Using Patient-Oriented Workflow to Develop a Holistic Understanding of Anticoagulation Management

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Abstract
A patient-oriented workflow methodology is proposed to study anticoagulation management, which takes place both in clinical and non-clinical settings. The methodology provides an integrated perspective that can be used to uncover quality, efficiency and safety problems in diverse healthcare settings and inform systematic interventions to overcome these problems. However, practical, methodological and theoretical challenges exist to studying patient-oriented workflow.

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General Terms
Design

Introduction
The current health care delivery system heavily depends on discrete episodes of care taking place in specially designed care settings. Ideally, patients' experience during the series of these discrete healthcare episodes is coherent, connected and consistent with their medical needs and personal context. However, patient care activities to achieve wellness are not bounded by episodes that take place in formal settings. The boundaries also encompass various daily living settings. From the patients' perspective, the management of health is a continuous course (e.g. patient trajectory), and the patient care activities taking place in daily living and care delivery settings can be seen as a part of the same continuum. Such a perspective provides a complete and comprehensive view of health from a patient's perspective.

The concept of workflow [1] can be useful to project and examine numerous activities conducted by actors in different roles and in various contexts. Workflow can potentially depict the activities that happen in care delivery and daily living contexts in an integrated way. Patient-oriented workflow focuses on the steps patients go through within care delivery systems and consists of activities and other work elements carried out to meet the needs of patients.

Oral anticoagulation management [2] provides a good case for demonstrating opportunities and challenges to for using patient-oriented workflow to develop an integrated understanding of health management for a single patient as a continuous process taking place in anticoagulation clinics and daily living environments. Anticoagulation management requires connected health activities by the patient and clinicians. A careful examination of the complex network of needs, preferences, expectations and requirements of the patient is needed to ensure that health activities by patient and clinicians complement each other. These activities can be well modeled and examined by patient-oriented workflow.

Patient-Oriented Workflow for Interorganizational Contexts

Dr. Ozkaynak, as a part of his dissertation work, developed and tested a methodology called patient-oriented workflow, designed to allow researchers and practitioners to systematically characterize patient care by using the concept of workflow [3]. The methodology uses the following definition: workflow is a "sequence of activities by interdependent multiple clinical and nonclinical staff members for care of single patient." The focus is on individual patient care episodes. In [3], patient-oriented workflow was used to successfully characterize patient care in emergency department settings in terms of sequences involving activity-role pairs, and revealed important features of cooperative work . Findings were useful for examining sequential variability and for identifying workflow patterns.

The patient-oriented workflow methodology provides an alternative perspective to clinician-oriented approaches, which are currently dominant in workflow research. Clinician-oriented approaches focus on a specific clinician and capture activities conducted by the clinician, whereas the patient-oriented methodology focuses on a patient and captures activities conducted by several related provider roles for the patient. In the patient-oriented workflow approach, the focus is on what happens to the patient instead of what a clinician does.

A patient-oriented workflow approach provides an opportunity to understand the overall health care delivery system at multiple levels, to identify broken links and to guide design of health informatics interventions. In patient-oriented workflow, the building blocks of workflow are organized for single patients. The boundaries cross multiple formal and informal care settings. Identifying boundaries precisely is critical to examining how the system functions as a whole (i.e. with all relevant system elements). These boundaries implied by the patient-oriented work allow researchers to carry out comprehensive modeling and examine how the care delivery system functions.

The patient-oriented workflow methodology is particularly useful when examining cooperative work because it allows the order of each roles' contribution

to patient care to be captured in a temporal sequential context. The methodology can be used to evaluate work interventions in terms of how the intervention fits the existing workflow and how the intervention affects the workflow. Dr. Ozkaynak developed and tested the patient-oriented workflow methodology in the context of emergency departments (single type of setting). Because the methodology is theory-based, there is an opportunity to tailor this methodology to other health care delivery settings. For our current research, we will apply patient-oriented workflow to characterize and examine anticoagulation management, which takes place in multiple types of settings.

Significant challenges exist to studying patient-oriented workflow. Practical challenges include the difficulties of integrating workflow studies into ongoing medical practice. Methodological challenges include reliability and validity concerns with the collected data due to a high level of variability and complexity in clinical settings. Theoretical challenges include lack of comprehensive, robust conceptual frameworks that will guide workflow studies. Our research agenda addresses these challenges by developing theory based systematic field methodologies.

Understanding Continuity of Care for Anticoagulation Management

Oral anticoagulation treatment with Coumadin (Warfarin) derivatives is prescribed as lifelong therapy for conditions such as mechanical heart valves, atrial fibrillation or inherited/acquired thrombophilic disorders. However, much of the potential benefit from Coumadin therapy is still not realized because anticoagulation management is either not done or not done well. Managing oral anticoagulation is challenging from both providers' and patients' perspectives because of the narrow therapeutic range and wide range of individual responses to the medication due to genetic factors and varying life styles. The therapy can easily lead to harm both from excessive anticoagulation and insufficient anticoagulation.

Perhaps more than any other therapy, the provider and the patient simply must work together as a team to achieve good results. Successful management of anticoagulation requires a diet consistent in vitamin K, 100% compliance with pill taking, and constant communication with the anticoagulation clinic about any changes in diet, lifestyle, health, or other medications. The patients, who are not formally trained as health professionals, engage in health-related activities in their homes and other living environments. The use of home testing devices makes anticoagulation management even more complex. When self-monitoring, the patient can either self-test and self-adjust treatment according to a predetermined dose schedule, or self-test and call a clinic to receive the appropriate dose adjustment. Anticoagulation management activities, carried out by either or both the provider and patients, are conducted in clinical and non-clinical settings. These activities should be studied together for a comprehensive understanding. Continuity of care requires seamless integration of health care activities, which take place both in formal and informal care settings.

Qualitative studies have produced consistent results, demonstrating that patients are often unprepared for their management role in the next care setting, receive conflicting advice regarding chronic illness management, are often unable to reach an appropriate

health care practitioner who has access to their care plan when questions arise, and have minimal input into their care plan.

The patient-oriented workflow methodology can be useful for examining the congruence of the health care activities that take place in formal and informal settings. This holistic assessment can improve anticoagulation management by identifying provider roles, self-contained meaningful activities, variability and temporal patterns associated with anticoagulation management.

Discussion and Future Research

The patient-oriented workflow methodology has been useful to study cooperative work in emergency departments and is potentially as or more useful for examining anticoagulation management, which is a challenging therapy in terms of quality of care, safety and patient satisfaction.

The methodology can potentially be used to uncover existing problems and inform the design and implementation of systematic work interventions (e.g. health information technologies) to overcome these problems. Relevant studies in the health information technologies literature repeatedly report problems that develop because the activities and roles of all staff members involved in patient care were not considered during HIT design and implementation (e.g. [4,5]). In the context of anticoagulation management, consideration of all involved parties is even more critical. Patient-oriented workflow can provide valuable information on how relevant parties contribute to managing anticoagulation together.

To overcome the practical, methodological and theoretical challenges of patient oriented workflow, innovative data collection techniques and more collaboration among researchers from diverse disciplines are needed.

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