Feasibility of encoding the Institute for Clinical Systems Improvement Depression Guideline using the Omaha System

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ABSTRACT

Evidence-based clinical guidelines are being developed to bridge the gap between research and practice with the goals of improving health care quality and population health. However, disseminating, implementing, and ensuring ongoing use of clinical guidelines in practice settings is challenging. The purpose of this study was to demonstrate the feasibility of encoding evidence-based clinical guidelines using the Omaha System. Clinical documentation with Omaha System-encoded guidelines generates individualized, meaningful data suitable for program evaluation and health care quality research. The use of encoded guidelines within the electronic health record has potential to reinforce use of guidelines, and thus improve health care quality and population health. Research using Omaha System data generated by clinicians has potential to discover new knowledge related to guideline use and effectiveness.

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1. Introduction

The excess financial burden caused by unnecessary health care services, services inefficiently delivered, and missed prevention opportunities was conservatively estimated at $750 billion for 2009 [1–3]. Achieving widespread utilization of evidence-based practice would improve care efficiency and effectiveness, and evidence-based clinical guidelines have been developed to bridge the gap between research and practice [4]. However, disseminating, implementing, and ensuring ongoing use of clinical guidelines in practice settings is challenging [2–7]. The Institute of Medicine estimated a delay of 17 years from publication to widespread adoption of evidence in practice settings; and some scholars have suggested that the results of many studies may never impact practice [2–7].

Electronic health records (EHRs) have potential to provide solutions for these financial, quality, and dissemination issues in health care by incorporating evidence-based clinical guidelines, enabling information exchange and interoperability, and generating meaningful data capture to evaluate care [7–18]. Meaningful Use incentives are driving EHR policy and implementation, and a goal of Meaningful Use is better access to information and data through the EHR to improve care quality and patient outcomes [10,11]. Stage 2 meaningful use criteria include meeting standards for electronic data collection and exchange of information [11]. Approved standards include SNOMED-CT for problems, procedures, or interventions; LOINC for laboratory data; and RxNorm for medications [11].

The purpose of this study was to demonstrate the feasibility of an encoded-guideline approach for guideline representation within the EHR, using an Institute for Clinical Systems Improvement clinical guideline (Health Care Guideline Major Depression in Adults in Primary Care (*Depression Guideline*)) and a standardized interface terminology (the Omaha System) [17–23].

1.1. Institute for Clinical Systems Improvement: Depression Guideline

The Institute for Clinical Systems Improvement (ICSI) is a nonprofit organization that develops and disseminates evidence-based guidelines to improve health care [19]. The ICSI convenes diverse stakeholders in order to transform the health care system, with the goal of delivering patient-centered, value-driven care. It is sponsored by five Midwestern United States health plans and its membership is comprised of 62 medical groups [19]. The ICSI has developed numerous guidelines, for topics such as emotional, mental, or behavioral health; heart disease, hypertension, and other causes of cardiovascular disease; musculo-skeletal disorders;

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patient safety issues in the inpatient and outpatient care setting; maintaining good health, immunizations, or preventing illness or disease development; respiratory illness or lung disease; and obstetric and gynecologic health [19]. There is potential to develop a process to further disseminate and support ongoing use of ICSI guidelines by encoding and incorporating them within the EHR [11–13].

1.2. The Omaha System: interface terminology and health ontology

The Omaha System is a multidisciplinary interface terminology that is used for encoding evidence-based clinical guidelines, and enabling data capture and exchange [16–18]. It is also an explicit health ontology that conceptually links the problem list with interventions and outcomes [16–18].

Use of the Omaha System for knowledge representation and data capture in the EHR is advantageous for several reasons [16–18]: the granularity of the problem list level is low, which enables ease in aggregation of relevant data and mapping to other semantically similar codes and terms; customizability of the signs/symptoms and care description levels enables precise description and expressiveness; documentation using the Omaha System reinforces clinician understanding of guideline content; and using Omaha System terms for individualized documentation (typically from a pick-list in the EHR) generates data that create a relational problem-intervention-outcome database. Finally, visible Omaha System terms enable a priori clinician involvement and understanding of an organized, rational, individually tailored approach to care description, care delivery, and data capture [16–18]. Data generated by use of the Omaha System have been used in numerous studies for research and evaluation purposes [17,18,24–35].

The Omaha System is integrated into the National Library of Medicine's Metathesaurus; Logical Observation Identifiers, Names, and Codes (LOINC®); and SNOMED CT®, and facilitates compliance with meaningful use as defined by the Health Information Technology for Economic and Clinical Health (HITECH) Act [18]. The Omaha System therefore it meets the data standards criteria for meaningful use [18].

Table 1 and Fig. 2 illustrate the use of SNOMED CT® compared to the use of the Omaha System [14–18]. SNOMED CT® codes accessed on-line for *a burn on the palm of the hand* are shown in Fig. 2 [15]. Omaha System codes created for comparison by the research team for *monitoring and treating a burn on the palm of the hand* are shown in Table 1.

2. Materials and methods

2.1. Guideline

The ICSI Health Care Guideline *Major Depression in Adults in Primary Care* (*Depression Guideline*) has been adopted in Minnesota and nationally to guide clinical practice [21]. It was chosen for this project because it is a robust, mature evidence-based guideline in its 14th edition. The *Depression Guideline* is designed to assist primary care in developing systems that support effective assessment, diagnosis and ongoing management of adults (ages 18 and over) with new or existing diagnosis of major depression; with the goals of promoting remission of symptoms, reducing relapse and return-

ing to previous level of functioning [21]. The ICSI *Depression Guideline* was disseminated and implemented by a major initiative entitled Depression Improvement Across Minnesota, Offering a New Direction (DIAMOND) [20–23]. The DIAMOND initiative involved a sequence of activities including assessment of operational readiness of clinics; participation in collaborative team meetings and conference calls; data submission; and training regarding operational workflow, clinical best practices, and implementation tools [20–23]. It has been successful in improving treatment adherence, patient quality of life, and depression outcomes [20–23,36]. A key point in the comprehensive treatment plan is the Collaborative Care Model, which has been tested in 37 randomized controlled trials [36]. A general overview of the *Depression Guideline* is summarized by a flow diagram consisting of 12 steps from screening through treatment and evaluation of response (Fig. 1).

2.2. Omaha System terms and definitions

The Omaha System has three components: the Problem Classification Scheme, the Intervention Scheme, and the Problem Rating Scale for Outcomes [17].

2.2.1. Problem classification scheme

The Problem Classification Scheme is a standardized problem list that logically classifies health information into 42 non-overlapping concepts (problems). Each problem is identified by a unique definition and set of signs/symptoms (s/sx). For example, the Mental health problem is defined as "Development and use of mental/emotional abilities to adjust to life situations, interact with others, and engage in activities". The Mental health problem has the following s/sx: "sadness/hopelessness/decreased self-esteem, apprehension/undefined fear, loss of interest/involvement in activities/self-care, narrowed to scattered attention/focus, flat affect, irritable/agitated/aggressive, purposeless/compulsive activity, difficulty managing stress, difficulty managing anger, somatic complaints/fatigue, delusions, hallucinations/illusions, expresses suicidal/homicidal thoughts, attempts suicide/homicide, self-mutilation, mood swings, flash-backs" (p. 199) [17]. Additional s/sx can be specified if needed using free text designated as 'other' [17].

2.2.2. Problem rating scale for outcomes

The Problem Rating Scale for Outcomes is a standardized instrument that measures three dimensions of health for each problem: the patient's knowledge (K), behavior (B), and status (S). These KBS scales are Likert-type ordinal scales, from 1 (lowest) to five (highest). KBS data have been used to describe outcomes of care, forecast risk, and benchmark outcomes across settings [28–30].

2.2.3. Intervention scheme

There are four terms that are linked to form an intervention: problem, category, target, and care description. The problem term is any problem within the Problem Classification Scheme. The category term is the action component of the intervention. There are four categories: teaching, guidance, and counseling; treatments and procedures; case management; and surveillance. The target term is a defined object that serves to further characterize the intervention action or patient need. There are 75 defined target

Table 1
Omaha System Codes for Monitoring and Treating a Burn on the Palm of the Hand [17].

Problem	Category	Target	Care description
Skin (26)	Surveillance (4)	Signs-symptoms-physical (51)	Burn – palm of the hand
Skin (26)	Treatments and procedures (2)	Dressing change/wound care (14)	Burn dressing protocol