Implementing a Real-Time Electronic Data Capture System to Improve Clinical Documentation in Radiation Oncology

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Abstract

Purpose: Electronic health records (EHRs) often store information as unstructured text, whereas electronic data capture (EDC) using structured fields is common in clinical trials. We implemented a web-based EDC system for routine clinical care, and describe our experience piloting this system for breast cancer patients receiving radiation therapy.

Methods: Our institution uses dictation for clinical documentation in a centralized EHR; a separate radiation therapy-specific record-and-verify system contains prescriptions, schedules, and treatment documentation. The implemented EDC system collects patient, tumor, and treatment characteristics using structured data fields and merges it with data from the radiation therapy system to generate template-based notes in the EHR. Mean times to create notes using dictation versus EDC were compared. Users were surveyed about their experience. Acute toxicities were captured using the EDC system, and reported.

Results: The EDC system has been used by 25 providers for 1,296 patients. In the most recent month, 978 clinical notes were generated. The average clinician documentation time over a typical course of radiation was reduced from 22.4 minutes per patient with dictation, to 7.1 minutes with EDC. The user survey response rate was 100%, with 92% of respondents being either satisfied or very satisfied with their experience. The worst acute toxicities were mostly grade 1 (51%) or grade 2 (43%), with rare grade 3 (3%) events.

Conclusions: We implemented an EDC system for routine clinical use in the breast radiation therapy service that resulted in significant time-savings for clinical documentation and prospective population of a database to facilitate outcomes reporting.

Key Words: Radiation oncology, electronic data capture, electronic health records

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INTRODUCTION

Phase III randomized controlled trials remain the gold standard for comparing new treatment regimens against the standard of care, to advance clinical oncology knowledge. However, these studies are time consuming and resource intensive; as a result, less than 5% of all oncology patients are enrolled in randomized controlled trials [1,2]. Retrospective studies can be performed more readily, but they often require manual review and coding of patient charts. Although they may result in interesting hypothesis-generating findings, these studies are often limited by selection, recall, and other biases that reduce their generalizability.

Electronic health records (EHRs) are being used increasingly, with estimates that they are being adopted by as many as 80% of physicians [3]. The Health Information Technology for Economic and Clinical Health (HITECH) Act continues to provide a substantial financial incentive for an evolving definition of "meaningful use" of EHRs in the United States [4].

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Although these systems can improve the efficiency and completeness of clinical documentation, the rich clinical data are often captured as unstructured free-text, which means subsequent retrospective chart reviews must be used to glean clinical insight. In contrast, electronic data capture (EDC) systems are often used in randomized controlled trials to capture data in a structured format, through electronic case-report forms, but the collection fields are limited to trial-specific data elements, and they are completed in addition to routine documentation.

We sought to implement a web-based EDC system for routine clinical care, using structured data entry to improve the ease of clinical documentation, and simultaneously populate a patient database to facilitate outcomes reporting. The pilot group for this system was our breast radiation oncology service. The goals of this study were to describe the implementation of the clinical tool, report on its initial impact in terms of efficiency gains, and provide proof-of-concept for future outcomes research.

METHODS

Information Systems

An overview of the information systems used at our comprehensive cancer center is depicted in Figure 1. An EHR that was developed in-house serves as the centralized repository for clinical documentation that includes clinical notes, radiology images and reports, pathology records, scanned outside documentation, and radiation treatment plans. Various departments commonly rely on specialty-specific software to manage their own workflow and generate appropriate internal documentation, with selected documents being deposited into the EHR for all providers to access.

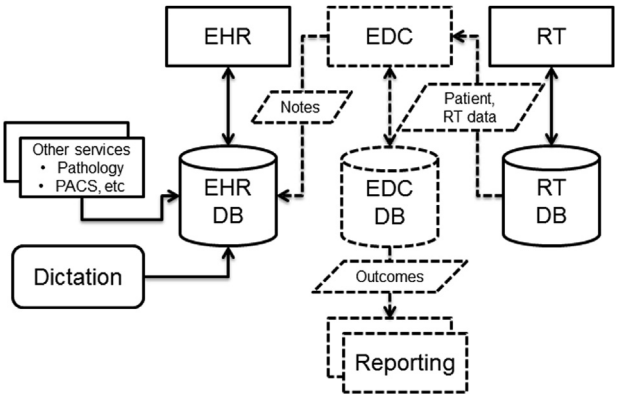

Fig 1. Diagram of information systems at our cancer center. *Dashed lines* denote new functionality implemented as part of the EDC system. EDC = electronic data capture; EHR = electronic health record; RT = radiation therapy system of record; DB = database.

The radiation oncology department uses MOSAIQ (Elekta, Stockholm, Sweden) as its record-and-verify system, which includes a patient database, simulation orders, radiation prescriptions, treatment plans, treatment documentation, and clinical schedules. Clinical notes are usually dictated on the telephone, transcribed by an ancillary service, imported into the EHR as preliminary documents, and edited by the dictating provider before finalization. For each patient treated by the radiation oncology department, clinical documentation in the EHR includes the following: (1) a detailed initial consultation note; (2) a simulation note describing the treatment simulation procedure; (3) a treatment planning note documenting the proposed treatment plan; (4) a quality assurance (QA) note from weekly staff physician review of treatment plans; (5) weekly on treatment visit (OTV) notes documenting acute side effects; (6) a treatment summary at completion of therapy; and (7) routine follow-up notes tracking disease outcomes and late toxicities.

The implemented EDC system operates as an intermediary between MOSAIQ and the EHR (Figure 1). Initial patient and clinical information entered into MOSAIQ is asynchronously imported into the EDC to pre-populate a web interface for additional structured data entry by the provider. The combined data are used to generate documentation in the EHR based on predefined note templates and are stored in the EDC to pre-populate subsequent notes. These structured data additionally serve as a prospectively generated database to facilitate outcome reporting. The exchange of data is protected by secure sockets layer-encrypted network communications, database- and application-level security, and logging of all personal health information views.

Implementation Process

A radiation oncologist (one of the investigators) collaborated with an institutional information technology group to design an intuitive and responsive web interface for the EDC system, by analyzing and identifying opportunities to optimize the clinical workflow. The interfaces captured structured data by maximizing the use of drop-down menus, selection boxes, and radio buttons while minimizing catch-all fields labeled "Other" with corresponding free-text. The web pages were