Development of an Electronic Nursing Records System Based on Information Models and Clinical Practice Guidelines

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Abstract. The purpose of this study was to test the feasibility of an electronic nursing records system for perinatal care that is based on information models and clinical practice guidelines in perinatal care. We first generated 799 nursing statements describing nursing assessment, diagnoses, interventions, and outcomes using the entities, attributes, and value sets of detailed clinical models for perinatal care that we developed in a previous study. We then extracted 506 detailed recommendations from clinical practice guidelines. Finally, we created sets of nursing statements to be used for nursing documentation by grouping nursing statements based on these detailed recommendations. A prototype electronic nursing records system providing nurses with detailed recommendations for nursing practice and sets of nursing statements based on the detailed recommendations to guide nursing documentation was developed and evaluated.

Keywords. Computerized medical records system, Nursing records, Information models, Evidence-based practice

Introduction

The benefits of electronic nursing records (ENR) system include reducing errors, improving the quality of care, and lowering cost. These benefits can be maximized by using standard nursing terminology, which improves data quality, data sharing, and decision support. However, a standard-nursing-terminology-based ENR system has certain limitations in ensuring full semantic interoperability if nursing statements used for documentation have different levels of granularity with different qualifiers and value sets. Most of the current ENR systems also are not based on the available evidence on clinical practice guidelines (CPGs) and clinical pathways [1, 2].

An ENR system based on information models and CPGs is proposed to solve these problems. The purpose of this study was to test the feasibility of this system in perinatal care by examining its content quality and user satisfaction.

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1. Methods

Nursing statements describing nursing assessment, diagnoses, interventions, and outcomes in perinatal care were generated using the entities, attributes, and value sets of the information models developed in a previous study [3] and validated by the authors. We searched and reviewed published CPGs related to the assessment and management of perinatal care. The search terms used included 'labor,' 'pregnancy,' 'management of labor,' and 'delivery care.' We then extracted from these CPGs detailed recommendations that are relevant to nursing care, and used them to create sets of nursing statements arranged according to the type of delivery and stage of labor. Finally, a prototype ENR based on information models and CPGs was developed.

A questionnaire was used to evaluate the relevancy, usefulness, and applicability of the prototype ENR system based on information models and CPGs by 12 domain experts, who were nurses with more than five years of clinical nursing experience. We presented the domain experts with organized sets of nursing statements based on the detailed recommendations and asked them to rate their relevancy, usefulness, and applicability using a five-point rating scale ranging from 'strongly disagree' to 'strongly agree.'

2. Results

In total, 799 nursing statements were generated with entities, attributes, and value sets of 90 detailed clinical models for perinatal care. We identified the following seven CPGs for different stages of labor, different types of delivery, and high-risk pregnancy: 'antenatal care for normal pregnancy,' 'intrapartum care for vaginal delivery,' 'postpartum care for vaginal delivery,' 'intrapartum care for Caesarian Section (C/S),' 'postpartum care for C/S,' 'preeclampsia,' and 'gestational diabetes mellitus.' We extracted 506 detailed recommendations related to nursing practice from these seven CPGs and used them to create 506 sets of nursing statements.

Figure 1 shows the relationship between nursing statements generated using the information models and the detailed recommendations from the CPGs. For example, a nursing statement 'labor pain presents at 5-minute intervals' was generated using the entity, attributes, and value sets of the 'labor pain' detailed clinical model. This nursing statement was used as one of nursing statements for the detailed recommendation called 'assessment of the labor pain' extracted from the 'intrapartum care for vaginal delivery' CPG.

These 506 organized sets of nursing statements organized were implemented in the prototype ENR system based on information models and CPGs. Their mean scores for relevancy, usefulness, and applicability were very high, at 4.7, 4.8, and 4.8 out of 5.0, respectively.
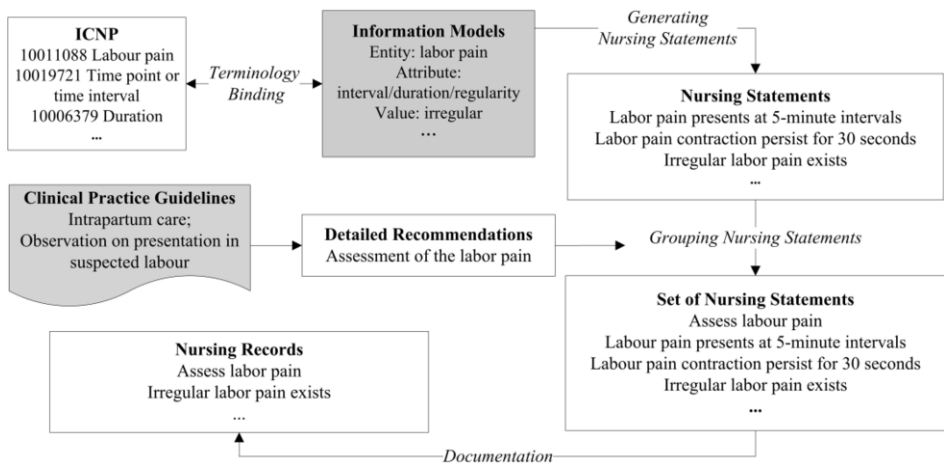
Figure 1. ENR system based on information models and CPGs.

3. Discussion

In this study the nursing statements were generated manually by combining the entity-attributes-value sets of detailed clinical models to facilitate structured data entry; a system for automatically generating natural language to create user-friendly and readable nursing statements needs to be developed in the future. The present study used only published clinical practice guidelines as clinical evidence; different types of clinical evidence could be added to the ENR system in the future.

This study is one of the first attempts to develop an ENR system based on information models and CPGs to support nursing practice and nursing documentation. Nursing statements arranged around detailed recommendations in the prototype system were found to be sufficiently relevant, useful, and applicable. This study has revealed the feasibility of developing such an ENR system.

References

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