SPECIAL COMMUNICATION

Strategies for Primary Care Stakeholders to Improve Electronic Health Records (EHRs)

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The use of electronic health records (EHRs) and the vendors that develop them have increased exponentially in recent years. While there continues to emerge literature on the challenges EHRs have created related to primary care provider satisfaction and workflow, there is sparse literature on the perspective of the EHR vendors themselves. We examined the role of EHR vendors in optimizing primary care practice through a qualitative study of vendor leadership and developers representing 8 companies. We found that EHR vendors apply a range of strategies to elicit feedback from their clinical users and to engage selected users in their development and design process, but priorities are heavily influenced by the macroenvironment and government regulations. To improve the "marriage" between primary care and the EHR vendor community, we propose 6 strategies that may be most impactful for primary care stakeholders seeking to influence EHR development processes. (J Am Board Fam Med 2016; 29:126–134.)

Keywords: **Delivery of Health Care, Electronic Health Records, Information Systems, Primary Health Care, Qualitative Research**

The use of electronic health records (EHRs) and the vendors that develop them have grown exponentially over the past few years. Driven by regulatory and governmental imperatives as well as rapid uptake by health care providers, the number of EHR vendors more than doubled between 2011 and 2014. Among office-based physicians, the use of EHRs increased from 18% in 2001 to 78% in 2013.[1] Primary care providers (PCPs) were among the higher-frequency users. By the end of 2012, approximately 107,000 unique medical professionals had attested to meaningful use (MU) of a complete EHR in an ambulatory setting, and by 2013 this figure nearly doubled to 209,000.[2,3]

Adoption, implementation, and MU of EHRs remain a challenge. Implementation requires a significant investment of time and resources—an average of $162,000 for a 5-physician practice, with 130 physician hours and 600 care team hours devoted to training and transition.[4] Emerging research has identified adverse unintended consequences, such as the shifting of administrative tasks and documentation burden to PCPs.[5] A survey of 400 physicians found that while they appreciated the benefits of EHRs in accessing patient information and quality of care, most felt that current EHR technology worsened their professional satisfaction. Dissatisfaction was multifactorial, including poor usability and the degradation of clinical documentation.[6,7]

In 2013 the American Medical Association called for massive overhaul of EHRs and insisted that better EHR usability should be a priority for the industry, offering an 8-point usability framework for EHR vendors.[8] Two years later, however,

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there were still signs of dissatisfaction among EHR consumers. A national survey of 305 physicians who had recently switched EHRs found that >50% made the switch to achieve greater functionality, and others to meet MU requirements or to obtain better vendor support and training.[9] Even after changing, less than half of the respondents were happy with their new EHR system.

Despite the apparent disconnect between users and producers, as well as the important role EHRs have to play in primary care transformation, little is understood about the incentives that drive EHR development.[10] A literature review conducted by this study team between June and August 2014 found a growing body of literature on the impact of EHRs on physician satisfaction and workflow, but little about the drivers of EHR development from the perspective of EHR vendors (T. Slomoff, K. Dubé, R. Willard-Grace, and J. N. Olayiwola, unpublished data).

In this qualitative study we sought to understand the role of EHR vendors in optimizing primary care practice from the perspective of those who develop, refine, and improve EHR software. Our goal was to better understand "both sides of the aisle" and highlight opportunities for PCPs to influence this emerging and dynamic field. Given the uptake of EHRs in the primary care space, this may be a complicated marriage, but we must work to make it a successful one.

Methods

Study Design

We conducted a series of in-depth, qualitative interviews with representatives from 8 EHR companies between July 2014 and March 2015. Interviews used a semistructured interview guide (Appendix) developed and refined by 3 members of the University of California, San Francisco (UCSF), research team: a family physician/health services researcher, a qualitative research manager, and a qualitative research–trained research assistant. The interview guide explored driving forces behind EHR development, how feedback was prioritized in development plans, and the perceived role of EHRs in health care transformation.

The interview guide was pilot tested by key informants in the field of EHR transformation as well as by study partners from the research division at the Health Information Management Systems Society (HIMSS), the primary membership organization for EHR and health information technology vendors.

Recruitment

UCSF researchers recruited participants through 1 of 2 purposive sampling means: (1) direct outreach to leadership of EHR vendor companies with whom a study team member or key informant had an existing relationship; or (2) recruitment E-mails sent by HIMSS to their membership. We sought to recruit participants who were familiar with the processes of gathering user feedback and planning for the development of new software in their respective companies. Interested vendors communicated with the study team, who provided a written introduction to the research protocol. Participation was voluntary and no incentives were provided. All participants provided consent to participate in an audio-recorded semistructured phone interview. This study protocol was deemed exempt by the Committee on Human Research at UCSF (institutional review board no. 14-13646).

Data Collection

In-depth phone interviews lasting approximately 60 minutes were completed by 2 research assistants trained in qualitative data collection. Interview sessions began with 4 open-ended introduction questions. As the interviewer established rapport, the session moved into the body of the interview, which consisted of 12 open-ended questions that explored driving forces of EHR development, understanding the design input and testing process, and the perceived role of future EHRs in health care transformation.

Data Analysis and Synthesis

Interviews were audio-recorded and transcribed verbatim by a professional transcriptionist. Thematic synthesis was applied in 3 stages: free line-by-line coding of data, organization of the "free codes" into related categories to construct descriptive themes, and then development of analytic themes. Coding was conducted using modified grounded theory methodology.[11,12] Four UCSF research team members independently read all transcripts and identified the first round of free codes followed by descriptive codes. The team then collaboratively sorted codes to develop a codebook, which was refined through an iterative process of testing, review, and revision based

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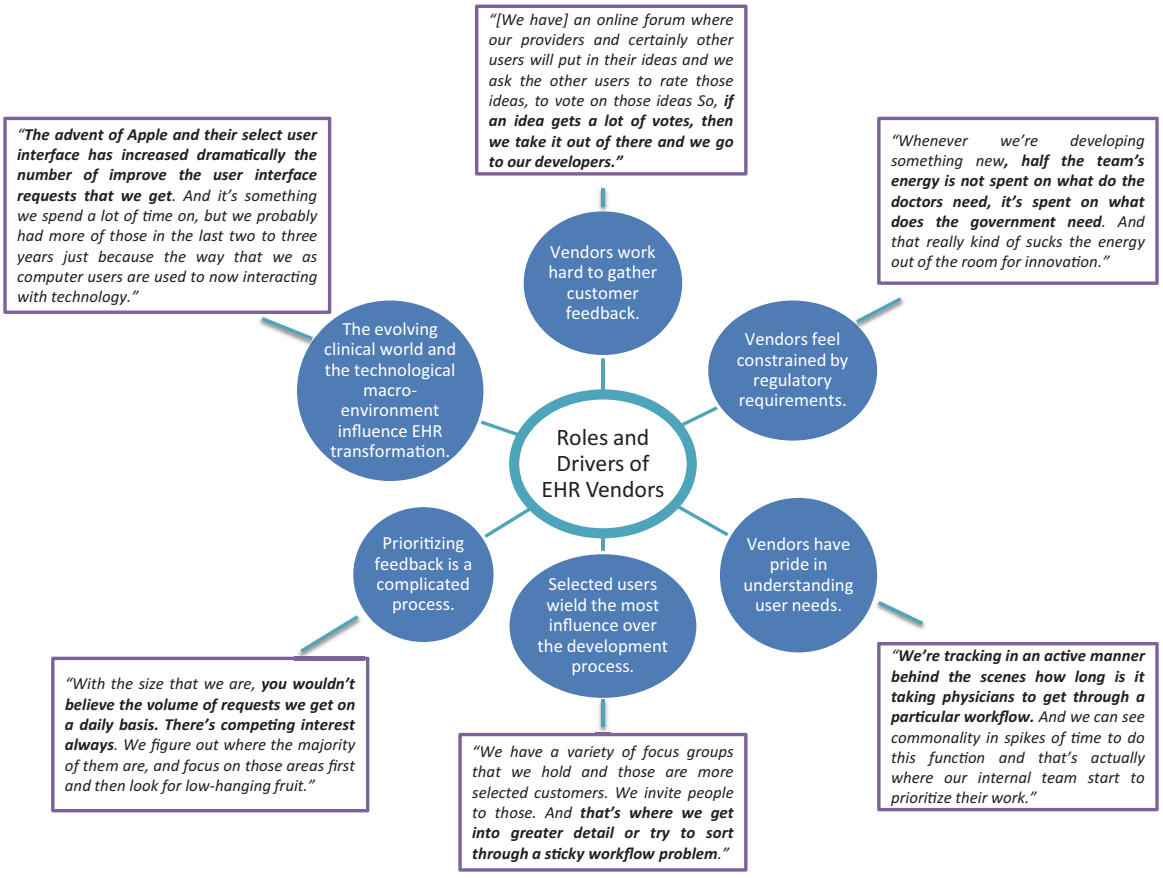
Figure 1. Six final themes. Through a 3-step thematic synthesis process, we outlined descriptive codes that were subsequently categorized into 6 thematic groups. Content analysis was used to derive these final themes. EHR, electronic health record.



on consensus. After the codebook was established by the entire team, at least 2 team members independently coded all transcripts, and any discrepancies were resolved through group discussion. ATLAS.ti software (version 7.1.1; ATLAS.ti Scientific Software Development GmBH, Berlin, Germany) was used to code and organize data. The descriptive codes were subsequently categorized into 6 thematic groups, based on which content analysis was performed and the entire study group derived the final analytic themes.

Results

Participants

Key stakeholders from a diverse sample of 8 US-based EHR companies participated in the study. Participants included clinical informatics physicians, software developers, and senior leadership such as chief medical officers and chief executive officers. Seven of these companies are considered large vendors based on provider attestations for MU and HIMSS revenue standards, and 1 was considered a start-up vendor.[2,3,13] In total, these 8 companies command approximately 45% of the market share for small practices in the United States.[14] These vendors provide software for small, medium-size, and large primary care practices, other ambulatory practices, and hospitals. Most have a portfolio of offerings in addition to their EHR, such as practice management systems, business intelligence services, and patient portals.

Themes

Six major themes emerged from our analysis (Figure 1).

Theme 1: Vendors Feel That They Provide a Variety of Venues to Gather Customer Feedback

One of the driving forces behind EHR development is the mass feedback vendors collect from user

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forums either in person or online. As 1 respondent noted, "[Our company physician forum] meets twice a year, usually around our health conference, and then in the summer they come in and there's a number of things that occur. We provide insight into what we're working on. They give us feedback or we show them things that they had given us feedback into and they are validating or designing it".

The online version of mass feedback generation allows vendors to engage users in voting on options for development in these contexts, as noted by another respondent: "One other significant area of our input of new ideas coming from our customers is . . . an on-line forum where our users . . . will put in their ideas and we ask the other users to rate those ideas, to vote on those ideas. So therefore, if an idea gets a lot of votes, then we take it out of there and we go to our developers".

In addition, vendors garner feedback from implementation teams and customer service lines, identifying some users to engage in an ongoing relationship for feedback.

Theme 2: Hand-Selected End Users Wield an Even Greater Influence over the Development Process

An inner circle of selected users yield the greatest influence in the prioritization and development of new EHR features and functionality. One respondent stated, "We identified clients who . . . we felt were representative of the needs of most of the clients. . . . You cannot survey thousands of people . . . we needed to have meaningful conversations. [We picked people], not because they were our favorites. It was usually people that have been using our software [and] have insights and good ideas to help us fix that".

Some means of identifying these selected users include recruitment from annual user group meetings or public forums, word of mouth, or by user groups themselves. As another vendor stated, "We also have a variety of focus groups that we hold, and those are more selected customers. And that is where we get into greater detail or try to sort through a sticky workflow problem and say . . . 'What do you guys think?' . . . Those are invite-only calls and we tend to pick people and ask them who is been constructive in the past, people who can look at the application and make comments: 'This is the kind of thing I would improve' as opposed to, 'I do not like it'".

Theme 3: Prioritizing Feedback Is a Complicated Process in Which Many Ideas from Clients Are Lost

Vendors described many factors that affect whether ideas make it to the development phase, including government mandates, market demands, the company's strategic plan, and ease of change. One respondent described some of their dilemmas as follows: "With the size that we are, you would not believe the volume of requests we get on a daily basis for 'can you do this' or 'could it do that?' so there's competing interest always. So what we tend to do is . . . look for low-hanging fruit and then go to the ones that are hardest last . . . And then it is prioritizing what is left over into 'What am I going to go tackle first?' And it is not a first-in-first-out system".

Several respondents describe the process of prioritizing feedback as "sausage making," and others described a complex, nonlinear process dictating which ideas or feedback is acted on. While some vendors use voting systems or focus groups to guide prioritization, final decisions seem to rely on the judgment of senior leadership and developers. Another respondent described how user ideas and technical requirements may be in conflict: "An example would be where the customer's coming in, and he or she is convinced that this is the greatest thing to do for the product, but we see very few people supporting it. It is technically very complex and we feel like it adds very little value. Essentially it is doing more or less like a risk/benefit analysis. Those that have huge benefit, we try to prioritize those".

Thus vendors constantly assess the development environment and available resources, fitting user ideas into what they believe to be the larger technical context.

Theme 4: Vendors View Their Responsiveness to Customers as Constrained By Regulatory Requirements

Although many respondents recognize government regulatory requirements such as MU as a legitimate part of EHR accountability, they feel that these requirements detract from their desired innovations and responsiveness to client needs. They cite the significant time that goes into meeting requirements as a result of the high degree of testing required. As 1 respondent described, "The environment is very regulatory, as you are aware, with [MU] and things like that. And that controls so much that you lose innovation energy. So, you

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know, like I said, whenever we're developing something new, half the team's energy is not spent on what do the doctors need, it is spent on what does the government need. And that really kind of sucks the energy out of the room for innovation. And I am not saying that some of the things that have been identified are not, you know, the way things should be".

Some expressed the feeling that regulations tended to set a low bar that did not drive significant change in the field and that it would be more beneficial to set goals with specialty organizations of physicians rather than federal agencies:

> "One way that I would really like to see that shift is really move away from government regulation and bureaucracy to specialty organizations doing that. Good examples in surgery, what the government shows for measurements, for example, for prophylactic antibiotic usage, was something that probably 95% of physicians were compliant with. So to measure something that people already do is not going to create much of an improvement in outcomes and care . . . the American College of Surgeons has approached CMS [Centers for Medicare and Medicaid Services] and ONC [Office of the National Coordinator for Health Information Technology] and said for future meaningful use . . . why do not we tell you what those areas are that we should measure . . . and really improve outcomes and care."

Theme 5: Some Vendors Pride Themselves on Being Able to Understand User Needs At a Level That Goes Deeper Than What Users Know They Want

Respondents described pitfalls in being too focused on the direct requests of customers, which are limited by their previous experience, habits, and limited understanding of the capabilities of EHR technology. One respondent articulated this as follows: "We basically try to understand the underlying kind of root cause of their problems and then build and design around those problems. So we do not sort of build what they ask for. We build the thing that solves the underlying root cause of what is causing them to ask for those things".

To understand these "root needs," vendors reported that they got information not only from user-identified issues, but also from their observations of user behavior through direct observation and through "analytics on the back end" that track how physicians interact with the software.

Theme 6: Both the Rapidly Changing Clinical World and the Technological Macroenvironment Influence EHR Transformation.

External factors are driving a transformation of EHRs beyond record-keeping systems toward user-friendlier problem-solving systems. One respondent expressed the following:

> "Most of these [traditional] systems are designed around—not around care coordination and they are not really designed around population management. They are designed around how do we get paid for this one instance of this one patient coming into our office? The EMR vendors need to start thinking about how do they make clinician or physician workflows more effective in the population . . . angle. I think that the other thing is that working in teams. Providers haven't really been incentivized to do that. But now with direct care models and value added care models coming . . . that actually does start making financial sense. . . . Those are very positive trends . . . that will drive structural behavior in the way that software is developed."

As phones and computers in the larger technology world are embracing more intuitive user interfaces, EHR consumers are also seeking these qualities in their EHR systems. Vendors feel a pressure to "keep up" with these clinical and nonclinical trends as they design their future EHR platforms. In describing common types of requests from consumers, 1 respondent stated, "The advent of Apple and their select user interface has increased dramatically the number of improved [*sic*] the user interface requests that we get. . . . The more pervasive Apple gets, we all get the expectation that [the interface] should be sleek and clean and simple to use and the docs actually like that. So we still have the hardcore going and we need to change code but a long winded way to answer [is that] 3 years ago it was probably 70% hard code, 30% user interface, and it is kind of the inverse now".

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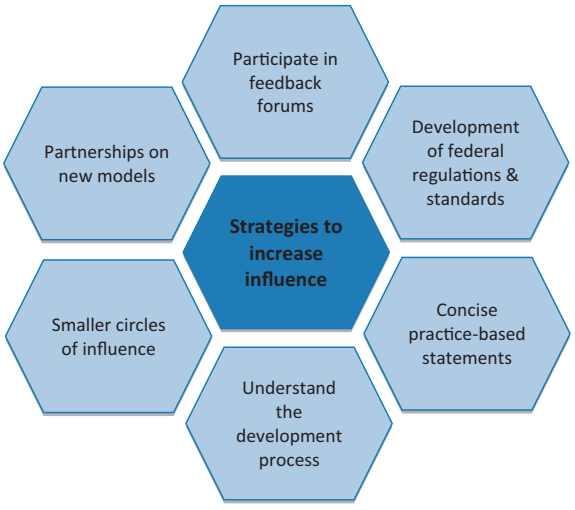
Figure 2. Strategies to improve primary care stakeholder influence. These are our recommendations based on the 6 themes that emerged from the analysis of the 8 vendor interviews.



Discussion

This exploratory qualitative study is to our knowledge the first study to explore perspectives of EHR vendors on drivers of their development process and strategies they use to engage end users. EHR vendors in our study incorporate several strategies to elicit feedback from their clinical users and to engage selected users in the design process.

Our findings suggest that the goals of EHR developers and PCPs are more closely aligned than is assumed. It is important for both groups that these areas of commonality be strengthened by changes in the way that PCPs interact with the EHR development process. Based on our findings, we propose 6 strategies that may yield the highest impact for primary care stakeholders in the EHR vendor community (Figure 2).

1. Strategically engage PCPs and their membership organizations in the placement of their constituents in EHR public vendor feedback forums, such as conferences and online forums. Although these forums may seem too large for any one voice to be heard, EHR vendors respond to ideas and suggestions that amass significant support, and these venues are also a place from which selected users are identified for more in-depth engagement in development decisions.
2. Encourage PCPs and their membership organizations to more actively participate in the development and revision of federal regulations and standards through formal representation on workgroups or committees, making recommendations on proposed rules during public comment periods, taking legislative action and giving testimonies, and strengthening the voice of societies representing other front-line staff in national conversations.
3. Organize practice-based challenges, barriers, and inefficiencies into concise statements and suggestions that EHR vendors or training specialists can review and communicate to their development teams. This may involve on-the-ground testing and demonstration of workflows and usability challenges that lead to suboptimal care for patients, and may gain considerably more momentum if multiple practices contribute to these statements. EHR vendors are more responsive to users offering concrete ideas for improvement.
4. Create opportunities for PCPs and their clinical teams to better understand software development processes and cycles, including solutions that require major programming and code revisions versus those that are design and interface modifications. Enhanced understanding by the clinical users of these products may help to categorize recommendations being made. This could be more formalized as part of vendor training programs for clinical teams or by building on existing relationships between practices and their information technology support services.
5. Enlist more PCPs in the smaller circles of influence, through select focus groups, testing groups, and other superuser opportunities. Coordination through membership groups can help to strategically place PCPs to avoid unnecessary overlap of participation. In addition, PCPs can invest time in user groups for smaller EHR vendors. While these vendors may not offer stand-alone products, they may have more flexibility and agility in designing and developing adjustments to larger EHR programs to better meet the needs of PCPs.

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6. Devise more opportunities for PCPs, their colleagues, and patients to partner with EHR vendors on new software models that promote patient engagement, team-based care, care coordination, population health, mobile platforms for patients and providers, intuitive interfaces, and interoperability with multiple systems. Embracing the reality of the medical neighborhood and the many synapses that connect to form the experiences of patients and their care teams will enable EHR vendors to adapt better to the ever-changing needs of their consumers and maintain the beauty of the doctor–patient relationship.

All these strategies will demand time and resources from PCP practices. Practices should consider this sacrifice in productivity and clinical time for their front-line clinicians and staff as an important investment in the overall functioning and efficiency of the clinical teams that will payoff for their practices in the future. Clinicians should also be aware that time commitments are variable and that, if coordinated properly, participating in a single annual user group meeting could make a significant impact on daily productivity in the office only a few years in the future.

A number of physician membership organizations such as the American Academy of Family Physicians and the American Medical Association have represented physicians in raising governmental awareness on EHR challenges, pitfalls, and opportunities at the federal executive and legislative levels.[8,15] We encourage more dialog between primary care stakeholders and EHR vendors as they both seek solutions to current challenges and make their marriage work.

The major limitation of this exploratory study was the small number of vendors we interviewed. As mentioned earlier, however, the vendor companies surveyed cover approximately 45% of the market share among small practices. In addition, we reached saturation early with the congruency of responses.. Another limitation was that the majority of respondents were large EHR vendors, and we interviewed 1 small vendor. It is possible that the experience of small and medium-sized vendors may be different from that of larger organizations. Further research can help to explore these issues among a broader subsection of EHR vendors.

Primary care practices and EHR vendors have historically had tense relationships—what we describe as a marriage that is complicated but essential. The parties each feel that their needs are not being met or addressed effectively. However, given the fact that both parties depend on one another, and that the newer models of care are so dependent on the incredible tools offered through health information technology and EHRs,[16] we must move toward improvement-focused solutions. We are all in it together, for better or for worse.

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Appendix

Interview Guide

July 2014

Introduction

1. Could you tell me a little bit about your role in EHR development?
2. How long have you been involved in EHR development? What did you do before that? What kinds of experience have you had working within a clinical setting (if any)?
3. Could you tell me about the history of your EHR platform?
4. What are some of the ways that the development process has changed over time?

Body of Interview

5. When you think about the **driving forces** behind EHR development, what are the issues that are most pressing on your mind when you think about priorities for development?

Potential probes: Market share? If so, what drives that? Regulatory requirements? Who are your most important stakeholders? What are you under pressure to do or accomplish?

6. How do you **solicit input** on design and development of your EHR from your users? Do you ever receive **unsolicited feedback** from users? How do you decide what to do with that feedback? How likely are you to respond to the concerns that they raise? Could you tell me about a time when a user provided feedback that lead to changes in the EHR platform?
7. How do you assess the standard workflows of practices that are interested in purchasing your EHR platform?

Why do you collect workflow data in that way?

How likely are you to make significant changes to your EHR platform based on input from primary care providers aimed at optimizing primary care workflow?

8. How are the **priorities** for development of EHRs set in your organization?
9. Who are your most important **stakeholders**? Where does primary care fit into the hierarchy of stakeholders?

Potential probe: For example, how do you address different needs between practice administrators and care providers?

10. As you work with end users to **test your products**, how do you identify those people? What kinds of people tend to provide feedback in the process?

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Potential probes: Do you have primary care clinicians test your product? Who represents this perspective?

11. Health care—and primary care in particular—are in the midst of a lot of changes. To what degree do you think of it as your role to help **shape those changes** (eg, in workflow, roles)? What kinds of changes do you want to promote (if any) in primary care?

12. Two topics that people are interested in are clinicians working in teams and looking at the overall health of populations. In your opinion, how do those relate to EHRs?

Potential Definitions:

Team-based care: One aspect of team-based care is the incorporation of a variety of health professionals with different types of expertise and different levels of training into the care of a patient. An example is a physician teamed with a registered nurse, medical assistant, clinical pharmacologist, and social worker all working with the same patient.

Population health: One aspect of population health is the health outcomes and distributions within a group of people, as opposed to purely individual health outcomes.

13. Is the role of EHR to be an **electronic form of an Article chart** or is it designed to more fundamentally change the way that care is delivered?

Cool-down

14. If someone in a primary care practice were to ask you what they could do to more effectively influence the design and development of electronic health records, what **advice** would you offer them?
15. What about the development or use of your EHR platform are you most proud of?
16. In what ways do you hope that EHRs will be different in 10 years?

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