This section features original work on the ethical, legal, policy, and social aspects of the use of computing and information technology in health, biomedical research, and the health professions. For submissions, contact Kenneth Goodman at kgoodman@med.mimai.edu.

How Should Health Data Be Used?

Privacy, Secondary Use, and Big Data Sales

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Abstract: Electronic health records, data sharing, big data, data mining, and secondary use are enabling exciting opportunities for improving health and healthcare while also exacerbating privacy concerns. Two court cases about selling prescription data, the *Sorrell* case in the U.S. and the *Source* case in the U.K., raise questions of what constitutes "privacy" and "public interest"; they present an opportunity for ethical analysis of data privacy, commodifying data for sale and ownership, combining public and private data, data for research, and transparency and consent. These interwoven issues involve discussion of big data benefits and harms and touch on common dualities of the individual versus the aggregate or the public interest, research (or, more broadly, innovation) versus privacy, individual versus institutional power, identification versus identity and authentication, and virtual versus real individuals and contextualized information. Transparency, flexibility, and accountability are needed for assessing appropriate, judicious, and ethical data uses and users, as some are more compatible with societal norms and values than others.

Keywords: confidentiality; health data privacy; health records; secondary use; big data; data mining; pharmaceutical marketing; *Sorrell v. IMS Health Inc.*; *R v. Department of Health, Ex Parte Source Informatics Ltd.*

Introduction

Electronic health records, data sharing, big data, and secondary use of health data enable exciting opportunities for improving health and healthcare. They also contribute to new concerns over privacy, confidentiality, and data protection. Two court cases, one in the United Kingdom and one in the United States, provide opportunities for thinking through ethical issues related to these developments. Each case involved selling data for marketing prescription drugs, and in each case the court decided in favor of selling the data. However, the cases were decided on different grounds, raising more general issues of secondary use of health

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data and the growth of health-related databases, data sharing, data aggregation, and biometric identification.

Significant health data protection, policy, and ethical considerations are inherent in these cases. The cases call into question just what constitutes "privacy" and "public interest," and considerations for balancing them. They provide an opportunity to weigh privacy against the numerous beneficial uses of data: for individual patient care, public health, research, biosurveillance, and marketing. The cases prompt ethical questions of commodifying medical information and of harmonizing policy across jurisdictional boundaries. They raise concerns of how health data can, and should, be used. Their consequences may affect biomedical informatics, patient and provider privacy, and regulation in ways this article explores, both in the United States and elsewhere.

How health data can, and should, be used is at the intersection of public health, research, care, privacy, and ethics. This article provides an ethical analysis of these interwoven ethical issues involving appropriate, judicious, and ethical secondary data use, reflecting a more general discussion of big data benefits and harms, and touching on common dualities of the individual versus the aggregate or the public interest, research (or, more broadly, outside the health field, innovation) versus privacy, individual versus institutional power, identification versus identity, identification versus authentication, and virtual versus real individuals and contextualized information.[1]

I start by discussing what makes health data special, including international consensus on the importance of the clinician's duty of confidentiality and on health data privacy or protection. Next I summarize the court cases. Then I consider who benefits from data disclosure and aggregation, and secondary use for data mining, research, and sale. Throughout, I highlight potential benefits and harms and argue that transparency, flexibility, and accountability is needed. Ethical and policy analysis should assess data uses and users, as some are more compatible with societal norms and values than others.

Considering how health data should be used in light of these issues suggests policy opportunities concerning patient data and privacy protection. As the use of electronic health records, electronic medical devices, mobile and e-health applications, and biometric, social and behavioral, and genomic data spreads, these considerations are becoming more relevant worldwide.

What's Special about Health Data?—International Principles

All countries recognize confidentiality as a patient's right[2] that is good for individual patients and clinicians, and for society as a whole.[3] Intimacies are revealed in the interest of good healthcare, so clinicians' professional and fiduciary duties include a duty of confidentiality. Therefore, health information is given special protection internationally, though specific ways of achieving it differ. Lifestyle choices, reproductive abilities, and stigmatizing conditions are considered highly sensitive. But what is included in these categories differs with cultural background, from place to place, and from time to time. What is considered very private, embarrassing, stigmatizing, or grounds for discrimination varies among individuals and groups.[4] Countries, likewise, vary in what personal information is treated as needing restricted collection, use, and disclosure.[5,6] They also balance privacy and other considerations differently; thus privacy protection is more lax in some places than in others. In India, for example, the judiciary considers

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privacy on a case-by-case basis, as an exception to the rule that permits government interference in private life. Unlike in Europe and the United States, public interest, welfare, and safety take precedence over individual rights, liberty, and autonomy.[7]

Yet, as discussed subsequently, even if individual clinicians scrupulously meet the professional obligation of confidentiality, confidentiality can be compromised by legal requirements to collect, document, and disseminate personal health information, especially when maintained in computer databases that can be combined easily with other sources of information about the person.[8] What patients reveal for the purpose of healthcare may then be used in ways they never intended. Privacy practices have not caught up to these trends.

Fair Information Practices and De-Identification

The same Fair Information Practices(FIPs) underpin privacy policies in both the European Union and the United States. The European Union and the United States each protect personal data, including data concerning health, albeit differently.

The United States approaches privacy by sector; separate laws address confidentiality in distinct domains, such as finance and healthcare. Health data privacy collected in the course of clinical care is governed by the U.S. Health Insurance Portability and Accountability Act (HIPAA) of 1996, extended by the HIPPA Privacy Rule in 2001 and again in 2013 by changes mandated by the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act (part of the American Recovery and Reinvestment Act [ARRA] of 2009) and the Genetic Information Non-Discrimination Act (GINA) of 2008.[9,10,11]

The European Union takes a more comprehensive general approach to privacy; Article 8 of the European Convention on Human Rights includes the right to data protection. This right is embodied in the 1995 Directive 95/46/EC on the Protection of Individuals with Regard to the Processing of Personal Data and on the Free Movement of Such Data.[12] Member states implement directives differently, but the EU Data Protection Regulation establishes a single set of rules for data protection across the EU; the final texts are expected to be adopted by the European Parliament at the beginning 2016 and the new rules to become applicable two years after.[13,14]

Despite their differences, both the United States and the EU construe privacy ascontrol and protection of data rather than other conceptions of privacy.[15] Both the United States and the EU also make special note of health information, and both rely on stripping data of content presumed to identify the individual represented by the data. As Paul Ohm points out: "In addition to HIPAA and the EU Data Protection Directive, almost every single privacy statute and regulation ever written in the U.S. and the EU embraces—implicitly or explicitly, pervasively or only incidentally—the assumption that anonymization protects privacy, most often by extending safe harbors from penalty to those who anonymize their data."[16]

As these safe harbors stipulate, neither HIPAA nor the EU Data Protection Directive applies after data are de-identified. However, relying on de-identification contributes to what is considered an inadequate and problematic legal framework for data protection.[17] Addressing concerns over de-identification "would require a significant shift in approach towards data-protection across Europe."[18] Similar deficiencies plague the United States.[19,20]

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Privacy protection, then, depends not merely on de-identification but on expectations, transparency, and how data are used. De-identification, or anonymization, presumes that it is possible to identify and enumerate the kinds of data that might contribute to privacy risks and to specify how to prevent harms,[21] that such a list is static and sufficient in all contexts,[22] and that there are no privacy harms if the individual is not identified, even though individuals may object to uses of their personal data even if they themselves are anonymous.[23] Furthermore, HIPAA permits secondary uses of data for research, public health, law enforcement, judicial proceedings, and other "public interest and benefit activities," without individual authorization, thereby assuming that "public interest" is clearly understood.[24,25] All are questionable assumptions.

Duty of Confidentiality

Health data privacy relates not only to expectations about privacy in general but also to norms involving professional practice, privilege, autonomy, paternalism, and protected communication and the duty of confidentiality, as well as to requirements for data collection, dissemination, and retention.

Physicians and nurses have duties both to their individual patients and to the health of their communities.[26] At least since the time of the Hippocratic Oath, it is believed, societal norms and common law have recognized that clinicians' duty to patients includes maintaining confidentiality, except where protecting the public interest or other individuals requires overriding it. The International Code of Ethics of the World Medical Association (WMA) makes respecting the right to confidentiality a duty integral to a physicians' responsibility to patients.[27] The WMA Declaration of Helsinki—Ethical Principles for Medical Research Involving Human Subjects (revised 2013) places a duty on physicians "to protect the life, health, dignity, integrity, right to self-determination, privacy, and confidentiality of personal information of research subjects . . . even though they have given consent."[28]

Recognizing that this personal information, whether collected for research or clinical practice, increasingly is held in databases, in 2002 the WMA adopted the Declaration on Ethical Considerations Regarding Health Databases: "Confidentiality is at the heart of medical practice and is essential for maintaining trust and integrity in the patient-physician relationship. Knowing that their privacy will be respected gives patients the freedom to share sensitive personal information with their physician."[29]

In this 2002 declaration, the WMA reaffirmed that violating this duty could "inhibit patients from confiding information for their own health care needs, exploit their vulnerability or inappropriately borrow on the trust that patients invest in their physicians" while at the same time recognizing the value of secondary health data use for quality assurance, risk management, and retrospective study.[30]

Thus, a key reason for treating health data as requiring special protection is to maintain trust between clinician and patient in the interest of both social and public order as well as better care for each individual patient. In recognition of this ethical duty, confidentiality is seen worldwide as a health professional's legal duty, one that protects the professional from giving legal testimony, thereby serving the interests of patient and public by maintaining trust during medical encounters. Nowhere can private data about a patient rightly be passed to a third party without that patient's permission, except as required

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by law. French criminal law makes this universal spirit apparent by criminalizing a physician's breach of confidentiality even in court testimony, even if the patient would allow it.[31]

How people value and respond to concerns about health data privacy is affected by context and common expectations of privacy.[32] Many recognize that clinicians need highly personal information in order to care for them, and, because of the long-standing history of trust in professional confidentiality, such patients willingly share sensitive information with those who treat them. As Deryck Beyleveld and Elise Histed eloquently point out:

> Information that patients provide for their treatment is about very personal and sensitive areas of their lives. Indeed, it relates to their very existence, both physically and symbolically. As such, it is not information that they may be presumed to be prepared to disclose or have used freely. It is their vulnerability, constituted by pain and distress, or fears about their health and lives, that leads them to disclose this information to health professionals. At the same time, people are apt to attach great importance to intimate information about themselves and their bodies, and this can be associated with mystical and religious beliefs, which by their very nature can be idiosyncratic.[33]

Patient Benefits and Harms

Individuals also may provide health information freely via health-related social networking, web postings, and searches; or because it is required legally, as for prescriptions. Such information could be consolidated and linked with other data for beneficial or nefarious purposes, sometimes without individuals' knowledge. Patients benefit from having their record information available from previous clinical visits, whether or not those visits were with the same clinician or in the same facility, because clinicians can make better care decisions in light of fuller understanding of their patients' past clinical histories. Patients also benefit from public health surveillance and research that depends on combining health information from individual patients to improve public health and develop better treatments. Patients may benefit from making identifiable information concerning adverse drug events available to pharmaceutical companies so that those companies can follow up with patients and improve drug safety, as Source Informatics argued in the U.K. court case discussed subsequently, and as the International Pharmaceutical Privacy Consortium argues more generally.[34,35] Data aggregator IMS Health Canada (IMS Health, Inc., was a plaintiff in one of the court cases) unsurprisingly takes the position that analyzing doctors' prescribing habits contributes to patients becoming informed consumers.[36]

Yet patients can be harmed when data about them are used to violate privacy: to deny employment, credit, housing, or insurance, and for identity theft and other unsavory purposes. Some fear that patients who are insecure about the confidentiality of prescription or other health record information may withhold information, refuse diagnostic and genetic testing, or decline electronic prescriptions.[37,38,39] People do change their behavior and withhold information in order to protect their health information privacy.[40] Even before the widespread use of electronic health records, a 2000 Gallup poll indicated that the vast majority of people in the United States opposed third-party access to medical data without a patient's

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permission, and, furthermore, that 67 percent of those polled opposed the release of data to medical researchers.[41] Similarly, the Pew Internet and American Life Project reported that, to protect privacy, according to a 1999 survey, nearly one in six patients withheld information, provided inaccurate information, doctor-hopped, paid out of pocket instead of using insurance, or even avoided care. Eighty-five percent feared that seeking health information on the Internet would result in changes in insurance coverage or otherwise reveal their information.[42]

Transparency and Consent

As information resources become more ubiquitous and information sharing becomes more profitable, more thought is needed concerning which data uses are acceptable and what control individuals should have over data about themselves. Privacy violations may compromise patient care, the information in patients' records, and patient-clinician relationships. The principles of data protection—transparency, legitimacy, and proportionality—embodied in the EU Data Protection Directive, therefore, specify that the person from whom data are obtained should be informed of what will be done with this information and to whom it will be disclosed. This allows the individual to consent or object and to withdraw or correct the data. Also, according to the directive, the data should be kept only as long as necessary for the specified purpose,[43] even though that could compromise later retrospective research.

Patients' privacy concerns are exacerbated when patients, and even clinicians, have little idea of what becomes of their data, or just what is protected and what is not.[44] Withholding information from one's clinician is neither in the public interest nor beneficial to that patient's individual interest in proper healthcare. Yet, removing identifying information from patient records may not alleviate concerns, especially in light of increasing public awareness of privacy violations surrounding big data and the ease with which data sets that were meant to be kept apart now are combined and used for reidentification.[45,46,47,48,49] Further, without transparency, consent is meaningless.

Two Court Cases

Two court cases provide occasion for thinking about the ethical implications of data sale and secondary use in light of international principles of health data privacy and protection. Each case involves selling prescription data for pharmaceutical marketing. In both the United States and the United Kingdom, data aggregators successfully challenged restrictions on such data use and sale.

The 2011 U.S. Supreme Court case *Sorrell v. IMS Health Inc. et al.*[50] was decided on free speech grounds. Although the legalities involve unique features of U.S. constitutional law, a similar case in the U.K. in 2000, *R v. Department of Health, Ex Parte Source Informatics Ltd.*,[51] points to the international nature of the ethical issues. That case was decided on the grounds that selling anonymized (de-identified) data did not violate pharmacists' duty of confidentiality.

The decision in each case runs counter to public expectations of health data confidentiality. The public is hardly aware that aggregating and selling prescription and other health data are an international enterprise. Thus, the *Sorrell* and *Source* cases raise more general global concerns of privacy and data protection, on the one hand, and appropriate use and secondary use of data for data mining, marketing, research, public health, and healthcare,

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on the other. Elsewhere I address data de-identification, prescription and other health data aggregation and sale, and issues more specific to these two cases.[52] This article explores other ethical issues related to the cases—the benefits and harms of data sale; the trade-offs among privacy, individual health, and public health; and the need for transparency—so ethical dimensions of responsible and ethical health data collection and use can be assessed.

Who Benefits?

Clinical data include data that patients are required to provide to receive care. In both the *Sorrell* and *Source* cases, prescription data was aggregated and sold. Patients, prescribers, and pharmacies are required by law to collect information related to prescribing. Data aggregators perform a valuable service in collecting, cleaning, and combining these and other data into useful resources, though the value does not accrue directly to those who are the original source of the data. Data aggregators should be compensated for the value added, but the sources deserve some benefit as well. Currently, they primarily bear costs, both financially and in privacy.

The combination of required disclosure of personal data and the ease with which data can be collected and disseminated is not unique to pharmacies. It is a cost of healthcare to collect and store patient records, a cost passed on to patients and payers, whether private or governmental. The organizations providing these data obtain it from those legally required to provide it—from individuals who pay directly, or indirectly through their private or public insurers, for its collection and maintenance. These individuals gain little direct benefit from the aggregation and sale of data about them, and they may be harmed by it. It mostly occurs without their knowledge or permission. Even in light of arguments that patients should be required as a condition of treatment to allow data about them to be used for research—a requirement counter to professional norms to provide care—it seems improper to require either patients or clinicians to disclose data they would otherwise choose to keep private so that others may financially profit from them, whether or not the data are de-identified.

Secondary use and big data analytics also are affected by the costs of collecting, storing, and organizing data, as well as by the costs of meeting regulatory requirements. To reduce costs, health data processing is outsourced from countries with stronger privacy protections to countries with weaker ones, despite its sensitive nature and consequent privacy risks.[53] Also to reduce costs, U.S. marketing organizations oppose opt-in consenting on the grounds that it would increase the cost of doing business.[54]

But costs must be paid somehow. Both the *Source* and *Sorrell* cases were fought to protect the commercial value of health information. One way of recovering costs is by selling these data. Though some sources provide some data sets at little or no cost to researchers, cost could make it easier for pharmaceutical companies and other commercial enterprises than for researchers to access data.[55,56] Some fear that the trend toward treating data as private property could make it more difficult to develop comprehensive databases crucial for public health and research.[57]

Research, trade, and innovation, as well as the globalized healthcare industry, provide considerable public benefit. There are ethical as well as economic costs to privileging privacy, but economic value may not be more important than privacy or other considerations. Law and common ethical practice prevent

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releasing medical information without a patient's permission, but U.S. law does not prevent selling or transferring rights to records.[58] Data that can be sold, can be sold and replicated anywhere and, once sold, may be used for good or ill. Tracing the chain of data sales and use is difficult, making transparency and consent nearly impossible the further data are transferred from the original source.

Health Data Uses: Big Data, Data Mining, Research, and Biosurveillance

Electronic health records and health information networks provide a wealth of data for public health, health outcome improvements, and research. Data could be used for a range of beneficial purposes, from outcomes and comparative effectiveness research to designing clinical trials and monitoring drug safety. The benefits of these data for public health, marketing, research, drug development, identifying adverse effects, and biosurveillance; for reducing costs and overprescribing; and for regulating devices and software all are intertwined with privacy concerns. For some of these purposes, it is crucial to be able to identify individuals and link together an individual's records, so a requirement for de-identification may further impair research.

However, there also could be harms. Patients may withhold sensitive information if they fear it will be used against them, even though it may be useful for other purposes. Studies based on analyzing large data sets could be compromised if individual prescribers or patients withhold information or their consent for data use.[59]

Privacy advocates, researchers, and public health officials can be at odds over how to achieve benefits while protecting privacy; their disagreements may stem from different values and historical legacies. For example, the U.K.'s National Health Service (NHS), Royal College of Physicians, and the Wellcome Trust led a coalition of leading medical research organizations opposed to the proposed European General Data Protection Regulation, which, unlike the Data Protection Directive it would replace, would bind all 28 member countries. The proposal was acceptable to most EU nations; the European Parliament approved the committee report in full in 2014.[60]

The regulation affects any organization that gathers, processes, and stores data, whether operating within the EU, doing business with organizations within the EU, or storing data in EU-member countries. As of this writing, most organizations were not ready for compliance. Research organizations were among those concerned about its impact. It is especially relevant here that the regulation defined personal data as any information about an individual, whether it relates to his or her private, professional, or public life; and thus such data includes medical information. Much of these personal data—a name, a photo, an email address, bank details, posts on social networking websites, or a computer's IP address[61]—too, are part of medical records. The original proposed regulation, therefore, increased health data protection and would have made illegal the NHS mass database of citizens' health information, which could provide a valuable resource for improving care.[62,63,64] Opposition from the NHS and other research organizations contributed to changes put forward by the EU justice ministers in March 2015 to improve data sharing across healthcare services. They also tabled amendments regarding how to manage such special forms of data as health and genetic data, and when patient consent is needed.[65] The European Parliament, the Council, and the Commission agreed on the new regulation late in 2015 and it is expected to

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be adopted by the European Parliament at the beginning of 2016.[66]

This NHS database also provokes privacy concerns while providing financial benefit, as the NHS sells the data.[67] Individuals can opt out of the new care.gov database, which was to contain, for the first time, records from primary care (GP) practices. Privacy concerns delayed including those GP records.[68] Although other rules allow greater third-party access to other NHS databases,[69] insurers, pharmaceutical companies, and other private commercial enterprises will receive "pseudoanonymized" records that the NHS claims "will not contain information that identifies you," but that instead include NHS numbers, birth dates, postcodes, and ethnicity and gender information.[70] The database was created, according to the NHS England website, to improve NHS services,[71] and to "drive economic growth by making England the default location for world-class health services research."[72]

In the United States, too, researchers and bioethicists recognize that privacy protections can impede research and healthcare quality improvement, with calls from such influential agencies as the Institute of Medicine to change the HIPAA Privacy Rule to allow for information-based research—that is, research using medical records or stored biological samples.[73]

Some innovative approaches to meeting privacy, research, and commercial needs for data sharing include the new international Open Humans Network, which "attempts to break down health data silos through an online portal that will connect participants willing to share data about themselves publicly with researchers who are interested in using that public data and contributing their analyses and insight to it,"[74] and businesses based on similar ideas, such as PatientsLikeMe. Using the data people post, PatientsLikeMe produces publishable material on patient outcomes and comparative effectiveness, which is valuable for effectiveness research. Epidemiologic trends also can be identified through social media postings.[75,76,77] Those engaging in this social networking presumably feel it is beneficial to them. Even so, it would be better if they were aware of what is done with their data, instead of being surprised if they have not read subscription agreements carefully enough to know that PatientsLikeMe sells data to pharmaceutical and other companies and that sites such as Facebook are not private places.[78,79]

Who Sells and Uses Data? One Man's Bread is Another Man's Poison

As is evident from the multiplicity of uses, health data are valuable. Internationally, the idea of "liberating" data for secondary use is recognized as beneficial for individual and public benefit, research, entrepreneurship, and policy. Though transborder data flow is regulated by international agreements, such as the EU Data Protection Directive, presumably health data could be sold worldwide, to anyone, for any purpose. Balancing this with privacy concerns is fraught.[80] Strong privacy protection, such as the rights-centric approach of the European Court of Human Rights, could adversely affect the globalized healthcare industry, and innovation and trade.[81,82,83,84]

Entire patient records are among the many possible sources of data for which there is a lucrative market, for laudable as well as unsavory purposes. Incidents of medical identity theft increased by more than 20 percent in 2014 compared to 2013.[85] In the active black market in identifiable medical record information, health information is more valuable than U.S. Social Security numbers for identity theft.[86,87] Though prices vary, such information sells for about ten times

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more than credit card numbers (which typically sell for no more than a few U.S. dollars) because it can be monetized by getting treatment paid for via identity theft or to extort money from hacked corporations.[88,89]

Electronic records also make it possible for computer or software vendors, intermediaries, or newly created organizations to bundle and sell rights and data,[90] a practice useful for research, policy, marketing, and business. In the United States, there is an exhaustive list of organizations that can use and legally sell health information,[91] some for purposes patients and clinicians would not anticipate. Data sold by both U.S. state and federal agencies can be linked to individuals by using publicly available information, even if some of the data are de-identified.[92,93]

Some may consider what is done with these data as harmful to some of the individuals who have provided the data and, at the same time, as beneficial to other individuals, depending on what the data reveal. This combination of benefits and harms is evident in a variety of examples in which one's records affect one's services and costs. In the United States, where private medical insurance is the norm, private insurers use prescription and other claims data to deny insurance, charge differential premiums, or exclude some conditions.[94] Businesses often check the MIB (Medical Information Bureau) for job applicants' underwriting data.[95] Aggregators purchase and combine data from the states as well as from pharmacies.[96] Credit agencies are the most frequent buyers of multistate health profiles, though IMS Health also purchases data from the states.[97] Government fusion centers, designed to promote data sharing among federal agencies and state and local governments, combine data from multiple sources—including health record information—for law enforcement, immigration control, and homeland security.[98,99]

Organizations, too, may benefit financially while providing social benefit through data sales. The American Medical Association and the U.S. Centers for Medicare and Medicaid sell provider data, whereas state Health Information Exchanges (HIEs) sell secondary data.[100,101,102] The U.K.'s National Health Service, too, sells data.[103] Insurance companies or health information technology vendors might aggregate and sell provider-identified data on performance and quality measures, the number of procedures performed, U.S. meaningful use criteria, data security breaches, and other useful compilations. Cash-strapped community health organizations, state Regional Extension Centers (RECs), county hospitals, the U.S. Veterans Administration, the Indian Health Service, the Joint Commission, or hospital associations also could sell data for similarly beneficent purposes. Hospitals routinely sell birth records.[104]

Genetic data are also double-edged. Such data are needed for research, personalized medicine, and biobanking but also can make individuals and communities vulnerable. For example, in 2000, Iceland's parliament sold exclusive rights to all the genetic and genealogical data from each of its 275,000 citizens to the U.S. company deCODE Genetics. Soon thereafter, deCODE signed a $200 million contract with Hoffman LaRoche to search for several common human genetic diseases. Iceland had an opt-out policy, and the data were encrypted to de-identify individuals. Nevertheless, the Icelandic Supreme Court later ruled that creating the database was unconstitutional because it did not adequately protect personal privacy.[105]

Clearly, provider or patient information is valuable. Hospitals could purchase

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data about competitors, providers could identify populations for treatment, researchers could conduct studies involving healthcare and public health practices, and government agencies could identify and influence health trends. If such sales were restricted, some fear, the data would not be collected or maintained at all, which could compromise research and new drug development.[106,107] The Iceland genetic database sale, for example, led to identification of genes linked to disease,[108,109] though capitalizing on these kinds of discoveries was limited to the company with exclusive rights to this gene discovery. DeCODE's 2009 bankruptcy and the consequent database ownership change from a scientific research company to Saga Investments LLC, and the subsequent sale of the database in 2012 to biotech pioneer Amgen, again raised questions about data privacy and use.[110,111]

Countries as different as Canada, Estonia, Sweden, Singapore, and the Kingdom of Tonga have developed various models for protecting privacy and differing policies regarding commercial involvement and rights to samples for gene banks, all with the goal of improving the public health of the studied population, and, in some cases, to generate revenue for national healthcare budgets. Though all these policies are intended to maintain confidentiality, all of the data uses require personal identifiers so as to link individuals' records from genetic, medical, genealogical, and lifestyle databases. International controversy over such databases, therefore, centers around confidentiality, consent, to what extent commercial interests should influence policy, and whether commercial ownership facilitates or impedes research,[112,113,114] all of which are concerns related to collecting and selling healthcare data in general.

As a way of raising additional considerations, I pose possibilities that might occur were there unrestricted selling of health data. Abortion opponents presumably could buy aggregated prescription information for medications that cause abortions, or animal rights activists could buy information about researchers' animal or veterinary medicine purchases. Depending on who buys it and their purpose, such information could threaten or protect researchers', clinicians', and patients' safety and might have adverse effects on research and clinical practice or might open new avenues. Physicians, patients, hospitals, and so on, in one country may be targeted for marketing by commercial ventures or medical tourism facilities in another. Some may welcome learning of such opportunities, whereas others may feel harassed or violated. Individuals in one country may experience salutary or salacious effects from having (identified or possibly re-identified) data available elsewhere. But without transparency, there is little chance of gaining individual consent or, on both individual and societal levels, assessing harm or benefit.

Ownership, Commodification, and De-Contextualization

The right to sell data is muddied by lack of clarity over the legalities of data ownership. Law in and outside the United States does not address health data ownership clearly; it is not clear who the owner should be, or whether ownership is better than current or alternative approaches.[115,116] It also is not clear where those who sell data analytics services obtain the data, or how they might use them.[117] Well-known electronic health record vendors have sold de-identified copies of their patient databases to pharmaceutical companies, medical device makers, and

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health services researchers.[118] Vendor contracts are unusual in that some vendors lay claim to patient record data, whereas businesses and financial institutions typically do not give up their data to their software vendors.[119] Regardless of whether the data themselves or the means of access to them are owned by electronic health records vendors, some academic medical centers pay to get data from their own patients' records. Vendors often consider their contracts intellectual property and do not reveal these and other contract provisions, a practice the American Medical Informatics Association considers unethical.[120]

If health data are property, presumably, whoever owns the data can sell them. Some advocate clearly defined property rights in medical information, giving patients the right to monetize their access and control rights, as a way for individuals to control and benefit from what happens to data about them.[121] Others argue against property rights in patient data and advocate instead for public ownership akin to a data commons so that data from multiple sources can be de-identified and combined population-wide for public benefit.[122] Commodifying medical information strikes still others as anathema to professional values and the special relationship between doctor and patient. Privacy is valued because it facilitates ideals of personhood involving autonomy, individuality, respect, dignity, and worth as a human being.[123] Therefore, the idea of selling personal health data also disturbs those who think the practice commodifies the self and sullies ideas of personhood.[124,125] Compromising of personhood is compounded because data in databases necessarily are decontextualized. De-identification is an attempt to remove any connection with the person, but even identifiable health record data typically do not include all information a person may consider central to the self.

Conclusions

Widespread use of electronic patient record systems enables opportunities to improve healthcare through data sharing, secondary use, and big data analytics. Multiple healthcare professionals, payers, researchers, and commercial enterprises can access data and reduce costs by eliminating duplication of services and conducting research on effective care. However, widespread use of electronic patient records systems also creates more opportunities for privacy violations, data breaches, and inappropriate uses.

Ethical and policy analysis related to health data and informatics should consider benefits and harms, taking into account both the uses and users of the information.[126,127] Embarrassing an estranged spouse by publishing his or her mental health records is more distasteful than using those records combined with others' to study and improve mental health. As this example suggests, some users (the researcher) are more appealing than others (the spouse). Moreover, an uncontroversial use may be morally offensive if the user is unsavory or controversial.[128] How should distinctions be made so that some data uses and users are permissible and some not? On what grounds? And who is best placed to make such decisions: the courts or legislators, clinicians and researchers who are most familiar with their data needs, companies that develop and market new medications, or patients and prescribers, who are most affected by privacy violations and can best weigh the relative importance of various values to themselves.[129]

Those most familiar with, closest to, and affected by the potential use should have a strong say. They need to know

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about those uses, though, to express their preferences in an informed, thoughtful way. Many patients do not know what is, or can be, done with data about them, but keeping them ignorant is not the way to address concerns. Lack of accountability and transparency about health data uses feeds the public's privacy concerns,[130] undermines the possibility of informed consent, and impairs research, care, and public health.

Ethical considerations over data use will, and should, evolve as the public becomes more aware of the value and pitfalls of data sharing, data aggregation, and data mining. Cases like *Source* and *Sorrell* encourage debate over propriety and values related to different kinds of data use. They also lead to examining when it is in the public interest for personal health data to be made available, just what that "public interest" is,[131,132] and, for that matter, just what "privacy" comprises and entails as norms evolve.[133] The issues include considering, in a healthcare context, the dualities playing out with respect to big data in domains other than healthcare: the individual versus the aggregate, research versus privacy, individual versus institutional power, identification versus identity, identification versus authentication, and virtual people versus real people and contextualized information. They involve big data harms and benefits related to innovation and economic advancement, power shifts, access to knowledge, and freedom of communication.

Societies and governments need to grapple with these ethical issues, tensions between privacy and other considerations, and shifting norms. The numerous cross-cutting issues suggest that other areas of law, ethics, and social policy also can inform related ethical and legal considerations. For some time, the legal, bioethics, and informatics communities have been considering issues such as appropriate secondary use of data; patient and clinician relationships in light of the growth of electronic health records and health information technologies;[134,135,136] reliance on increasingly untenable de-identification; burgeoning electronic data collection, sharing, transmission, and aggregation; data use for public health, research, and innovation; and the privacy and security of health data.

As health information exchanges and health tourism develops; as lifetime electronic health records that follow patients across governmental and institutional boundaries are used more widely; as databases grow and biobanks become digital; as biometric identification becomes more common; as radio frequency identification devices (RFIDs) are embedded in medical devices, smartpills, and patients; as home sensors and monitors are increasingly used; as mobile, wearable, and e-health applications expand; and as health information exchanges develop,[137,138,139,140] informaticians can add to the conversation among governments, courts, regulatory agencies, professional societies, and other organizations to consider responses to issues involving health-related data. Combining legal and ethics scholarship with informaticians' expertise concerning judicious and ethical data collection and use, together with their technical knowledge of data aggregation and identification, can contribute to more informed policies.

The *Source* and *Sorrell* court cases can provoke an initial reaction of outrage over privacy violations and data use without consent. Consequently, they call into question just what constitutes "privacy" and "public interest" and stimulate considerations as to how to balance them. They provide an opportunity to weigh privacy against numerous beneficial uses for data. Transparency and accountability are needed so that

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harms and benefits can be judged through public discussion and so that individual as well as societal decisions can be made on more informed and thoughtful grounds. Using data collected for one purpose (such as prescriptions) for another purpose (such as pharmaceutical marketing) can undermine public confidence, especially if the public is unaware of the reuse. Doing so without individuals' permission violates international principles of data privacy.[141,142,143,144,145] The court cases prompt ethical questions about commodifying medical information and harmonizing policy across jurisdictional boundaries. Their consequences may affect biomedical informatics, patient and clinician privacy, and regulation in ways this article explores, in the United States, United Kingdom, and elsewhere.

Notes

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