Electronic Medical Record Information System for Patient Consultations in Chinese Medicine

Heidi BJERING\textsuperscript{a,1}, Athula GINIGE\textsuperscript{a}, Anthony MAEDER\textsuperscript{a}, Alan BENSOUSSAN\textsuperscript{b}, Xiaoshu ZHU\textsuperscript{b}, and Charles LATTUCA\textsuperscript{c}

\textsuperscript{a} School of Computing and Mathematics, University of Western Sydney, NSW, Australia
\textsuperscript{b} Center for Complementary Medicine Research, University of Western Sydney, NSW, Australia
\textsuperscript{c} Surity Pty Ltd, Sydney, NSW, Australia

Abstract. Currently there are no widely used systems to electronically record individual patient consultations with Traditional Chinese Medicine (TCM) practitioners. As TCM practice differs significantly from western medicine both in diagnosis and treatment, using information systems created for western medicine is not suitable. There is a need for information systems developed specifically for TCM practitioners to manage patient consultation and treatments. Such system should be designed to facilitate safe and effective practice by providing decision support, utilising existing knowledge such as known herb-drug interactions to signal safety risks. Utilising current and developing standards and vocabularies such as those developed by the World Health Organisation (WHO) is important to facilitate interoperability with other systems. To facilitate continued growth in consumer demand, this type of system should be compatible with the needs of the individual electronic health records and other medical systems, and provide interfaces to external systems such as Medicare, pathology and radiology systems, and insurance systems. This paper presents the high level design of a patient consultation system for TCM practitioners that addresses the individual practitioner’s needs for health records entry, storage, retrieval, display and support in managing health care delivery to patients and be part of Australia’s emerging e-health system.

Keywords. Traditional Chinese Medicine, Electronic Medical Record, Information Systems, Clinical Decision Support Systems

Introduction

Traditional Chinese Medicine (TCM) practitioners, like many allied healthcare practices in Australia, have been slow to adopt information technology in their consultations and management of patient care. There are no current, widely used systems to record electronically individual patient consultations with TCM practitioners.

\textsuperscript{1} Corresponding Author: Heidi Bjering, School of Computing and Mathematics, University of Western Sydney, Campbelltown Campus, Locked Bag 1797, Penrith, NSW 2751, Australia
Chinese researchers have developed a clinical reference information model (RIM) and physical data model to manage the various information entities and their relationships in TCM clinical data. Based on this they have developed a standalone data warehouse and populated it with 20,000 TCM inpatient data and 20,000 outpatient data, which contains clinical observations (e.g. symptoms, physical examinations and laboratory test results), diagnoses and prescriptions [1]. They are using this data warehouse for scientific hypothesis generation and validation and to promote the development of TCM from individualized empirical knowledge to large-scale evidence-based practice.

TCM practice is significantly different to western medicine [2]. Consequently there are aspects of their practice that have not been codified suitably for incorporation into an Individual Electronic Health Record (IEHR) or meet the existing or emerging clinical electronic record management and decision-support standards such as those being developed by the National e-Health Transition Authority (NeHTA).

Information structures in TCM and complementary medicine in general do not map directly onto those of western medicine (e.g. diagnosis/treatment is holistic covering multiple body sites rather than selectively symptomatic; medicines are composed of mixtures of generic natural substances from varying origins rather than single branded items). These differences make it difficult to simply adapt existing IT solutions from orthodox medicine (e.g. processes for recording findings during consultation sessions; proformas for specifying, ordering and recording medications). There is a need to develop a specific TCM IT solution for managing information associated with patient consultations and treatments, based on the current paper-based recording systems. This should be designed to operate in harmony with the current national IEHR developments [3] so that eventual integration can occur.

The World Health Organisation (WHO) is actively supporting an international effort to develop standards for health messaging and other health informatics areas, to standardise terminologies, archetypes and templates for recording information, including TCM. In 2007, WHOs Western Pacific Regional Office published WHO International Standard Terminologies on Traditional Medicine in the Western Pacific Region[4]. This book contains standard terminologies for TCM. Publications about standard acupuncture point location have also been published [5, 6]. Australia is one of the support countries for this International Standards Organisation (ISO) work item and the team of researchers working on this project will leverage this work-in-progress to develop a world-class TCM information system that addresses the individual practitioner’s needs for health records entry, storage, retrieval, display and support in managing health care delivery to patients and be part of the emerging e-health system. The rest of this paper will give a high level overview of the first stage of the TCM information system under development.

1. Method

The overall aim of this project is to develop an electronic medical record information system for TCM practitioners. This system will consist of a Patient Consultation Data Capturing System, Patient Medical Record Management System and a Decision Support System linked to a centralised TCM Knowledge Repository (Figure 1).

This project is developed and funded in several stages. The current phase is designing and developing the electronic medical record information system that will
enable traditional Chinese medicine (TCM) practitioners to efficiently capture and manage patient consultations electronically. Specifically, this phase of the project:

- Develops an understanding of TCM practitioner-patient consultation information needs and TCM practitioner preferences in making a record of consultations; and
- Investigates ways an Information System can assist the consultation process by developing a prototype user-interface linked to a TCM Knowledge Repository to access pre-existing knowledge that can assist in decision making.

1.1. Research Questions

During this first phase of the project a working prototype of the Patient Consultation Data Capturing System is being developed, including the essential functionality required in the Patient Medical Record Management System such as ability to add TCM practitioners, patients and consultation records in order to test the Patient Consultation Data Capturing System. Links to pre-existing TCM knowledge about herbal medicines, standard formulae prescriptions, and general information that can assist the practitioner in the diagnostic process at the time of consultation is also facilitated. Safe and efficient prescribing in acupuncture and Chinese herbal medicine is aided with mechanisms such as pull down screens for diagnostics, herbal treatments, dosages etc. Thus within the scope of the first stage of this project we are investigating two major research questions:

1. What are the characteristics and functionality of user interfaces essential for TCM practitioners to accept the proposed system?
2. How can pre-existing TCM knowledge (related to diagnosis and treatment processes) be most easily integrated into the proposed system?

The success of the overall system will greatly depend on whether the TCM practitioners will use the user interface to record clinical data during the consultation process. Usability of the interface is a critical factor that will influence the acceptance of the system among TCM practitioners. We have been working closely with TCM practitioners from the outset and have adapted an iterative approach to develop the Patient Consultation Data Capturing System.
1.2. Scenario-based Design

To solve the first research question we are using a scenario-based design approach proposed by Rosson and Carroll [7]. The first step in our research approach was to determine with TCM practitioners the various types of clinical cases they experience in clinical practice and the steps that they follow to manage these cases. This has helped identifying a few typical case scenarios to work on. Based on practitioner workflow patterns, the types of observations they record about patients and their identified information needs, we are generating a set of user requirements and validating these through another iterative step with TCM practitioners. In the next step we have converted the identified user requirements into prototype user interfaces. The user interfaces are demonstrated back to practitioners and further refined based on feedback. This iterative process is repeated several times until TCM practitioners signal adequate enthusiasm and satisfaction with the user interface for the Patient Consultation Data Capturing System to be adopted in everyday practice. Once this stage is reached, the system is expanded to support other frequently used consultation scenarios and a more formal evaluation of the prototype with external TCM practitioner reviewers will be undertaken.

The time required to develop databases and software required for an initial prototype as well as making changes based on user feedback has been the main barrier to this iterative scenario-based design approach. However, our AeIMS research group has over many years developed a framework based on meta-design paradigm to support rapid development of prototypes and applications [8-11]. This is greatly assisting us to use the scenario based iterative development methodology proposed by Rosson and Carroll [7] to arrive at a set of user interfaces that will have excellent usability aspects.

1.3. Decision Support

Finding solutions to the second research question enables us to provide a value added service that can further enhance the adoption of this system among TCM practitioners. We are achieving this by linking the Patient Consultation Data Capturing System with a pre-existing TCM Knowledge Repository. We are investigating how pre-existing TCM knowledge related to diagnosis and treatment processes can be made available to practitioners at the time of consultation via the Patient Consultation Data Capturing System. For this we are adopting widely used knowledge management models proposed by Snowden [12, 13] and Nonaka [14].

A glossary of TCM terms consistent with WHO and ISO standards is being adapted and stored in a database, including herb names and formula prescriptions, acupuncture points and TCM diagnostic categories. A critical emphasis is on how this data can be made most easily available to TCM practitioners at the time of consultation via the user interface of the Patient Consultation Data Capturing System.

1.4. Further Development

The aim of this first stage initial investigation is to establish a prototype system that allows all TCM consultation activities to be recorded and later enable this system to be interfaced with other e-Health software such as Medical Director. The system in the long term will facilitate integrated record management (including all medical and allied healthcare) and provide for:
• All billing, including Medicare and Hicaps
• Alignment with pathology and radiology results
• Alignment with insurance reports
• Alignment with e-Health requirements including personal health records
• Facilitated medicines dispensing
• Dispensing Consumer Medicines Information (CMIs)
• Capacity to deliver longitudinal data and link with other databases.
• Support and integrate quality assurance mechanisms.
• Decision support software including herb-drug interaction flags; diagnostic and prescribing tools.

Achieving inter-operability among above mentioned systems is a challenging task in terms of data formats, security, privacy and data integrity. Where possible we plan to use SNOMED terminology [15] and OpenEHR archetypes [16] to facilitate interoperability. We also plan to use HL7 messaging format between our TCM data capture system and other systems as HL 7 already address some of the security and privacy issues [17]. Consideration also needs to be given to issues such as access and authentication controls to ensure only authorised users/external systems can access this system, audit trails of user activities and the safe and secure storing of the data, including back-up processes.

2. Results and Discussion

There are an estimated 8,000 TCM practitioners in Australia who from July 2012 will be required to comply with national registration requirements in order to practice. Encouraging the movement from paper based to electronic consultation records, supplemented with decision support software, can facilitate safe and effective clinical practice. A reliable effective electronic clinical record system will be widely supported by government and health insurers alike, especially if decision support software that can signal safety risks (such as known herb-drug interactions) is built into such system.

TCM practitioners will have a strong interest in the software as, in addition to initially help improving safety and effectiveness of practice, subsequent versions will increase professional efficiency through rapid billing mechanisms, including Medicare and Hicaps; alignment with pathology and radiology results; alignment with insurance reports; and by facilitating dispensing of medicines.

Given the lack of electronic consultation data management outside of general medical practice, this project (and software designs) will eventually be extended to other allied health professions and is of international significance.

References


