Where is the EHR in Oncology?

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Abstract

Electronic health records (EHRs) have the potential to increase the quality and decrease the cost of cancer care. These twin goals can only be met by a fully functional oncology EHR, which includes at a minimum: searchable data repositories, clinical decision support (CDS), the ability to electronically order chemotherapeutic medications, and the ability to interface with patients via a patient portal. Such fully functional EHRs not only offer patients the best potential for high-quality care, they enable retrospective analysis to answer a wide variety of comparative effectiveness and quality improvement questions. The significant barriers of cost, time pressures, aversion to CDS, and interoperability will need to be overcome if EHRs are to be meaningfully used by the majority of oncologists. (JNCCN 2012;10:584–588)

Over the past 20 years, technological advances have transformed the clinical practice of oncology. Significant changes have been made in radiation oncology, novel targeted chemotherapies, and new modalities of diagnostic radiology. In comparison, progress in electronic records has been limited. In 1991, the Institute of Medicine (IOM) encouraged the implementation of computer-based patient records, now commonly referred to as electronic health records (EHRs). Despite the promise of increasing health care quality and decreasing cost, adoption of EHRs has been surprisingly slow. Over the same 20 years, the rising costs of health care, including cancer care, have brought the United States to the crisis point and beyond. The increasing rate of growth of medical care costs, without evidence of a corresponding improvement in health care quality, threatens the system of medical care. Oncology accounts for a sizeable and growing proportion of total health care costs, especially those borne by “entitlement” programs, such as Medicare. The complexity and cost of oncology care require the organizational capacity that a fully functional EHR can offer.

Fully functional EHRs foster the twin goals of increasing quality and decreasing costs in 3 major ways: 1) enabling effective communication, 2) allowing the use of decision support technologies, and, most importantly, 3) generating structured data. First, given the complexity of cancer care throughout the disease process, it is not unusual for a patient to have multiple sites of care (e.g., surgeon and medical oncologist at a tertiary center, radiation oncologist at a location closer to home, physical therapist at a third location, visiting nurse and/or hospice care at the home). Electronic records directly augment the coordination of services between these providers. The ability of individual providers to manage the continuing proliferation of novel chemotherapeutic agents, imaging modalities, molecular diagnostic testing, and the appropriate use of radiation oncology is becoming increasingly difficult. Although decision support algorithms (such as the NCCN Clinical Practice Guidelines in Oncology [NCCN Guidelines]) are available outside of an EHR, an integrated solution will improve the workflow in busy offices. Computerized decision support (CDS), as part of an integrated EHR, will ensure compliance with national guidelines and may even supplant third-party appropriateness review. Finally, the importance of data generation from routine patient interactions cannot be overemphasized. These data allow for the systematic collection of risk-adjusted outcome data to create much-needed comparative effectiveness and utilization review databases.
Practicing oncologists who use EHRs will use them in 1 of 4 ways: 1) as a data repository, 2) as a database that can generate information for clinical and research tasks on demand, 3) as a chemotherapy order entry tool, or 4) as a means of communication with patients via a patient portal. So where are the EHRs in oncology now and why has progress in this arena been so slow? Before discussing the incentives for and barriers against implementation of EHRs, each of these are considered individually.

**EHRs as a Data Repository**

According to the Centers for Disease Control and Prevention’s National Ambulatory Medical Care Survey (NAMCS), half of the outpatient EHRs in use today are basic systems that are essentially data storage facilities. For example, high-throughput scanners can easily transform the thickest paper records into an electronic PDF format. Although this transition can alleviate physical storage problems, the fact that these charts are often faxed or reprinted when clinically necessary is evidence that these are “EHR” in name only. The usefulness of these repositories is also diminished by vast amounts of information that no longer has clinical relevance, such as vital sign records obtained during a hospitalization. Although optical character recognition technology may be able to transform these EHRs into databases in the future, their ability to facilitate provider communication and decrease cost of care is limited.

**EHRs as a Relational Database**

All EHRs that function beyond basic repositories are structured databases. The “heart” of these systems is a relational database management system; simplistically, this generates data output in the form of tables or other structures at the user’s request. The work to generate this output is done “behind the scenes” so that the end user sees a seamless front end without having to worry about the details. After all, it does not really matter to clinicians how the vital signs, laboratory results, notes, and radiology reports are stored, as long as they are readily accessible. These systems typically have capacity for extended “look-back,” so that a chart biopsy is relatively easy for the practicing oncologist (as long as the patient has been seen previously at the institution, which is discussed in more detail later). In addition to enabling efficient clinical care, database-driven EHRs also can become valuable resources for health services, quality, and outcomes researchers. Despite this, structure concerns remain that even extensive EHRs do not contain sufficient information.¹

One obstacle to clinician buy-in to these systems is that many of them tend toward an unnatural, database-driven data entry system. Entering data in structured format (e.g., checkboxes and drop-down menus) places severe constraints on clinician autonomy and consumes the precious resource of time.² The time required to interface with an EHR has been shown to be a source of clinician career dissatisfaction. Fortunately for clinicians, these structured data can be used to feed CDS algorithms, which dramatically improve the efficiency of patient care. For example, a simple CDS system can remind providers that all female patients of child-bearing age with newly diagnosed cancer should have a documented pregnancy test before starting chemotherapy. In a fully integrated scenario, the NCCN Guidelines themselves could be embedded within an EHR oncology module, such as reminding a clinician of the NCCN level of evidence and consensus for the use of maintenance rituximab after initial therapy in follicular lymphoma but not in diffuse large B-cell lymphoma. For the portions of the EHR that remain in narrative format (such as most clinician notes, radiology reports, and pathology reports), promising new technology based on natural language processing and machine learning has shown that important information, such as adverse drug events, postoperative complications, and elements of the oncologic history, can be automatically extracted with acceptable accuracy and precision.³–⁶

A lack of interoperability has also diminished enthusiasm for these systems. This occurs for several reasons, primarily HIPAA concerns and the widely held perception by practices that they “own” their patients’ data. Given the long list of potential health care providers, it would be very unusual for a patient to receive all of their care at a single institution, especially the tertiary care institutions that NCCN comprises.

Several solutions to this problem have recently arisen. One solution is simply for multiple practices to adopt a unified EHR that should theoretically cap-
ture more of a patient’s medical history. Although this solution may give a practice group a competitive edge, it also creates “walled gardens” that still suffer from the interoperability problem for patients who are changing geographic locations. Health information exchanges (HIEs), most notably the Indiana HIE, subvert this problem by developing methods for individual EHRs to “talk” to each other, allowing for secure sharing of patient data at a regional level. Broader efforts to extend this solution through the HL7 data interchange are also underway. Another solution that has recently been implemented at Harvard Medical School, primarily for research purposes, is a federated database called the Shared Health Research Information Network (SHRINE). This is a virtual database that can search across individual institutional databases and present results in aggregate form, de-identified form, or even fully identified form when appropriate Institutional Review Board (IRB) review has occurred. The usefulness of this tool is hampered somewhat by the requirement of Data Use Agreements for HIPAA Limited Data Sets between all participating institutions and IRB review for anything other than aggregate data, but the tool does represent a leap forward in interoperability. Some initial forays were also made toward patient-centered EHRs, wherein patients ultimately maintain their own records, such as through Google Health, but this specific effort was recently terminated.

**EHRs as an Order Entry System**

The order entry capabilities of an EHR are usually intertwined with the data storage operations but should be considered separately, and are often sold as separate commercial products. For the oncologist, the essential capability that these systems offer is the ordering of chemotherapy, with automatic calculation of body surface area, creatinine clearance, and more. These systems can essentially eliminate sources of error such as handwriting illegibility and incorrect mathematical calculations. They also offer the opportunity to interface with the routine outpatient pharmacy system and can identify potentially deadly medication interactions and allergies. Although EHRs that integrate chemotherapy regimen ordering cannot eliminate error completely, they offer the promise of consistency and increased safety. Such an integrated system can also easily meet most of the requirements of “meaningful use” as defined by the Health Information Technology for Economic and Clinical Health Act (HITECH). In the future, advanced systems are likely to offer recommendations regarding renal and hepatic dosing modifications and oncologic subtleties, such as capturing lifetime doses of anthracycline.

**EHRs as a Patient Portal**

Although most innovations in EHRs have focused on robust data storage, improving clinician workflow through order entry, and safety checks through CDS, the ultimate beneficiary of all of this effort is the patient. A parallel effort to provide patients with increased access to their records has resulted in the creation of patient portals at many large and small health care institutions. This is considered one of the central definitions of Accountable Care Organizations (ACOs).

This stipulation is not without controversy for oncologists, who often must deliver bad news to patients. Many oncologists see their central role as the “navigator” of bad news (often due to the results of radiologic studies), and when patients are able to access this news themselves in advance of a face-to-face meeting, the potential result is excess anxiety. Additionally, most radiology reports contain language that can be concerning and frightening to patients, even when they do not, in fact, contain bad news. This controversy has caused resistance in adopting patient portals and does not yet have a clear resolution.

**Incentives and Barriers**

The degree to which oncology practices are currently implementing fully functional EHRs (those that have functions beyond basic data storage, billing, and scheduling services) is difficult to estimate. Clearly, the transition from paper records to EHRs has significantly lagged behind the IOM call and the more recent 2007 ASCO Electronic Health Record Roundtable recommendation that EHRs be widely adopted by oncology practices. More recently, the converging forces of risk redistribution in the form of ACOs and comparative effectiveness data acquisition are rapidly accelerating this transition. The expense associated with conversion from paper to
electronic format, which is usually identified as the major obstacle to implementation, is beginning to be defrayed through incentives. HITECH was enacted as part of the American Recovery and Reinvestment Act of 2009 and provides incentive payments, up to $44,000 per individual practitioner, to promote the adoption of EHRs. These incentives will turn into penalties beginning in 2014, placing further financial strain on already marginal practice revenue.

Although most practices will certainly have gone electronic by then, some will be less likely to make the conversion, primarily because the financial barriers to implementation may not be exceeded by the financial penalties of noncompliance with HITECH. Although the complexity of the software product is a major driver of initial expense, maintenance of software and hardware are likely stronger contributors to overall cost. Hardware must be regularly upgraded and be robust enough to deal with the demands of large databases and real-time information requests. Additionally, security strategies to ensure the preservation of privacy in the event of theft or loss of information are costly to implement. Software must also be regularly upgraded, especially for systems that incorporate chemotherapy order entry, as continuing approvals of antineoplastic drugs fortunately continue to occur. These upgrades are usually provided at great expense by software vendors, and may also require one or more full-time staff onsite, depending on the size and complexity of the EHR system.

Aside from the financial incentives and barriers, several other notable obstacles exist to conversion from paper chart to EHR. The most significant is time pressure. An EHR will almost inevitably operate more slowly than a paper chart. The reasons range from the simple time needed to boot a computer or log in to a system, to the time needed to type electronic signatures, to the time needed to check boxes on a structured template. The ever-increasing pressures on oncologists to see patients in a timely and efficient fashion compound this broad change in the health care landscape. An EHR that cannot accommodate the workflow of a busy practitioner will not be adopted regardless of the financial pressure from the HITECH funding.

Another barrier, which perversely is also the major promise of EHRs, is an aversion to CDS. The “annoyance factor” of a nagging reminder that has little clinical consequence for oncology patients, such as a reminder for a patient with terminal breast cancer to get their colonoscopy, may lead to a general aversion to CDS in general. In general, the physician population as a whole has not yet been sold on the usefulness of CDS, which is also sometimes thought of as a threat to general physician autonomy. The hope is that robust and useful CDS, such as automated incorporation of guidelines into the EHR, will become widely available in the next few years. The efficiency offered by this level of implementation and the improvement in the quality of oncology care should finally overcome this barrier.

The final major barrier to implementation is the simple human desire to preserve the status quo. Although those born after 1980 have grown up in a society immersed in technology, many practicing oncologists do not fit this mold, and may prefer to maintain the paper charts they have always used.

Conclusions

Interest in using EHRs in the oncology setting has never been greater. Robust, fully functional EHRs, which are not merely data repositories but rather comprehensive data storage and retrieval, CDS, order entry, and patient portal systems, are clearly the best way to create a rapid learning system for cancer care. Not only do these systems offer patients the best potential for high-quality care, they enable retrospective analysis to answer a wide variety of comparative effectiveness and quality improvement questions. Academic researchers will have far more valid estimates of disease-free survival for critical subpopulations treated with high-risk biologics, and will be able to capture the entire spectrum of cancer care in large numbers of patients. The incorporation of genotype-directed therapy (e.g., BRAF, ALK, EGF) into cancer care and the maintenance of these data can only realistically occur in an EHR. Finally, outcomes data culled from EHRs will enable the delivery of accurate pay-for-performance initiatives.

Critical challenges remain, most notably the technical and institutional challenges of interoperability, the ethical challenges of patient portal disclosures, and the problem of turning barriers into incentives. In answer to the question “Where is the EHR in Oncology?,” the only answer is that the next 5 years will dramatically transform the practice.
References


