There is increasing concern about EHR systems streamlining the nursing process. The perception is that the EHR has a propensity to overlook the data and contribution of nursing care to patient healthcare outcomes. This concern originates from the clear absence of an objective method in electronic health record systems to collect structured, coded nursing data to analyze the benefit of the nursing process: assessment, diagnosis, outcome identification, planning, implementation and evaluation.

An examination of nursing workflow may provide an understanding of the nurses’ workflow and contributions. This article reports on the background of the conceptual development for the concept of nursing workflow as nurses carry out patient care in an acute care setting using the EHR.

**NURSING THEORY IN HEALTHCARE TECHNOLOGY**

Nursing informatics is a relatively young specialty with preceding research focused on problem-driven studies such as electronic health record implementations; the professional organization of nursing informatics as a nursing specialty; and nursing terminology in preference to research on concept development about nursing workflow in relation to technology.
Early health information systems represented a workflow perspective different from the traditional nursing workflow. Today, health information systems are compelling new nursing competencies and innovative nursing workflow strategies to accommodate the protean electronic health record systems installed in many healthcare facilities.

If the objective of nursing informatics is to improve nursing practice through the use of technology, then nursing workflow must be established to guide the conditions for technology transformation and provide the appropriate constraints. While the term “workflow” is a universal concept applicable to multiple disciplines, this article used the Walker & Avant concept development framework to guide the review of the literature and identify the antecedents and consequences of nursing workflow along with empirical referents and opportunities for further research.

BACKGROUND

From any environment, at a basic level, a workflow represents a sequence of activities. At a practical level, workflow allows the assessment of activity in context and the review of a sequence of work; such as all the nurse’s activities related to patient care on a given day on a given unit. At a greater level of abstraction, workflow is a pattern of processes for information processing.

In the early 1920s, F.W. Taylor and H. Gantt were intellectual leaders and pioneers of concept of workflow, with the Gantt Chart established as the iconic standard for the visual representation of workflow processes. Others participated in the development of concepts involving information workflows including M. Dewey of the Dewey Decimal System.

However, the classic 1956 book on workflow was The Organization Man by William H. Whyte. The 1920s to 1960s were the peak periods of workflow formulation. By the 1980s, the concept of workflow was being dismissed by Abraham Maslow, who developed the Hierarchy of Needs theory and gained wide acceptance in nursing schools as the key theory of the conceptualization of human needs.

In the 1990s, the emphasis on organizational workflow was reignited by the Institute of Medicine reports on healthcare quality: To Err is Human; Crossing the Quality Chasm. This period, 1980-1990, experienced the emergence of Total Quality Management and Six Sigma, and witnessed the evolution of Business Process Reengineering. The bright spot in the emphasis on quality was that workflow again became the focus of management and researcher surveillance.

TRADITIONAL NURSING WORKFLOW

The historical perspective of nursing workflow is as a clinical sequence of work focused on patient status, nursing interventions performed and the patient’s response.

In the traditional view of nursing workflow, the nurse would perform activities to detect changes in the patient’s condition. Another example of traditional nursing workflow would be the work to observe a patient’s condition; e.g., no change in size or condition of a right foot pressure ulcer or observance of a patient’s or family member’s response to teaching.

In general, informaticians accept that information, when given meaning through interpretation, becomes knowledge. Management and computer science colleagues focusing on the impact of computers in their disciplines have been preparing students for successful working relationships with computerized information systems for decades. Management views computers as supporting the accomplishment of management objectives and supports the trends in information processing that encourage decentralizing data—for example, iPhone applications and social networking by employees.

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Gibbons and Smith report management results derive from the “workflow of the team,” while computer science defines workflow as the scheduling of independent jobs on a computer and the set of relationships between all the activities in a project, from start to finish. In this discipline, the common refrain is that data is less than information; information is less than knowledge; and information processing should be isolated from workflow. As derived from past experience, the statements accurately reflect the data conditions in today’s healthcare information systems.

However, the purpose of collecting data, information and knowledge is to be able to make wise decisions (e.g., create wisdom), and if data sources are flawed; meaning that if data is collected in isolation from workflow, then one might reason that management decisions based on a classic computer science model and interpretation of the established standard information workflows will be flawed.

The net effect of an “isolated” workflow model must be surmised to have transformed the data collection processes in healthcare—and nursing in particular. Nursing data collection is more than discrete facts stored in a relational database. Nurses reply on the data for patient care planning. Nurses transform the data within electronic health systems by judgment into meaningful information. While the information by itself does not infer knowledge, the cognitive and analytical ability of the nurse places EHR data and information, in the context of the nursing workflow; and demonstrates that information processing for patient care delivery should not be isolated from workflow for the confident delivery of healthcare quality.
METHODOLOGY
As mentioned, the methodology used in this analysis is the Walker and Avant concept analysis method. The general findings of the literature are that workflow articles were typically associated with specific problems such as patient safety, medication administration, specific nursing units or specific departments such as the emergency department.

A review of the computer science literature through the Applied Science and Technology Abstracts database, which has abstracts and periodicals from 1963 to present in engineering, aeronautics, chemistry, computer technology and applications, earth sciences, energy and environment, mathematics, metallurgy and physics, identified 805 articles using the term “workflow” primarily related to information messaging schemas.

Clarification of the concept was accomplished by analyzing the common use of the concept through the way in which the concept was expressed. The literature included articles over a 29-year span, from 1970 to 2009, that is especially relevant to the evolutionary method of analyzing a concept over time.

The articles selected from the multidisciplinary databases were based on relevance and pertinence to the concept of nursing workflow in the electronic health record. The literature was identified by a combination of title, abstract and key word searches using the terms: nursing workflow, electronic health record, workflow, electronic health record, electronic medical record, CPOE and other terms combinations developed for use with the presentation engine at the time of the search.

Over the course of this article, more than 105 articles from three key disciplines—nursing, including social science, management science and computer science—were selected for the evolutionary concept analysis. References with similar concept content were organized through a process of comparable analysis. A theme identified during the literature review was that workflow analysis has often been researched with the goal of improving efficiency. A classic study was the observation of routine tasks performed by the operating room (OR) team by Cendan and Good.

CONCEPTUAL DEFINITIONS

Workflow:
1. A process description of how tasks are done, by whom, in what order and how quickly. Workflow can be used in the context of electronic systems or people, i.e. an electronic workflow system can help automate a physician’s personal workflow.
2. The set of relationships between all the activities in a project, from start to finish. Activities are related by different types of trigger relation. Activities may be triggered by external events or by other activities.
3. Workflow is defined activities delivered by nurses to the provider, patient or organization, regardless of technology.
4. The movement of documents around an organization for purposes including sign-off and evaluation.

DEFINING THE ATTRIBUTES

The definitions of the essential attributes identified through the literature are listed below:

Practitioner instructions, written or oral, for the treatment of a patient’s medical care.

ANTecedENTS AND CONSEQUENCES

The antecedents and consequential occurrences for the concept of nursing workflow are:

Antecedent occurrences: Patient need.

ASSUMPTIONS

Ontological assumption: Knowledge and understanding of human existence is by understanding how a problem engages the present.

Epistemological assumption: Knowledge and understanding of the concept through the way in which the concept is expressed.

CASES

Model case. Hospitals and other healthcare organizations are installing electronic health records mobile stations called Computers-on-Wheels (COW), which support the nursing workflow 24/7 with electronic access to patient information.

COWs perform as personal computers, despite being shared among a team of nurses, and streamline the daily patient care task for nurses who need patient information readily available.

The demand for the right information at the right time for the right patient at the bedside is the COW strategy that achieves efficiencies in patient care. The nursing workflow with COWs, given greater access to information, translates into greater patient safety in high volume areas (e.g., electronic medical administration).

For example, the nurse wheels the COW to patient’s door and prior to dispensing initiates an electronic audit of the patient’s medication schedule, dose, and allergies. In another example, a nurse assesses a patient after administering pain medication. The patient reports less pain and while in the room the nurse conducts another assessment. With the mobile electronic health record, COWs, the nurse is able to coordinate with the patient’s care plan and incorporate nursing interventions and assessments from the EHR, as well as any data from the patient, at the bedside instead of going to a computer at the nurses station.

This is the benefit of the COWs; the ability to adapt to the nurses’ workflow and support the availability of electronic information at the bedside. As a model case COWs is a non-disruptive nursing workflow technology.

BORDERLINE CASE

In a borderline care, computerized provider order entry (CPOE) is EHR software installed using a component model. In CPOE, nursing workflow must adapt to the capabilities of the electronic health record. An immobile CPOE offers less data at the bedside.
and on every day, of any shift, the CPOE has a fixed location often remote to the patient’s location of care.

CPOE is a borderline case since a majority of direct care by nurses—i.e., vital sign monitoring, input and output, performing patient Activities of Daily Living (ADL)—requires nurses to be tethered to the nursing station computer terminal.

CPOE is effective for specific workflow tasks such as laboratory order messaging; however, the electronic nursing workflow is not completely supported by the CPOE electronic health record application.

**CONTRARY CASE**

The contrary case is the complete opposite of the concept being defined and can clearly show what the concept is not.9 The traditional workflow scenario is a contrary case because the attributes shown in the nursing workflow model case are missing. The traditional perspective of nursing workflow is a sequential account of the patient’s care, nursing interventions performed, and the patient’s response.

In the traditional view, nursing would typically identify workflow as activities performed to care for a patient’s condition such as progression, regression or the development of new problem; for example, ambulating for three minutes and feeling tired or the workflow included in providing treatment or medication and the nursing activities to assess the patient need, perform the nursing action, teach the patient or family and manage any subsequent nursing intervention that contribute to the nurses’ traditional nursing workflow.

The contrary case of nursing workflow documentation reflects and describes the inability or missed opportunity of the nurse to use the EHR. The nurse continues to work in the traditional manner. The nurse conducts all care processes in the traditional manner during the nursing shift and provides all care and interactions without the benefit of technology including the Electronic Health Record. Therefore, nursing workflow tasks are managed in the traditional manner without electronic support for the following: a.) preparing patients for respiratory support such as oxygen, IVs, laboratory orders, and documentation of patient status and symptoms; b.) performing vital signs; c.) providing medication; and d.) monitoring any adverse effects of therapies and medical regimens.17

**IMPLICATIONS FOR NURSING PRACTICE AND EDUCATION**

The advantage of concept analysis is that “it renders very precise theoretical as well as operational definitions for use in theory and research.”9 The analysis of the nursing workflow concept is to better understand the essential components of nursing care for the electronic medical record to allow nurses to demonstrate their contribution to patient healthcare outcomes as effective advocates for patients.

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Nursing informatics research on the nursing workflow concept supports the development of electronic health record data systems to collect and record the significant care knowledge and wisdom of nurses with standard, coded nursing terminology.

**CONCLUSION**

Nursing workflow documentation is a functional and essential component of nursing practice. This paper is an initial concept analysis on the nursing workflow in relationship to the electronic health record system to provide a basis for further research into the impact of the electronic health record on nursing processes and to inform nursing education. Nursing workflow is patient-centered and must be supported by electronic health record.

While, in general the concept of workflow is non-nursing-specific, health data is unique in that much of the information and knowledge is patient rather than discipline-related. While nursing considers the transformative affects of new technology and examines the interdependence between the electronic health record and nursing practice, the continuation of nursing informatics research in this area is critical to harnessing new health information technology to support nursing care. JHIM

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