Chapter 9
Patient-Oriented Workflow Approach

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9.1 Introduction to the Patient-Oriented Workflow Approach

Existing research that focuses on designing, implementing, and assessing organizational interventions (such as information technology) in health care and improving care delivery have two important limitations: (1) care delivery is seen as a series of unrelated or independent (discrete) episodes (Elhauge 2010), and (2) the research focuses on individual care settings, predominantly formal health settings or daily-living environments, instead of the connections between settings. As a result, healthcare delivery (particularly chronic disease management) is often not examined in an integrated, holistic way, and organizational interventions to improve healthcare delivery across settings can create challenges impeding optimal design and implementation.

An integrated understanding of workflow across settings is important to inform the design of health information technology (HIT) to support improved health outcomes (Ozkaynak et al. 2016a; Werner et al. 2017a). In general, workflow can be defined as "the flow of work through space and time" (Karsh 2009)—i.e. temporally organized activities that occur across settings. However, most workflow studies focus on limited boundaries, typically single settings such as emergency departments (EDs) (Fairbanks et al. 2007; Yen and Gorelick 2007), operating rooms (Kobayashi et al. 2005; Marjamaa et al. 2008), intensive care units (Malhotra et al. 2007), primary care settings (Unertl et al. 2009) or the workflows of individual

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clinician groups (physician's workflow, nurse's workflow) or individual care processes, such as barcode medication administration (Carayon et al. 2007a), that take place in a single organizational context. Capturing workflow within a defined boundary or a single setting or role is less challenging methodologically. However, health care occurs beyond a single setting (Walker and Carayon 2009; Werner et al. 2016, 2019). Incomplete understanding of workflow across diverse settings may result in failure to adopt new technology, localization (lack of context awareness), and operational ineffectiveness (Walker and Carayon 2009). For example, lack of adoption of personal health records by both clinicians and patients is likely if there is a gap between clinical workflow and patient's workflow at home (Tang et al. 2006). Extreme localization due to lack of understanding of workflow across diverse settings has been reported to be a barrier for health information exchange (Unertl et al. 2013; Ozkaynak and Brennan 2013a). Suboptimal operational effectiveness related to coordination challenges can occur when the interaction of activities that take place across diverse settings is ignored, and when activities are studied in each setting separately rather than holistically (Abraham and Reddy 2010).

Although workflow is a useful concept, identifying appropriate system boundaries is needed for its full utilization (Xie et al. 2016). We argue that patient-oriented workflow is an appropriate approach to study workflow holistically (i.e. capturing all essential activities and other elements in the health care of the patient). This approach re-conceptualises workflow so that it focusses on patients. In a healthcare context, this means decoupling workflow from the personnel who work in formal settings and coupling it, instead, to the patient (Ozkaynak et al. 2013), who is at the center of all work and who spans all settings, formal and informal.

The patient-oriented workflow approach allows us to re-define the system boundaries of healthcare activities (i.e., incorporating both clinical and daily-living environments). Identifying system boundaries precisely is critical to examining how health care delivery systems function in their entirety (i.e., with all essential elements) (Xie et al. 2016; Karsh and Alper 2005). Studying workflow enables an understanding of how work elements (including information, resources, and influence) are organized. Workflow models can help explain patient interactions (Unertl et al. 2009) and reveal design directions for HIT that supports user performance (Yen and Bakken 2012).

A patient-oriented workflow approach focuses on the three essential elements of workflow: activities, roles, and sequence (Ozkaynak et al. 2013; Ozkaynak and Brennan 2013b). We believe that a patient-oriented workflow model provides the "true flow of the work" perspective (Zheng et al. 2010) by including activities performed by the key players—patients, informal caregivers, "care partners" (Sarkar and Bates 2014), and clinicians—in the "coproduction of healthcare delivery" (Batalden et al. 2016). Patient-oriented workflow also captures the cooperative work that typically occurs across traditional organizational boundaries. In other words, the patient, rather than the clinician, drives the flow of work (Ozkaynak and Brennan 2013b). This approach to workflow follows the patient "out the door" of the formal healthcare setting rather than stopping "at the door". It allows us to study

workflow across healthcare environments by including all relevant activities in all settings.

Patient-oriented workflow focuses on actual episodes or instances, rather than "typical" cases. By examining many individual episodes, patterns and variations can be analyzed (Ozkaynak et al. 2015). For example, in a study of five ED sites, the pattern of unique interactions among disciplines in the ED, could be graphically mapped (Ozkaynak et al. 2015). Variations (in terms of how various activities are conducted in a sequence) in care received, as well as those providing the care, could be identified. These patterns and variations can then potentially be related to their affect on health outcomes.

The holistic perspective that patient-oriented workflow provides, (Ozkaynak et al. 2013, 2016a) can inform the design and implementation of various interventions by: (1) accounting for multiple roles and their interrelated activities; (2) connoting continuity over time and between visits; (3) helping tailor care to patients' needs and preferences; and (4) capturing the relationships between patients and caregivers (Werner et al. 2019).

9.1.1 Patient-Oriented Workflow Informs the Design of Health Information Technology (HIT)

HIT literature indicates that explicating workflow across settings is essential to obtaining desired results (Moen and Brennan 2005; Brennan and Casper 2015; Kaufman et al. 2009; Valdez et al. 2015a; Ozkaynak et al. 2018a). Un-nuanced workflow models may lead to reduced adoption of new technology (Tang et al. 2006), lack of awareness of external health information (Unertl et al. 2013), mistrust (Ozkaynak and Brennan 2013a; Ross et al. 2010) and unintended consequences, such as medical error (Koppel et al. 2005) or coordination issues (Abraham and Reddy 2010).

Development of HIT has traditionally focused either on clinical settings (e.g., electronic health records [EHR]) or on consumer use (e.g., home glucose devices). The design of most clinical information systems aims to effectively use clinical information such as laboratory results and/or radiological/other tests to formulate a diagnosis or guide treatment. Consumer HIT systems, on the other hand, are generally designed to provide information to patients for self-management at home. Therefore, existing HIT generally fits exclusively into a clinical-solution bucket or a consumer-solution bucket. Patient-oriented workflow can be an effective approach to bridge clinical and consumer HIT (Ozkaynak et al. 2018a) and inform a collaborative HIT design, which jointly optimizes clinical and consumer informatics technologies (Valdez et al. 2015b).

As patient-oriented workflow eponymously focuses on the patient, it engenders a significant but undervalued healthcare-related work unit patient work (Werner et al. 2017a; Valdez et al. 2015a; Holden et al. 2015a). Examination of patient work

can help identify information/data needs across diverse settings (Coleman et al. 2004), and identify the gaps between activities in diverse settings (Ozkaynak et al. 2018a). Patient-oriented workflow can make technology more user-centered by getting the right information to the right people at the right time. These "right's" are essential for effective use of HIT (Werner et al. 2017b; Campbell 2013). For example, clinical decision support systems (CDSS) can support antimicrobial stewardship efforts in EDs effectively only if they can support decisions at multiple points of care (within overall care delivery) and at multiple physical locations (Ozkaynak et al. 2018a). Patient-oriented workflow can inform the development of CDSS by identifying these points and physical locations.

9.1.2 Patient-Oriented Workflow Informs Organizational Design

Workflow studies are common at various stages of organizational (re)design of healthcare institutions. An important objective of these workflow studies is to ensure that technical and social components (or subsystems) are congruent with each other and that together, they are congruent with the environment. Patient-oriented workflow or patient-focused workflow (compared to traditional workflow methods), can potentially better inform organizational design by; (1) showing variability in how work is accomplished, (2) showing cooperation between involved parties, (3) identifying sources of problems, (4) facilitating communication and coordination, and (5) facilitating patient-centeredness.

Although some variability in healthcare work is inevitable lack of awareness of these variabilities in care can lead to poor outcomes. For example, treating patients with acute asthma with systemic corticosteroids within an hour of presenting to the ED significantly reduced admission rates, while administration of steroids later than 1 h after presenting to the ED may lead to poor outcomes (Rowe et al. 2001). Patient-oriented workflow can highlight the existence of inconsistencies during the delivery of care in health care settings. Likewise, in the setting of everyday living, a workflow pattern can capture inconsistencies in self-management. The patient-oriented workflow includes time-stamped information, enabling all relevant care-related activities to be closely examined. For example, Ozkaynak et al. (Ozkaynak et al. 2015) studied patient-oriented workflow in 6077 asthma-related patient care episodes in five EDs. They demonstrated how variability in events and timing occurred for patients presenting to EDs with a similar diagnosis. The work also quantitated the workflow in various sites showing differences based on ED, patient acuity, and arrival mode (ambulance vs. walk-in). Electronic health records (EHR), barcoding technologies, and Radio Frequency Identification (RFID) technologies can allow researchers to make connections between the number and types of individuals who performed activities based on their background (education, experience etc.) to patient outcomes. Patient-oriented workflow can also show how various individuals perform various roles at different times throughout a patient episode.

Ability to identify problems at their source is an important organizational design objective (Clegg 2000). Effective organizations can capture and mitigate the problem as soon as they occur before it propagates over time across the entire organization. In the context of healthcare, these problems can be in the form of inefficiencies, safety concerns, quality of care issues, reduced access to care, low patient satisfaction, and high cost of care. Current EHRs and other technologies (e.g. barcoding, RFID) can successfully track and record workflow steps and patient outcomes at multiple points. By capturing patient episodes across diverse settings and associated activities, roles and temporal relationships to patient outcomes can allow for problem identification at their source. For example, if nursing assessment prolongs assessment of the patient by physician, a workflow targeting nursing activities alone would not reveal this barrier and the actual source of the problem. Patient-oriented workflow will both reflect the variety of challenges experienced by patients and providers and capture deviations from optimal care management.

Self-management is an increasingly important aspect of both chronic disease management and post-acute care (Wagner et al. 2001). Although the term "self-management" refers to health activities in daily-living environments, these activities are not generally created in the home. Self-management protocols are often created in formal, clinical healthcare settings. An important barrier to effective self-management is the disconnect with events in clinical settings (Nagelkerk et al. 2006; Rogers et al. 2005). Thus, workflow study can reveal inconsistencies between clinical and daily-living settings, and the way these inconsistencies lead to challenges and deviations optimal care delivery and health management.

In short, because the communication and coordination needs of contemporary healthcare delivery go beyond the boundaries of single settings (Coleman et al. 2004), understanding these needs will reveal problems and provide the basis from which to improve communication and coordination. Patient-oriented workflow helps identify these needs by focusing on the patient, operationalizing her or his needs, and identifying reasons for unmet needs.

9.1.3 Patient-Oriented Workflow Informs Implementation and Evaluation

To successfully implement HIT, it is essential to understand the workflow in which implementation is to be integrated. Without an accurate understanding of current roles and activities, the implementation of HIT in healthcare delivery may alter the workflow in an adverse way, resulting in unintended consequences (Carayon 2012; Carayon et al. 2007b; Karsh et al. 2010). Because the focus of patient-oriented workflow is on the patient instead of the clinician, it can inform implementation practices across boundaries, personnel, and time (Werner et al. 2016). Implementation across boundaries is inevitable in some circumstances such as personal health records (Tang et al. 2006) and health information exchange initiatives (Unertl et al. 2013). Analysis of this type of workflow can highlight variations in practice and allow us to isolate

an efficient or preferred workflow. For example, in the hospital, medication is typically administered by nurses, but when the patient leaves the hospital, the same task is performed by the patient or an informal caregiver. Clinician-centered workflow permits awareness of only hospital-based workflow, leaving out critical implementation barriers that may be relevant in the home. The patient-oriented workflow allows us to take a holistic view of workflow as it occurs across work systems and informs whether or not the implementation of an organizational intervention (such as HIT) is suitable for a longitudinal process rather than discrete episode of care.

Patient-oriented workflow can also inform evaluation research. An important reason for unintended consequences of interventions in healthcare, is the complexity of healthcare systems (Sittig and Singh 2010). Interdependence between various settings (e.g., hospital, primary care clinic, home, workplace) requires inclusion of relevant settings and cross-setting connections for a comprehensive evaluation. Patient-oriented workflow takes the interdependence between settings into account and highlights the connections and/or problems with these connections.

9.1.4 Limitations of Patient-Oriented Workflow Approach

Despite the benefits of gaining an increased understanding of patient-oriented workflow, such models are challenging to develop. There are difficulties in conducting workflow studies in both formal (e.g. clinical) and informal (e.g. home) health settings (Holden et al. 2015b). Methodological challenges include ensuring the reliability and validity of the collected data due to a high level of variability and complexity in health settings (Ozkaynak et al. 2018a; Chung et al. 2017). Theoretical challenges include the lack of comprehensive, robust conceptual frameworks that can be used to guide patient-oriented workflow studies (Ozkaynak et al. 2016b). Additionally, patient-oriented workflows involve a larger scope and more complex work phenomena. These workflows often rely on patient entry of data which may require technical literacy or written data input which often results in missing data. The home environment also will vary among individuals based on cultural, ethnic, and social factors etc. The inconsistencies across reported workflow studies have been attributed to the combination of these high levels of complexity as well as simplified modeling techniques (Zheng et al. 2011). More sophisticated modeling techniques are needed to address this escalated level of complexity.

9.2 Approaches to Study Patient-Oriented Workflows

9.2.1 Qualitative Methods

Both qualitative and quantitative methods have been used to model and evaluate patient-oriented workflows (Ozkaynak et al. 2016a). Traditionally, workflow evaluation has consisted of in-depth (ethnographic like) observations, interviews, and

contextual inquiry that are leveraged to explicate individual workflows. These methods yield rich qualitative data that provides a depth of understanding to the multiple components of patient-oriented workflow (Ozkaynak et al. 2018a). However, several limitations are associated with this method. First, ethnographic work of this kind is resource intensive, often requiring time-consuming and costly data collection. Second, in-depth ethnography to explain workflows can be invasive and burdensome for study participants, requiring numerous prolonged interactions between study participants (clinicians and patients) and researchers. Third, as a result of the former limitations, sample sizes tend to be small and may lack representation of a broader context. Finally, qualitative methods yield descriptive findings that limit the ability to statistically associate workflow findings with outcomes.

Recent methods have been developed to quantify qualitative findings. For example, Epistemic Network Analysis (ENA) (Shaffer et al. 2009, 2016), a novel method of mixing qualitative and quantitative data, creates quantitative models of the qualitative data. ENA is a new analytical approach that combines principles from social network and discourse analysis, to identify and quantify connections among elements in coded data and represent them in dynamic network models (Shaffer et al. 2009, 2016; Gee 2014). A key feature of ENA is that it enables comparison of different networks, both visually and through summary statistics that reflect the weighted structure of connections. As such, ENA also provides a potential mechanism for quantifying workflow comparison.

ENA is based on an epistemic frame, which is a pattern of associations across knowledge, skills, and habits of mind along with other cognitive elements that characterize communities of practice. This data analysis method can be utilized to model interactions across work systems in healthcare delivery, and to better understand which cognitive patterns propagate through the patient journey. Wooldridge et al., have used ENA to study task allocation communication in primary care teams (Wooldridge et al. 2018). Qualitative data were collected through 15 h of observations of a high performing primary care team that included a physician, nurse, medical assistant, and unit clerk in task allocation communication. ENA was employed to build a quantitate model of the observation data specifically to evaluate sender, receiver, and synchronicity impact of task acceptance. From this analysis, the researchers learned that physician and unit clerks were most efficient in allocating tasks. ENA can be employed in other applications across work systems to identify patterns of barriers and facilitators for desired work system outcomes.

9.2.2 Quantitative Methods

Recently, quantitative methods have been applied to study patient-oriented workflows (Ozkaynak and Brennan 2012, 2013b; Ozkaynak et al. 2015; Chung et al. 2017). The quantitative data for patient-oriented workflow research includes structured observations and EHR data. Data typically includes time stamped activities and roles of individuals who conduct these activities. Quantitative methods, in particular temporal sequence analyses such as Markov modeling, provide a method of

characterizing patient-oriented workflow in a way that allows for statistical comparisons (Ozkaynak et al. 2015). However, quantitative methods also have limitations; data from EHR needs to be validated in terms of completeness both within and across organizations (Dziadkowiec et al. 2016) and collecting the necessary quantitative data through field studies is resource-intensive.

The patient-oriented workflow approach in particular results in some unique challenges for data collection and analysis. Studying workflows as they occur across healthcare settings often requires data collection in a patient's home. In-home research typically limits researchers in the time they can spend in a house, the number of visits to a home, and may be restricted to a certain number of homes due to travel or cost limitations (Holden et al. 2015b). Novel methodologies that engage patients in collecting data such as journaling (Ozkaynak et al. 2016b) and photovoice (Wang 1999; Woda et al. 2015) can help overcome this challenge. Additionally, crossing organizational boundaries pose challenges associated with getting buy-in from multiple organizations, clinicians, and patients, as well as accounting for procedural and environmental changes.

Taking a patient-oriented approach inherently broadens the scope of the analysis, increasing the complexity of the workflow. Variability due to this increased complexity can lend itself to challenges in ensuring the reliability and validity of the data (Ozkaynak et al. 2018a). Patient-oriented workflow is more likely to involve incompatible data sources and challenges in aggregating data, due to the study across diverse settings using actual individual episodes. Quantitative methods facilitate statistical analyses of workflows that allow for associations. However the escalated level of complexity (e.g. involvement of multiple individuals (or entities) with activities at different levels of details, concurrency of activities and high level of variability across patient care episodes) can be problematic without thoughtful planning and resources such as statistics experts and other support personnel.

9.3 Case Studies

As mentioned above, the patient-oriented workflow approach has several applications in healthcare. To follow is a description of the application of the patient-oriented workflow, in four different care environments: EDs, daily-living environments, nursing homes, and skilled home health care.

9.3.1 Emergency Departments

The first author developed a preliminary version of a patient-oriented workflow in the context of EDs (Ozkaynak 2011). Although EDs represent a single setting, different roles are assumed in various subsettings of EDs. Patient-oriented workflow can be used to identify cooperative work in EDs (Ozkaynak and Brennan 2012,

2013b). Early stages of 108 patient care episodes were identified using structured observations in three EDs (Ozkaynak and Brennan 2012). Data were collected on time-stamped activities and roles of individuals who conduct these activities. Each episode was modeled as a workflow and included a sequence of activity-role pair. Data analysis yielded 96 different sequence patterns. Using data reduction techniques, such as multidimensional scaling and hierarchical cluster analysis, six patterns of care delivery were identified, differentiated primarily by whether the prescriber was a physician or midlevel clinician. Secondary differentiators included whether the patient arrived in the ED as walk-in or via ambulance, and in which ED patient care occurred. The high level of workflow variability reported in this study can inform the design of ED work systems. The variability in workflow could not have been captured using a strictly clinician-oriented approach (e.g. studying single type of clinician's workflow). The study concluded that work interventions should not limit EDs' flexibility to handle sequential variability in patient care.

In another study, patient-oriented workflow using EHR extracted data demonstrated factors that shape the workflow patterns and the relationship between workflow and patient outcomes (i.e. length of stay) (Ozkaynak et al. 2015). In this study, 6077 episodes for asthma patients were identified in five EDs in one calendar year. The data included time-stamped activity data. EHRs could track logs for many activities, the following activities were followed and used in the analysis; patient arrival, triage started, pain assessed, patient roomed, nurse/tech assigned, attending assigned, resident/fellow assigned and patient departed from ED. Using Markov models and visual analytic techniques, patient-oriented workflow yielded workflow patterns for each of the five EDs by aggregating the sequence of activities for each episode. These patterns were correlated with length of stay. Moreover, the workflow displayed variations for different arrival modes, settings, and acuity levels. Clinician-oriented approaches on the other hand, would not have been linked to patient outcomes such as length of stay, as they are generally linked to clinician outcomes (e.g. spent time on various activities, clinician activity patterns) (Ozkaynak et al. 2018b).

Both of these ED studies identified workflow patterns and factors that resulted in these patterns. Identifying the factors and linking patterns to patient outcomes, allows the redesign of ED systems that lead to better outcomes and discourage patterns that lead to worse outcomes.

As discussed previously, the patient-oriented workflow approach has been applied to study longitudinal processes of healthcare. Doutcheva et al. applied this method to study the workflow associated with older adults transitioning to the ED and then returning to their homes following hospital discharge (Doutcheva et al. 2017). Qualitative methods were used to identify: (1) the organizational boundaries crossed, (2) barrier/facilitator interactions across organizational boundaries, and (3) the patient work consequences that occur when patient work occurs across boundaries. Thirty-six semi-structured interviews were conducted with older adult patients who were discharged from a level 1 trauma center ED to their home. The goal of the interviews was to have patients describe their "patient journey" from their initial decision to go to the ED to their current state of care after being discharged home from the ED. Specifically, the SEIPS (Systems Engineering Initiative for Patient

Safety) framework was used to guide the directed content analysis of the interview data to answer the research question described above (Carayon et al. 2006; Hsieh and Shannon 2005). Results revealed that patient work crossed several organizational boundaries including the home, hospital, primary care facility, pharmacy, and community organizations. Further, barrier/facilitator interactions across boundaries were connected to either positive or negative consequence for the patients from their perspective. In this study, the use of a patient-oriented workflow enabled the researchers to trace cross-boundary barriers, facilitators, and post-ED discharge patient consequences related to those barriers that would otherwise not have been identified had the focus only been on the clinical setting. The results highlight that ED transitions happen longitudinally, that is, beyond the care that occurs within the ED, and extend into the community. As a result, the process is vulnerable to variances in the different work systems. Currently, interventions to improve ED discharge and transitions from acute care settings to the home have focused on the discharge process that occurs in the clinical setting, leaving out the potential to identify and subsequently address downstream effects. Use of the patient-oriented workflow approach in this case allowed for the ability to identify many of the issues associated with transitions in healthcare that happen after the patient leaves the clinical setting. As a result, subsequent system redesign can focus on supporting patient work across system boundaries to ensure successful care transitions.

9.3.2 Daily-Living Environments

The patient-oriented workflow approach has been applied to understand performance barriers related self-management in the home environment. Holden and Mickelson examined patient work among elderly chronic heart failure (CHF) patients in their homes (Holden and Mickelson 2013). A sociotechnical system approach was used to understand patient work associated with self-care for patients with CHF and their caregivers including: therapy related knowledge, motivation, tools/technologies, barriers/difficulties, strategies/resources, and social/physical environment. Thematic analysis of interviews with patients and their caregivers revealed several patient-reported barriers in the patient work system. These barriers included physical limitations, knowledge gaps, medication complexity, side-effects, lack of or overdependence on aids, lack of indoor gyms, sodium-rich food culture and, stairs. Patient-oriented workflow allowed the researchers to expand the patient's work system beyond the clinical environment and identify challenges that may inhibit the delivery of quality care at home.

Management of anticoagulation treatment in daily-living settings has been studied using patient-oriented workflow (Ozkaynak et al. 2016b, 2018a). This approach allowed for identifying gaps between the clinical workflow and healthcare activities the setting of daily-living. The term "gap" refers to a "break in continuity" between health-related activities across diverse settings. Gaps can disturb care delivery and lead to poor patient outcomes (Booth et al. 2013). These gaps can inform the design and implementation of gap-filling, collaborative health information technologies

(HIT) (Valdez et al. 2015a). Collaborative HITs can potentially allow patients to capture patient work (self-management practices, daily living routines and context) (Ozkaynak et al. 2018a) and to share with their provider. Clinicians can then have a better understanding of patients' barriers and obstacles for self-management at home and community settings for patient-centered care to address management issues.

9.3.3 Nursing Homes

Nursing homes entail distinct workflows (Morrill et al. 2016) that comprise the numerous daily-living activities of residents and asynchronous communication between team members. This asynchrony often occurs because, unlike hospital settings, some providers, such as medical staff, are often external to the facilities and thus not constantly available. This situation results in enhanced roles for nurses and other caregivers in clinical decision-making (Lim et al. 2014). Nursing homes comprise differing levels of clinical or residential support for clients. Residents with high level clinical needs depend on staff and resources for care and assistance in activities of daily living. Staff work within their scopes of practice, guided by regulations i.e., formal rules and licensure responsibilities. In low-care hostel or nursing home settings, residents are relatively independent and require limited clinical services but have the support of services such as housekeeping and social engagement activities, and have access to staff nearby if required. Although clinical and residential support activities have different dynamics, they need to coexist together and both residents' and clinicians' preferences should be factored in (Ozkaynak et al. 2018c). Patient-oriented workflow can be an ideal approach for studying the temporal organization of healthcare workflow, which lasts all day and interacts with the daily routines of residents. Workflow in nursing homes often crosses temporal (between shifts), organizational (e.g., hospital, lab, primary care, pharmacy) and institutional (clinical and daily-living) boundaries. Ignoring cross-boundary workflows in nursing homes can lead to safety and quality problems (Stokoe et al. 2016). Acknowledging cross-boundary workflows can lead to health IT and other interventions that ensure pertinent information (e.g. resident preferences, daily routines or medication list) is transferred across boundaries and is made available to the right people at right time.

9.3.4 Skilled Home Health Care

Another area where patient-oriented workflow has been applied is Skilled Home Health Care (SHHC), also known as community care services. SHHC is a formal, regulated program of care that provides a variety of skilled services such as nursing, physical therapy, speech therapy to patients in their home. Typical tasks involved in SHHC include wound care, physical therapy, and medication management, along

with some house keeping and social support activities. Werner and colleagues applied the patient-oriented workflow to understand medication management (MM) during transitions from hospitals to SHHC (Werner et al. 2017a). Transitions in healthcare require the execution of several tasks distributed across multiple people, organizations, and time. Patient-oriented workflow allows researchers to study how processes are distributed across healthcare delivery settings through an analysis of interactions and emergent properties that would not have been possible at the task level. Werner and colleagues used interviews and observations with older adults, caregivers, and SHHC providers involved in care transitions from the hospital to SHHC (Werner et al. 2017a). The study identified: (1) key attributes of the MM process through the transition from the hospital to SHCC, (2) emergent properties of MM across system boundaries and related barriers, and (3) patterns of barrier propagation through the transition processes. The patient-oriented workflow approach facilitated identification of barriers to the process specific to crossing organizational boundaries. Additionally, barriers identified in one system of care were traced throughout the hospital to SHCC care transition. Barrier propagation across organizational boundaries was associated with negative work system outcomes such as process delays like missed medication, as well as frustration and increased workload for the SHHC provider. The use of patient-oriented workflow allowed researchers to conceptualize care as a continuous process across systems rather than a discrete care episode. The results suggested that work systems need to be aligned to support critical care processes across transitions to reduce the potential for process breakdowns.

9.4 Conclusion

Although workflow analysis in general, and patient-oriented workflow analysis in particular, has inherent challenges and limitations, the potential benefits for both care delivery processes and HIT design/implementation far outweigh the potential disadvantages. To successfully redesign healthcare delivery, as well as design and implement HIT that can account for care across the entire patient journey, healthcare delivery must be examined as an integrated system of a longitudinal process rather than a cluster of discrete tasks/processes in isolated environments. Patient-oriented workflow can provide the needed integrated perspective.

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