

Evolution and use of a note classification scheme in an electronic medical record

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ABSTRACT

Titles of clinical notes within an electronic medical record (EMR) are important because they influence the speed and completeness of the review of a patient's health record. We created a note classification scheme our EMR consisting of a 2 level hierarchy of note titles used to identify newly created and existing text and scanned notes. In a sample of 3 of the 18 months since beginning production use, an average of 2,810 notes are added each day. The number of distinct note titles rose by 32 percent between November 2003 and February 2005. Few changes were made to the upper level of the hierarchy. Thirty-three note titles accounted for 75% of the notes entered in February 2005. Note titles are one of several attributes that in conjunction with the user interface used to display them may affect the efficiency and completeness with which clinicians review their patient's records.

INTRODUCTION

A key function of EMR systems is to permit creation, storage, and review of clinical documents such as discharge summaries, and daily progress notes. As the volume of documents rises and individual patient records contain hundreds or thousands of documents, finding documents of greatest interest becomes an important challenge. EMR design choices such as the user interface used by clinicians to browse and select documents, and the identifiers attached to each document, such as the document title, can simplify the search for documents. Document titles may be general, such as "Discharge Summary," "Operative Note," and "Clinic Note," or more specific, such as "Orthopedics (Spine) Initial Evaluation Note." In a healthcare organization with a broad range of services, the number of note titles may be quite large if more specific titles are used, or could remain small if a smaller number of general titles is used. The number of titles available may affect the speed and precision with which clinicians find documents of interest to them. We have previously reported on the choices we made in creating titles for our EMR.¹ The

purpose of this report is to describe how the collection and use of note titles has changed over the 18 months our EMR has been in production use in our academic medical center.

BACKGROUND

Setting

This study was conducted at UW Medicine, the collection of medical centers and clinics that comprise the patient care delivery arm of the University of Washington in Seattle. UW Medicine includes Harborview Medical Center, a 413 bed county-owned medical center, the University of Washington Medical Center, a 450 bed university hospital, and clinics affiliated with these 2 medical centers. The electronic medical record is also used at the Seattle Cancer Care Alliance, a 30 bed inpatient unit and clinics that are a consortium of Fred Hutchinson Cancer Research Center, the University of Washington, and Children's Hospital and Regional Medical Center.

ORCA

The Online Record of Clinical Activity (ORCA) is the EMR being implemented in UW Medicine and Seattle Cancer Care Alliance. It is based on the Cerner Millennium application suite including Powerchart, ProFile, Provision, Medical Transcription Manager, Pharmnet and other applications, and includes applications developed by other vendors and locally developed. Practitioners in UW Medicine currently use ORCA to edit, sign, and forward transcribed documents and for entry of new notes using several direct entry tools. It is also used for results review, for medication profile review and as the inpatient pharmacy system. We plan to use ORCA in the future as the inpatient electronic flowsheet, for CPOE, an electronic medication administration record, and for other departmental applications.

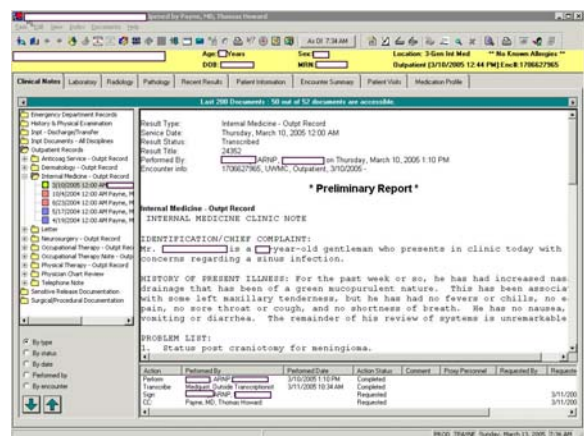
Directly entered, dictated, and scanned images are managed and viewed using ORCA. Completion of discharge summaries and operative notes, and

authentication of transcribed documents are tracked by medical record committees using ORCA. Clinicians use the electronic inbox to manage, edit, sign, and forward documents. Each day, roughly 1,000 users log in to ORCA and 3,200 view results and documents within the ORCA database using a locally developed web front-end called MINDscape. Because note browsing and selection is influenced by the user interface, we'll describe the ORCA user interface in some detail.

The ORCA user interface

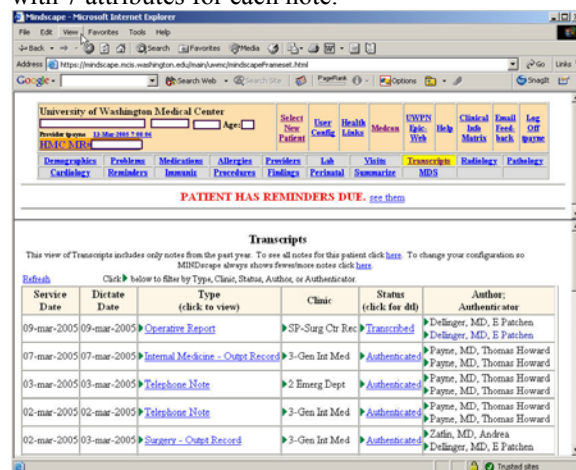
Clinical documents stored in the ORCA database are viewed by clinicians using 2 interfaces, shown in Figures 1 and 2. The Clinical Notes tab of Powerchart permits viewing of documents using one of 5 axes, listed in Table 2. Only 1 axis is displayed at a time until further user action is taken. The most commonly selected axes are type, date, and author. After selecting an axis, a list of folders is displayed corresponding to contents of the selected axis. After choosing to view the documents according to type (title), for example, a list of folders corresponding to the upper level of a 2 level hierarchy of note titles that are the subject of this report is shown. Double-clicking reveals folders for the 2nd level of the hierarchy, corresponding to note titles. Double-clicking on the title shows a list of dates of all notes with titles in that category contained in that patient's record for the time interval or number chosen by the user. When an individual note is opened for viewing by double-clicking, the note and its header containing other note attributes is displayed. Design of the Clinical Notes tab is controlled by the vendor.

Figure 1. View of ORCA notes by type. This is the Clinical Notes tab of Cerner Powerchart. Three mouse double-clicks lead to this view: first opens folder in top level of the note title hierarchy; second opens folder for 2nd level of hierarchy, third opens selected note.



Viewing the same underlying database using MINDscape is accomplished using a different interface, which consists of a list of rows, each of which corresponds to a single note. Each row includes 7 note attributes: date, service date, title, location, status, author, and authenticator. Single clicking on a row opens the note for viewing. Clinicians prefer the MINDscape interface over the Powerchart interface for browsing notes in part because of the number of note attributes displayed.

Figure 2. MINDscape Transcripts tab user interface. A list of notes within the ORCA Millennium database is shown using a web browser, with 7 attributes for each note.



Process used for adding new note titles

Requests for new notes type are forwarded to a centralized Forms Management Committee led by Patient Data Services staff who then present them to Medical Record Committees of each medical center for approval. Discussion in the Medical Record Committee includes whether note titles for certain specialties would become increasingly detailed in comparison with other specialties, and whether this is in the best interest of users of the EMR. Medical Record Committees at the two organizations meet separately, but there are shared members who present the same list, and convey questions and concerns from the other committee.

METHODS

We used a query language (Cerner Command Language [CCL]) to extract from our Millennium database a list of all text notes entered into ORCA during 3 different months after the September 9, 2003 go-live: November 2003, November 2004, and

February 2005. Data shown in Table 1 were extracted in 2 week increments and stored in a separate analytical database used for this report. We then determined the number of unique note titles for each of those months. Because some note titles were selected only once, and possibly because of an error, we also calculated unique note titles from the pool of note titles used more than once. No information that could be used to identify individual patients or practitioners was extracted. This analysis was performed for Medical Record Committee quality improvement activities.

Table 1. Data extracted for each note.

Field name	Contents
ce_event_disp	Note title
ce_updt_dt_tm	Date entered
ce_contrib_sys	Contributing system
p_position_disp	Position of person entering
e_loc_facility_disp	Facility

Table 2. Note attributes displayed in note viewing user interface in two clinical computing applications in use in UW Medicine. The ORCA note viewer is the Clinical Notes tab of Cerner Powerchart. MINDscape is a locally developed web-based results reporting application.

Field name	ORCA*	MINDscape
Note date	Present	Present
Service date	Present	Present
Service location		Present
Note title	Present	Present
Author	Present	Present
Authenticator		Present
Status	Present	Present

*Only one attribute is displayed at a time until further action is taken.

RESULTS

The number of notes entered in ORCA during November 2003, November 2004, and February 2005 is shown in Table 3. In the 88 days covered by these samples, this represents an average of 2,810 notes per day. The number of distinct note titles for these 3 months is shown in Table 3

There were 72 note titles used in November 2004 that were not used in November 2003, or an average of 6 note titles added each month. There were 27 note titles used in February 2005 that were not used in

November 2004, or an average of 9 note titles added per month. Between November 2003 and February 2004, the number of distinct note titles used more than once rose from 161 to 213, an increase of 32 percent.

The most frequently used note titles during February 2005 is shown in Table 4.

A review of the 99 note titles first used after November 2003 shows that they include a mixture of note used by specialties not previously covered in the title list, more specific titles for existing specialties, and new titles for purposes not previously covered. An example of the latter category is 'E-Mail/Mail Communication.'

TABLE 3. Unique note types and total number of notes entered in 3 representative months. The decline between November 2004 and February 2005 is due to disuse of some titles in February.

Month	Number titles (those used > 1)	Number of notes
November 2003	193 (161)	42,237
November 2004	256 (215)	99,026
February 2005	244 (213)	106,053

TABLE 4. Most frequently used note titles, February 2005. These 32 titles represent 75% of notes entered into ORCA, either directly or via dictation.

Note title	Number
Family Medicine - Outpt Record	5517
Discharge Summary	5260
Internal Medicine - Outpt Record	4866
Orthopedics - Outpt Record	4661
Letter	4205
ED/UCC Note	4129
SCCA - Outpt Record	4109
Operative Report	4062
Procedure Report	3162
Telephone Note	2934
Cardiology/Heart Care - Outpt Record	2651
Adult Medicine - Outpt Record	2520
Physical Therapy - Outpt Record	2487
Womens/Gyn - Outpt Record	2455
Pediatric - Outpt Record	2412
HMHS Case Management Note	2231
Psych Record - Outpt	1773
Endocrinology/Diabetes - Outpt	1735
Exercise Training - Outpt Record	1719

Oto Head & Neck - Outpt Record	1707
Dermatology - Outpt Record	1621
Social Work - Outpt Record	1547
Urology - Outpt Record	1410
Initial Clinic/New Consult	1296
Anticoag Service - Outpt Record	1285
Surgery - Outpt Record	1265
Madison - Outpt Record	1260
Rehab Clinic - Outpt Record	1248
Bone and Joint - Outpt Record	1242
Neonatal ICU Progress Note	1134
International Medicine - Outpt Record	1129
Neurology - Outpt Record	1009

DISCUSSION

EMR users are interested in meeting immediate information needs quickly. Efficient retrieval of notes is one of many critical functions required by EMR users. The speed with which users retrieve needed information depends on many factors including the number of note types presented to them. At the same time a descriptive note title can make clinicians aware of new health problems they had not known were present. For example, if while looking for a discharge summary the clinician sees a note from an oncologist, this may raise questions regarding possible malignancy.

Why does the number of note types in an EMR make a difference? There are practical issues, such as the time required to scroll through a long list of notes to select a title when entering a note, and the length of a list of titles within a patient's chart. Beyond these practical issues there are tradeoffs for clinicians using the record. If there are 65 note titles for oncology care, a clinician may miss critical clinical information when searching the record of oncology care. On the other had, if there is one title note for oncology care, then searching for that title will lead the clinician directly to all notes written about oncology care. Our note scheme was developed after reflecting on our prior experience with a very small number of titles—thought to be too few—and the experience of other hospitals who felt they had too many. We attempted to strike a balance between these poles.

Limiting the number of note types can reduce variability in the location where a note is placed on creation. In the above example, one can envision two providers placing a note that functions in the same capacity under two different note titles, for example,

'Chemotherapy Patient Intake' and 'Admission History and Physical – Heme/Onc'. Under this scheme, each provider might have difficulty locating the other's note.

The user interface and the number of note attributes easily displayed within that interface are also important factors in determining how easy it is to search and browse a large note collection; note titles are just one such attribute. Within our current ORCA interface, two note attributes are easily viewed at one time. (Using mouseover or widening window for note listing can a 3rd and 4th—date and subject). Users often prefer the MINDscape interface for this reason, because it shows 7 attributes in one screen.

The VA CPRS interface shows only 2 attributes: date and title. A proposed note title standard by Brown and colleagues would increase this by embedding other attributes into the title itself.² The document naming nomenclature they describe is used in some VA CPRS installations and has been proposed for adoption elsewhere.

What is the optimal number of note titles for use in an EMR? Is the rate of growth in note titles we observed a good thing? This depends on answers to questions that we have not addressed in this analysis. If clinicians using the EMR are able to find notes that they wish quickly and do not miss notes appropriate to their need, then we would argue that the note classification scheme is meeting its objective. One can imagine that if there were thousands of different titles, and the user interface for browsing note was not enhanced, that it would be difficult to answer such questions as "What note written by cardiologists are available in this patient's record?" Some organizations have chosen to have over 1,000 titles in their EMR, while others have far fewer.²

Organizations such as HL7 have proposed standards for clinical document names, drawn from LOINC (Logical Observation Identifiers, Names and Codes).^{3,4} At the time our scheme was developed, these standards were not widely adopted, and our review did not find them detailed enough to represent our existing scanned and directly entered notes. Use of the LOINC document type code standard is intended primarily to facilitate note sharing, recognizing that institutions may have more detailed, local document names⁴ such as those described in this report. This practical approach recognizes that many institutions will have existing note naming schemes. We have not yet mapped our note scheme to external standards, but there may be important reasons to do so, including simplifying future inter-organizational data exchange.

Operational considerations

Another change that has occurred in our note classification scheme is reassignment of some titles within the highest level of the hierarchy. For example, in the initial design, one high level folder was Sensitive Release Documentation. The purpose of the category is to heightened attention and caution when accessing and disclosing records. Soon after go-live, users began requesting documents be mapped to a category more closely correlated to the document content. Usually this request was made facilitate coordination of care with better way finding in the medical record. For example, notes on HIV care are now in the Outpatient folder rather than Sensitive Release Documentation.

Most health care facilities will use a commercial EMR. When using a commercial EMR, the user interface used to display notes is provided by the vendor, but the number and type of note titles may be the customer's organizational choice. The 2 extremes are to have a very small number of note titles such as Clinic Note, Discharge Summary, Operative Note and Letter, or to have hundreds of specific titles. A smaller number of titles can be thought of as more sensitive, but not specific, in that opening the Clinic Note folder would reveal notes by that title by a wide variety of users. On the other hand, having a large number of specific titles may require that search of many different note types to identify the note desired.

Questions for future research

Note titles, the hierarchy with which they are organized, and the user interface used to browse and view notes are all intended to assist clinicians using the EMR. The goals include browsing, searching, and understanding the record of an individual patient. How can we determine the optimal note title scheme or user interface? How can current EMRs improve on existing user interfaces? It is very likely that an entirely different approach, based not only on document attributes but also on the document contents⁵ be a better approach. Titles are only a high-level, coarse indicator of what the document contains. Randomized controlled trials testing the speed and completeness of search in real-world conditions using new interfaces to existing EMRs would be an extremely useful step in identifying better methods to find needed information. How quickly and accurately can a cross-covering resident learn what she needs to know about a patient whose condition has rapidly deteriorated? How long does it take for a consultant to become familiar with a newly

referred patient? How long does it take for a primary care provider to prepare to see a patient in clinic?

CONCLUSIONS

Our note classification scheme includes 244 distinct titles used to create 106,053 notes in our EMR during February 2005. Since November 2003, 99 new titles have been added to this collection. The rate of growth in new titles has not declined over the months measured. Until data on optimal numbers of notes are available to guide us, we plan to restrict the number of new note titles added because we feel large numbers of note titles may create difficulties for clinicians in browsing and searching within the growing collection of notes within our EMR.

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