Unification of Electronic Health Records and Holistic Medicine

Sitalakshmi Venkatraman and Andrew Stranieri

Centre for Informatics and Applied Optimisation
UNIVERSITY OF BALLARAT
PO BOX 663, MOUNT HELEN, BALLARAT, VICTORIA 3353, AUSTRALIA

s.venkatraman@ballarat.edu.au, a.stranieri@ballarat.edu.au

ABSTRACT

Recent trends in the increasing use of complementary and alternative medicine (CAM) as "holistic medicine" by patients in technologically advanced nations have prompted the need to integrate their CAM information into their Electronic health records (EHR). Studies indicate that over 70% of the public in Australia used at least one form of CAM that includes nutritional products such as vitamins, supplements, and herbal medicines, and alternate medicines such as homoeopathic, Ayurvedic and Chinese medicines. There is also a growing acceptance of CAM among healthcare providers, and patients are increasingly visiting CAM practitioners. In this paper, we argue that by unifying patients' information about their CAM history along with their EHR, the healthcare quality and accuracy of measurements could be improved, and we identify six key benefits for healthcare and CAM practitioners as well as consumers. On the other hand we also foresee certain issues, such as availability of electronic data and standardised practice of different forms of CAM, and we have unearthed six main issues that require prime attention. We discuss these issues and provide recommendations for the way to go forward in integrating automated CAM software components into EHR systems.

Keywords: Electronic health record, EHR, complementary and alternative medicine, CAM, unification, integration issues

INTRODUCTION

Recent fast-paced, high volume environment has led to many countries venturing into electronic health record (EHR) systems that could be patient accessible and personally controlled (Garvin 2004, SilowCarroll, Edwardsand and Rodin 2012). An Electronic Health Record (EHR) is a longitudinal electronic record of patient health information of every event or encounter in a healthcare delivery environment (e.g hospital admission, medications, progress notes, general practitioner visit, allergies, laboratory data, past medical history, etc.) (Smith and Kalra 2008). It is predicted that "consumer directed" movement will evolve dramatically in the healthcare industry more than any other since health concerns an individual more than anything else (Groen, Mahootian, and Goldstein 2008). In a similar vein to other technologically developed countries, in Australia, the establishment of personally controlled EHR (PCEHR) is a national priority (NEHTA 2008) because patients could empower Health Care Professionals (HCP) with a full description of their health history that would enhance the quality of service (QoS) through streamlined clinician's workflow. Recent years have witnessed an increased number of electronic medical record products that have proliferated into the market facilitating this EHR evolution worldwide (SilowCarroll, Edwardsand and Rodin 2012). However, there are adoption issues mainly related to technological challenges associated with the establishment of an EHR that include, data governance, interoperability, security, and privacy (Groen, Mahootian and Goldstein 2008).

Our premise is that issues to do with the widespread adoption of EHR are not restricted to factors associated with technology acceptance. Consumers, who increasingly access CAM are likely to have more positive attitudes toward EHR systems if these systems are able to facilitate the treatment of the whole person, in terms of mind, body and spirit. In general, CAM supports diagnosis and healing based on a holistic and primarily "person centered" philosophy. Patients are increasingly turning to CAM modalities such as aromatherapy, acupuncture, herbal medicines, Traditional Chinese Medicine (TCM), Ayurvedic Medicine (AM) and the like for supplementing and enhancing their health and wellbeing (Griggs 1991, Eastwood 2000, Smith and Kalra 2008).

In United States of America, the major CAM organisation is the Federal Government's lead agency for scientific research on CAM, National Center for Complementary & Alternative Medicine (NCCAM 2008). The NCCAM conducts surveys and rigorous scientific research to explore the effectiveness of complementary and alternative healing practices and provide authoritative information to the public and healthcare professionals. One such investigation was conducted in 2007 as a National Health Interview Survey (NHIS) and the comprehensive survey of CAM use in America concluded that about 38% use CAM effectively (Barnes et al. 2004). Studies in Australia have reported that over 70% of the people in New South Wales have increasingly visited CAM practitioners and have used at least one of 14 forms of CAM therapies (Wilkinson and Simpson 2001, Xue et al. 2006).

While there is an increasing trend in the consumer demand for CAM, there are also critiques debating whether CAM is scientifically proven (Fontanarosa and Lundberg 1998). Numerous allopathic practitioners have criticised CAM as having no scientific evidence base. While debates on the safety of CAM procedures continue

in academic circles, many patients perceive herbal medicines to be safer than allopathic medicines that could have adverse side effects in the long term (Ernst 1995, Kristoffersen, Atkin and Shenfield 1997). CAM practitioners also promote their theory that unlike scientific tests conducted in other fields, a patient should be treated as a whole individual with a history of doctor-patient interactions rather than a mere medical case for experimental testing (Fulder, 1996).

We believe that more scientific evidence on the effectiveness and adverse effects of CAM remedies is possible if CAM health events are integrated into an EHR. Data deriving from the totality of health events, treatments, and remedies can provide insight and evidence toward the efficacy and adverse effects of treatments from all medical traditions.

There is a paucity of research related to combining EHR and CAM, their benefits and issues. As a first step in this direction, this paper aims to explore the unification of EHR and CAM as we believe that such an integrated system would result in a more effective and high quality healthcare system with personalised and accurate measurements.

The rest of the paper is organised as follows. Section 2 describes the five categories of CAM defined by NCCAM and examples of what we mean by unification of conventional medicine with CAM therapy. In Section 3 we describe the benefits .of unifying EHR and CAM. We also identify the issues related to such unification and these are explained in Section 4. We provide our recommendations and proposed future research in Section 5. Finally, we provide conclusions in Section 6.

WHAT IS UNIFICATION WITH CAM?

Complementary and Alternative Medicine (CAM) covers a huge domain of healing beliefs, theories, practices, and modalities that are distinct from conventional medicine (allopathy) or 'Western Medicine' (Aakster 1986, Atkinson 2003). CAM therapies are used to either complement or substitute conventional treatments. When CAM therapies are combined with allopathic therapies, unification is said to occur. National Center for Complementary and Alternative Medicine (NCCAM) has defined integrative medicine as a term for combining conventional therapies with those CAM therapies that have certain scientific evidence with respect to safety and effectiveness. In this paper, when we say unification with CAM, we include the five major CAM categories of NCCAM when combined with conventional medicine (NCCAM 2008). These are:

i) *Whole medical systems* The most ancient as well as matured CAM therapies are homeopathy (Jonas, Kaptchuk and Linde. 2003), naturopathy, traditional Chinese medicine (Bensky and Gamble 1993), Ayurvedic medicine (Hardy 2001), and other forms that are of indigenous in nature and well accepted by a society. These medical systems have evolved based on a different theory that has traditional roots in certain culture and society. Such medical systems fall under this category of alternative or whole medical systems.

ii) *Biologically based medicines* This includes natural therapies such as use of vitamins, herbs, certain types of plant or animal extracts that serve as supplements along with food (Agency for Healthcare Research and Quality 2003). Historically, dietary supplements were the first attempts for maintaining good health to improve the human physical wellbeing. These are often termed CAM natural products and may include dietary supplements such as probiotics, echinacea, and fish oil that are currently popular among dietary supplements for adults and children (Taylor et al. 2003).

iii) Mind-body interventions. The theory behind this approach is that mind has the capability of controlling and affecting the body. Typically cognitive behavioural theories are applied here and mind-body relaxation techniques such as music, prayer, meditation, hypnosis, Yoga, Aromatherapy, and other forms of physical and mental involvement fall under this category of CAM therapy. Symptoms due to stress could be treated with such interventions and some studies have claimed these to be effective during pregnancy and labour (Vieten and Astin 2008, Beddoe et al. 2009). Some acupuncture procedures (Lee, LaRiccia and Newberg 2004) that stimulate specific points on the body are also considered as mind-body interventions and could even adopt manipulations by hand or electrical simulations.

iv) *Manipulative and body-based practices* These methods make effective use of the physical manipulation of human body through movements such as physical exercises, osteopathy, chiropractic manipulation and massage of body parts. These techniques focus on musculoskelet al manipulation for pain management and for improving the physical functioning of the patients. Pain symptoms due to lower back pain, arthritis, joint pains, etc. could be treated under this CAM therapy (Xue et al. 2006).

v) *Energy therapy* These practices deal with the use of energy fields that could be either measured (veritable) or those that have not been proven measurable (putative). They could be classified under two main types, namely biofield therapy or bioelectromagnetic based therapy. Veritable energy therapies employ electromagnetic forces, mechanical vibrations, monochromatic radiation, and other methods of manipulating rays of the electromagnetic spectrum (Hintz et al. 2003, Vallbona and Richards 1999). Such techniques when used to treat patients could be verifiable as they employ measurable wavelengths and frequencies On the other hand, biofields are considered putative as they follow the theory that humans are bestowed with subtle forms of energy. Biofield therapies are employed by applying pressure that affect the energy field that surround and penetrate the human body by placing the hands in the fields to infuse the vital energy or life force termed under different practices such as Qi Gong, Reiki, and Therapeutic Touch. Manipulation of such energies are expected to have an effect on the patient's spiritual, emotional, mental, and physical health. The positive and negative energy forces that oppose each other bringing a balance in the human body is from the Yin and Yang. theory of Traditional Chinese Medicine. It is believed that a patient's health gets affected when there is an imbalance in the Yin and Yang forces that disrupts the flow of vital energy or qi (Sancier and Holman 2004). Energy therapists believe in restoring the health of the patient by

transmitting the energy to balance the recipient's life forces.

Stranieri and Vaughan (2010) identify four future scenarios that plausibly describe the relationship between conventional allopathic medicine and complementary and alternative medicine; embedded coexistence, independent coexistence, allopathic dominance, and integrated medicine. Under an *embedded coexistence* regime, diverse medical systems will continue to coexist and increasingly be accessed by patients not necessarily familiar with the underpinning religious or philosophical tradition. For instance, an Australian adolescent suffering from chronic fatigue syndrome accepts acupuncture applied by a TCM practitioner, Melatonin prescribed by an allopathic specialist, and a stretching regime developed by an Ayurvedic practitioner. Each practitioner has full knowledge of, and actively encourages the patient's endeavours in other modalities without integrating alternative approaches into their own practice. Pirotta et al. (2000) report a growing acceptance of CAM by not only patients but also healthcare professionals.

Under and *independent coexistence* regime, diverse medical systems will continue to coexist but each system is accessed solely by patients familiar with each tradition. For instance, patients with Chinese heritage solely seek to consult TCM practitioners. Under and *Allopathic dominance* regime Western Medicine will dominate and other forms of medicine will remain subordinate. For instance, complementary practices are prohibited or barely tolerated so that few practices exist and government or insurance support is minimal. Under and *Integrated Medicine* regime one or more of the Complementary Medicines (CAM) will become integrated into Western practices and viceversa. For example, (Mok et al. 2007) reports on the use of TCM to relieve symptoms of chemotherapy. (Hardy 2001, Robinson 2006) describe the use of allopathic pharmaceuticals in addition to supplements such as fish oil other Ayurvedic or Chinese herbs to control cholesterol levels by patients diagnosed with a heart condition.

Stranieri and Vaughan (2010) claim that *embedded coexistence* is far more likely than alternative scenarios. Allopathic dominance is unlikely given that China and India, emerging economic powerhouses, both have strong traditional medicine systems and government policies in China espouses TCM renewal (Xu and Yang 2009). In the West, the popularity of many complementary systems is likely to continue because they are perceived to offer patient centric care and are, in many cases effective, particularly for chronic conditions. McLaughlin (2012) linked the popularity of complementary medicine amongst older women in Australia to factors associated with health care selfresponsibility. Conversely, fast and often more immediately effective treatments offered by Western pharmaceuticals are increasing in popularity outside the West as global pharmaceutical companies enter new markets.(Stremersch and Lemmens 2009)

According to Stranieri and Vauguan (2010), coexistence of diverse medical systems is not only more likely but also potentially more beneficial than other scenarios for patients, governments and health care professionals, if implemented with appropriate checks and balances. Coexistence enables patients more choice. The pool of sources of insight into health and well being is broader potentially leading to greater understanding of health and disease. The world wide shortage of (allopathic) health care professionals and rising costs of health can conceivably be alleviated with a broader base of professionals that coexistence enables.

The integration of CAM events into an EHR is particularly appropriate under an *Embedded Coexistence* regime. If CAM was integrated into the EHR interaction the efficacy of treatments deriving from diverse traditions, optimal dosages and interaction effects could be analysed. Integration of all these data is possible when we have a system that could unify EHR and CAM. The benefits of such an unified approach are explained next.

BENEFITS OF UNIFYING EHR AND CAM

Studies conducted in different developed countries have demonstrated several reasons for an overall increasing trend in the usage of some form of CAM therapies (Eastwood 2000, Barnes et al. 2004, Smith and Kalra 2008, SilowCarroll, Edwardsand and Rodin 2012). Patients who are dissatisfied with allopathic medicine due to their adverse side effects would tend to employ other means of treatment. Even though there are different forms of CAM therapies, they share the same common "holistic" approach to a person's physical, mental and spiritual health that could attract the consumers towards CAM for a preventive healthcare support as well as a lifestyle factor. CAM is also popular in cases where the allopathic treatment of certain chronic or untreatable health conditions prevail and CAM could alleviate the situation for the patient. In all these cases, when an individuals EHR are unified with CAM therapy information, there would be several benefits to the consumers, both allopathic and CAM practitioners as well as researchers. In this paper we propose that by unifying EHR and CAM, many benefits could be realised and we identify six key benefits that are described below:

i) *Holistic patient information.* A unification of EHR and CAM information would lead to personalised medicine that caters to each individual's unique needs based on physical, genetic, environmental and other lifestyle factors.

ii) *Improved research outcomes.* By integrating a patient's EHR with the CAM therapies employed, more accurate research outcomes can be arrived at since the effects of coupling CAM and mainstream medicines could be clinically and scientifically studied. Research outcomes could help in the emergence of best practices and new theories about human systems as well as about addressing specific disorders.

iii) *Reduced risk* Inadequate communication between conventional medicine and CAM practitioners were leading to the question of safety and risks involved in their drugherb and therapeutic interactions. Through unification of EHR and CAM data, both conventional healthcare practitioners as well as CAM therapists would know to avoid any treatment that could be of potential risk due to adverse counter effects or coupling interactions. For example, if a massage therapist is able to know the a patient's muscle content from the clinical lab

report of EHR, it would lead to a customised therapy or to avoid a particular therapy that could be of risk to the patient's muscle damage that could occur due to intolerance to the massage. Understanding the interaction effects of one over the other would help in adopting a more safe CAM procedure. Similarly, conventional healthcare practitioners need not overdose a particular allopathic medicine if the information about patient's CAM therapies is also known. For example, if a blood pressure patient is already employing nerve calming medicines through Ayurveda, the allopathic medicines could be started on a lower dose and the effects could be monitored and customised appropriately to suit the individual over a period of time. This way the risks and sideeffects of prolonged and high dosage of allopathic medicines could be reduced to a great extent.

iv) *Increased consumer acceptance of EHR* The introduction of EHR has raised many privacy and security issues. Healthcare consumers are yet to accept EHR systems wholeheartedly. In addition, patients who have not been able to derive the effects of treatments through allopathy would further not have faith in EHR systems. However, such patients would increasingly adopt CAM therapies and would buyin the unification of their medical records with CAM. This way indirectly consumer acceptance of EHR systems would increase.

v) *Enhanced integrated knowledge* Currently, the crossknowledge of allopathy and CAM is limited. Patients gather much information about therapies from unreliable sources and try to employ them on their own. The unification of EHR and CAM would facilitate in providing an integrated knowledge that would benefit consumers as well as healthcare and CAM practitioners. CAM practitioners would now be able to incorporate the knowledge of conventional medicines and clinical assessment skills that would enhance the quality of training for new CAM practitioner and their capability to identify risks accurately. Similarly, healthcare practitioners would become more trained in assessing the requirement of CAM therapies for their patients. The training could be enhanced with latest research findings in the theories of both conventional medicine and CAM. The quality of practitioners could also be improved with ongoing professional training and education of these systems. Authentic information and integrated training would also benefit patients who could explore different treatment options without any fear or risk as they would be wellinformed about both types of medicines and treatments.

vi) *Patient empowerment* In countries like Australia, where personally controlled EHR systems are being introduced, each person becomes responsible for making their own healthrelated decisions. Through the unification of EHR and CAM, every person would be empowered to have their complete holistic health information. This would also facilitate in a more personalised supportive care management based on patient preferences and priorities, that could be more unique for certain kind of chronic diseases as well as for agedcare support requirements.

ISSUES IN UNIFYING EHR AND CAM

There are several issues to be addressed for an effective unification of EHR and CAM systems. With the marketplace indicating a growing acceptance of CAM, the development of information technology tools for CAM can be expected to emerge. In this paper, we discuss issues associated with this that require attention.

i) *Electronic CAM* – The majority of CAM practitioners still maintain a manual record of their patients and any kind of automation they adopt is only to record the patient's personal details. Delays in the adoption of electronic CAM patient management systems will delay the unification of EHR and CAM. Smith and Kalra (2008) report that those EHR systems designed on the ISO/EN 13606 standard for mainstream healthcare can also be used for homeopathy. Studies have concluded that homeopathy the allow homeopathy records to be represented in the system. It could even include evidence and reasoning used for the CAM dosage and therapy. Hence, electronic CAM should be developed with the intention to share patient records with EHR systems of mainstream healthcare.

ii) *Standardisation of practice* Firstly, EHR products themselves are required to be certified to comply with data standards consistent with HIPAA. Once that is in place, unification with CAM could be attempted. CAM automation is much more complex than EHR systems. Many studies found in literature have identified the lack of consistent standard of practice and procedures in CAM (Fontanarosa and Lundberg 1998). For example, certain herbal products and CAM procedures lack authentication, quality control and could be employed in a varied and inappropriate way. There are more than 17 forms of CAM therapies with significant variations in the standards of practice and they lack regulations (Weir 2005). Once CAM practice standards are specified, then the unification concerns would be mainly to address the technical issues in integrating CAM records with EHR.

iii) *CAM practitioner registration* Conventional medicine healthcare sector has typically three main groups, general practitioners, specialists and allied professionals who come under professional registration statutes. Among the CAM practitioners, in Australia, chiropractors and osteopaths have registered status and the Victorian Chinese Medicine Registration Act 2000 acupuncturists, Chinese herbal medicine practitioners and dispensers to have registered status (Weir 2005, Stone 2005). Other CAM practitioners could still practice based on membership in professional associations or they could even practice without any membership, which could be affected by the statutes prevailing in the region. Some legislations such as Therapeutic Goods Act 1989 (Commonwealth) regulate the manufacturing and supply of complementary medicines such as homeopathic and herbal substances. However, there are unregistered CAM practitioners whose practice may not be regulated by any specific legislation. This becomes a major issue for unification with EHR systems. It becomes more important for CAM practitioners to have registration to not only have a statutory recognition but also for adhering to standards that would facilitate in unifying CAM with EHR systems.

iv) *Healthcare professionals' CAM acceptance* Studies indicate that there is a general lack of acceptance of CAM therapies among allopathic doctors (Weir, 2005).

This results in patients not willing to disclose their CAM treatment information with their doctors. In a study conducted in Sydney, 47% of the participants were using CAM but their doctors were not aware of their CAM treatments (Kristoffersen, Atkin and Shenfield 1997). It is important for healthcare professionals to become educated and more receptive of CAM as their patients are increasingly embracing CAM. They should encourage their patients to share their CAM therapy information during their consultations and consider this to be very much relevant for patient wellbeing.

v) *Patient empowerment* In personally controlled EHR systems, while the privacy concerns are addressed, questions on the accuracy and currency of health records due to patient empowerment becomes an issue. By empowering patients to have access and take responsibility of their own health records, patients are required to maintain information about their CAM encounters within their EHR systems so that their allopathic doctors are aware and receptive of their health related history with CAM for a better medical treatment. Patients should understand that both their EHR and CAM records require unification as they relate to each other for identifying any possible interactions of CAM therapies with their allopathic medications and vice versa.

vi) *Communication between CAM and EHR systems* At present there are issues surrounding interfacing and communication standards between CAM and EHR systems. Information exchange and data standards such as Health Level 7 (HL7) utilised in EHR messages may not readily contain data related to a CAM message. Future EHR systems should be able to share patient records seamlessly in support of a holistic healthcare. Some studies have investigated the potential for a standardised EHR designed for mainstream healthcare systems to be also used by CAM practitioners, such as homeopaths (Smith and Kalra 2008). It was concluded that patient records from homoeopathy practices could be modelled to comply with European and International Standard for EHR Communications (ISO/EN 13606) so that the current approaches to the representation and communication of EHRs could also incorporate such CAM records. However, not all CAM practices have been automated with the capability to facilitate the communication of patient records between CAM and EHR.

RECOMMENDATIONS AND FUTURE WORK

In coming decades, we expect that the majority of healthcare practitioners and patients will use EHR systems and a majority of these patients would also be using CAM therapies. The above mentioned issues that are technical, legal, ethical and social, are required be addressed since it becomes imperative to capture and track CAM records and unify with patients' EHRs to accurately assess their positive effects. Only then best practices could emerge showing efficacy of coupling CAM and conventional medicine for quality treatments of health disorders in patients. We identify a set of core recommendations for the future as described below.

i) CAM software modules should not merely keep track of patient billing information and other primitive data, rather they should capture detailed information about each patient's CAM encounters, treatments and consultations, complying with international data standards. It is important to start the software automation with core essential modules and then incrementally include peripheral functionalities using agile software development methodologies. This would facilitate possible unification with EHR systems that are much more mature and sophisticated than existing CAM systems.

ii) Though the first step should be to establish CAM systems with international standards for data capture, terminologies, formats and procedures, more acceptance for such systems to become unified with EHR systems would occur if advanced and intelligent data mining and analysis of the data captured are made available. The systems should have the advanced capability to integrate CAM data with EHR data to generate accurate measurement of outcomes. Software development initiatives towards open source and collaborative standards form the main prerequisite for this.

iii) Once unification of CAM and EHR systems are in place, more detailed research (Berman and Straus 2004) is required to be conducted to arrive at new findings, theories and best practices for coupling CAM with allopathic medicines customised for different health cases.

iv) Both allopathic medical practitioners and CAM practitioners should be receptive of each others' practices and encourage the unification of EHR and CAM data. This could be achieved through proper training and education of both the systems.

v) Consumer acceptance of the unification of EHR with CAM should be targeted more than ever. CAM and mainstream practitioners as consumer demand for such systems would be a major driving factor for an overall successful adoption. This would require incorporating policies for addressing ethical concerns and complaint management (Bellucci et al. 2012). Training, education sessions and campaigns promoting the benefits of CAM and EHR integration would facilitate user acceptance of such new IT solutions.

vi) Quality circles should be established as working groups to provide guidance for pilot testing, deployment, monitoring and refining through continuous improvements for achieving the desired quality in the unification of EHR and CAM systems.

CONCLUSIONS

The Electronic Health Record is a virtual record of every health event an individual experiences is currently emerging, albeit slow and at great cost in many nations that have extensive information and communication technology infrastructure. These systems integrate with clinical management systems and utlise internationally defined messaging and terminological standards. In this article the case is made that the extension of EHR systems to encompass CAM health events is desirable. Benefits include a complete and holistic health record for each person, research discoveries arising from the comprehensive data, enhanced health outcomes and

reduced risk of adverse reactions. Though desirable, issues that this raises pertains to the need to ensure more CAM practitioners utilise patient management software, and rapidly develop terminological and messaging standards that can be used to upload data to an electronic record without ambiguity. A number of recommendations about how CAM modalities might pursue integration with EHR were advanced.

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