

**Health Organizational Design:  
Information Exchange and Accountability**

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**Forthcoming in *Wiley StatsRef: Statistics Reference Online***

This is the submitted version of the following article:  
Soo-Hoon Lee, Tinglong Dai, Phillip H. Phan. 2020. [Health Organizational Design: Information Exchange and Accountability](#). *Wiley StatsRef: Statistics Reference Online*. stat08229.

# **Health Organizational Design: Information Exchange and Accountability**

## **Abstract**

In this article, we introduce two essential components of the field of healthcare organizational design: information exchange and accountability. We emphasize how the limitations from information-exchange and accountability theories can be bridged by operations management principles to improve patient outcomes through redesigning healthcare delivery processes. We also highlight managerial implications for health organizations and venues for future investigation.

Keywords: Information exchange, accountability, operations management, patient safety, patient-centered care

## 1. Introduction

The goal of operations management is to orchestrate technologies, resources, and processes to transform inputs into products of value to end users in an efficient and effective manner (Phan & Chambers, 2013; Dai & Tayur, 2017). Examples of operations management in health organizations include redesign of the clinical handoff process between healthcare providers to ensure patient safety (Lee et al, 2016); efficient movement or transfer of patients across the care continuum without sacrificing quality of care (Chan, Dong & Green, 2016); and optimal division of labor in medical office practices (Dobson, Pinker & Van Horn, 2008). In this article, we focus on the activities in the healthcare setting that utilize operations management principles to improve information exchange and accountability along the value chain of care delivery. Information exchange is the structured bidirectional transfer of data and its meaning between two or more parties, while accountability entails the provision to another party of a justification for actions undertaken (Tetlock, 1985; Patterson & Wears, 2010).

Within the category of service-based organizations, healthcare is likely the most complex, with tighter regulation that involves a variety of ancillary industries such as insurance, pharmaceutical, as well as professionals such as physicians, nurses, and allied health professionals (e.g., respiratory therapists, occupational therapists, physical therapists, and medical social workers) in providing services (see [stat05324](#); Dai & Tayur, 2019). To improve patient safety and quality of care [<stat05338>](#) requires a detailed and thorough understanding of complex organizational challenges in healthcare delivery, which is the goal of the field of health organizational design. In this article, we introduce two essential components of the field of healthcare organizational design, information exchange and accountability, and bridge their limits using the principles of operations management.

## 2. The Healthcare Context

Apart from being complex, the contemporary healthcare environment is highly dynamic. Healthcare services involve task interdependent processes directed at the needs of patients that vary greatly by individuals across time and settings. Unlike most standardized processes in manufacturing, transportation and logistics, and personal and consulting services, the targets and requirements for health services are heterogeneous and uncertain. The

consequences of getting it wrong can be fatal, so the margin of error is narrow. For example, the frequent transitions of care that some patients experience between specialized healthcare professionals may introduce a risk of irreversible medical errors (Blatt et al., 2006). Combined with the frequent changes in team composition and miscommunication, errors and mistakes due to lapses in judgment, coordination, and misinformation can occur (*see stat04000*). In the United States, the lack of attention to safe patient care has produced between 200,000 and 400,000 premature deaths, accounting for 15-30% of all premature deaths (Makary & Daniel, 2016; Wears & Sutcliffe, 2019). The costs of safety lapses are borne by policymakers, patients and their families, healthcare organizations, and payers (insurance companies and the government), amplifying the scope and costs of the negative consequences. Thus, the quest for high quality care, defined by the Institute of Medicine as “care that is safe, effective, timely, efficient, equitable and patient-centered,” is ongoing (Hoffmann, Morgeson & Gerras, 2003).<sup>1</sup>

The defining objectives of patient safety initiatives include the protection of patients from harm or injury as well as the prevention of “near-misses” and avoidable “adverse events” through care provider collaboration (Kim et al., 2015). Near-misses occur when care providers detect and correct procedural deviations from safe operating standards or rules before a patient is exposed to harm whereas an adverse event is a deviation from safe practices that results in actual patient harm. From the perspective of operations management principles, exemplified by the Toyota Production System (TPS), also known as Lean Manufacturing (*see stat04005*), the combined effects of these harms constitute a *muda* (waste) as they have a negative impact on efficiency due to remediation work (Liker & Meier, 2005).

The goal of managing a healthcare organization’s operations is to maximize its productivity <stat03463> with available resources by designing, implementing, and controlling coordination mechanisms to improve patient safety (Dai & Tayur, 2018; Dada & Chambers, 2019). In accord with this goal, we posit two ways to improve patient safety are to develop standardized ways of exchanging patient information among care providers while

<sup>1</sup> <http://www.who.int/patientsafety/en/> Accessed August 1, 2019

holding providers accountable for established standards of care to minimize unsafe work behaviors. We introduce a theoretical framework combining information exchange and accountability theories to achieve this.

### **3. Theoretical Framework**

#### **3.1 Information Exchange Theory**

Information exchange (aka information sharing) theory refers to the extraction, organization, transmission, and utilization of information, whereby a receiver efficiently reconstructs a message with low probability of error in spite of channel noise (Shannon, 1948; *see stat06422, stat07920*). In the healthcare setting, the ability to make accurate and timely decisions about a patient's care (diagnosis, prognosis, and treatment) is impacted by the information a provider receives. For example, during patient transitions of care, information exchange involves a sending (or handing-off) provider communicating patient information to a receiving provider (Arora et al., 2005; Lee et al, 2016). Communication during transitions of care creates hazard of near misses or adverse events because unclear instruction and data omissions create ambiguity for the receiver (Apker et al., 2007; Raduma-Tomás et al., 2011).

Information exchange entails structuring data exchange between providers to ensure information integrity and comprehension. Information exchange can be improved with defined protocols and structured message formats. As a result, the information delivered by the sender gives the receiving provider greater confidence to know what to expect, when to seek assistance, and the questions to ask as they take over the care of a patient. For example, when patients are transferred from the emergency department to the intensive care unit, specific data on the patient's presenting complaint, known comorbidities, and diagnostic results need to be conveyed in a way that the receiver can reliably recognize critical actionable information every time.

Information exchange includes two-way interactions, which provides a cushion against (or reduces) ambiguity (March, 1987). Because frequently there are multiple treatment options, providers who actively communicate with each other about the delivery process can positively affect quality by improving their own understanding of patient needs. The result is fewer errors because of reduced uncertainty or misunderstanding. In

the economics literature, information exchange is often modeled as a signaling game in which the sender uses a communication strategy to convey asymmetric information to the receiver in a credible manner; the resulting equilibrium entails an understanding shared by the sender and the receiver of the correspondence between the signal that the sender chooses and the sender's "type."<sup>2</sup>

In the operations management literature and practice, information exchange (often referred to as "information sharing" in this literature) is a hallmark of effective coordination within an entity and across various entities of the supply chain, especially when the end-user demand is uncertain and non-stationary over time (Lee, So & Tang, 2000; Raghunathan, 2001).<sup>3</sup> Ill-designed information exchange has been attributed to the lack of coordination and loss of value in supply chain operations. A notable case in point is the so-called "bullwhip effect," in which upstream suppliers tend to suffer from dramatic fluctuations in their inventory and production operations, even when downstream players experience little demand variability (Lee, Padmanabhan & Whang, 1997).

To ensure that senders and receivers of information share a common understanding of the meaning and valence of the information transferred, information exchange is usually conducted through structured protocols. Evidence-based clinical protocols are often presented with checklists comprising systematic steps and specific sequences of behaviors to enact specific clinical tasks (Sackett et al., 1996). Protocols and their accompanying checklists of tasks convey the expectations of how care providers must behave in specific circumstances to maintain safe delivery of care (Martínez-Córcoles et al., 2014). Without a structured protocol or checklist, the receiver cannot process all the information from the sender. Standardized protocols and checklists mitigate against limitations in human factors and nontechnical skills to manage the complexity of care, and hence help to reduce medical errors and improve patient safety (Haynes et al., 2009).

<sup>2</sup> See Spence (1973) for a seminal paper about signaling in the job market, and Dai & Singh (2019) for a recent application in the healthcare context in which physicians use their diagnostic and treatment pathways to signal their inherent diagnostic ability.

<sup>3</sup> See Ha and Tang (2017) for an overview of the operations management literature on information exchange.

**Proposition 1:** Standardized protocols and checklists improve efficiency in information exchange by reducing ambiguity and uncertainty.

### 3.2. Limits to Information Exchange

Limits to information exchange effectiveness have two aspects. First, the nature of healthcare services may be complex and contextually dependent on patient characteristics and history (*see stat05319*). The degree of ambiguity or lack of clarity of the clinical situation may attenuate the strength of the information signal. Second, a care provider's level of expertise, experience, and absorptive capability (Cohen & Levinthal, 1990), which influence her ability to assimilate and process the information, may moderate the fidelity of the information signal. Many medical conditions have multiple etiologies, so the diagnostic options and treatment pathways may be highly heterogeneous. When a provider's absorptive capacity is low, the fidelity of the received signal may be low because the provider cannot easily synthesize the information provided to make informed decisions. For example, a junior clinician may not always possess the same level of understanding or knowledge to synthesize patient data in the same way as a senior clinician. Thus, the information exchange effectiveness is dependent on the capacity of the receiver to receive and interpret the information conveyed. Third, the information delivery format may also affect information exchange effectiveness. For example, face-to-face communication, while costly, is less prone to ambiguous interpretation (Waller et al., 2014). The amount and richness of information provided to a recipient minimize search costs and expands information processing capacity.

Several operations management principles echo the limits of information exchange. First, the distinction of "push" (i.e., information flow moves primarily from downstream to upstream) versus "pull" (i.e., information flow moves primarily from upstream to downstream), an important design consideration in exchange, has to fit into the specific operational context (Chopra & Meindl, 2013). Second, the enabling technologies are essential for facilitating information sharing. Information technology, such as radio frequency identification (RFID), for example, has been shown to be effective in collecting and sharing real-time operational information and enabling

rapid operational adjustments (Cachon & Fisher, 2000). However, such technologies often require significant upfront investments and institutional support that are not always available. In addition, the effect of limited absorptive capacity has been reflected in growing physician burnout that can be partially attributed to the use of Electronic Health Records (Topol, 2019). Third, the operations management literature has outlined a number of perils of information exchange, especially related to the risk of data leakage in the presence of competition (Li, 2002).

**Proposition 2:** Ambiguity, limitations to absorptive capacity, and message delivery format attenuate efficiencies in information exchange.

### **3.3 Accountability Theory**

In multi-disciplinary care settings, multiple providers have to work interdependently to deliver care to the patient. The multiple and frequent transitions of care for each patient places patients at a high risk of a safety mishap from changes in team composition (Blatt et al., 2006). Providing good care often involves active coordination and cooperation of care providers (Hyde et al., 2013). No stakeholder group is better positioned than coworkers to detect near misses or decisions or activities that could cause patient harm since they work interdependently and near each other. Holding others accountable to follow established standard protocols may be critical for intercepting mistakes that could lead to a medical error or adverse event (Vogus & McClelland, 2016).

Accountability is defined as “being answerable to audiences for performing up to certain prescribed standards, thereby fulfilling obligations, duties, expectations, and other charges” (Schlenker et al., 1994: 634). To be accountable to others, individuals have to be aware of behavioral standards and then judged on their behaviors against those standards (Schlenker & Weigold, 1989). They are rewarded or sanctioned based on the variance between actual and expected behaviors (Erdogan et al., 2004; Frink & Klimoski, 2004). Because care providers work in peer teams and are already familiar with the task requirements, they are in the best position to reliably observe and hold each other accountable by speaking up or “voicing” (Kolbe et al., 2012).



Voicing to coworkers may include questioning, correcting, or clarifying a current procedure (Okuyama, Wagner & Bijnen, 2014). It provides a timely way to correct emerging errors, mistakes, and mishaps due to lapses in judgment, coordination, or a lack of information. Voicing is an important means to interrupt an undesired chain of events that could lead to major harm. It can also change the status quo of unsafe working conditions by raising safety concerns or reporting dangerous working conditions to prevent potential injuries. Hence, voicing highlights and remedies unsafe work behaviors or practices to enhance patient safety and promote patient well-being (Okuyama, et al., 2014).

Voicing is particularly useful for informing or reminding others about the availability or use of specific evidence-based procedures (Edmondson, 2003). For example, perianesthesia nurses may exercise voice toward surgeons or anesthesiologists to review patients' records before a surgical procedure to prevent wrong site surgery or medication allergies (Windle, Mamarii & Fossum, 2008). In voicing, care providers are requesting their coworkers to be accountable for their work behaviors and is a means to exert organizational governance.

In the operations management theory and practice, voicing has been viewed as a central element of the TPS. In a manufacturing or service setting, a key requirement for implementing the TPS is for employees, particularly frontline workers, to be empowered to speak up whenever and wherever they observe mistakes or errors. In implementing the TPS, asking the question "Why" five times has been cited as an effective way to identify the root cause of a problem (Liker & Meier, 2005). Only when employees are rewarded, not punished, for exposing defects or risks at the lowest level and closest to when and where they occur can the system improve over time (Spear and Bowen, 1999). Given the narrow margin of error in healthcare, the importance of speaking up cannot be overstated in implementing the TPS in a health organization (Furman & Caplan, 2007).

**Proposition 3:** Voicing improves efficiency by intercepting and correcting mistakes.

### **3.4 Limitations to Accountability**

Decisions to speak up are strongly influenced by organizational culture. Organizational culture is a set of common beliefs and expectations based on shared values and assumptions, and those shared cultural beliefs and expectations result in implicit corporate conduct, practices, policies and rules (Schein, 1990). Exercising responsibility to hold others accountable may be attenuated in healthcare organizations that are not participatory or have a ‘blame’ culture. A blame culture focuses on punishment and negative consequences, which engenders a climate of fear and silence (Dekker, 2007; 2009). In organizational cultures that are intolerant of criticism and dissent, employees learn to withhold information, not “rock the boat,” or create conflict (Clapham & Cooper, 2005). Hence, leadership support is paramount to a work culture that values voice (Edmondson, 2003).

Additionally, psychological safety, defined as a belief that it is safe for interpersonal risk taking in a group setting (Edmondson, 1999), is a prerequisite for voicing (Detert & Burris, 2007). The perceived lack of psychological safety to speak up for fear of retaliation or a breakdown in future work relationships may result in employees keeping ‘mum’ when they encounter questionable conduct (Milliken, Morrison, & Hewlin, 2003), particularly in the healthcare setting (Rosenbaum 2019).

Lack of clarity in work roles can make employees feel uncertain as to whether a breach of work behaviors and procedures have in fact occurred. For example, without knowing coworkers’ job descriptions, employees might be reluctant to challenge a coworker. Thus, with high levels of role ambiguity, people are less certain about how to hold others accountable. When the care provider perceives a lack of an open and supportive environment for employee engagement or low expectations that leaders will respond, there will be little incentive to exercise accountability (Erdogan et al., 2004). Thus, the decision to exercise accountability is influenced by the perceived trade-offs between the benefits and costs of speaking up.

The recognition of these limits to accountability have been behind several key TPS principles. For example, among the widely influential four “rules-in-use” that make up the “DNA” of the TPS, introduced by Spear and Bowen (1999), the top three are: (1) “All work shall be highly specified as to content, sequence, timing, and outcome;” (2) “every customer-supplier connection must be direct, there must be unambiguous yes-or-no way to send requests and receive responses;” and (3) “the pathway for every product and service must be simple and

direct.” All these three rules address the lack of clarity in work roles that can hinder the effective exercise of accountability. The fourth rule stated by Spear and Bowen (1999) is related to organizational culture and specifies that “any improvement must be made in accordance with the scientific method, under the guidance of teacher, at the lowest possible level in the organization,” which is possible only if the organization values “respect for people,” a cornerstone of the TPS (Liker & Meier, 2005).

**Proposition 4:** Lack of leadership support, psychological safety, and role clarity attenuate efficiencies in voicing.

#### **4. Discussion**

At the heart of healthcare transitions is the communications process. Information exchange theory is both descriptive of the way communications can fail between individuals and organizational units, as well as prescriptive in the way such failures can be mitigated. A core insight of health organizational design is that information exchange theory is incomplete without articulating the way feedback loops, how information on the outcome of an intended message affects subsequent messaging attempts, are initiated, received, and processed. For feedback loops to function (i.e., affect communicants’ behaviors), senders and receivers must be *accountable* for their own roles and responsibilities and that of their co-workers. In the healthcare setting, reliable information exchange requires that senders and receivers assume individual responsibility for the accuracy and timeliness of the data they exchange.

Research in patient safety and quality has shown that error reporting and speaking up on the frontlines of care improves patient safety outcomes (*see stat08031*). As supported by both organizational and operations management theories, the reduction of error in healthcare depends on successfully navigating through a culture of the willingness to disclose problems without fault-finding and retaliation (Moore & McAuliffe, 2012, Furman & Caplan, 2007).

Our propositions identify individual (e.g. absorptive capacity) and contextual (e.g. leadership support) factors that affect the efficiency of using standardized protocols or speaking up in a healthcare organization. Absorptive capacity can be improved for care providers through a training process, such as having a rubric to

learn evidence-based medical practices and protocols, with incentives and rewards. Healthcare organizations can provide training and guidance on how and when to speak up to be effective. This may include training in diplomacy and communication style to choose the appropriate words and strategy based on the listeners' styles and personalities (Kolbe et al., 2012).

Finally, we argue that individuals can exercise accountability only if they perceive that their voice will be heard, recognized, rewarded, and acted upon (Wei et al., 2015). Individuals will be more likely to speak up when they believe that their position is supported by others (Bowen & Blackmon, 2003). A conducive organizational structure, such as the use of anonymous reporting channels and support from top management for error reporting, helps to overcome the tendency of care providers to keep silent. Additionally, having explicit performance standards can mitigate the reluctance to speak up.

## **5. Conclusion**

In this article, we have introduced the role of information exchange and accountability to ensure positive patient outcomes in healthcare organizational design. Frontline staff, such as medical residents and nurses, plays a crucial role in providing patient-centered care in the increasingly complex hospital environment. By establishing reliable information exchange processes such as the use of standardized communication protocols and checklists, frontline employees gain the ability to hold senior or higher-status coworkers accountable for their work practices. Hence, the reduction of error in healthcare depends on successfully navigating the barriers to effective information exchange by ensuring that providers exercise personal responsibility for holding co-workers accountable by speaking up.

### **Related Articles**

*stat03463, stat04000, stat04005, stat05319, stat05324, stat05338, stat05335, stat06422, stat07920, stat08031*

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