Healthcare Reform, Quality, and Technology: ADHD as a Case Study

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Abstract

The concepts of healthcare reform and population health are shifting the emphasis from traditional, volume-based care to a model in which value, or quality, predominates. High quality care will be increasingly rewarded, with financial consequences for poor performance. This shift will be accelerated by the use of healthcare technology, a rapidly growing industry with tools ranging from electronic health records to smart phones and web portals. In this article we highlight pertinent legislative reforms followed by a review of technologies that may play a role in the implementation of these reforms. Pediatric Attention Deficit Hyperactivity Disorder is used as an example given the large number of proposed tools for this condition. While the evidence base is weak for some technologies, research regarding web portals is better developed and will be presented as an example of a technology that may allow practitioners and organizations to improve healthcare quality in several dimensions.

Keywords

Meaningful use; Quality improvement; Healthcare reform; Attention deficit hyperactivity disorder (ADHD); E-health; Digital technology; Electronic health records (EHRs); Remote monitoring systems; Web portals; Videoconferencing; Smart phones; Online therapies; Psychiatry

Introduction

In the last decade, healthcare has witnessed the emergence of two concepts that now seem tantamount to its survival: healthcare reform and information technology. Reform, in this context, refers to the movement away from fee for service payment to pay for performance or value. Attendant with any such concepts are the identification of quality and outcome indicators for payment and use of the quality improvement (QI). Relatedly, digital technology applications in the health setting, from electronic health records (EHRs) to

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smartphones, hold promise in furthering reform and quality initiatives thanks to supposed efficiencies and data collection. Meaningful changes in healthcare, however, and especially in mental health care, have been slow, especially when compared to the pace of technology development.

In this article, we briefly review healthcare reform trends with an emphasis on the importance of quality of care in the provision of mental healthcare for children. The current state of healthcare technology, using ADHD as an example, is reviewed. The relationship between reform, quality and technology will be explored, highlighting the specific example of pediatric Attention Deficit Hyperactivity Disorder (ADHD) care given the body of work that exists for this particular condition. Recommendations for future study and development are proposed.

Healthcare Reform and Related Legislation

The term "healthcare reform" is often used interchangeably with the Patient Protection and Affordable Care Act (PPACA) passed in 2010[1]. Although PPACA contains many components to accelerate reform, healthcare reform more accurately refers to the linkage of payment with quality and outcome measures. Traditionally, clinicians have been paid for volume of care through fee-for-service payments. Such arrangements lead to the provision of unnecessary care, higher costs of care, and increased rates of iatrogenic morbidity. Proposals to reform the healthcare system tie reimbursement directly to the quality, efficiency, and outcomes of health services. This linkage is accomplished through increasingly strong incentives, beginning with simple pay-for-performance bonuses for achieving quality metrics, progressing to bundled payments, and finally to full capitation with accountability for population health outcomes.

While the popular debate in the press focuses on only a few aspects of PPACA, healthcare reform already has a strong non-federal foothold in many parts of the country and is rapidly spreading through both public and private payment systems. Medicare Accountable Care Organizations (ACOs), the federally recognized provider groups taking various forms of financial risk to manage populations, are adding millions of members each year. The federal government has funded ten regional Medicaid programs focused on children and adolescents that will employ tools such as the ACO model and pay for performance schemes[2]. Many private payers have launched global and bundled payment proposals in an effort to reduce cost, often in partnership with state agencies[3].

To date, policy discussion and pilot studies around healthcare reform have been centered in the adult healthcare landscape, with recently released rules being promulgated for Medicare. These rules, along with public discussions and technical assistance from the Centers for Medicare and Medicaid Services, have been restricted to discussions of reform for adults almost exclusively. To some extent, this focus on Medicare is understandable given the uniformity of Medicare rules, the high costs of care for the elderly, and the precarious fiscal state of the Medicare program. However, Medicaid, the federal/state entitlement serving low income children, represents the fastest growing portion of state budgets across the country and is a major target for improved healthcare quality and savings. Moreover, the pediatric healthcare market is organized quite differently than the adult system in several specific ways. First, pediatrics has a greater degree of regionalization in specialty care, which is largely centered in pediatric hospitals throughout the country. Secondly, the concentration of adult patients with chronic illness and the potential for savings in individual practices is much greater in adult primary care than in pediatrics, where larger numbers of patients or practices may be needed to demonstrate cost savings from improved chronic care coordination and efficiency. Finally, primary care and outpatient pediatrics is largely

focused on the delivery of preventive services and early intervention. All of these features will require a different orientation for reforms that focus on children.

As payers increasingly focus on cost and quality, recent healthcare legislation has incentivized healthcare organizations and physicians to also monitor their own provision of high quality care and patient outcomes. Passed in 2009, the Health Information Technology for Economic and Clinical Health (HITECH) act was designed to promote the adoption of health information technology (HIT), thereby improving healthcare quality, safety, and efficiency[4]. Meaningful Use incentives within the HITECH act specifically encourage physicians to use EHRs and other healthcare technology to create patient registries (Meaningful Use Stage 1), track the quality of care being offered to patients (Meaningful Use Stage 2), and to track patient outcomes (Meaningful Use Stage 3). To date, only Stage 1 of Meaningful Use has been implemented in a widespread fashion. Nevertheless, there will be increasing number of carrot and stick approaches to encourage clinician use of technology to improve outcomes and efficiency.

Challenges to the Provision of Quality Care

In order to improve healthcare quality, providers and organizations are in need of accessible data that can be used to determine current performance and identify strategies for improvement. In most settings, neither aggregated data on the quality of care nor the outcomes across a population of patients is available. Obtaining such aggregated data that summarizes performance is often the first step in QI efforts[5]. That is, before providers or organizations can identify targets for improvement, they must first understand their current performance. Using ADHD as an example, a provider could choose to measure a process (eg. the proportion of ADHD patients for whom DSM-IV ADHD criteria are documented) and/or patient outcomes (e.g., average percent reduction in ADHD symptoms after 1 month of treatment), then identify targets for improvement. The ability to track performance during an improvement effort is vital in order to evaluate whether attempts at improvement are effective and deserving of full implementation [5].

Practitioners have historically relied on chart reviews in order to summarize delivery of care and patient outcomes. Especially if done through random sampling of patient charts, chart reviews can provide objective and non-biased estimates of care and/or patient outcomes [6]. However, conducting chart reviews to obtain aggregate data, whether for determining baseline performance or response to quality improvement efforts, can be a time-consuming and overly burdensome process. For this reason, such aggregation of data occurs rarely in the context of paper charts.

In addition to practitioners and organizations, patients and families are also in need of feedback and aggregate data to manage disease and ultimately to improve patient outcomes. Self-management is especially important for patients with chronic illness, including mental health conditions[7]. The combination of self-management tools plus provider supports such as decision support, delivery system design, and changes to healthcare organization, has been linked to improvements in cost and quality[8]. Using ADHD as an example, parents and children may benefit from the monitoring of the patient's ADHD symptoms during treatment. This type of symptom monitoring may be cumbersome using traditional "paper and pencil" methods, especially when collecting information from additional sources such as teachers. Advancements in healthcare technology, as reviewed below, will likely help to further operationalize these concepts.

Patients, practitioners, and healthcare organizations are thus faced with a necessary shift in the traditional delivery of care. Previously, practitioners and organizations were primarily responsible for care delivered within their four walls. In order to achieve population health

and true healthcare reform, patients and healthcare delivery systems must enter into a partnership to encourage healthy behaviors, from prevention to early diagnosis to high quality treatment, *in between* healthcare appointments and hospital stays *as well as during them*. This endeavor will require multiple steps. Key components will be the capacity for early identification (eg. screening), ongoing monitoring of symptoms, patient registries to track population level outcomes and monitor intervention effects, and efficient means of communication between patients and providers. Patients will need to be engaged and educated about their healthcare and have access to high quality care, and busy providers will need support (both financial and technological) to provide this level of care. Technology can be viewed as a tool to operationalize these concepts.

The Promise of Technology

EHRs

EHRs have been touted an instrumental tool in improving healthcare quality and reducing cost. Researchers from the RAND Corporation estimated in 2005 that over $81 billion could be saved annually if health information technology, namely EHRs, were successfully implemented[9]. Nearly a decade later, reviews have been mixed. This may in part be due to the lack of standardization among systems, the lack of interoperability between systems, and a lack of system redesign as EHRs have been implemented[10, 11]. Technical assistance *after* implementation, in addition to the support typically provided during implementation, is likely needed to recognize the improvements in care delivery that EHRs can offer[12].

Considering the example of ADHD, it becomes clear that EHRs offer several potential supports to address the key concepts presented in table 1. General mental health screening tools and ADHD-specific rating scales can theoretically be programmed into EHRs and can be used for early identification, diagnosis and treatment monitoring[13]. Increasing levels of advancement include automated scoring algorithms, symptom tracking, and ultimately the collection of aggregated patient data to show patient improvement over time, as well as response to medication changes.

EHRs also offer provider support tools such as electronic reminder systems and decision support tools[10, 14]. Most EHRs allow the user to build in reminders in the form of pop-ups that are programmed to appear when certain events or responses occur in the system. For example, a pop-up may provide a reminder to send a behavioral rating scale to the parent or teacher when the order for stimulant medication is placed in the EHR. Decision support tools such as ADHD-specific templates and clinician reminders for best practice have been studied. Patients seen using the decision support tool appeared to receive higher quality ADHD care during the study period than patients seen using traditional documentation systems[13].

An additional feature useful for QI work is the ability to develop patient registries to identify groups of patients in need of further care. The Veterans Health Administration used their EHR to identify patients prescribed antipsychotic medication doses above those clinical indicated for the treatment of schizophrenia in order to reduce the development of tardive dyskinesia[10]. While many EHRs employ this type of functionality, and although it represents an improvement compared to manual chart reviews, obtaining meaningful data may still be time consuming and is dependent on the resources of the organization to pull and analyze the data.

Videoconferencing

The use of videoconferencing to conduct medical and mental health visits is growing, although its growth has been limited by state-specific regulations for providers.

Videoconferencing can be delivered via either synchronous (real time) or asynchronous (recorded) exchange. In the field of mental health, synchronous videoconferencing has been shown to produce satisfaction rates in line with traditional face to face services[15, 16]. Presently, most videoconferencing occurs between specialty providers and patients located outside of the home setting, such as in an office-based practice or the hospital setting. Emerging technologies allow for care to be delivered within the patient's home, yet regulatory requirements may need to be developed or revised. System compatibility and privacy remain relevant barriers that may soon be resolved. Given the relative scarcity of mental health providers, especially in remote areas, videoconferencing may provide to be a useful tool to improve access to underserved areas.

Remote Monitoring Systems

Remote monitoring systems allow for the collection, tracking, and transmission of data from remote locations (eg. the patient's home) to the health care provider, thus providing enhanced communication. Remote monitoring may include tracking of biometric data such as vital signs, weight, blood sugar, and patient movement[17]. A sophisticated remote monitoring example is the European Enhanced Complete Ambient Assisted Living Experiment (eCAALYX) system, developed to provide remote monitoring for older adults with chronic disease, thereby allowing increased quality of life, safety, and independence for elderly patients[18]. e-CAALYX employs a wireless garment worn by the user that tracks a variety of parameters including changes in biometric data or patient activity such that preventative measures can be employed to prevent deterioration. Similar technology has been suggested as a method of assessing hyperactivity in children with ADHD[19]. While technologic uses for remote monitoring in ADHD care have been proposed, review of DSM-IV criteria and use of behavioral rating scales remain the recommended method of assessment and management.

Smart phones

Smart phones and related technologies provide multiple healthcare related opportunities. Since their inception, the development of smart phone applications or "apps," has skyrocketed. In 2010, estimates suggest that over 5 billion apps were downloaded, and in 2012, nearly half of American homes owned a smart phone, making this technology integral to the lives of many children and adults[20, 21]. Apps for healthcare and mental health concerns are plentiful and include symptom diaries, text messaging reminders for behavior change, clinical calculators, goal setting, and education[17, 22, 23]. Apps are also plentiful for chronic disease management for both medical and mental health concerns[24-26]. Available apps related to ADHD focus on supports to improve organizational skills, push notifications for reminders, timers, reward charts, and tools to establish routines, stress reduction, and behavior tracking. Positive reinforcement may be provided through "gamification," the use of badges or phrases to reward participants for meeting their goals[27-29]. Few apps are supported by an evidence base, and there is currently no governing body responsible for quality control. Some authors have called for a mechanism to endorse educational material and treatment recommendations for certain conditions, which may be particularly useful for mental health conditions[25].

Online Therapies

In the field of mental health, online therapies have emerged as an effective method of delivering evidenced based care for conditions such as disruptive behavior disorders in young children as well as affective disorders such as anxiety and depression in adolescents and adults[30, 31]. These types of therapies are delivered via the internet and may be completed by the patient or family alone or through varied levels of clinician support. While patient engagement in online programs can be challenging, they provide opportunities to

disseminate prevention materials and evidenced-based treatment to remote or underserved areas. Online therapies may also be more palatable for patients who are reluctant to see face to face to face care due to stigma or other concerns[32].

The Triple P Positive Parenting Program, an evidenced-based program that provides a tiered level of support for the parents of children with disruptive behavior, has recently been developed into an online program, Triple P Online (TPOL). Face to face Triple P has been shown to be effective in reducing challenging behavior in young children with attentional difficulties and disruptive behavior[33]. In TPOL, parents work through 8 electronic modules in a self-paced fashion. In a pilot study, participants reported reduction in child disruptive behavior, reduction in dysfunctional parenting, and improved confidence in parenting[34]. The majority of participants were well educated, and the generalizability of this type of technology needs to be further studied. While this type of intervention may not be relevant for every family, it may provide an additional option for certain families who may otherwise have experienced treatment barriers, such as distance or stigma.

Web portals

Web portals provide unique opportunities for several key aspects required for healthcare reform, including screening, symptom tracking, patient registries, communication, access and provider supports. Web portals are designed to allow physicians and patients to work together to coordinate patient care. Common portal features include (1) patient resources such as education and referral lists; (2) online communication between patients and their physicians; and (3) shared online posting of personalized health information such as test results [35]. Web portals provide an opportunity for physicians to better engage patients in their own care, increase accountability for the care they provide, increase efficiency, and possibly eliminate some time-consuming tasks [35]. The best portals orchestrate an electronic dialogue between patients and providers through exchange of information[35]. Several ADHD web portals have been developed over the past 10 years [36] [37] [38]. While existing ADHD web portals have some differences in features and functionality, the primary function that exists across ADHD web portals is the ability for parents and teachers to input ADHD ratings and for those ADHD ratings to be presented in a clear and clinically meaningful manner to physicians.

To illustrate the potential breadth and clinical utility of ADHD web portals, we briefly describe the myADHDportal.com web portal [37]. This portal was developed by Cincinnati Children's Hospital Medical Center in the context of their myADHDportal.com Improvement Program. This intervention combines ADHD web portal technology with quality improvement methods to improve ADHD care among community-based practitioners. At its core, the intervention modifies office systems within practices to accommodate the web portal, thereby ensuring that the American Academy of Pediatrics (AAP) ADHD consensus guideline recommendations are instituted across the entire practice.

To begin the program, practitioners complete online trainings embedded within the web portal to learn about the AAP ADHD consensus guidelines and recommended practice behavior[39]. A large component of the online program involves hands-on training through the web portal and creation of an office ADHD workflow through an online wizard. The wizard guides practice staff through a series of 20 questions about office workflow in the context of web portal-enhanced delivery of ADHD care (e.g., "who will check the web portal for patient alerts?"). Once all 20 questions are answered, staff members' roles and responsibilities are highlighted on a customized ADHD workflow diagram. This ADHD workflow diagram remains on the web portal for online viewing, or it may be printed out for posting at the office.

After training is completed, patients are registered on the web portal for ADHD assessment and/or ADHD treatment. Once registered, parents and teachers are invited to complete ADHD rating scales and side effects ratings about patients online. The web portal automatically scores rating scales and provides practitioners with easy-to-read and easy-to-digest summarized reports that aid the physician in diagnosis and treatment monitoring. The web portal scores follow-up rating scales for patients enrolled in treatment mode, and an automatic warning is sent to the practitioner if treatment ratings indicate problematic behavioral deterioration or an increase in side effects.

The ADHD web portal also allows parents, teachers, and pediatricians to communicate with each other and with other mental health professionals during the assessment and treatment process through the online email system. These e-mails are resident in the portal so that a user only need identify the patient and the targeted individual (e.g., patient's teacher) in order to send a personalized email. All emails remain within the ADHD portal in order to maintain secure communication.

A unique feature of the myADHDportal.com web portal is the quality improvement features built-in to the system. An online report card tied to the AAP ADHD guidelines (e.g., percentage of children assessed for ADHD with completed teacher ratings) continually updates information regarding pediatrician practice behaviors. Data is presented in chart form so practices can track each ADHD care behavior over time. Hence, pediatricians can continuously monitor how well they are following the AAP guidelines. If certain behaviors are identified as needing improvement, the practice can develop small tests of change known as Plan-Do-Study-Act (PDSA) cycles to improve the quality of ADHD care at their practice. A PDSA wizard guides the physician though a series of questions to determine which ADHD care practice behavior to target, followed by a list of possible PDSAs to target that practice behavior. Each PDSA option has been shown to be effective at other practices [40]. The report card is then annotated such that practitioners can monitor whether PDSA cycles were effective and thus merit full implementation or whether additional PDSA cycles are necessary.

A cluster randomized controlled trial of an intervention modal relying primarily on this web portal demonstrated significant intervention-related improvements in quality of ADHD care at trained practices across a diverse cross-section of community-based pediatric practices [6]. In addition to being effective on most care outcomes, the intervention was well accepted by pediatricians who were highly satisfied with the intervention model and would recommend it to other pediatricians [40].

Though ADHD web portals can have high clinical utility, be effective at improving ADHD care, and likely increase family engagement in their child's ADHD care, web portals do have their limitations. First and foremost, existing ADHD web portals reside outside the EHR. Thus, physicians, in effect, must use two electronic records (i.e., their primary EHR and an ADHD web portal). Moreover, transferring information between the web portal and the EHR can be burdensome. For example, information about medication types and dosages must be entered in both the EHR and ADHD web portal, and ratings entered by parents and teachers directly into the web portal are not easily transferred into the patient EHR. A portal that offered more integration with the EHR would increase efficiency and ease of use. A second weakness of web portals is that they require that patients have access to the internet. Though rates of internet access in the home are high (over 70%; [41]), and there are options for accessing the internet outside the home (e.g., libraries), the use of an interactive webportal would be overly burdensome for some families.

Conclusions

The integration of healthcare reform and healthcare technology holds great promise. Potential benefits include improvements in quality of care and better access to healthcare with the ultimate goal of improved population health. In order for these successes to be realized, several existing barriers must be addressed. Multiple stakeholders should be involved as goals, initiatives, and specific technologies are developed. These stakeholders include, but may not be limited to, patients, families, primary care and specialty providers, schools and communities, insurers, and industry. Integration between systems and optimization of existing systems will need to occur; this remains challenging given the rapid pace of technology development and remaining concerns about information-sharing, transparency, and privacy. Just as technologies will need to be integrated, so will the relationship the between patient and provider, who will need to engage as a team to promote health and successfully treat disease. Insurance reform will need to continue with an ongoing shift from volume to value. As noted by Bodenheimer et al, an endeavor such as preventing readmissions is most appreciated in a reimbursement landscape that values improvements in care over volume-based payments[8]. This is indeed the promise of healthcare reform, and healthcare technology provides an emerging and valuable resource to help us get there.

Acknowledgments

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Table 1

Key Components Necessary to Achieve Healthcare Reform and Population Health.

Component	Rationale
Early identification	Reduce disease burden by providing intervention early in disease course
Symptom monitoring	Provide shared understanding of disease course and determine effects of intervention
Patient registries	Identify population level benchmarking and determine effects of intervention
Efficient, effective communication	Exchange of relevant information both during and in between healthcare encounters
Improved access	Provide timely and effective treatment once concerns are identified
Provider supports	Encourage practice change through the use of supports to change behavior