner 2012), reasons completely unrelated to bias or conflict of interest.

This isn't to say that medical professionals and ethicists are unconcerned with industry involvement in medical education. Conflict of interest questions are major concerns for medical professionals, attorneys, and regulatory bodies. Their policies and directives are designed to protect consumers from COI, but they tend to focus on drug samples, vacation-like seminars, free food, financial recompense, and other gifts, while ignoring COI issues surrounding apps. For example, when Lo and Field (2009) list potential sources of conflict by the pharmaceutical industry, medical apps are absent from the discussion, despite the increasing role that they play in medical education and practice. Freedman et al. (2009) provide a similar analysis from the perspective of psychiatry, as do Hébert et al. (2010) from the perspective of industry-based conflicts of interest in Canada. Granting that the *Merck Manual* and a number of medical apps have been a benefit to the medical community, this inconsistency in attention paid to them is still troubling. In an age when apps are made and put online quickly and with little oversight, it can be difficult to verify the role of industry or other sources of content in the creation of medical apps, as was shown from the perspective of dermatology by Hamilton and Brady (2012). Further, it is entirely plausible to imagine that a particular medical app, owned by a pharmaceutical company, might suggest its own medicine for a particular disease. Even if that resource also listed other drugs, the fact that it offers its own drugs first is a potential problem.

If apps are only a tool for the individual, then some of the issues discussed in this paper might seem less important, at least from a COI point of view. In fact, some apps are intended as novelties, labeled by developers as breathalyzers, thermometers, and the like. In each of these cases, the apps contain disclaimers stat-

ing that they are for entertainment purposes, and that they are not reliable measures or indicators of health-related information. Sadly, despite these indicators, a quick read of these apps' comment sections shows that many app purchasers do not understand the warnings, as many complain that the apps do not work, despite repeated attempts to get accurate readings. However, other apps claim to provide real data (such as heart rate), and still others make medical claims, such as an app that uses the light from the iPhone camera, claiming that it will clear up acne. For the "real" medical apps, the hope, echoed by medical professionals, is that these data are accurate and that qualified health-care professionals are creating the apps based on treatment protocols (Gill 2012). Whether in fact these apps do provide safe medical information and advice can, at this time, only be found by reading through the comments and reviews, as no regulatory body has been assembled for vetting these innovative medical technologies.

The United States is not the only country to be concerned with medical apps. The Medicines and Healthcare Products Regulatory Agency (MHRA) in the United Kingdom has put out a set of recommendations on medical apps, and other European Union countries are also putting out guidelines for their use. The EU's approach, lacking a central authority, creates a number of problems (beyond the scope of this paper), including questions of whether app usage can cross state lines, worries about how EU countries will be confident in app safety, and whether apps need to be approved only in a single EU country to be accepted throughout the EU.

Noting a lack of oversight, the U.S. Food and Drug Administration (FDA) has recently stepped in to respond to questions surrounding the safety of medical apps that have made their way to the market, including some that have made fraudulent claims about being able to provide medical treatment. In 2011, the FDA even released draft guidelines to evaluate and make advisory decisions on "Mobile Medical Apps." As the industry contains a wide variety of types of apps, the FDA clarifies and limits what it sees as needing regulation: "This narrowly-tailored approach focuses on a subset of mobile apps that either have traditionally been considered medical devices or affect the performance or functionality of a currently regulated medical device" (FDA 2011, p. 12). Although this draft seeks to address issues surrounding patient safety, the reader will find no mention of bias, conflict of interest, or the like. The FDA has drawn comments ranging from accusations that the FDA is using this new program to attack people who want to save lives by slowing them down or subjecting them to unnecessary scrutiny and oversight, to arguments that the FDA is not strong enough to create a safe environment in which to trust medical apps (Emord 2012; Hogan and Kerin 2012). While perhaps the FDA should not be held to a standard that others fail to meet, it is distressing that an organization that clearly understands the dangers that can come with conflicts of interest does not address the COI problem more directly.



**CHANGING GOVERNMENT, CHANGING TECHNOLOGY**

Perhaps when people think of bias in medical apps, they are not thinking in terms of conflict of interest, but instead they are asking more general questions, such as whether we should trust these apps, and whether we are prepared for a future where medical apps play an increasing role in American medicine.

To some, the age of the app has put us in a period of crisis. Jasanoff (2003, 2011) argues that changes in science and technology have not only benefited us by increasing our level of comfort, they have had other less savory effects: putting us at risk from what could be seen as “dangerous technologies,” using eugenics and other advances in biology to redefine what it means to be a person or citizen, creating a gap between the production and consumption of technological products, and so overwhelming us with information so as to paralyze us. Her solution, based on an historical analysis of the oversight of technology, is that it is time to reevaluate the role of government in this sphere, replacing current governmental absence with what she sees as a restored regulatory balance. Whether this is the best solution or not, the question remains how we are to move forward, and who should be responsible for our safety and well-being in matters technological. In the past we put our faith in governments, but despite the continued existence of a number of governmental science advisory councils, the onus of responsibility has shifted back to the private sector. As academics and private companies are as susceptible to bias as are government officials, this move seems more likely to bury than to solve the problem.

Interestingly, the U.S. government may be moving back to the center of regulatory debates for reasons totally unrelated to issues of responsibility and balance. For a number of years, government health-care systems (Medicare and Medicaid) have begun experimenting with technologies designed to increase medical efficiency while cutting costs. Now, as the Affordable Care Act brings more and more Americans into this market, efficiency of coverage is becoming more central to good health governance. Given the increasing availability of medical apps and related distance-health devices, these low-cost and potentially high-benefit devices will likely move further into the health-care mainstream. The government’s interest in patient home monitoring and its demand for universal electronic medical records (EMRs) are two examples of ways that medical apps could move from luxury or novelty to necessity for physicians and for the public at large.

For a number of years, insurance companies and telemedicine providers have studied the effectiveness of home monitoring for a variety of chronic health conditions, including Type 2 diabetes and hypertension. As monitoring these conditions can result in keeping people healthy and out of hospitals, private medical insurance companies have already recognized the potential benefits of integrating these sorts of systems into their programs. Groups like CSC provide remote medical technologies (including apps) being used by a variety of insur-

ance companies (Turisco and Harmon 2010). Now, with the promise of universal health care, the burden for paying for these services for largely underserved populations is going to fall to the government. As far back as 2005, the Centers for Medicare and Medicaid Services (CMS) produced a *Quality Improvement Roadmap* that had as one of its five foci a charge to help develop, evaluate, and implement health-care technologies to help improve efficiency and economy. In 2008, CMS proposed expanding its “hospital quality measure reporting program,” which tracks, among other things, hospital readmissions. Although there is no explicit mention of medical apps in this document, the discussion centers around measures designed to give discharged patients the tools necessary to keep them from needing to be readmitted to the hospital, potentially saving Medicare \$12 billion dollars annually. This is one thing a medical app can do, and rather inexpensively at that.

Currently, the use of home monitoring devices is being studied on an incentive-based model, and some groups are reporting positive results. For example, a 2012 Aetna study, based on Brennan et al. (2010), shows that the use of home monitoring equipment, coupled with targeted counseling, showed significant health benefits to African Americans, a group that has historically suffered from higher rates of untreated hypertension. As apps make home monitoring easier and more convenient than bulky alternatives (noted by Jimison et al. 2008), there is little question that as home monitoring becomes more common and inexpensive, medical apps will be a major delivery system for these data.

Likewise, as health care becomes more and more expensive, and as the real benefits of preventative medicine are recognized by the government, incentives could eventually become requirements, and remote monitoring of health could be a mandated part of the American health-care system. Going beyond checking hypertension and monitoring blood glucose levels, it is an easy step to imagine that a wide array of home monitoring devices could be set up in every home, providing data that would replace the reports given by patients during visits to their doctors. Granting that patients may not always be truthful about their habits to medical professionals, this demand for cost savings and accurate data may be seen by many as being offset by a dangerous infringement on privacy.

Despite the fact that some medical apps are capable of dispensing general advice (such as ways to lower blood sugar) based on entered or captured data from the user, and despite calls to lower medical costs by introducing medical technology, fortunately there has been no argument to date that medical devices should take the place of trained medical staff. Brennan et al. (2010) focus on the efficacy of apps in combatting hypertension in their target group, but only in conjunction with direct contact with medical support staff by phone. Similarly, arguments for expanded remote monitoring are being made to give medical professionals access to more medical data, improving patients’ lives by monitoring chronic conditions or quickly providing medical professionals with background information when immediate interventions are necessary. Parer and

Hamilton (2010) introduce a new system for interpreting fetal heart rate data by showing the relative parity between the evaluations made by a group of experts and by a computer using PeriCALM Patterns software. Granted, medical technology is not in any way ready to replace medical professionals for technological reasons. However, even if there were a strictly technological barrier that could be brought down, there are still good questions about whether technology could replace human medical staff. Critics note there may be something special about human judgment and question whether our accounts of human judgments can be replaced by neuro-computational accounts of behavior (Davis 2012; McCauley 1996). In any case, whether as a matter of practice or principle, from the consumer's perspective, medical technology is being promoted as an outside consult, not as medical outsourcing.

In addition to moving into the American home, medical apps will also play an expanding role as America shifts over to EMRs. Title 13 of the 2009 American Recovery and Reinvestment Act stipulates the creation of a national "Health Information Technology" program. The HIT system is designed to incentivize government and private-practice physicians to convert to an EMR-based system. In 2013, Medicare providers were tasked to implement "meaningful use" EMRs by 2014, with the goal of full implementation by the American medical system (public and private) by 2014. To reach this goal, the CMS is using both carrot and stick. The last year that participants in this incentive program could join to gain the maximum benefit was 2012, and professionals who do not implement an EMR system by 2015 will begin to be penalized by payment adjustments downward of up to 5%. Further, in addition to the payment adjustments that violators will incur for not adopting EMRs by 2015, CMS wants to "promote" e-prescribing using a similar model (Ford et al. 2009). Although non-CMS providers are not currently being forced to adopt EMRs, the blending of private and government health care promises to make opting out more and more difficult in the coming years.

As health-care providers and administrators are forced to meet these goals, app developers will continue to build platforms to fill these gaps. Currently a number of companies, including TotalMD medios and Waiting Room Solutions, have created a wide variety of tablet and phone-enabled apps to act as a "front end" for physicians' offices, allowing them to add to and access EMR data. As EMR standards change and as the EMR system grows, medical caregivers' needs for portability will demand that medical apps grow as well.

#### OVERSIGHT

Are there good grounds for trying to force a change in direction with medical apps? The fact that conflict of interest has (for the most part) not been a part of the discussion about medical apps helps to prove a point mentioned by a number of philosophers of science, that when people encounter a new technology,

it is impossible to predict which issues will come to the fore. In fact, another way to engage the issue of trust and oversight is to ask whether we have the right to interfere in this sphere at all. To some, it is difficult to separate creator and creation. As we have merged more and more with our technologies, we may have lost some ability to step back and reevaluate their utility or morality:

Technologies do much more than merely extending and strengthening the abilities and capacities that human beings already possess, or highlighting and enlarging specific aspects of the world. Technologies always connect human beings in specific ways to the world and in doing so they help to shape both the character of human existence and of the world in which it plays itself out. What technologies afford us; how they connect us to the world and what world they connect us to, points to a fundamentally non-transparent human-technology relation. Technologies do not extend human beings, but rather help to constitute them. (Kiran and Verbeek, p. 419)

Whether on an esoteric level or as a matter of fact, questions surrounding whether we can separate ourselves from technology have no easy answers. Professionals in a number of highly specialized fields, including medicine and law, no longer think of technological adjuncts as optional or as luxuries. These are necessary tools of the trade. In fact, the metaphors used by these professionals show how connected (or interconnected) people are with these devices, routinely arguing that they can no longer do their jobs without the aid of their “peripheral brain” (see, for example, Linn 2012). Although this talk is often in jest, the fact is that health professionals are forced to work with a rapidly increasing and changing data set, and as they become increasingly dependent on these technological adjuncts, they themselves are questioning whether they are really in control of their information, and whether their job as doctors has changed. Where doctors used to be thought of as a source—if not the sole source—of information about human health, now they need to be able to sift and evaluate competing diagnoses, treatment protocols, and drug regimens, many being brought to the office by an increasingly engaged patient population well informed by medical apps and health information websites. Whether medical apps help respond to this problem or whether they are its cause is a good question.

As humans have created and interacted with technology, we have changed in immeasurable ways. In the past, scientists used microscopes to radically change our perspective about the nature of disease, and the current generation of medical professionals is extending our lives via a wide array of technologically based diagnostic tools, including apps. Although some lament changes in their daily lives that have come with the rise of new technologies, would anyone really want to return to a simpler age? Would it be possible to imagine putting these technological genies back into their bottles?

Rather than arguing that we have no ability to act on new problems, other ethicists demand that we engage fully in our present, changing our policies

dynamically as problems appear. Mitchell and Streeck (2009) believe that the solution to uncertainty about the future is to expect the unexpected:

Adaptive management in place of “predict-and-act” models introduces flexibility to respond to both new situations and new knowledge of the situation. Where we cannot predict, we should not pretend to know what the future will hold. As noted, we cannot even reliably assign probabilities to future conditions. Our understanding of what will happen next needs to be updated regularly. Monitoring and adjusting regulations in light of dynamically changing conditions is a better match to the kind of complexity found in the social world than expectations based on a time honored paradigm of simple, linear, deterministic models. Surprises, ironically, should be expected. (pp. 7–8)

However, this goal is by definition elusive at best. Even relatively straightforward issues, such as conflict of interest, may be missed, and only seen as relevant in hindsight.

Second-guessing every move is all but impossible. However, many legislative and regulatory bodies have studied and in some cases adopted a more conservative alternative, the precautionary principle (PP). This principle, that there are times when we need to make decisions about the potential harm of a particular piece of technology in the absence of sufficient data, argues that waiting until the facts are in would result in needless deaths and suffering. Instead, we have a responsibility to err on the side of caution. This move has been argued for a number of reasons, one of the most interesting (from a philosophical point of view) being that there are times when the science is insufficient, and in those situations, risk analysis is simply not up to the task of protecting ourselves from ourselves:

When the bounds of the possible outcomes are not known and no credible ground exists for the quantification of probabilities, and ethical dimensions of inter- and intra-generational equity are at stake, the other decision principles fail to satisfactorily address these problem characteristics. For exactly these cases, the PP offers a rational alternative. Because the PP applies to those cases where serious adverse effects and surprises can occur with an unknown probability, it is rational to follow a “better safe than sorry” strategy. Failing to take precautionary measures in a timely manner could result in devastating and irreversible consequences. Such consequences might have been avoided by proactive and anticipatory interventions whose costs are justifiable in comparison to the damages and losses that could occur. (COMEST 2005, p. 29)

The charge that traditional risk analysis is not up to the task of dealing with ethical problems depends on a straw man account of risk analysis. If the precautionary principle advocates are to be believed, anyone who believes in the merits of risk analysis must be unaware of the array of values that inform their practices and analysis.

If risk analysis actually was based on this view of science, then the precautionary principle might seem a viable alternative. However, philosophers interested in ethics and public policy have been thinking about the roles a variety of values play in scientific practice for decades. For example, in the middle of the 20th century, philosophers such as Carl Hempel (1966) attempted to keep so-called non-epistemic values out of scientific practice, only acknowledging their presence when hypotheses were suggested, and never when they were being tested. However, philosophers of science such as De Melo–Martin and Intemann (2012) now understand that values play a role in science, and their interests are in finding out how values and judgments impact scientific practice:

Although a growing body of literature has called attention to the role of non-epistemic values in science, many scientists still work under the assumption that scientific claims should be kept separate from value judgments, even when the scientific claims are relevant to informing public policy, and where risk assessment is involved. Presumably, scientists fear that if non-epistemic values are allowed to enter into play, they will lead to bias. Thus, disagreements that arise among scientists are generally thought to be merely empirical or methodological disagreements. While this can sometimes be the case, it is not always so. We have argued that interpretations of empirical data are tightly bound up with a variety of value judgments. (p. 67)

De Melo–Martin and Intemann are well aware that allowing these value judgments into science (or admitting that they are already present) will have an impact on the direction of scientific inquiry. Arguing against past accounts (including Longino 1990, 2002) that have argued that particular groups' values might play differentially constructive (read, scientific) roles in reasoning, they understand that experts bring their biases with them to the table, and that eliminating interested parties from their fields of expertise would be impossible. If interest is, therefore, a necessary part of science, then disclosure can only be possible when these biases are explicitly made a part of the discussion.

Rather than focus on whether particular sorts of values present roadblocks to good reasoning, Hansson (2007b) claims that our focus should be on specific problems at specific times. When it comes to risk analysis, scientists and regulators are interested in one thing:

We need a framework for argumentation that increases our ability to come up with risk decisions that we are capable of defending even if things do not go our way. Such a framework can be obtained by systematizing a common type of argument in everyday discussions about future possibilities, namely arguments that refer to how one might in the future come to evaluate the possible actions under consideration. (p. 638)

Calling this view “hypothetical retrospection,” Hansson (2007a, 2007b) believes that thought experiments are ways to develop more defensible rational argu-

ments for potentially risky decisions. He argues that standard risk assessment and the precautionary principle fail to protect us on the one hand, or allow us to make any decisions on the other, by focusing in terms of ideal/best-case scenarios. Alternatively, by studying possible answers to a known problem from the perspective of hypothetical future end states (a sort of inverted equifinality), Hansson believes that he can replace the aforementioned abstract ideals with concrete solutions. By focusing on the agents' values at the time of the decision, his goal is to choose between possible outcomes to find the one that would be best (or most morally acceptable) through the full range of hypothetical futures. Whether he can escape from the added task of being able to come up with all of the possible futures needed for this analysis, or whether any of the other alternatives mentioned above is a good starting point, the issue here is that philosophical writings on risk (as on conflict of interest) would help to work toward an answer to these questions.

Medical apps may at present appear to be risky technologies. But a literature review as outlined by Hansson would not merely be a matter of theoretical naval-gazing. It would have a real impact on developing well-reasoned reactions to these new technologies.

### CONCLUSION

The goal of this paper has not been to determine whether medical apps are safe or suspect. The purpose has been to argue that that there are interesting connections to be made between ways of thinking about medical apps in the press, in scientific journals, and from the point of view of regulatory bodies on the one hand, and in philosophical writings about technology, ethics, and social problems on the other. It is, of course, hard to find app-les to compare here. Whether this is because medical apps are still relatively new, because they have not yet been seen as a significant threat to the medical community, or because philosophers have not thought about medical apps when they have thought of COI or risk analysis, this is a discussion that should move forward by all of these interested parties.

If there are connections to be made, the final question is whether philosophical arguments on science and values, technology, and public policy can substantively add to the discussion, if not solve these problems. As risk does not seem to be a problem that is waning, and as accusations of conflict of interest similarly are on the rise, the role of philosophy here may be open for debate, but this is a debate well worth having.



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