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Effect of implementation of a coded problem list entry subsystem

Chia-Chang Chen [a,b], Chung-Hsin Chang [a], Yen-Chun Peng [a,c], Sek-Kwong Poon [a], Shih-Che Huang [d], Yu-Chuan Jack Li [b,e,*]

[a] Division of Gastroenterology and Hepatology, Department of Internal Medicine, Taichung Veterans General Hospital, Taichung, Taiwan
[b] College of Medicine Science and Technology, Graduate Institute of Biomedical Informatics, Taipei Medical University, Taipei, Taiwan
[c] School of Medicine, National Yang-Ming University, Taipei, Taiwan
[d] Department of Emergency Medicine, Taichung Veterans General Hospital, Taichung, Taiwan
[e] Department of Dermatology, Taipei Medical University—Wan Fang Hospital, Taipei, Taiwan

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ABSTRACT

Objectives: Complete patient problem lists may improve the quality of care. To improve the completeness of the lists at our institution, we implemented the coded problem list entry subsystem (CPLES) in our electronic medical record system. Subsequently, physicians used the CPLES instead of handwritten notes to document coded problem lists and progress notes. We evaluated the effect of implementing the CPLES on the completeness of problem lists.
Methods: We compared the completeness of coded problem lists input after CPLES implementation with that of problem lists handwritten before CPLES implementation and determined the differences. Moreover, the efficiency and usability of the CPLES were evaluated.
Results: The efficiency and usability of CPLES were acceptable. However, the completeness of problem lists was reduced after CPLES implementation. The possible reasons for this reduction, namely system usability, efficacy, incentives, leadership, and education, were crucial for successful CPLES implementation and are discussed in the text.
Conclusion: CPLES implementation reduced the completeness of problem lists. Institutions may learn from our experience and carefully implement their own coded problem list systems to avoid this consequence.

1. Introduction

Problem-oriented medical records (POMR) were introduced by Dr. Larry Weed and are the current gold standard for medical records, with the problem list as its core component [1]. Complete problem lists may improve the quality of care [2]. Problem lists support clinical workflows such as assessing problems, documenting interventions and evaluating the effect of treatment. Problem lists also help in retaining information across

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* *Corresponding author.* College of Medicine Science and Technology, Graduate Institute of Biomedical Informatics, Taipei Medical University, Taipei, Taiwan. Tel.: +886 227361661x8866.
E-mail address: jaak88@gmail.com (Y.-C.J. Li).

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the healthcare continuum and reducing redundant processes [3]. Computer-coded problem lists are required for meaningful use of electronic medical records (EMR) [4]. Coded data enable data exchange and sharing [5] and are the foundations for data mining and secondary use of data, as well as for computerized clinical decision support [6]. Clinical decision support systems often use coded problem lists for triggering alerts for physician review [7].

Most clinicians are aware of the value of problem encoding. However, problems lists are often inaccurate, incomplete, and outdated [8–10]. For example, only 27.7% of pregnant women with a body mass index of >30 kg/m^2 had obesity documented in their problem lists by obstetricians and gynecologists [11]. Only 11% of patients with chronic kidney disease had the related diagnoses present in their problem lists [12].

In 2013, 78% of office-based physicians used any type of EMR system. The rate of use of problem lists by these physicians was not assessed. Meanwhile, 48% of office-based physicians reported using a system that met the criteria for a basic system [13], which should include problem lists [14]. Thus, the use of problem lists and implementing related systems are essential for physicians and hospitals. Limited research has been conducted on this topic.

A clinical alerting system [15] and natural language processing [16] have been used for improving the completeness of problem lists. The support systems efficiently improve the completeness of problem lists; however, they can also be a source of tremendous clinical documentation errors, which may affect patient care [17,18]. While these innovative systems have both advantages and disadvantages, many hospitals do not code problem lists, and some do not use problem lists at all; most physicians still use handwritten problem lists or computer-free text entry [19].

In this study, we implemented the coded problem list entry subsystem (CPLES) in a medical center and evaluated the result of this implementation. Physicians used the CPLES instead of manual notes for coding problem lists and inputting progress notes. We describe the development, implementation, and functioning of the CPLES. Two years after CPLES implementation, we compared the completeness of the problem lists coded after the implementation with that of problem lists handwritten before CPLES implementation. We also evaluated the efficiency and usability of the CPLES. We discuss the reasons underlying the change in quality of problem lists after CPLES implementation and suggest the development of similar systems in the future.

The following text was structured with three main parts. Part one (sections 2 and 3) is about how and why we implemented CPLES. Part two (sections 4 and 5) is the evaluation of CPLES implementation. Part three (section 6) is discussion about the result and suggestions for other institutions.

2. Target institution and development of coded problem list entry subsystem

The CPLES was developed in a tertiary referral medical center having approximately 1400 beds. Before 2012, the hospital physicians used EMR for inpatient admission, discharge, and surgical notes. They still manually document inpatient progress notes and problems lists for each inpatient. Each problem list contains the past and current diagnoses of a patient and is updated according to the patient's admission course. A new problem list is generated if the patient has another admission course.

We developed the CPLES with 2 main aims: transition to a paperless hospital (ie, replace handwritten notes with the CPLES for coding problem lists and maintaining problem-related progress notes) and improvement of problem list completeness.

Informaticists as well as clinicians extensively participated in the CPLES development; they collaboratively and comprehensively evaluated the literature for the development of a CPLES prototype. Clinicians provided suggestions regarding the graphic user interface and core components of the CPLES.

Before CPLES implementation, several physicians were recruited to evaluate the CPLES and provide feedback. After system debugging and adjustment, they were comfortable using the CPLES, and the system was released online in September 2012. Several instruction sessions were conducted for all physicians before the online release. By November 2012, the CPLES usage rate was relatively high and stable; therefore, we decided to commence the complete implementation of the CPLES and discontinue the use of manual POMR.

3. Function of coded problem list entry system

The CPLES is a module integrated into our EMR system, which is a web-based application. Using a browser, users can access the main functions on the CPLES homepage (Fig. 1). The homepage shows patient problem lists containing information on problems (listed sequentially and chronologically) and their duration, activity, current assessment, and the main treatment plan. Users can edit the basic components of each problem directly on the homepage or/and can perform advance editing by clicking "Edit link" (Fig. 2). Users click the "Add" button on the right side of the problem to input problem-related progress notes and trace problem-specific progression notes by clicking the digit (indicating quantity of notes) on the right side of the "Add" button.

The interface terminology of the CPLES combined the Systematized Nomenclature of Medicine–Clinical Terms (SNOMED CT) and the legacy terminology of the institution. The legacy terminology of our institution was used for several years before CPLES. It contained most frequent diagnoses of the institution. Most of these diagnoses were mapped to the International Classification of Diseases, Ninth Revision, Clinical Modifications (ICD-9-CM). We used Clinical Observations Recording and Encoding (CORE) problem list subset of SNOMED CT® [20] and the legacy terminology as the main database of CPLES. So, our users can search their familiar term as well as concepts in CORE. We also provide option for users to search full set of SNOMED CT concepts if they could not find appropriate terms in the main database.