Over the last 2 decades, the US health care system has experienced an explosion in health information technology (health IT) and other technological innovations designed to support health. This paper explores primary care health IT deployment to date, its shortcomings in support of the nation’s Triple Aim, and offers strategies and tactics that family medicine could pursue to improve the utility of health IT for primary care through Family Medicine for America’s Health (FMAHealth) and other initiatives. Beyond health IT, this paper then discusses the broader options for family medicine in addressing the need for new technologies to ensure that these serve primary care physicians and their patients well.

Health IT

An overwhelming majority of US primary care practices and hospitals now use electronic health records (EHRs), and there is evidence of increasing consolidation and focus on interoperability. However, policy

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matters of science and technology) who advise the US government on
ciency overall.

EHRs have reduced physician effi
tion for clinical decision support and
for sharing data.6

Much of the core functionality of
current EHRs was driven by pay-
ment systems designed during the
era of paper-based medical records.
EHRs effectively collect the data
needed to substantiate payments; how-
ver, most EHRs fail to capture
clinical data in the best format to
truly measure and then improve
care delivery. Thus, clinicians are
inundated with EHR data but do
not have effective tools to aggregate,
translate, and assimilate data into
useful formats for informing and im-
port during patient care, or support
health IT in the United States.”

To address some of these short-
comings, the US Department of
Health and Human Services (HHS)
has tried to standardize essential
EHR functions under the umbrella
of the certification program of the
Office of the National Coordinator
(ONC) for health IT. ONC’s certifi-
cation program requires practices
that participate in the Centers for
Medicare and Medicaid Services
(CMS) EHR incentive programs to
purchase and implement “Certified
EHR Technology.” While this added a
significant financial burden for many
practices wanting to upgrade (eg,
from “2011 Edition” certified prod-
ucts to “2014 Edition” certified prod-
ucts), it is unclear to what extent
these upgrades will improve prima-
care practice and patient health.

In general, primary care has
been unable to sufficiently influence
health IT policies and standards to
better support important primary
care functions despite compelling ar-
uments and recommendations.14,15

Several of the FFM recommenda-
tions regarding information sys-
tems in health care have not been
met;6 however, some progress has
been made. For example, the Amer-
ican Academy of Family Physicians
(AAFP) Center for Health Informa-
tion Technology was a response to
the FFM call for IT advocacy. The
Robert Graham Center received fed-
eral funding to help identify options
for harmonizing primary care data
standards.14 The North American
Primary Care Research Group cre-
ated a health IT committee in response
to FFM, which published important
statements about how to improve
health IT functionality to support
primary care practice and research
(Table 2).15 Some family physicians
have been using innovative health
IT tools to deliver better care to
populations and to partner with pa-
ients in doing so.16-18

More recently,

Table 1: Themes From the JASON Study1

- EHRs and health information exchanges (HIEs) are currently woefully inadequate in what they provide to health care professionals.
- Data collection interrupts workflow and needs to be made less intrusive.
- The level of interoperability set forth through the CMS Meaningful Use criteria, as a result of the HITECH Act, is too low to drive meaningful progress.
- Innovation in health care appears to be frozen by a deluge of overly ambitious, insufficiently practical, and often conflicting advice.
- Vendor proprietary issues are a barrier to interoperability and innovation.
- There are a plethora of standards and national deployment organizations but none that might be regarded as a consensus for adoption.
- A HIE infrastructure that will support research has not yet been identified, and current efforts toward this infrastructure may have the opposite effect.
- EHRs should not be things that one buys but rather things that evolve through cultural change aided by technology.
- It is desirable to have a continuous rather than episodic personal health record.
- At present, HIEs are largely seen as replacements for fax machines.
Table 2: Critical Primary Care Needs of Electronic Health Records

| 1. Enhancing the extraction, interpretation, and prioritization of critical health information for individual patients and a physician’s patient panel. |
| 2. Advancing information exchange to coordinate care across clinicians and settings. |
| 5. Reduction in documentation burden. |

The American Board of Family Medicine (ABFM) launched the Trial of Aggregate Data Extraction for Maintenance of Certification and Raising Quality (TRADEMaRQ) study with support from the US Agency for Healthcare Research and Quality (Grant 1R21HS022583-01A1), which creates a receptor site for the exchange of quality metrics based on EHR data from family physicians. The ABFM will soon launch the Data Abstraction Intelligence Quality Engine for Research and Improvement (DAIQUERI), an active data extraction to help pull data from family physician EHRs and turn it into clinically actionable information for practices and a means to exchange data for quality improvement. TRADEMaRQ and DAIQUERI will form a registry for the specialty, which promises to help overcome some of the shortcomings of current EHR technology.

Building on foundational FFM efforts, family medicine is poised to provide leadership to guide the design and implementation of health IT. This is an opportune time to again think strategically about an organized approach to family medicine’s efforts around health IT advocacy and evolution. While EHRs and other information systems dominate the technology landscape for many physicians, there are a number of other technological innovations that have come onto the scene and have great potential to improve primary care practice and patient health.

**Technology Beyond Traditional Health IT**

Patients want their health information, better access to their care team, and simple everyday tools to manage their health and wellbeing. This includes electronic or telemedicine consultations (e-visits or video visits). Some practices and health systems are experimenting with different patient engagement technologies to support these modalities, for example, through offering urgent video visits; however, most payment and practice models do not yet support these innovations, and many are unsure of the medical-legal ramifications of this form of care.

Some health systems, like Partners Healthcare, are plunging ahead with chronic care self-monitoring technology, electronic primary care visits, text messaging programs, and patient EHR portals. In the past, health-conscious patients brought their family physicians spreadsheets of their blood sugars, exercise, and meals, often drawing their own insights about which foods or activities correlated with better blood sugar levels. These same patients, and many others, are now wearing devices or using smartphone apps to do this work routinely. Patients are also increasingly wearing devices that capture their health habits and offer them feedback intended to influence their behavior. Data captured by these devices also have potential utility for improving care quality and population health, and technological enhancements that can integrate additional health and disease data are on the horizon.

Family physicians must play a leadership role in shaping how these data can be used most effectively. Further, translation of these data into information that can inform physician-patient interactions, virtually and in person, is an exciting opportunity that needs shepherding by family medicine to meet its potential.

Physicians want technology that can improve the delivery and quality of care, reduce practice and health care costs, manage populations of patients, and make practicing medicine easier. Comprehensive, broad-scope family medicine will also benefit from technology. Many family physicians are already using ultrasound to do what used to require other imaging, particularly for musculoskeletal diagnoses and procedures. There will be increasing capacity to move what are currently hospital- or subspecialty-based technologies out to the family medicine clinic in the near future, in much the same way that many tests that used to require specialized laboratories are now being done in primary care clinics at the point of care.

In addition to technologies that enhance our clinical toolbox, communication technology has the capacity to make us more available to patients virtually, increasing access and continuity. For example, Richard Roberts, MD, past president of the World Organization of Family Physicians, round on patients in the hospital in Wisconsin from halfway around the world using web-based communication services. Arkansas crafted Medicaid payment to support having a primary care physician in...
the room when complex prenatal patients are electronically meeting with maternal-fetal medicine specialists. New Mexico uses Telehealth innovations to engage hepatologists virtually in primary care visits for patients with Hepatitis C in rural areas. Having both physicians “in the room” (one physically, the other virtually) allows the patient to benefit from specialty services, allows the primary care physician to translate the plan, increases the competency of the primary care physician, and allows the patient to have an advocate who knows them, their health, and their values in order to help negotiate the health care plan. Web-based video is also becoming a popular place for patient and professional education content. This passive technology is already revolutionizing how we can instruct patients, but the future holds great promise for active technology that guides, coaches, and measures how patients are following our guidance.

In conclusion, some of family medicine’s early health IT efforts by individual practices, research groups, and national family medicine organizations are overlapping but have not yet been fully integrated. To continue progress toward achieving the FFM goals and to accelerate future progress, it is timely to consider how family medicine could more effectively organize resources to form a united front for improving health IT and other technologies for the specialty. Improved patient care, more robust population health, and reduced cost of care can all be augmented by family medicine’s leadership to improve and enhance a broad array of existing and new technologies. We need to capitalize on our collective strengths.

Opportunities

As a medical specialty with significant depth and breadth of experiences and expertise, family medicine is perfectly positioned to lead and support innovative initiatives in primary care technology. This section highlights a few of the promising new and emerging opportunities for the FMAHealth Technology Tactic Team to consider as priorities.

Health IT Tools

In addition to leading efforts to ensure that EHRs can be used to their full potential, family physicians have the expertise to partner with patients to identify and rigorously test other health IT innovations that can augment patient care and improve outcomes through patient, community, and health-team engagement. Some examples include: tools for decision-making, information and treatment management, lifestyle management; secure patient and care team communication tools; online health communities and social support; and tools that do quality and safety monitoring and reporting. These technologies are not intended to replace the patient-provider relationship but to extend it and improve health and health care. For example, family physicians can determine whether a relationship-extension tool expands upon limited EHR functionality, can be easily accessed by a patient or provider, and can provide an effective mechanism for starting a virtual conversation to personalize health care. Recently, four primary care organizations summarized the imperative for this important work:

Primary care needs EHRs to move beyond documentation to interpreting and tracking information over time, as well as patient-partnering activities, support for team-based care, population-management tools that deliver care, and reduced documentation burden.

Big Data

The enormous volume of data captured by EHRs, paired with growing capacity for data linkage and exchange, creates “big data” opportunities for measuring outcomes and informing efforts to improve patient and population health. This huge bolus of EHR data must be connected, normalized and analyzed appropriately, in order to best inform practice-based and community-based solutions and other initiatives to improve personal and population health. Family physicians can play a crucial role in leading primary care and community big data efforts and have already recognized that for both personal and population health, it will be essential that data from EHRs are aggregated with other data sources (eg, health insurance claims, public health surveillance systems, neighborhood-level health indicators). Further, integrated big data systems must also collect information directly from patients about their health behaviors, community resource utilization, social networks, and other social determinants of health. Social determinant data can also be collected ecologically from existing federal and state sources, which add additional information about neighborhood cohesion, as well as health and crime risks.

Although many of these data elements already exist, there are few examples where they are sufficiently integrated to inform practice, research, or policy. There is a need for the development of new methods to fully capitalize on the use and integration of multiple innovative data sources to reduce disparities and improve health equity. This was a specific recommendation of the Institute of Medicine consensus study “Primary Care and Public Health: Exploring Integration to Improve Population Health.” These big data opportunities will also help us better understand how to risk stratify our patients based on personal and neighborhood measures.

Primary Care Data Models

Primary care is the largest platform for clinical services in the US. Family medicine must develop strategies to capture and organize data to meet primary care needs while harmonizing a unique primary care data model with the rest of the clinical community. The immediate past chair of the National Committee on Vital and Health Statistics called
member visits via telehealth since 2013.40 We could learn from groups like them about the most effective means of delivering quality, technology-enabled care. There may also be opportunities to partner with technology companies to retrofit or design new diagnostic tools and tests for the outpatient setting. Partnering with our patients, family medicine is well-positioned to embrace practice technologies that improve our practices and our patients’ health.

**Patient Technologies**
Partnering with patients should also include discussions about how to better incorporate and use technologies available to patients to meet their needs. Which online videos are the most helpful? What are the best smart phone apps for monitoring and improving health? What kind of online peer-learning experiences are engaging or motivating? Have patients in our practices tried wearable devices, and are they interested in sharing the data they sync with their computing devices? How can family doctors best partner with patients to identify, improve, test, and adopt technologies that are most constructive and effective?

**Recommendations**
In early documents that laid the groundwork for the FMAHealth initiative, the Steering Committee outlined four core tactics for consideration and further development by the FMAHealth Technology Core Team (Table 3). This list includes the critical priority of creating a shared center for primary care health IT with governance similar to the Annals of Family Medicine journal, through which many primary care organizations and supporters would have shared ownership, funding, opportunity, and responsibility for the strategy. A collective center for health IT is needed to provide leadership, strategy and research, and to develop a shared vision for a health information strategy with common goals of improving health, promoting health equity, and achieving the Triple Aim.

In addition to the needs of primary care health IT outlined by Krist et al (Table 2) and the four initial FMAHealth core tactics (Table 3), we propose some specific recommendations for consideration by the FMAHealth Technology Tactic Team.15 Because some of these suggestions fall under the existing FMAHealth tactics and others build on these tactics, we identified other family medicine organizations that may potentially want to develop plans for implementing these recommendations:

1. Develop and implement strategies for creating datasets and data analysis techniques that integrate clinical data, care delivery data, population health data, socioeconomic data, and quality measurement data. These strategies should be driven by the fundamental information needs of family physicians and the teams in which they work (AAFP, ACOFP, ABFM, ADFM, AFMRD, NAPCRG, STFM).

2. Develop a strategic group to define, develop, and test measures for desired capabilities of primary care practices and to seek endorsement and adoption of these measures (AAFP, ABFM, ACOFP, NAPCRG).

3. Promote practice-, physician-, and patient-centered research to evaluate the health IT design and implementation needs of primary care (AAFP, ACOFP, ABFM, NAPCRG).

4. Develop clinical registries that can translate data into clinically useful information and facilitate exchange or reporting (ABFM, AAFP).

5. Develop population health tools that use patient, population, and community data within geospatial tools (ABFM, AAFP, ACOFP).

6. Create a strategy for the development and widespread adoption of data models that better serve primary care (AAFP, ACOFP, ABFM, NAPCRG).

7. Create fellowships to develop health IT leaders with specific
Table 3: Family Medicine for America’s Health Core Tactics

<table>
<thead>
<tr>
<th>Tactic</th>
<th>Sample Tasks</th>
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<tbody>
<tr>
<td>Launch the newly charged and expanded Center for Primary Care Health IT.</td>
<td>• Launch newly charged entity: Center for Primary Care Health IT, or other name as agreed upon.</td>
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<td></td>
<td>• Pursue funding. Collaborate with the Graham Center.</td>
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<td>• Work with counterpart organizations in other primary care professions (eg, AAFP, ACOFP, STFM) to increase impact through collaboration.</td>
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<td>Build improvements into existing EHR platforms, making it easier for physicians to practice great primary care.</td>
<td>• Define needs of high-functioning EHR on two levels:</td>
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<td>Patient needs: eg, decision support, patient access to data, patient-entered data, individual care plans, and quality metrics.</td>
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<tr>
<td></td>
<td>Population needs: eg, risk stratification, disease registries, reporting requirements, and analytics.</td>
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<td>• Identify EHR platforms with highest market share in family practices and work with them to close gap between needs definition and current state.</td>
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<td>• Explore opportunities to foster greater interoperability between systems.</td>
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<td>• Create and deploy ongoing feedback mechanisms to promote usability/flexibility with vendors over time and evaluate platforms.</td>
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<td>Link the use of new and emerging technologies to facilitating practice—strengthening relationships between patients and care team while enabling care team to practice in a more scalable way.</td>
<td>• Leverage capabilities and expand reach by collaborating with an organization like Consumer Reports to continually evaluate emerging technologies; work with research function to determine usefulness.</td>
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<td>• Assess potentially expanded role for technologies to deliver more patient centric care, including in-office ultrasound equipment and applied genomics.</td>
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<td></td>
<td>• Provide pathways for family physicians to integrate.</td>
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<tr>
<td>Assess potentially expanded role of applied genomics in primary care and provide a pathway for family physicians to integrate this technology with practice.</td>
<td>• Develop actions and timing based on what is learned about applied genomics and its implications for primary care.</td>
</tr>
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EHR—Electronic Health Record, ACP—American College of Physicians, APA—American Pediatric Association

Expertise in primary care technology needs (STFM, ADFM, AFMRD). (8) Develop curriculum and educational tools to address the key capabilities for family medicine practices that utilize health IT and other health technologies; advocate for increased health IT and health technology training in medical school and residency (STFM, ABFM, AAFP, ACOFP).

(9) Support learning collaboratives and laboratories for testing new technologies and disseminating best practices (like test farms of the Cooperative Extension Program) (AAFP, ACOFP, STFM, NAPCRG).

(10) Develop relationships with Health Information Exchanges, Regional Extension Centers, Health Center-Controlled Networks, and Primary Care Extension Services to support better data and technology use (AAFP and its chapters).

(11) Work with patient and consumer organizations to identify promising patient- and family-centered technologies, and collaborate to translate these into technology solutions; encourage practices to do the same locally (AAFP, ACOFP).

(12) Partner with technology companies to retrofit or develop technology solutions that improve access, continuity, and comprehensiveness (AAFP and its chapters).

(AAFP—American Academy of Family Physicians, ABFM—American Board of Family Medicine, ACOFP—American College of Osteopathic Family Physicians, ADFM—Association of Departments of Family Medicine, AFMRD—Association of Family Medicine Residency Directors, NAPCRG—North American Primary Care Research Group, STFM—Society of Teachers of Family Medicine).

Conclusions

Family physicians provide more outpatient visits than any other medical specialty in the United States and are leaders in the adoption and use of health IT. Collectively, family medicine is entrusted with clinical information for more than 20% of all outpatient care; thus, our discipline is uniquely positioned to play a leadership role in articulating how best to improve health IT to better serve patients and create a big data strategy for improving the nation’s health. Currently, the health IT that is in use does not capture or manage clinical information in ways that support the key functions of primary care (eg, patients’ concerns, complexity, continuity, coordination, episode management, behavior change). When practices successfully implement primary care-friendly systems, these are sometimes uprooted to make way for...
hospital-preferred systems despite the fact that only one in 15 patients who go to primary care touch a hospital. Beyond health IT, the specialty has barely scratched the surface in exploring how technology can enhance the best features of primary care. Family medicine has several opportunities to take a lead in shaping new health technologies to ensure that technology is better used in the service of better health, better health care, and lower costs.

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References

2. HHS Press Office. Doctors and hospitals’ use of HIT into medical education: National Cancer Institute (1R25CA1657-01A1) PI: Frances Biagioli, MD. Dr DeVo e declares that she received grant support for the creation of the ADVANCE Clinical Data Research Network from the Patient-Centered Outcomes Research Institute. The other authors have no conflicts of interest to declare.
