PILOT PROJECT FOR ELECTRONIC REIMBURSEMENT SYSTEM FOR PHYSICIANS IN INDONESIA

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ABSTRACT

A healthcare department in remove community of Indonesia aimed for reducing paperwork and improving the electronic system. As part of a pilot project, one aspect was replaced from manual to the electronic format. The proposed system was use of electronic form for claiming for fee reimbursement made by the physicians. The design of the system is intranet based and consisted of two separate portals. The first portal is for physicians and second portal is for billing clerk. The interface is user-friendly and packed with pre-defined codes set in several of its fields and sub-fields. The electronic form is also linked to a centralized database from which a physician can copy the existing patients record. For improving the system variance from individual needs, decision support algorithm is used. Whereas, for improving the system performance, machine learning algorithm is used. For data query, database query was designed. The relationship of columns in the database is displayed as a tabulated form to the user. In situation where a user selects a particular column, a filtered display mechanism displays those columns which satisfying the portion of the query already constructed. For obtaining data from the tabulated database, the SQL query is adapted. Rule-based knowledge inference model is utilized for reasoning about terminology and required domain knowledge. The inference used is algorithmic and helpful in performing all necessary tasks under the suitable billing circumstances. A survey is conducted with 35 physicians for judging their perception towards the system. Results of the survey indicate that most participants find the system suitable and better than the paper-based system in terms of several dimensions such as user friendliness, time saving, reducing errors, and accuracy.

Keywords: Electronic Form, Information System, Healthcare.
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INTRODUCTION

Maintenance of accurate clinical documentation is important for producing higher quality healthcare to the citizens. Now a days, the medical staff and healthcare units have to overcome the challenge of maintenance of large amount of paper which is imposed by regulators (Bleich, Sefran, & Slack, 1989). In this regard, the maintenance of healthcare related invoicing and bills are important because of customer and regulatory perspective. The process starts with charge capture where healthcare units charge the fee of various healthcare related services to patients which is later used for final invoicing. In this matter, a good health information system plays a vital role which is used to manage healthcare information as well as administrative details such as billing (Anderson, 1997)

Management of such clinical information in the health information system (HIS) is key to provide smooth healthcare services to the patients (Reich, Kahn, Wax, Palvia, Galati, & Krol, 2006). For management of health information infrastructure, it is important to provide explicit computer-interpretable reimbursement logic by the payers. This will facilitate in paying bills and releasing the efforts of both the payer and receiver in managing such transactions. However, among developed countries, the Information Technology (IT) adaption is lower than the other countries such as US lags behind the European countries in this regard. However, several countries are attempting to move from traditional data to electronic data capture for providing better healthcare services to the citizens (Millenson, 2004). This also leads to the problem to train large number of healthcare staff. A well-trained healthcare staff in the IT field on the other hand can have higher efficiency and service quality level; something very necessary in countries where healthcare system is under pressure (Anderson, 1997). By making use of IT, the paperwork can be reduced and more time can be allocated to the care of the patients rather than maintenance of unnecessary paperwork. Examples of healthcare units which implemented network-based IT system shows that it helps in reducing paperwork along with time and cost saving and better service to the patients. One example of such system is a hospital in USA which provided double-sided billing slip book to the attending physicians who record their patient care service charges in the inpatient units. The patient's demographic information is filled in by the physician or nursing station. The medical information such as disease history is also noted based on the classification scheme. The physicians submit the billing slips on regular interval to the billing department which is used as an input for billing reports preparation.

The system poses some challenges as it takes physician longer time to get the reimbursement from the concerned department because of extended processing time for the paper slips. Mostly, physicians face problems in filling the slips because of busy schedule resulting in delay of data entry and the reimbursement. The other problems include illegible handwriting which makes data entry difficult and prone to errors, incomplete progress notes and related discrepancies, and the time-consuming manual verification process. The paper slip is often found too small for inputting all the necessary information. Based on these limitations, the current study proposes a paperless information system which can be used to overcome some of these challenges. In this

proposed system, the billing information and related medical history is input in to an online database provided through the hospital's website.

METHOD

Design Considerations of the Intranet-Based System

For application development, the intranet approach is widely recognized. The intranet approach merits include ability to extend the value of legacy system, user friendliness, use of cross-industrial standards, ease of development and deployment, and low-cost connectivity (Siau, 2003). The system needs to be designed with the fact in mind that still several physicians uses manual system over the electronic one due to the habit and lack of training for the electronic system. The current study is conducted in a community healthcare department in Indonesia. The department runs healthcare units in remote areas and have intranet website for its staff for providing remote clinical applications including patient management, patient care system and financial information management application.

System Design

For system design, first we conduct a need analysis. This was done by conducting interviews with healthcare staff in the facilities in order to obtain their feedback about what are their preferences in terms of new system design. The results show that for the traditional system, the physicians required to fill the slip based on their memory of a patient's diagnostic data and putting this slip in to a coordinator mailbox. The error checking procedure was done manually by the clerical staff and if found correct, proceeded to next step. However, if there were some errors in the slip, so it was returned to the physicians for correction. Thus, the system becomes time-consuming and resource heavy. This resulted in delay of reimbursement made to the physicians for their work and reduced the morale and quality of service.

The proposed intranet-based implementation is covering the entire process and reducing the errors and aims to improve the service delivery efficiency and quality. For example, using of electronic system reduce the errors related to illegible handwriting. The report generation become also easy as clerical staff and the physicians do not need to go through all the slips to prepare some reports. With this new system, the report generation is only few clicks away. By making use of messaging system, the information flow is also become easier between the physicians, clerical staff, and the department. For designing the system, an electronic charge transmittal form is designed making use of an application in the Joomla which is a content management system. The electronic form contains information fields about patient data repository and its user-friendliness is enhanced using the PHP programming. The electronic data entry form is based on two portals. The first portal is for physicians which is used for inputting the key information about patients and its billing related information. The second portal is related to the billing clerk in the finance section of the department for processing the reimbursement claims. The outlook of the electronic form is similar to the original slip so that it is easier for the physicians and the clerical staff to locate the information. It also includes several windows features for managing the workflow. For improving the legibility of input of data and speeding up the process of data entry, the form is designed in such a manner that it facilitates reducing

keystrokes in a number of data attributes which can be given as pre-designed option on the system.

Interface Design

Greater efforts are made to made the system interface as much user friendly as possible. For this purpose, there are several hyperlinks added leading to the suitable online resources. These online sources could be used for finding relevant medical help. There were pre-defined codes set in several fields, and option of adding extra code is also made available for making system as flexible as possible. A centralized preliminary level database which already exist in the healthcare department is also linked and an individual's patient data can be copied from the database in to the form which reduce the efforts and improve efficiency and quality of data by reducing errors. If new patient shows up who don't have record in the database, so the physicians can manually add the patient record in the form but not in the healthcare department database.

For reporting purpose, physicians were required to mark the 'complete' checkbox on every completed case which was used by the system for generating reports on the completed cases in real time. Sign-in form is used to manage the record keeping between the physician and the billing clerk. In manual system, the physicians were required to submit the slip to the billing clerk mailbox. However, here, form once submitted, moving to the billing clerk dash board immediately. A notification email was also sent to the billing clerk email.

For improving the system variance from individual needs, decision support algorithm is used. Whereas, for improving the system performance, machine learning algorithm is used. This is achieved by making system capable of patient's data search and duplication from the patient repository without repeated entry and upgradation of the code pick list automatically. The electronic form system was implemented to make use of the functions of charge capture and submissions for reimbursement without involving any paperwork.

Database Query and Data Extraction

For data query, database query was designed. The relationship of columns in the database is displayed as a tabulated form to the user. In situation where a user selects a particular column, a filtered display mechanism displays those columns which satisfying the portion of the query already constructed. For obtaining data from the tabulated database, the SQL query is adapted. For example, if ICD-i-CM Code 431 will display the clinical diagnosis 'intracerebral hemorrhage' and vice versa.

By making use of query onto the relational database, the diagnosis process selection is imitated. This bring forward a set of available diagnosis which can be extracted from the database as a group of qualified items which will be eligible for the patient's state. The model can perform syntactic processing for transforming the input to a canonical form, performing user queries, and selection of suitable clinical terms for answering the query, and displaying results. The approach consists of metadata supporting a query front end which essentially hides the entity-attribute-value nature of individual attributes from the user. This function enable time saving for the user by reducing the keystrokes required on complicated medical terms thus avoiding data entry errors as well.

Algorithmic Inference Model

Rule-based knowledge inference model is utilized for reasoning about terminology and required domain knowledge. The inference used is algorithmic and helpful in performing all necessary tasks under the suitable billing circumstances. For an inference engine, decisions rules were developed based on algorithm which assist translation of relationships of medical diagnosis/treatment and their associated clinical vocabulary. For every inference rule, there was an associated clinical specialty and triggered to link appropriate treatment procedure for suitable billing code for every individual physician based on the guidelines of the billing agency. For improving the billing code representation of medical diagnosis and treatment, data mining and machine learning algorithm is used. This add to the knowledge stock when a physician adds a new item. For assisting a user from obtaining a particular medical record from database, the association rule algorithm is utilized. This function can also be used to copy patient record and demographic information in to the electronic billing form. The approach enables easier record extraction and maintenance. The data extraction process was programmed to display only the relevant patient attributes which was achieved using the rules algorithm.

Data Collection and Analysis

For testing the performance of the implemented electronic billing form system, surveys were conducted with the 35 participating physicians. Data is thus collected to judge the participants perception regarding the implemented system.

RESULTS

The results on the feedback of the proposed system are as follows;

Table 1: Results

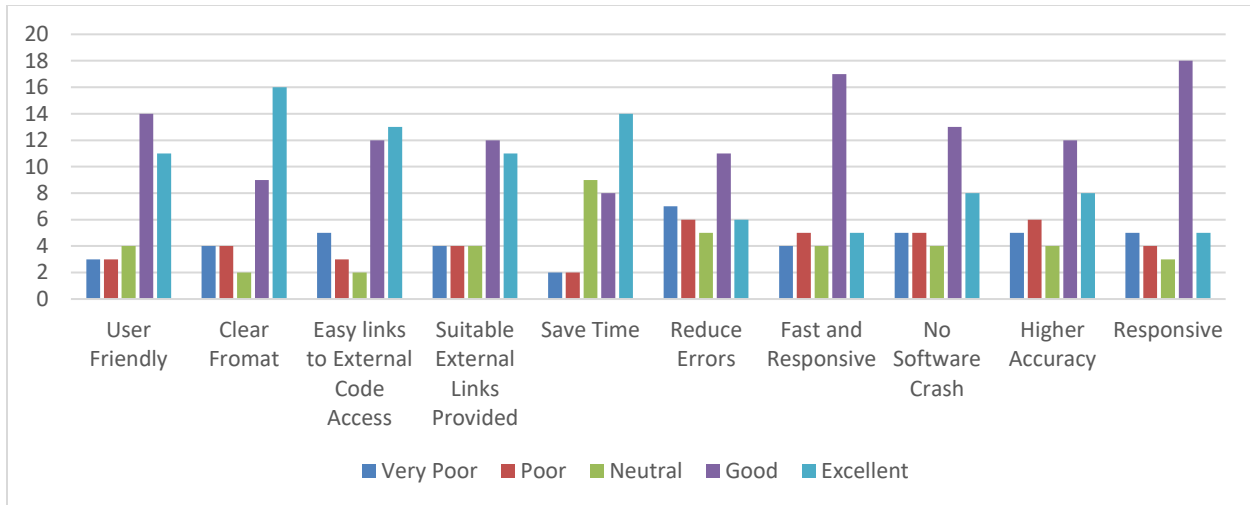| Dimension	Very Poor	Poor	Neutral	Good	Excellent	Total
User Friendly	3	3	4	14	11	**35**
Clear Format	4	4	2	9	16	**35**
Easy links to External Code Access	5	3	2	12	13	**35**
Suitable External Links Provided	4	4	4	12	11	**35**
Save Time	2	2	9	8	14	**35**
Reduce Errors	7	6	5	11	6	**35**
Fast and Responsive	4	5	4	17	5	**35**
No Software Crash	5	5	4	13	8	**35**
Higher Accuracy	5	6	4	12	8	**35**
Responsive	5	4	3	18	5	**35**

Figure 1: Results

The results of the survey show that on the user-friendly dimension, 3 participants responded very poor; 3 participants responded poor; 4 participants responded neutral; 14 participants responded good; and 11 participants responded excellent.

For the clear format dimension, 4 participants responded very poor; 4 participants responded poor; 2 participants responded neutral; 9 participants responded good; and 16 participants responded excellent.

For the easy links to external code access dimension, 5 participants responded very poor; 3 participants responded poor; 2 participants responded neutral; 12 participants responded good; and 13 participants responded excellent.

For the suitable external links provided dimension, 4 participants responded very poor; 4 participants responded poor; 4 participants responded neutral; 12 participants responded good; and 11 participants responded excellent.

For the save time dimension, 2 participants responded very poor; 2 participants responded poor; 9 participants responded neutral; 8 participants responded good; and 14 participants responded excellent.

For the reduce error dimension, 7 participants responded very poor; 6 participants responded poor; 5 participants responded neutral; 11 participants responded good; and 6 participants responded excellent.

For the fast and responsive dimension, 4 participants responded very poor; 5 participants responded poor; 4 participants responded neutral; 17 participants responded good; and 5 participants responded excellent.

For the no software crash dimension, 5 participants responded very poor; 5 participants responded poor; 4 participants responded neutral; 13 participants responded good; and 8 participants responded excellent.

For the higher accuracy dimension, 5 participants responded very poor; 6 participants responded poor; 4 participants responded neutral; 12 participants responded good; and 8 participants responded excellent.

For the responsive dimension, 5 participants responded very poor; 4 participants responded poor; 3 participants responded neutral; 18 participants responded good; and 5 participants responded excellent.

CONCLUSION

The study proposed and tested on pilot basis an electronic form replacing the paper-based process of making reimbursements made by the physicians. With this electronic form, the physicians were easily able to enter the patient information and forwarded the same to the billing clerk. The billing clerk is also further able to process the form and prepare reports. The proposed form is claimed to be reducing the paperwork and improving efficiency along with the benefits of saving time and reducing errors. Based on the survey results, the proposed form is found to be having higher acceptability among the staff who perceive it better than the manual form in number of dimensions.

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