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Effect of Direct Management of Clinical Documentation and Its Contents (Medical Record Items)

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Abstract

Many clinicians need a rapid creation and change of clinical document according the fast change of medical environment. However, it is not easy to create new clinical document and it is more difficult to change its contents on the system of paper based clinical document. The Severance Electronic Medical Record (EMR) system was constructed and run on the basis of clinical documentation with XML format and its contents under the name of medical record (MR) item as a new concept. Each MR item has its characteristic and own attribute values. In this study, we tried to evaluate the effect of this direct management of clinical document and its contents (MR items) by the changes during 1 year after implementation.

Keywords:

EMR, medical record (MR), MR items

Introduction

The clinical document has a vast of variety by the department and individual clinician. Many clinicians need a rapid creation and change of clinical document according the fast change of medical environment, such as research and new devices. However, it is not easy to create new clinical document and it is more difficult to change its contents on the system of paper based clinical document. The main reason is that those change needs the process of consensus, confirmation, inspection, and registration, moreover this process is not so flexible to accommodate the promptness of clinician, and also impossible to create all the documents as clinicians please.

The Severance Electronic Medical Record (EMR) system was constructed and run on the basis of clinical documentation with XML format and its contents under the name of medical record (MR) item as a new concept. Each MR item has its characteristic and own attribute values.

The system has two main functional modules. One is clinical document editor, which enables creation or change of clinical document, and the other is MR item registration module, which register new MR item and change the attributes of MR item. On the blank board of clinical document editor, the clinicians can select MR items that they want and place them where they want. Through this, the creation or change of clinical documents was very fast and can be created as clinicians needs. MR items were gathered by fractionation of the every content item of paper clinical documents. In order words, it provides the maximum flexibility of customization of clinical document and contents to the clinicians.

In this study, we tried to evaluate the effect of this direct management of clinical document and its contents (MR items) by the changes during 1 year after implementation. We inspected the change of numbers by electronic calculation, and evaluate the process of new adaptive classification, and estimate the controllability of the in time recording. The result shows the dramatic rapider change of the clinical document and its contents than paper-based record.

On the basis of the results, we can conclude that there has been very insufficient reflection of clinician's needs on the clinical document in the previous paper-based recording system. And also we can sure that its main reason is easy and direct management of clinical documents and its item by themselves. So, if an institute wants to implement self evolutional EMR system, the maximum customization should be provided on the modules of clinical documentation and its contents.

Material & method

All data was retrieved from the Electronic Health Record (EHR) system of one hospital, Severance hospital, Seoul, Korea. The hospital has 8,000~12,000 Outpatients per day, 2,000 inpatients, 2,100 beds, 2,500 clinicians, 54 medical department, 57 general ward, 9 ICU, 5 specialized centers. The whole hospital information system has been constructed on the basis of EHR system that contains EMR and Computerized Patient Order Entry (CPOE, order communication system) system. On the EHR system, the other systems are integrated, such as 3 PACS, one Dynamic PACS, Enterprise resource system, Groupware, Dataware house, and Disaster recovery system.

Before retrieval of data, the number of paper based clinical document (PBCD) was checked before and just after revision of clinician for the conversion of electronic form.

During revision process, lots of new paper based clinical document was gathered from the clinical department and nursing field. After then, those are revised for electronic conversion. The number of the original categories and revised categories of PBCD was also checked. And then the number of initial electronic clinical document (ECD) was checked via EHR system.

The follow up of the changes of the ECD and MR item was checked monthly for 1 year. At the time of 8 months after implementation, the data was analyzed by the classification of the database of recording log of CD by

MS SQL according to classification of the ECD, number of new ECD, and the analysis of the changes of attribute of MR item and MR item itself. Through this procedure we postulate common ECD by its frequency of usage according to its clinical objectives. So, the commone ECD is a kind of reestablished current ECD of the institute. For this work, 1,677,434 patient's clinical records were examined. Through this work we identified number of available ECD from total patient's records by using above analysis process.

The estimation of the controllability on actual recording was done four specific limited ECD. Those documents are admission note, operation note. The occurrence time of events of admission and operation were compared with the recoding time of each records, and the existence of the recorded ECD of each records.

Results

Evaluation changes of CD, ECD, and MR items

Table 1 - Change of paper based clinical document

Before revision	After revision*
Medical 18, Nursing 40	Medical + Nursing : 960

*After revision involves not only revised document but also department managed (can be called hidden) document from whole clinical, nursing, and other supporting departments.

Table 2 - Change of ECD from revised paper document

Period	Number of clinical document
Pre-EMR (Paper)	960
Initial in EMR (Nov, 2005)	1,169
6~7 Mon later after EMR	5,370
1 year later, Present (Nov, 2006)	2,707

Table 3- Category of paper based clinical document (PBCD)

Original categories	Revised categories
No category ; Admission note Laboratory result report Examination result report Procedure result report Discharge note, Summary note, Progress note, etc < Other many record that was used without management of the medical record department.>	Four categories ; 1. Progress note – OPD progress note – IPD progress note – Operation note – Consult note – Anesthesia note – Treatment note – Doctor order note etc 2. Result report – Laboratory – Radiology – Pathology – Examination etc 3. Legal form – Consent form – Diagnostic certificate – Refer note etc 4. Education Document and Other

* Revised category was applied to the ECD in same.

	Pre- EMR	Present	Modification
MR Item	15,092	24,858 (+9,488, 41.7% Δ)	240 (1.8%)

Table 4 - Change of number of MR item

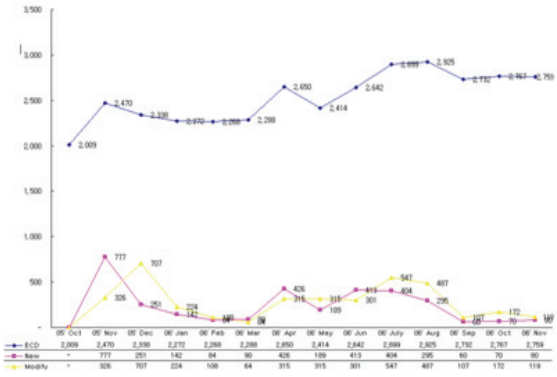

Figure 1 - Transition of ECD, frequency of new generation and modification

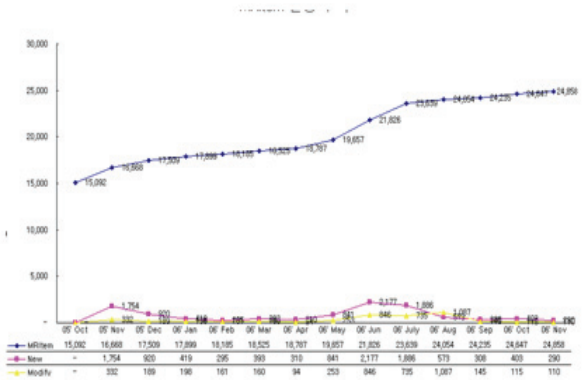

Figure 2 - Transition of MR item, frequency of new generation and modification

Extraction of common ECD at 8 month of implementation.

- Through 1,677,434 patients, 25,074,974 ECD was existed. Among these ECD we can identify available, in other word proper recording was done, ECD is 19,394,233. From these available ECD, we also identify 1,538 of new common

EMR was forced by the massive creation of CD by clinicians and departments which contained different contents (MR item) even though those are CDs of same purpose.

For this extraction, the new creation of ECD was measured in two ways. We treated the CD that has changed more than 50% in its MR item as a new ECD, and treated the others as a changed ECD. And the change of MR item was measured a log of modification of MR item database.

Estimation of controllability of ECD

The recoding time of admission note and operation note was checked. The frequency of completeness of recording within 48 hours has been increase very sharp after 5 months of implementation in admission note (Fig. 3). For the operation record the module of control of recording time was applied at the 11th months after implementation, so the frequency of completeness shows sharp increase at the time of 12th month of implementation (Fig. 4). This means that the adaptation of admission note is faster than the operation record. In other word, the work process of admission note has been changed gradually by ECD environment, but for the operation record, the habit of physician has not changed until the control module (time warning module) was applied. In paper based operation record, this kind of control was impossible.

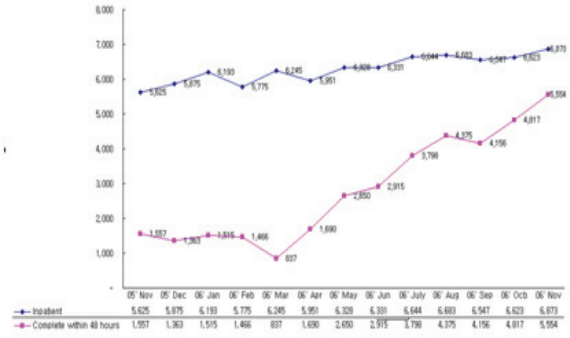

Figure 3 - Recoding time of admission note and number of inpatients

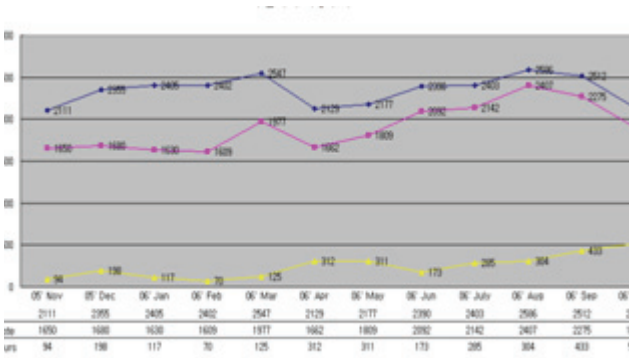

Figure 4 - Recoding time of operation note and number of OP-patients

Discussion

The expansion of medical information makes the evolution of the electronic management of the information. The expansion is not only its amount but also its variety.[1][2][4] In the last decade, it was possible to adapt the changing environment of the medical information through the paper based recording system, however nowadays it is impossible to adapt appropriately because the change is so fast and variable.[2][4] The institute of this study has started one clinical document, so-called discharge summary note, before 60 years. Before implementation of EHR system, the department of medical record has managed and archived only 58 clinical documents, however, there were lots of hidden clinical document that has been managed by individual department. So, the number of whole paper documents was collected up to 960 before implementation of EHR system. This change can be a evidence of hidden need of change of medical document of the institute during last 60 years(Table 1).

Before implementation the clinicians of the institute examined and revised their clinical document forms and its items as a preparation for the conversion of the EMR system.[1][2][3][5] The 5,370 CD was created as new one at the 8 months of implementation, this would be another evidence of need of diversity of clinical document. This 8 months' change of ECD makes a decision of provision of extraction of common ECD. As the result of extraction of common ECD and rearrangement, the 2,707 CDs were existed at 1 year of implementation (Table 2, Figure 2).
To achieve this direct management of CD and its contents by users, we have to create the new concept, so called, MR item. The terminology system is a collection of term.[5] Each term has its own meaning. However, we found that each medical term can have different meaning by specialty and situation, and also we found that medical term can involve image, grid, voice not only text. So, every clinician can not select the term in same meaning, and this makes impossible to select items of ECD by clinician. The concept of MR item was started from this insufficiency of current terminology system. The result of this concept makes two main modules, named *Clinical Document Editor*, and *MR Item Registration.* This enables clinician to create and change their ECD and its content directly whenever they need. The recorded ECD is stored XML format with electronic signature and MR item is stored into database sever. This enables confidentiality of records and reusability of information. From the items of content of revised paper CD, record items were unified, classified, and fractionated into 15,092 MR items at the time of implementation and then has increased 24,824 MR items after 1 year of implementation(Table 4, Figure 2). This change may reflect the clinician's needs of change of the terms.

The main objective of this study is whether clinicians have high need of direct management of CD and its contents. The observation of the change of ECD and MR items reveals that there is a high need (Table 2, 4). The progressive increase of ECD is somewhat unexpected phenomenon because the total revision was done by clinician themselves just before conversion of paper document to electronic one. We can sure that almost triple increment of ECD means explosion of high need for their clinical document. Also this means that there has been a limitation of expression on the previous system paper based clinical documentation.

The result of change of MR item means another desire of clinical documentation. The result shows that there was same need for the term itself. Clinicians want to use accurate term for their documentation. For example, the term 'time' can be a same item in two different clinical documents. However, it can be used year-month-day in one record and can be used hour-minute-second in other document. Previous paper document can hold this term 'time' in one meaning, though the real records is different. However, in the situation of direct management of items, clinician seek proper MR item, create item, and use it as a reflection of their desire of accurate description for better medical record. At this time MR item have different time attribute even though the name of item is same and they saved in different sector. This kind of addition of MR item has been occurred 24,858 times and time of change of attribute has been occurred 4,425 for 1 year. It also shows their adaptation of the new system as much as they use the system frequently. As another meaning, the simple collection of term, the terminology system should have any kind of intermediate tool that accelerate the usage of exact terminology like MR item.

By the above changes, the extraction of common ECD was possible, even though actual ECD is different from department and clinicians. For example, the items of discharge summary note is different in obstetrics and dermatology, however, they can be treated as a same discharge summary under tagging of department name of obstetrics and dermatology. Complete reconstruction of common ECD was possible by analyzing the changes of ECD and MR item at 8 months after the implementation of system. This would be another effect of direct management of ECD and MR items, because clinician left spontaneous consensus as well as difference of their record in the system. This traceable evidence makes easy transition of completeness of recording in time.

The estimation of completeness of medical recording [3] was greatly improved after reconstruction of essential ECD. The result of the time check of 2 time-limited medical records shows sharp increase of completeness (Figure 3). Completeness of operation note also has been more increased than initial of EMR (Figure 4). Clinicians can agree easily the time-limited document and accept the systemic alarming of time limitation. If they did not create their own record item and form of documentation, it is easy to make this kind of high completeness [3].

Other effect of direct management of ECD and MR item, the ECD for the research can be achieved. Even though we can not fully differentiate which one is ECD for research, we can sure that many portion of new ECD except essential ECD would be created for the research.

Conclusion

The direct management of ECD and its contents can satisfy clinician's need of expression, and extract their positive consensus of medical record, and also expected to accelerate their research mind. So, any institute should provide best tool for the direct management of electronic clinical document and its contents, when they implement new system, if they expect better return on investment.

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