

## ARTFUL AND CONTORTED COORDINATING: THE RAMIFICATIONS OF IMPOSING FORMAL LOGICS OF TASK JURISDICTION ON SITUATED PRACTICE

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Ongoing coordination is the backbone of work process and organizational effectiveness. Coordinating requires that interdependent specialists achieve integrating conditions for coordination—including understanding who is accountable for carrying out a given task, how a sequence of actions should proceed, and how one's work fits into the whole on an ongoing basis. Navigating the inevitable disconnect between formal logics of action and the specifics of the local context and situation at hand is a hallmark of effective coordinating. Nevertheless, as work systems designed to direct action with a heavy hand are increasingly implemented in organizations, the disconnect between formal delineations and situated practice is transformed with large negative consequences for organizations. Through 16 months of empirical research using ethnographic methods surrounding implementation of an electronic health records (EHR) system in a hospital obstetric unit, we find that the EHR rendered what was once a *productive disconnect* between formal logics and situated practice into an *unproductive disconnect*. Further, this shift engendered a new form of ongoing coordinating. What was once “artful coordinating”—in which clinicians across occupations drew upon formal logics, local context, and situated contingencies as resources to action and, in so doing, created conditions of predictability and informal accountability—became “contorted coordinating,” characterized by working around formal logics of the EHR while struggling to meet the demands of local context and situated contingencies, thus undermining predictability.

*It is hard to take a box, with no flexible material, fit yourself inside, and say, “Oh, I like that.”*—Mary, R.N., describing how it feels to coordinate mundane work with other specialists after the introduction of a formal work process system.

Mary is an experienced, dedicated, and intelligent registered nurse (R.N.). At the beginning of this

study, Mary had been nursing for 18 years. She had good relationships with physicians, compassionate insight into the needs of patients, and the tacit knowledge necessary to integrate formal hospital policies with unexpected demands. In other words, she knew the ins and outs of how to get things done in the hospital. Mary worked well with her colleagues and together they engaged in a form of coordinating that was generally artful and effective. Grounded in interpersonal trust and expert knowledge, this unit fluidly navigated task jurisdiction and flexibly responded to patient needs and changing personnel. However, with the introduction of a new formal work process system, Mary and her colleagues struggled. They continued to coordinate sequences of work, but they repeatedly described these attempts with language similar to Mary's quote above—fitting “oneself” into an inflexible box. The result was a form of coordinating that required contortions. Attempts to respond to the situation at hand,

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while simultaneously working around the delineations of action embedded in the work process system, forced staff to take awkward and inefficient actions in everyday attempts to coordinate with their actions.

In this paper, we theoretically examine what happened to Mary, her colleagues, and the organizational system as a whole, when a work process system imposed formal logics of task jurisdiction onto the situated practices of everyday work. Further, we use our empirical observations to show how the unproductive disconnect created by this situation led to a fundamental shift in the form of coordinating that occurred—from artful coordinating to contorted coordinating. In so doing, we shed light on how different forms of coordinating are achieved in unpredictable, complex, and time-sensitive work.

Understanding how people work together is a, if not the, fundamental question in organizational research. Scholars continually revisit the question of how coordination happens, and recently Okhuysen and Bechky (2009) made substantial strides in synthesizing and reconciling a long legacy of research on coordinating practices. In wading through and clarifying the variety of mechanisms that lead to coordination, these authors present a compelling framework that outlines the underlying integrating conditions through which ongoing coordinating is achieved.

In this paper, we build on this insight by investigating *how* integrating conditions (accountability, predictability, common understanding) are realized in different organizational contexts, and the form and nature of coordinating that emerges when integrating conditions change. In investigating how integrating conditions for coordinating are realized in practice, we directly attend to a paradox that colors much of coordination research. It is inevitable that situated practices will deviate from the legal and socio-political rules (what we term “formal delineations” or “formal logics of action”) that attempt to delineate and direct work practice. This is true broadly (e.g., Suchman, 1987) and in the case of task jurisdiction (e.g., Abbott, 1988; Strauss, Schatzman, Bucher, Ehrlich, & Sabshin, 1964). Yet, formal delineations are designed into work process systems and shape expectations of how work will, and should, unfold. Thus, questions persist related to how formal delineations shape situated practices, and what happens to ongoing coordination when formal logics are imposed on situated practice with an assumption of perfect alignment.

Looking at how specialists navigate task jurisdiction in a medical context as a case of coordinating, we

examine what happens when formal logics (based on an ideal of pre-defined rational sequences of work) are embedded into a work process system. With recent advances in information and communication technologies (ICT), there has been a rise of ICT enabled work process systems (electronic health records, enterprise resource planning systems, etc.) that attempt to direct the flow of work, binding everyday activities with a heavy hand. In this article, we examine one such case through a 16-month field study and outline how such binding engendered a new form of coordinating between occupational groups. We argue that while this form of coordinating (labeled “contorted coordinating”) served the ideals of institutional accountability and current financial accounting practices, it undermined other ideals of dynamic responsiveness and patient care.

Work systems that enforce formal logics of action need not be digital work process systems—organization policy and work systems broadly construed can be designed to enforce formal logics of action and affect the form that ongoing coordination takes. However, ICT-based systems often promise ultimate oversight and visibility of work practice. Thus, understanding how systems meant to direct end-to-end work process affect coordinating is critical in managing the introduction of ICT-based work process systems into organizations.

## RELEVANT LITERATURE

Our research draws on and extends the literature on coordinating, which we will review in-depth. First, we offer a brief overview of the literature on occupational task jurisdiction to illuminate the richness of situated negotiations of task jurisdiction as a space for exploring ongoing coordinating. At the macro level, professions negotiate the borders of a domain of practice, assert authority, and autonomy, and establish dominance through definitions of task jurisdiction. A large body of literature describes how professions vie for jurisdiction and draw boundaries around tasks and expertise in order to establish prestige and maintain status in society (Abbott, 1988; Friedson, 1986; Larson, 1977).

Formal delineations promote social stability through, for example, pinpointing accountability and setting and upholding standards for professional practice. However, scholars are aware that the highly formalized legal definitions of jurisdiction “reject the living complexity of social life” (Abbott, 1988: 64). As pointed out by Abbott, the living picture of task jurisdiction negotiated in situ inevitably differs

from formal, macro-level delineations of jurisdiction. While this disconnect is recognized by scholars, we do not fully understand the relationship between the two. As such, task jurisdiction is an ideal case in which to explore how coordinating is achieved through the interplay between formal logics and situated practices.

Turning to coordination more broadly, scholars have long paid attention to how interdependent work is coordinated. A rich body of research has explored the mechanisms that underlie effective coordination, such as formalization of plans and rules (Bardram, 2000; Faraj & Xiao, 2006; Fayol, 1949; Taylor, 1916); artifacts (Carlile, 2002; Star & Greisemer, 1989); proximity (Allen, 1977; Kraut, Fussell, Lerch, & Espinosa, 2005); and roles (Biddle & Thomas, 1966; Faraj & Xiao, 2006; Okhuysen & Bechky, 2009).

Another strand of research has examined aspects of context that influence coordination. Chief among these is uncertainty. While early theorists of coordination focused on questions surrounding designability, such as the design of work activities themselves (Taylor, 1916) or the design of relationships between different positions in an organization (Fayol, 1949), the organizational scholars who followed gave increasing attention to uncertainty and its effect on interdependent work. These scholars acknowledged that coordinating work under circumstances of novelty and uncertainty was inevitable and could significantly affect coordination and complexity of work (e.g., March & Simon, 1958; Perrow, 1967; Thompson, 1967). A large body of literature that investigated the fluctuating nature of coordination mechanisms in light of changing circumstances followed (Crowston, 1997; Feldman, 2000; Malone & Crowston, 1994; Pentland, 1992). As Faraj and Xiao (2006) claim, "At its core, coordination is about the integration of organizational work under conditions of task interdependence and uncertainty" (p. 1156).

Coordination research has shifted from designing arrangements in advance to identifying coordinating mechanisms and understanding the work that underlies coordination as it is happening. Coordination is now seen as an emergent, temporally unfolding, and contextualized process of managing inputs and articulating interdependent action (Faraj & Xiao, 2006; Heath, Hindmarsh, & Luff, 1999; Jarzabkowski, Lê, & Feldman, 2012; Kellogg, Orlikowski, & Yates, 2006; Schmidt, 2011; Suchman, 1987). Focusing on uncertainty as a key attribute of coordinating implicitly challenges the viability of predetermined

models of action as designed into work process systems.

Further, new work on coordination has called for a more dramatic shift in analytic focus, toward the study of coordinating as a dynamic social practice and away from the study of coordination mechanisms as reified rules and standards (Jarzabkowski et al., 2012). This research illuminates the effortful practices that workers use to enact coordination, such as the achievement of integrating conditions for coordinating (Okhuysen & Bechky, 2009) and the overlapping cycles through which people create and re-create coordination mechanisms (Jarzabkowski et al., 2012). Our research builds on this "practice turn" in coordination research. We understand coordinating as a "dynamic social practice" (Jarzabkowski et al., 2012: 907) and examine ongoing coordinating practices in a changing context.

Drawing on empirical work and a comprehensive literature review, Okhuysen and Bechky's (2009) integrative perspective on coordinating presents a compelling framework of how coordinating is achieved through three key integrating conditions: accountability, predictability, and common understanding. In Okhuysen and Bechky's (2009) view, multiple mechanisms are drawn together to achieve integrating conditions, which then result in coordinating. While this work describes how integrating conditions can be achieved through different mechanisms, it does not fully explore *how* the diverse ways in which accountability, predictability, and common understanding are realized affect the *form of coordinating* that is achieved and the organizational outcomes these different forms of coordinating engender.

More broadly, scholars such as Feldman (2000), Feldman and Pentland (2003), and Suchman (1987), describe the interplay between formal logics of action and emergent patterns of action. These scholars argue that situated practices are necessarily emergent, due to the need to adapt and shape action around the specifics of the situation at hand—but, they see formal logics of action, such as plans, policies, rules, and laws, as important resources that people draw on as they develop lines of action in situ. There is evidence from research conducted in other disciplines that situated conditions effect how formal delineations of action are brought to bear on daily work practice. For example, sociological research on public institutions such as courts and schools shows how individuals working at the "street-level" (Lipsky, 1980) of organizations are often responsible for interpreting and applying laws

and public policies. On-the-ground practitioners develop local practices to simplify complex work and thus exert large influence over how laws and policies are carried out in practice (Mazmanian & Sabatier, 1983).

Alongside the finding that practice is inherently situated and inevitably departs from formal logics of action lies a longstanding drive to formalize work. From Taylorism (Taylor, 1916) to lean manufacturing (Womack, Jones, & Roos, 1990) to six sigma (Pande, Neuman, & Cavanagh, 2000), innumerable work process systems have been introduced in an attempt to streamline work and offer centralized control over work process. Concomitant with the desire to formalize work has been a rise in managements' capacity to direct work process through the implementation of technological "solutions" to organizational functioning. Over the past 30 years, information and communication technologies (ICTs) have become increasingly pivotal in efforts to design and formalize work. Implementation of ICT-based work process systems is one of the most pervasive organizational change activities of the last two decades (Morris & Venkatesh, 2010), accounting for an estimated 30% of major change activities in organizations (Davenport, 1998). Such systems have reached adoption rates of 60% among service companies and up to 80% among Fortune 500 firms (META Group, 2004).

Comprehensive digital work process systems are intended to guide the flow of work, minimize inefficiency, and assure "best practice." Formal delineations intended to guide work process are inscribed in information technologies through customizable software templates designed and programmed with a specific logic of what "best practice" looks like in terms of task delineation (Dechow & Mouritsen, 2005; Scheer & Habermann, 2000). In previous work, we have shown that expectations associated with design, implementation, and use of such systems are conditioned by institutional paradigms (Pine & Mazmanian, 2014). This means that despite the presence of a body of literature showing that coordination is inherently situated and emergent, work system design reflects an institutional logic that action can be, and should be, designed in advance. Employees are expected to follow pre-specified lines of interdependent action. The explosion of ICT-based comprehensive workflow systems makes the question of how formal delineations of action can and should direct everyday work in service of coordinating and organizational effectiveness all the more pressing.

Considerable scholarly interest in workarounds has emerged in recent years, reflecting a concern with work system design, situated action, and adherence—or non-adherence—to formal logics of action (see, e.g., Boudreau & Robey, 2005; Urus, Molla, & Teoh, 2010). We argue that this scholarly attention to workarounds is not diagnosing the real problem, which relates to *why* such systems can be so difficult for people to work with on the ground. Instead, we seek to untangle the underlying dynamics of coordinating and to better understand how the design of work systems affects these dynamics. To do so, we empirically examine how different forms of coordinating emerge depending on the ways in which integrating conditions are achieved in practice. Examining how various forms of coordinating are achieved in practice allows us to orient to workarounds differently—as actions inherent in certain forms of ongoing coordinating.

In sum, our research addresses the following questions: (1) How does the introduction of a digital work process system affect (a) the way the integrating conditions for ongoing coordinating are realized in practice and (b) the form of coordinating that emerges? (2) How does the design of work systems—specifically, design as it relates to the inevitable disconnect between formal delineations of action and situated practices—affect the form of coordinating that emerges? (3) How do different forms of coordinating relate to organizational outcomes?

## SETTING, DATA, AND METHODS

Our research study is focused on generating theoretical insights through in-depth investigation of qualitative data. The first author collected data from multiple sources in a single fieldsite over a 16-month period using an inductive strategy and ethnographic methods. Data were analyzed using an ongoing and evolving method of reviewing field notes and transcripts, creating codes and themes, and refining themes within an emerging theoretical framework.

### Research Context

The working relationship between physicians and nurses is an ideal site for studying the dynamics of coordinating and the interplay between formal logics of action and situated practice in uncertain work environments. Medical sociologists have long observed that hospitals are highly complex organizations with a seemingly infinite web of interactions between various professionals and laypersons (Strauss,

Schatzman, Ehrlich, Bucher, & Sabshin, 1963). Medical settings are a fruitful site through which to investigate coordination (e.g., Bardram, 2000; Faraj & Xiao, 2006) and establishment and negotiation of task jurisdiction, both at an institutional level (Abbott, 1988; Friedson, 1986; Starr, 1982) and at the micro-level (Allen, 2000). Further, in a prior publication we used a subset of these data (not the vignettes that are the basis of this manuscript) to explore the relationship between the electronic health records (EHR) and “perfect” but fundamentally “inaccurate” records (Pine & Mazmanian, 2014).

### Research Site

The hospital where the research took place, which we refer to as “H1,” is a mid-sized independent university-owned teaching hospital in the Western United States. H1 is regularly ranked among the best hospitals in several specialties by publications such as *U.S. News & World Report*. The labor and delivery (L&D) unit of H1 has 14 beds. About 1,100 births per year occur in H1, which is considered a moderate number of deliveries. Primary medical personnel include approximately 55 nurses who work 12-hour shifts, approximately 16 full-time OB/Gyn and maternal-fetal medicine attending physicians and various part-time physicians, 24 resident obstetrics and gynecology (OB/Gyn) physicians, two nurse managers, and a director of maternal-fetal nursing (please note that the terms physician and doctor are used interchangeably). The unit also hosts a rotating cast of medical students, nursing students, scrub tech students, and attending and resident anesthesiologists who serve patients hospital-wide.

### EHR Implementation

This research focuses on the practice of ordering, a fundamental component of medical work in hospitals. Ordering entails the entry of orders by a clinician for medications, tests, procedures, and a multitude of therapies and daily life activities (e.g., diet and ambulation) administered to a patient during his or her stay in a hospital. Orders are entered and managed in the patient’s record upon admission and as needed thereafter, and are a formal delegation of authority from one clinician to another (from physician to subordinates). Orders are also considered a legal specification of organizational activities and an official record of what occurred. In the United States, only physicians and certain

advanced practice nurses have legal authority to enter orders and prescribe medications.

The practice of ordering was selected as the key unit of analysis for multiple reasons. First, ordering is a ubiquitous activity—ordering and maintaining a comprehensive record of orders is integral to both coordination and accountability. Second, this research followed an emic and interpretive approach (Guba & Lincoln, 1994); as the EHR was implemented, ordering became a central focus of workers in the unit, particularly nurses. This was evident through increased time spent in ordering, conflict that arose around orders in nursing practice meetings, and self-reported frustration about orders during ongoing ethnographic interviews. Third, ordering is a practice that provides fertile ground for studying the interplay between formal delineations of jurisdiction and in-situ understandings of occupational work. In many hospitals, nurses do much of the day-to-day work of ordering. They enter “verbal” orders on behalf of clinicians and manage orders to ensure that the orders in a patient’s record match the actions that are actually taking place. This is necessary because orders are multiple, fine-grained, and frequently changed.

During fieldwork, a major change to the process of ordering occurred in all units across H1, including L&D. When the EHR went live, all order entry functions were migrated from an old order entry computer program (TDS) to the new system. The EHR was an off-the-shelf commercial enterprise system, customized to H1. Locally, the EHR was referred to by a given name (we will use the pseudonym “Voyage”) rather than the commercial brand name. The EHR, as with many commercial EHR systems, is an omnibus information system that houses several functions in a single platform, including order entry, progress notes, test results, lab results, etc.

Once Voyage was implemented, all orders had to be entered digitally through the EHR. However, the EHR was programmed differently than past order entry tools: a system of permissions delineated which actions physicians and nurses were allowed to initiate. We described the effect of the institutional logics on the production of accounts previously (Pine & Mazmanian, 2014). The data presented in the current article differ substantially in that the current article examines ordering practices in much more granularity and depth, while this previous work details the institutional logics for safety present in the EHR. Physicians now had system permissions to enter, manage, and remove orders, while nurses did

not. Previously, nurses had been able to call in orders under certain circumstances if necessary. Nurses had also been able to log into TDS, alter existing orders, and remove discontinued orders. The EHR was programmed so that nurses could take none of these actions.

The first author began observing meetings in which EHR implementation was discussed and conducting semi-structured interviews in November of 2009. She then began observations of work on the L&D unit in February 2010. In October 2010, eight months into the first author's observations on the L&D unit, phase 2 of Voyage "go live" occurred during which all functions previously performed using TDS were migrated to Voyage, including order entry. "Redcoats," or nurses who were both employees of H1 and of the EHR vendor were available in all units of the hospital for two months following phase 2 "go live" to provide support and training on the new system. During this time, all physician orders had to be entered into the EHR, phone order entry was discontinued, and paper order sheets were no longer printed. This constituted a major shift for the physicians and nurses working in L&D. Ethnographic fieldwork concluded eight months after the phase 2 "go live" of the EHR. The first author continued to check in and conduct informal interviews with key informants semiannually between 2011 and 2015.

### Research Methods and Analysis

Participant observations (Emerson, Fretz, & Shaw, 2011; Lofland, Snow, Anderson, & Lofland, 2005) in the L&D unit were conducted over 16 consecutive months for periods of time ranging from four to 14 hours during all times of the day and night. The first author conducted all observations. Unit observations began in February 2010 (eight months prior to the EHR change that affected ordering) and concluded in June 2011 (eight months after orders functions were migrated to the EHR). Observations took place once or twice a week, intersected by three four-week periods away from the field in order to reflect and analyze data. In all, 55 separate observations in L&D occurred. All aspects of L&D work were observed and detailed notes taken in situ. For each observation, the researcher selected one patient case to follow and followed this case for the duration of the observation.

Observation centered on the patient's nurse as a focal point. Nurses were selected because they are the "hub" of patient care. The rest of the care team

orients to the patient case through the nurse and the nurse is involved in all facets of coordination. Focusing on nurses allowed observation of all providers on the care team as well as interactions between nurses and physicians. In-depth and time-specific data related to all aspects of patient care during labor and childbirth were documented, including practices specific to ordering (order entry, order management, communications surrounding orders between providers, order discontinuance, and so forth). Observations of staff meetings, daily rounds, Practice Council, grand rounds, EHR training, and other education and training activities provided additional insight into observations conducted on the "floor" of the L&D unit.

Supplementing observation, the first author conducted 32 semi-structured interviews during the study period with 32 caregivers in the L&D unit of H1 and an additional 28 interviews outside of H1 before the start of observation in H1. Semi-structured interviews (Lofland et al., 2005) lasted from 45 to 90 minutes and were recorded with the consent of the participant. Additional unstructured, ethnographic conversations (Emerson et al., 2011) with all manner of participants also took place as opportunities arose during the course of each observation, either in the course of work or during breaks. These conversations provided a chance to clarify what was happening in a given situation and to assess the subjective experiences of participants. Through these conversations, we received additional insight into L&D practices, as well as the institutional context of medicine and quality improvement. We also learned about broader institutional concerns through multiple sources not directly related to H1. For example, before entering the field, the first author audited an Introduction to Obstetrical Nursing course for nursing students and attended several regional conferences and meetings held by nursing professional associations.

Our working definition of ordering, which became the basis of data analysis, was: the set of social activities related to assessing a patient or patient situation, creating an official order, carrying out the actions specified by the order, and managing the orders so that they matched the actions being performed on an ongoing basis. Taken together, this set of activities presents an identifiable, recurrent set of activities—a practice of ordering. Specific instances of ordering in the data were identified using careful read-throughs of data and line-by-line coding. Analyzing the multitude of specific instances of orders work allowed us to examine the fluid nature of

coordinating task jurisdiction, and the ways in which the work system impacted how ordering was done.

Following a grounded theory approach, data collection and analysis activities overlapped and informed each other (Corbin & Strauss, 2008). As new pieces of data were collected, constant comparison was used to compare new data to existing data, and similarities and differences were noted. Through this process, general patterns and aberrations from those patterns were noticed, resulting in the development of theoretical assertions about, for example, medication orders—such as specific instances in which nurses took agency to change an order. We selected specific vignettes of carrying out orders to analyze in depth. Several vignettes were selected with the notion of presenting one mundane example of orders work and one example of orders work in an emergency scenario.

In addition, narrative maps of performances of orders work (Pentland, 1999) were created in which each minute detail was mapped to gain a thick description of the interactions between physicians, nurses, and the documentation system (which included the EHR in the post-implementation time period). This technique provided insight into the micro dynamics of coordinating before and after the EHR. What emerged was an understanding of how implementation of a new workflow management system shifted the relationship between formal delineations of action embedded in the work system and situated practice, and thus changed the form of coordinating that arose in practice and the organizational goals that different forms of coordinating served.

A crucial step in identifying the integrating conditions for coordinating (accountability, predictability, and common understanding) came in triangulating observational data with interview data to ensure that our understanding of how integrating conditions were playing out in practice was accurate. We examined who actually did what under what circumstances in multiple scenarios of coordinating and compared observed behavior with interview data in which participants were asked who was expected to do what in a particular scenario. When the relationship between observed activity and reported expectations was unclear, we sought additional confirmation from participants (particularly the nurse manager) to confirm patterns of accountability, predictability, and common understanding. Finally, we mobilized analyses of observational and interview data to discover implications for organizational effectiveness in mundane and emergency scenarios.

## FINDINGS

By drawing on data during a particular moment of change in how formal logics of action intersected with situated practice, we shed light on two forms of coordinating engendered by different work systems (which we term “artful coordinating” and “contorted coordinating”), the inter-relationships between integrating conditions in artful versus contorted coordinating, and the effects of these differing forms of coordinating on organizations. After providing a general overview of ordering activities at H1, we use two illustrative vignettes to show how the EHR-propelled work system produced a contorted form of coordinating, characterized by an unproductive disconnect between formal logics of action and situated practice. The first vignette describes nurses dealing with an incorrect order entered by a physician for a mundane task. The second vignette describes coordinating order entry during an acute and dire emergency.

### General Overview of Ordering in L&D at H1

Unlike many hospitals, H1 had a longstanding rule specifying that physicians should enter all orders, rather than dictating verbal orders to nurses. The rule against nurses entering verbal orders (presumably dictated by doctors) is a bureaucratic manifestation of a social situation specific to teaching hospitals, where resident physicians (physicians in-training) staff a hospital under the supervision of attending physicians. The expectation that resident physicians enter orders is based on two contextual factors: first, entering orders is seen as a necessary and appropriate aspect of resident physicians’ training, and, second, resident physicians are on hand in the hospital rather than working from remote offices, thus the expectation was that verbal orders relayed to nurses by physicians working at a distance would not be necessary for efficient coordination. There were exceptions to this rule against nurses entering verbal orders; as explained by Deb (nurse with 11 years of experience), nurses were permitted and expected to enter verbal orders in emergency situations such as “when a patient on the table needs blood gases, or there’s severe respiratory distress.” Navigating order entry between doctors and nurses has never been entirely clear cut; an inherent tension exists because physicians are expected to enter orders yet nurses are often the clinicians with close knowledge of the needs and order set for a particular patient. The inflexible design of the work system thus had a substantial effect on how this tension was managed in practice.

Nurses are responsible for managing and coordinating the rest of the caregiving team around the patient's needs; as one nurse described, "We're like the hub of the wheel." Part of the nurse's job is close management of patient orders and nurses have an established organizational routine of doing a "chart check" roughly once an hour to review and "clean up" their patients' orders. This check helps keep orders accurate and up-to-date—a service which also helps physicians. The chart check also serves a safety function. As the nurse manager described, "We're the last line of defense [against errors]." It was understood by both doctors and nurses that a key part of a nurse's job is to pay careful attention to all actions involving their patient, including orders, and to intervene and "catch" errors or problems before they manifest in patient care.

The examples of situated coordinating around task jurisdiction to enter orders observed at H1 do not typically involve nurses entering new orders. Navigating task jurisdiction for order entry came in the form of nurses changing or altering orders once they had been entered, taking initiative to carry out certain activities when they were expected but as yet unordered, and working side-by-side with resident doctors to enter orders when a resident doctor was otherwise occupied. It is important to note that in a teaching hospital like H1 nurse discretion over ordering is already constrained compared to other hospital environments. Thus, it is likely that the implications of introducing similarly designed work systems in non-teaching hospitals would be more extreme.

### **Vignette 1: Correcting an Incorrect Order**

Sending a sample to the hospital's laboratory or blood bank for analysis is a very common activity—L&D nurses collected blood and urine samples from every patient upon admission to the unit. Additional samples were collected over the course of a patient's stay. Nurses were charged with preparing samples and sending them to the lab or blood bank. However, a formal order had to be entered for each analysis to be performed and a transmittal obtained before the nurse was able to send the sample to the lab. Personnel in the receiving unit used transmittals to identify and create records for each specimen and match specimens to the appropriate patient and order. Although each incidence of collecting a sample involved order entry and transmittal preparation, these activities did not necessarily take place in the same sequence. Individuals determined the series of actions depending on the situation at hand.

For example, we witnessed a woman—who was entering the hospital to give birth to her fifth viable baby—enter the obstetrics emergency room. She arrived with frequent and strong contractions and the sensation of a bowel movement (a strong indication of imminent labor). A nurse quickly initiated admission procedures, including drawing all standard blood labs; a few minutes later, a physician entered orders for the labs. Another nurse printed transmittals for the samples and sent them to the lab. The nurses knew what samples to draw and did not hesitate to take action prior to order entry, particularly because it was clear that expediency was important. However, even in slowly unfolding scenarios, samples are often drawn prior to order entry.

One situation that arose quite frequently both before and after EHR implementation was incorrect order entry for tissue sample tests. As noted above, physicians are expected to enter orders in H1. However, the battery of tests that need to be ordered is complicated and the process was sometimes confusing to doctors who were early in their medical careers—for example, a hemorrhage prevention protocol required doctors to select between three different testing protocols based on level of risk (as assessed by nurses). Nurses tended to be more familiar with routine orders than physicians, and the professional expectation of many OB physicians was that while they were trained to handle the big-picture patient trajectory, obstetric procedures, and obstetric emergencies, nurses attended to the specificities of routine labs. This assumption, coupled with regular technical glitches in order entry through dictation (pre-EHR) or computer order entry (post-EHR), meant that nurses often found themselves with an incorrect specimen order, thus an incorrect transmittal. Occasionally the nurse noticed the error prior to drawing samples and sometimes he/she noticed the error upon printing a transmittal and double-checking to make sure it was correct. Thus, the need to alter incorrect orders was a common condition that called into relief how task jurisdiction was coordinated differently at pre- and post-EHR implementation.

**Pre-EHR.** Prior to implementation of the EHR, doctors dictated orders via phone upon admission of a new patient to the unit. Orders were then populated onto TDS, a hospital-wide linked order entry system. Nurses logged into TDS to view orders (orders were also printed automatically on paper) and print transmittals for samples. When nurses noticed an incorrect order, typically when checking the transmittal to send a sample for analysis, they had three



courses of action open to them. The most common course of action was to simply log back into TDS and alter the original order entered by the resident or attending physician. Although according to formal hospital protocol physicians were expected to order all tests, the old computer system did not exclude nurses from altering orders once entered.

For example, one day Margaret, a nurse with 17 years experience, noticed that the order slip for a blood sample she had collected stated that the sample was a "hold clot." But, the patient was a medium risk hemorrhage patient, which meant that the sample needed additional tests, called a "type & screen," in which the blood is extensively typed in case a transfusion is needed during delivery. The first author witnessed Margaret throw the old transmittal in the shredder, log into the computer system, and change the order from a standard blood typing order to a type & screen. Then she printed a new order, double checked it with another nurse, and sent the sample to the blood bank. On numerous occasions, we watched nurses simply correct an incorrect order for a common routine order and obtain the correct transmittal. They did this without consulting, informing, or chastising physicians for incorrect orders.

One incident in the pre-EHR period presented a slightly different scenario. In this incident, a blood sample had been collected for the blood bank but the doctor had not yet entered an order for the sample. Rather than waiting for the doctor to enter an order, the nurse, Estelle, retrieved a paper transmittal form from a cabinet (these forms were still kept on hand in the unit). Estelle filled out the form with information about the patient and the test to be performed, and then sent the handwritten transmittal with the sample to the blood bank. Estelle felt that this was better than waiting to send the sample and she did not want to call the doctor's room to ask for an order when she knew the doctor would get around to entering the order as soon as she completed other admission tasks. This action was only observed once. Estelle was considered a very competent and effective nurse; she had 15 years of experience on the unit at the time.

It is worth noting that there is a third action that could have been taken by nurses when faced with an incorrect transmittal—the nurse could have asked the doctor directly to change the order in the system and then printed a correct transmittal. However, this action was never observed in the pre-EHR period. Nurses often consulted with each other when faced with incorrect orders, particularly less experienced

nurses who were unfamiliar with the computer system or who felt less assured in their own claim to discretion in changing orders. However, for routine orders such as standard blood tests, a tacit agreement existed that nurses had authority to handle this situation autonomously without involving the doctors. This was the case for other types of orders as well.

During one observation, a nurse named Carmela (35 years' experience) knew that a patient would be ready for discharge before the end of the nurse's shift. Discharge requires a particular set of orders, and the nurse began entering these orders into TDS, after discussing the case briefly with the charge nurse. The nurses later informed the resident physician that the patient was ready for discharge, and the resident physician called in a final set of tests for the patient without question. Knowing that resident physicians are technically supposed to enter discharge orders, the researcher asked Carmela about how she knew what to do—Carmela simply responded, "The resident is doing her part and I'm doing mine." This incident exemplifies the fact that trust surrounding understandings of what nurses were allowed to do and when did not need to be re-negotiated with each routine incident. Rather, in working together over time, specific individuals parlayed relations of trust into social norms related to who was expected to do what, and when. In this manner, physicians and nurses in H1 created predictability surrounding what they could expect one another to do in various situations.

Prior to the introduction of the EHR, workers in L&D flexibly enrolled formal logics of action (embedded in models of work process), local contextual factors (particularly informal social resources), and immediate conditions of the body and the unit when coordinating ordering. The actual negotiation of discretion to take action in the scenarios described here were largely non-verbal. The nurses involved in these cases drew on past interactions and immediate conditions to determine their own part in a line of action. Over time, nurses developed a shared common understanding (with each other and doctors) about when it was appropriate to interfere with an order.

Within this mode of coordinating, people created and maintained informal accountability with their colleagues via social norms and interpersonal relations. For example, less experienced nurses looked to their more experienced peers for license to use their own discretion in managing orders and inexperienced resident physicians would ask for input from experienced nurses. Thus, the local organizational context of L&D contained longstanding, tacit

agreements about nurses' authority to manage orders under certain conditions that were passed down to new generations of nurses and doctors. Repeated interactions, centered on negotiating task jurisdiction, had resulted over time in a great deal of accountability and predictability about work process—both when work was running smoothly and when unexpected contingencies arose.

Navigation of task jurisdiction as witnessed prior to the EHR did incorporate considerations of formal institutional delineations of jurisdiction. But these delineations were not expected to fully guide work. Nor did work typically unfold in the manner specified by such models. Rather, formal logics of action provided broad contours for delineating appropriate action. For example, under certain conditions a nurse might decide to administer ibuprofen to a patient without obtaining an order first. However, that same nurse would never administer a more powerful drug without an order, regardless of circumstances—the potential for legal, organizational, and social sanction would be high. Thus, while formal logics of action are important resources to action, they do not fully predict who will do what, nor entirely shape the ongoing arbitration of common understanding about who ought to do what.

**Post-EHR.** Formal models of work process were prevalent in the organization prior to the introduction of the EHR: standard operating procedures, training modules, prescription pads, and so forth are embedded within formal logics of jurisdiction for ordering. But implementation of the EHR led to considerable changes in the degree to which formal logics of action were leveraged to direct action with a heavy hand. While incorrect order entry of routine tissue samples continued to be an ongoing issue after the introduction of the EHR, how nurses dealt with this problem changed substantially. As will become clear below, prior understandings of the nurse's role as point person (the "hub of the wheel" for a patient's care), a role that included subtle yet important ordering tasks, was undermined by the formal delineations of task jurisdiction designed into the EHR.

In this vignette, which occurred five months post-EHR implementation, a patient was admitted and a doctor entered orders for the hemorrhage sample in the system soon after. The nurse then collected the specimen. The first author observed as the nurse attempted to prepare the specimen to send to the laboratory for testing.

Wanda—an experienced nurse who is new to H1 and is orienting with Sharon as a preceptor—logs into the

EHR system and completes a series of steps necessary to "add" a sample and print a transmittal. The transmittal prints out. When reviewing the transmittals, Wanda notices that the order is incorrect. The transmittal reads that the sample is to be used for umbilical cord blood, not the hemorrhage prevention sample it is supposed to be. Wanda double checks the orders in the EHR, finds the order is indeed entered incorrectly, and realizes the doctor mis-entered the order. Wanda then asks Sharon, her preceptor, what to do. Sharon looks at the order in the EHR, shrugs and says that before Voyage, she would have been able to delete the incorrect order and enter the correct order herself, but now they can't do anything in the EHR without the doctors, so they will have to wait until a doctor comes back. Sharon says they could page a doctor, but that seems totally unjustified for this relatively minor action. So Wanda slides the blood sample into the pocket of her blue scrub jacket for the time being—it is 12:55PM.

At 2:11PM, the doctors return from a lunch meeting and the doctor who entered the order sits down at a computer in the nursing station. Wanda approaches the doctor [a 4th year resident] about the hold clot order, she tells the doctor there isn't an order in the system for a hold clot and the current order is for an umbilical cord clot, so this patient hasn't had a clot sent to the lab yet even though her labs were drawn before 1PM.

The doctor asks Wanda, "Is it the standard order?" meaning the standard hemorrhage preparedness order, presumably the standard order for a low-risk patient as that is the most common order. Sharon is sitting in the nursing station as well and says to the doctor, "Yes, we want a clot for every patient."

The doctor says, "OK, I'll put it in," then logs into Voyage via a computer in the nurses' station, goes to the order entry function, and enters an order quickly. Since the EHR is programmed so that physicians have permission to enter orders, this is a quick task for the doctor. She searches for orders under "labs" then "blood" then selects an order for type & cross. According to the protocol, this is the order that is entered for patients at medium risk for a hemorrhage, and specifies that a clot should be drawn and a detailed blood type analysis be run on the clot so that existing stores of blood can be quickly matched to the patient in case of a hemorrhage. This is not the "hold clot" order that is needed for a low-risk patient like the one Wanda is caring for.

However, the nurses are not aware of the mistake until Wanda logs into Voyage to attempt to print a transmittal.

As she reviews the order, she sees that the order is, once again, incorrect.

Wanda turns to Sharon for help—she is frustrated and does not know how to handle the situation. Sharon is frustrated as well. The doctor has now entered the order incorrectly two times. However, the duo of nurses are unwilling to ask the doctor (who is currently sitting at the nurses station two seats away from them—arranged as a long and narrow desk with three computer terminal workspaces—to re-enter the order once again. They tell the researcher (in an informal exchange later in the day) that, because this is such a mundane thing, bothering the doctor again would have been inappropriate. In their own language, they didn't want to "bug her too much" and they will inevitably need to ask her for something else at some point so they wanted to maintain good will. However, the nurses still need the order and the transmittal. The two nurses decide to try and see if they can enter the correct order in the EHR themselves. They do this by going to the order entry workpad, where they find and select the correct lab order, but when Wanda clicks "submit" the EHR will not allow Wanda to complete the order using her account unless she enters a special password. Thus, the nurses are unable to print a transmittal of any kind. Although the nurses search for a workaround, they are unable to find a way to get a transmittal that is independent of the lab order.

Finally, Sharon and Wanda ask a third nurse for help. It is a lucky coincidence that this nurse is available—she is a former redcoat with special training on Voyage. This third nurse, Lucille, successfully removes the old order from the system and enters a new order using a password provided to her as a redcoat. The first nurse is then able to print a transmittal while commenting wryly, "We were working on that for hours." The second nurse, eyes big, hand on her chest in a "thank God" gesture, replies "OH, my goodness." The order was submitted and transmittal printed at 3:33PM.

Although a doctor entering an incorrect order for a routine blood sample analysis was common pre- and post-EHR, the above scenario reveals the degree to which this mundane mistake upends the smooth organizational process when nurses attempt to work around the formal logics of task jurisdiction embedded in the design of the EHR (without undermining local professional norms). As noted above, the EHR is programmed with permissions that specify that attending and resident physicians have the authority to make and modify orders and nurses do not. However, local occupational norms still held that nurses should manage orders and limit communication with doctors to urgent requests.

Such informal expectations regarding roles were in direct conflict with formal delineations of action designed into the system. Prior to the implementation of the EHR it was possible for different specialist groups to maintain contradictory logics of how orders were carried out—regardless of how ordering was actually practiced on the ground. Thus, the same doctors who assumed that nurses would not bother them with mundane issues in ordering also asserted that the formal logic of the system accurately depicted work process. For example, when asked what the responsibilities of doctors and nurses were with regard to orders, a doctor responded, "We enter the orders, and the nurses carry them out. It's a physician-driven environment."

The design of the EHR reflects a belief—a fictive belief—that formal delineations of action for ordering could be cleanly translated into practice. As one nurse (13 years' experience) put it: "[The EHR] requires a chain of things. The nurse cannot act without orders. But the doctor must enter the orders." This nurse expressed a feeling of being bound by a sequence that was out of her control—nurses were reliant on doctors for actions that they had previously been able to control themselves. In another incident, we witnessed Molly (six years' experience as a nurse in the U.S., 12 years' experience as a midwife in another country) dealing with a frustrating situation where a doctor had entered a recurring dietary order for a patient who wasn't supposed to eat. Molly had to continuously intercept dietary trays delivered to the patient's room so the sight of food that she could not eat would not upset the laboring patient. Molly lamented that she could not change the dietary order, which the doctor could too easily enter into the EHR by "not paying attention and clicking boxes." The result was that workers, who continued to look to situated conditions and local contextual features to determine who ought to do what and when, were forced to work around the EHR in order to achieve the everyday demands of their job.

However, pacifying the computer—finding ways to navigate the EHR that allow nurses to get what they need given the formal logics of the system—requires a lot of effort. Pacifying the computer is made more difficult by the ways in which formal delineations of action embedded in the EHR contradicted inter-occupational norms for courtesy and professionalism. Such norms dictated that doctors (and other nurses) should not be excessively interrupted for mundane requests—hence the nurses' unwillingness to ask the doctor sitting two seats away to fix an incorrect order. We witnessed numerous occasions

where doctors signaled non-verbally that they wished not to be interrupted. When an issue with mundane orders arose, they would simply stay very quiet and absorbed in their own tasks. This created a situation rife with social breakdowns as the introduction of the EHR created a constant stream of technical problems that nurses were unable to solve on their own, but because they were non-patient care related issues, they did not warrant “bugging” a doctor.

Occasionally, doctors aggressively over-stepped occupational task boundaries embedded in the design of the EHR by verbally asking nurses to do something that they were no longer able to do. In one observation (three months post implementation), an anesthesiology attending physician, who had just finished placing an epidural in an L&D patient, brought the patient’s nurse a paper order sheet. The order sheet allowed doctors to select a combination of orders for an epidural—this sheet was routinely used prior to EHR implementation, when some nurses would enter orders directly from the sheet into the computer system. Post-EHR, this was impossible. However, the attending doctor gave the nurse the order sheet with a simple “Here you go.” The nurse looked at the order sheet and said nothing. After the doctor walked away, the researcher asked the nurse, “Whose job is it to enter orders?” The nurse angrily raised her hand and said, “The idiot,” implying that the doctor assumes computer order entry is beneath his station. Given the organizational culture of H1, nurses were unlikely to speak up in an attempt to correct an attending physician. Thus, the nurse was forced to find another doctor she knew better and ask her to enter the orders, in the process losing time she could have spent on other tasks and risking tension with whomever she asked to do the computer work of another doctor.

While the introduction of the EHR upended assumptions that ordering unfolded according to formal delineations—e.g., that the specialists were actually operating in a “physician-driven environment”—this did not result in doctors taking over ordering tasks that they were expected to perform. Nor did it result in expanded privileges for nurses. What did result was escalating tension between the two groups of specialists and a breakdown of social norms which in the past had served as a useful resource to action. Informal accountability between the two groups was difficult to achieve, because norms were disrupted on an ongoing basis. Doctors, the occupational group who had formal authority to enter orders in the EHR, did not have the time, expertise in the computer system (these were resident doctors who rotated between

two hospitals with different EHR systems), or expertise in mundane orders, such as the routine hemorrhage prevention protocol. Nurses, who did have this expertise, as well as an occupational mandate to be the hub of care, did not have permissions to alter orders in the EHR. This made it very difficult to achieve informal accountability through social norms, and, paradoxically, work became less predictable as people engaged in unexpected actions in order to work around the system.

Recent conversations (held in 2015) reveal that four years after implementation, navigating jurisdiction for ordering has continued to be a challenge. One nurse pointed out that the EHR “turned up a lot of rocks . . . meaning practices that we shouldn’t be using.” Even after the long-term use of Voyage, clinicians were unable to operate it smoothly (i.e., completely without “rocks”). While ordering became somewhat easier after an extended adjustment period in which both doctors and nurses learned to work in accordance with the expectations of the system, the formalization of practices imposed by the system continued to hinder situated coordinating and in-the-moment effectiveness. H1 has recently decided to discontinue Voyage and implement a new EHR for various reasons. After their experience with Voyage, the clinicians we spoke with are concerned about new contortions to ongoing coordinating that will emerge due to increased formalization that the new system will impose (on top of having to learn new software).

A key illustration of the implications of the EHR for organizational effectiveness comes from instances of nurses changing IV bags. Formally, doctors must order IVs, yet managing IV fluids has long been under the purview of nurses in H1. Over the course of labor, patients switch from a normal IV bag to one with a sugar mixture as this helps give the patient extra energy. Pre-EHR, the tacitly agreed upon line of action was for nurses to assess when this change was needed, change the IV, and enter a new order in the computer. Post-EHR, nurses were no longer able to take this simple yet relatively important action. While changing an IV bag too early does not threaten patient safety, not changing a bag can have negative ripple effects. If a patient’s blood sugar drops, she may have very low energy and be unable to push effectively, increasing the chance of cesarean section. Not changing the IV at the appropriate time can significantly affect the patient’s experience and lead to further interventions. We observed an instance in which a nurse dealt with over two hours of frustrating obstacles to log such an IV change in Voyage (the nurse had to coordinate with the doctor, then wait

for an official double check from the pharmacy, then complete a series of steps in the EHR). Additionally, the record produced by the EHR was inaccurate, because the official record appeared as if the bag was hung well after it was actually administered to the patient. The process as inscribed in the EHR was fixed, thus the record produced could not look other than what was expected by the system (doctor ordering an IV change and the nurse responding to that order). Inaccurate records are thus an unavoidable outcome of attempts to respond to the situation at hand while working within the confines of the system—this effect has been documented in detail in prior work (Pine & Mazmanian, 2014).

The digital work process system is embedded with formal models of work process and designed such that it can stop or hinder action from taking place, either forcing people to act in accordance with the models programmed within the system, or making it appear as if they are doing so. Yet, L&D constitutes an environment where situations are inherently fraught with a multitude of major (i.e., emergent labor) and minor (i.e., error in order entry) uncertainties that must be taken into account in ongoing coordinating. Formal process models, which are always inherently partial, are unable to fully anticipate and direct action. These data suggest a resulting loss to organizational efficiency, as evidenced by delayed sample submissions, wasted time and energy, inaccurate records, and strained social relations. The work system is less facile, slower, and more cumbersome. These data suggest that the EHR hindered efficient reactions to changing circumstances and, in contrast to the productive disconnect present in the pre-EHR hospital, imposed an unproductive disconnect between formal logics of action and situated practice.

### **Vignette 2: Coordinating Side-by-Side in an Emergency Situation**

Where the prior data section focused on occupational groups working together in a loosely coupled fashion (where the groups are interdependent but action often takes place apart from other specialists in space and time), here we describe a scenario where doctors and nurses work in close proximity to coordinate orders during an emergency scenario. Unlike the highly recurrent and mundane practices outlined above, this section focuses on a rare obstetric emergency. While we do not have observational data of an incident under the same conditions pre-EHR, we rely on interview data and descriptions from those involved to understand how the nurses

and doctors imagine the scenario would have unfolded prior to the introduction of Voyage. After describing what likely would have occurred in the same scenario prior to implementation of Voyager, we present data from an actual event in the post-EHR hospital. This vignette outlines what happened during an obstetric hemorrhage, the leading cause of preventable maternal death in the United States. One doctor described this particular hemorrhage as a “once in a career incident.” Of the seven anesthesiologists and obstetrical doctors and nurses closely involved with direct patient care during the incident, only two had participated in an incident of this severity. Coordination during such an emergency is of utmost importance, especially given that the lines of action are necessarily novel and highly contingent on the body of the patient, which asserts itself as primary.

The key objectives in treating a massive hemorrhage are to contain blood loss and replace blood volume. To replace blood volume, it is critical that clinicians are able to quickly procure adequate quantities of blood that either are of the universal donor blood type or are already matched to the blood type of the recipient. There were two kinds of blood orders at H1—regular and rapid infusion protocol (Rip) orders. Regular blood orders provide a particular amount of a certain type of blood component. For example, a clinician might order two units of red blood cells that the blood bank would select based on a cross match with the patient’s blood (if they did not have this information, the blood bank would send O negative blood, but this is a precious resource and preserved at all costs). In situations of massive and rapid obstetric blood loss, clinicians would order a “Rip.” When a Rip was ordered, the blood bank would send a pre-arranged amount of different types of blood components either via vacuum tube or by hand to the patient’s location.

**Pre-EHR.** In the pre-EHR hospital, ordering blood from the blood bank was a paper-based process. Three paper forms were required to order blood: (1) the blood component administration order form which consisted of check boxes for all of the possible components of blood that could be ordered—clinicians indicated what components they needed, indicating how much; (2) a pneumatic tube request form that was filled out to indicate the location where products were needed; and (3) a form that authorized an emergency release of blood components for a recipient of unknown blood type. These forms were kept in the L&D unit and in Operating Room suites, readily available at a moment’s notice.

When a hemorrhage occurred, one physician (determined by seniority) would take on the role of

“captain” per the hospital’s protocol. The captain made decisions about ordering blood and would indicate these decisions to a nurse who would take charge of orders and paperwork. This person, often the circulating nurse, would fill out the necessary forms and send them via pneumatic tube to the blood bank. As soon as forms were sent, this same nurse would phone the blood bank to make sure the blood bank was aware of the emergency situation and of the request for blood products. This nurse could then act as a communication intermediary between the captain and blood bank personnel if needed.

Coordinating between physicians and nurses in this scenario was crucial. It was essential that the work systems in place in the hospital facilitated rapid coordinating of novel lines of action on an ongoing, minute-by-minute basis. However, in the post-EHR hospital, nurses, and physicians encountered serious issues in their attempts to coordinate so that blood products arrived during a massive obstetric hemorrhage. Issues arose because orders for blood products now had to be entered via the EHR, which was designed in a way that assumed doctors would both be making decisions and executing actions relating to these decisions. While there was still a team captain, the EHR required that a physician log in and enter orders for blood products. As becomes clear below, it is physically impossible for the doctors in the room to be attending to the body of the patient and simultaneously ordering blood via the EHR.

#### **Post-EHR.**

In this particular incident, Stephanie was the patient’s primary nurse (17 years experience). Stephanie had been taking care of this patient regularly as she was in the hospital long term for placenta percreta (a dangerous condition where the placenta grows through a weakened section of the uterus into surrounding organs). The patient requested that Stephanie be her nurse for the birth. The patient was brought down for her scheduled cesarean section when her baby was full term. Clinicians knew she was at high risk for bleeding and had placed two catheters in her arms for easy blood transfusion should the need arise. According to extensive debrief interviews with personnel involved, the cesarean section went fine—the baby was healthy at birth, and the back-up nurse Janelle (4 years experience) left to take the baby to the nursery confident that everything was OK. In addition to Stephanie, the medical team was composed of an anesthesiologist, a first-year resident (Dr. Davis) doing the procedure, a second-year resident (Dr. Smith) watching, a maternal-fetal medicine fellow acting as attending physician (Dr. Nguyen), and a scrub tech.

After the c-section, the team began to notice the patient was losing a lot of blood as they closed the wound. Nadine, the charge nurse, was called to bring the hemocue with her to the operating room (OR) since the backup nurse had already left with the baby. Nadine was aware there was some trouble (the hemocue is a device that tests hemoglobin at the bedside letting providers know if a transfusion is needed) and, upon arrival, was concerned with the amount of blood the patient had lost. Dr. Nguyen spoke up and said the patient needed a transfusion, but the anesthesiologist disagreed and said that the patient’s vitals were good. There was some push and pull between Dr. Nguyen and the anesthesiologist and Dr. Nguyen did not call for a transfusion, as it was unclear who was more senior. However, as they went to put the uterus back in the patient’s abdomen it became apparent that the patient had lost more blood than they had initially thought. Dr. Nguyen declared herself captain, decided to do a hysterectomy, and called for a blood transfusion. The first transfusion she ordered was for two units of crossmatched blood that were on standby for the patient in the blood bank.

This is where the true difficulty began. Entering this crucial order in the EHR proved a challenge. Stephanie, who normally would have taken charge of paperwork, logged into Voyage and attempted to enter an order for the blood products. However, she was unable to complete the order as she did not have proper permissions. It became unclear who should be in charge of computer ordering. The charge nurse and the anesthesiologist both logged into the EHR from different terminals and attempted to enter orders for blood products. However, the charge nurse was unable to enter orders and the team could not tell if the blood bank was seeing their orders. A decision was made in the room to send a nurse who had stopped by to check in on the situation, Bridget, to the blood bank in person to make sure the blood was sent. Bridget arrived at the blood bank to find the blood bank confused about multiple duplicate orders. However, they released the two units of blood to Bridget and she hand carried these units back to the OR.

After the first transfusion, significant blood loss was still occurring, so the captain decided to call a Rip protocol. Again, clinicians faced difficulty entering the order and different clinicians entered multiple orders. Nurses were unable to enter orders, so physicians had to turn their attention away from the hemorrhaging patient, log in, and enter orders. Over the course of the day, a second Rip along with multiple additional units of blood were ordered. Confusion persisted about who should man the computer, since

this appeared to be a nursing domain but nurses were not able to enter orders for blood products. Physicians had to physically reorient away from the patient and toward the computer every time orders were needed in the EHR. There was a lack of clear direction in figuring out how to coordinate the ordering. This issue was not resolved throughout the emergency. Thus, while blood products were eventually ordered and transfused this process was inefficient and distracting during crucial moments of care. Although the situation was controlled and the patient survived, the emergency hemorrhage protocols, communication channels with the blood bank, and expertise of various members of the team were unable to fully overcome the fact that the EHR was inflexible in order entry permissions.

The above data outline a dire emergency. Managing such an emergency requires skilled management of two sites of work—the patient's body and the paper/computer/phone system used for communication and documentation. As became clear in the vignette, the combination of permissions programmed in the EHR and the immediate conditions of the moment made it very difficult for nurses and doctors to coordinate work when it was most crucial. Prior to the EHR, L&D personnel followed locally established divisions of labor during hemorrhage emergencies in which doctors handled the hemorrhage directly while nurses coordinated tests, supplies, and documentation, and were in constant contact with the lab, pharmacy, blood bank, and other units involved in managing an emergent situation. Formal logics of action specified that doctors make decisions about orders, but nurses were able to write and manage paper-based orders needed in hemorrhage treatment in close contact with doctors.

However, the formal delineations of action embedded in the EHR, enforced with strict permissions for order entry, made it impossible for nurses to support the physicians, who were caring for a patient, by handling orders work. Pre-EHR, acting on the captain's orders during an emergency was assumed—through local social norms—to be within the purview of the nurse. However, post-EHR, as the nurse was unable to directly enter orders, a doctor had to leave the bedside to engage in what was considered a distracting (if crucial) task. This led to frustration from all parties involved and did not facilitate the calm, focused efficiency required to handle such a scenario. Coordinating in this situation was awkward and sub-optimal. Four years later, doctors and nurses feel that while they now understand the logics designed into the EHR, they still

experience difficulty in artfully coordinating together. Further, they struggle with the feeling that the formalizations in the EHR represent an ideal that “should” be achieved, although they are unable to realize it in practice. Formalizations embedded in the work system have exposed the informal practices through which work is done, and simultaneously imposed a measure of self-surveillance and a feeling that formalized protocols are correct, though unachievable, ideals of work. It remains to be seen how the formal logics of practice embedded in the soon-to-be-implemented new EHR system will impact situated coordination over time, although participants fear that the new system may be even less flexible than Voyage and thus pose greater challenges for achieving elusive formalized practices.

## MODELS OF COORDINATING

As noted above, implementation of the EHR allowed us to examine two different kinds of coordinating. In analyzing these data, we first noticed that while there are three integrating conditions for coordinating (accountability, predictability, and common understanding), it is necessary to distinguish between formal accountability and informal accountability. Okhuysen and Bechky (2009) note that accountability has both formal and informal components but do not make an analytical distinction between the two. Drawing on past work by Crawford and Ostrom (2005) who distinguish between rules and norms, we see “formal accountability” as institutional logics of action reified in the work system—these logics of action present the possibility of institutional sanction for violation. In contrast, we see informal accountability as comprised of norms for action that do not carry explicit institutional sanction (although their violation may carry social sanction). This distinction is important because at their core, the difference between what we have come to call “artful” and “contorted” coordinating revolves around the nature of the relationship between accountability and the other integrating conditions. To clarify, the formal logics, or delineations, that have been discussed throughout this paper are the means through which formal accountability is achieved. In other words, if people demonstrate adherence to formal delineations (working in accordance with the system), they are also upholding formal modes of accountability.

A disconnect between formal accountability and situated practice unfolding in the living milieu of work is inevitable. This disconnect takes different

forms, and, in so doing, engenders the two different kinds of coordinating we find in these data. In artful coordinating, a productive disconnect exists between formal logics of action and situated negotiations of task jurisdiction, enabling specialists to develop a responsive, flexible, and emergent form of coordination. In contorted coordinating, the heavy hand of a work system attempts to enforce formal logics of accountability. However, the impossibility of fully delineating and proscribing lines of action forces specialists to expend substantial time and energy on working around the system, leading to an unproductive disconnect between formal logics and situated practice. Both forms of coordinating, and their relationship to integrating conditions required for coordinating (as outlined by Okhuysen & Bechky, 2009), are discussed below.

### Artful Coordinating

In the dynamic and uncertain realm of healthcare, we argue that formal rules cannot fully anticipate the nuanced intricacies of local contexts and situated contingencies that arise in the course of performing complex and time sensitive work. Thus, we witnessed specialists using common understanding to navigate on an ongoing basis who should do what and when—an achievement made possible by the presence of a *productive disconnect* between formal logics of action and situated action. Our observations suggest that while accountability to formal logics of work process was a priority for specialists, the unique configuration of attributes presented by the local context and the specifics of the situation at hand regularly called on individuals to work between and across formal logics and immediate demands.

Our data show that while the three integrating conditions for coordinating articulated by Okhuysen and Bechky (2009) are related to the achievement of both forms of the ongoing coordination seen in our data, common understanding is the focal integrating condition for coordinating in complex and time sensitive contexts characterized by high levels of uncertainty. Common understanding is the shared perspective of a whole task and how an individual's work fits in with the whole (Okhuysen & Bechky, 2009). Common understanding about ordering in L&D prior to the EHR was achieved through situated interactions between specialists that often centered on information artifacts such as the patient order worksheet. While these artifacts reflected formal models of accountability in their design, the ongoing

interactions that produced common understanding also formed conditions of informal accountability (social norms about who was expected to take what action under what conditions) and increased predictability (understandings of the sequences in which action could be expected to unfold). These three integrating conditions resulted in an artful form of coordinating that was characterized by action sequences that were simultaneously cognizant of formal logics of action, relatively stable, and responsive to the specifics of the situation at hand. We find that the various workflow tools used by the hospital support coordination. In other words, such tools offered key resources to action, and reminded specialists of how a course of action *should* (in an ideal world) unfold. Yet, the productive disconnect allowed specialists to maintain a crucial margin for adaptation given the specifics of the situation at hand. Prior to the introduction of the EHR, the productive disconnect was taken for granted and unexamined—it was the space where work was done. Figure 1 graphically represents these various dynamics.

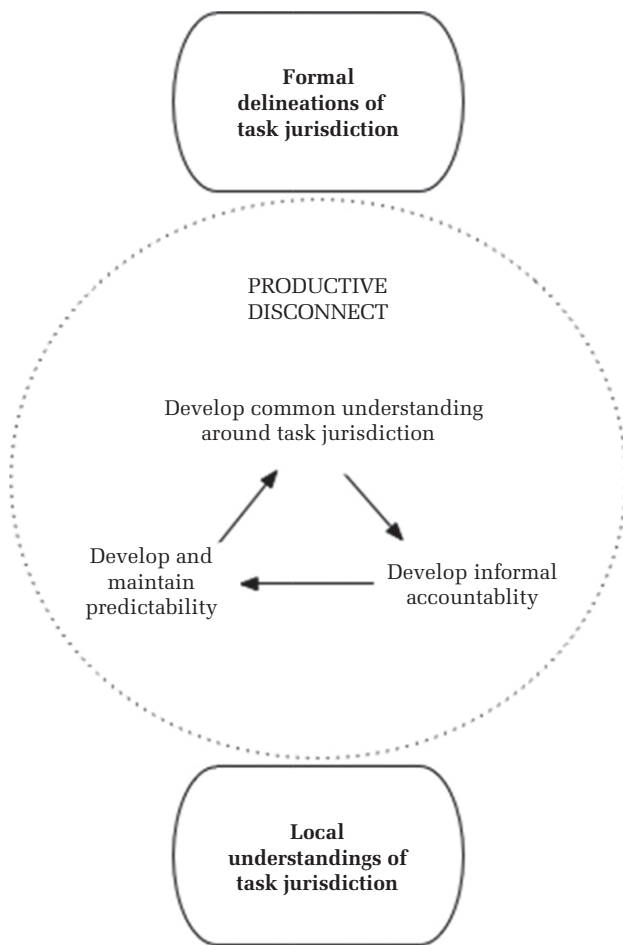
### Contorted Coordinating

In the post-EHR hospital, a different form of coordinating took place. Best described as “contorted coordinating,” the relationship between formal accountability and common understanding changed such that formal accountability was imposed directly into negotiations of common understanding through a computerized work system. Rather than scaffolding moment-by-moment negotiations of formal logics, local context, and current demands, the system was programmed to intervene in order to maintain clear sequences of action—based on formal institutional rules—regardless of context and situated contingencies.

The emphasis on achieving formal accountability in coordinating work redefined the relationship between the integrating conditions. The scope of formal accountability increased, such that formal accountability encompassed not just who was expected to do what, but also dictated to a greater degree than before the particular order in which sequences of interconnected action were expected to proceed. Another way to describe this situation is that the integrating condition of predictability was subsumed under formal accountability, since specialists were held accountable for carrying out lines of work in particular pre-defined sequences. Faced with a re-designed work system that foregrounded formal accountability and specified sequences of work in minute detail, the work of achieving



**FIGURE 1**  
**Artful Coordinating: Pre-EHR**



common understanding between specialists changed. Specialists were no longer interacting in order to artfully negotiate how to get work done. Instead, they were often forced to upend social norms, risk inter-occupational tension, and interact about how to work around the system. The hallmarks of contorted coordinating are thus: (1) increasing specificity of formal logics of work process, (2) the emergence of an *unproductive disconnect* between formal logics of action designed into a heavy handed workflow system, and (3) a shift in the character of common understanding such that working around formal logics of work process is a dominant focus in the achievement of common understanding.

Thus, while the development of formalized and standardized delineations of work process in the re-designed work system was expected to increase predictability, we found that the integrating condition of predictability as conceived by Okhuysen and

Bechky was substantially undermined by the EHR. The standardized end-to-end sequences of action expected by the work system departed from what specialists working in local contexts in specific situations actually did. This is because the work system does not allow for substitutions, recombining of sequences of action, and informal migrations of authority.

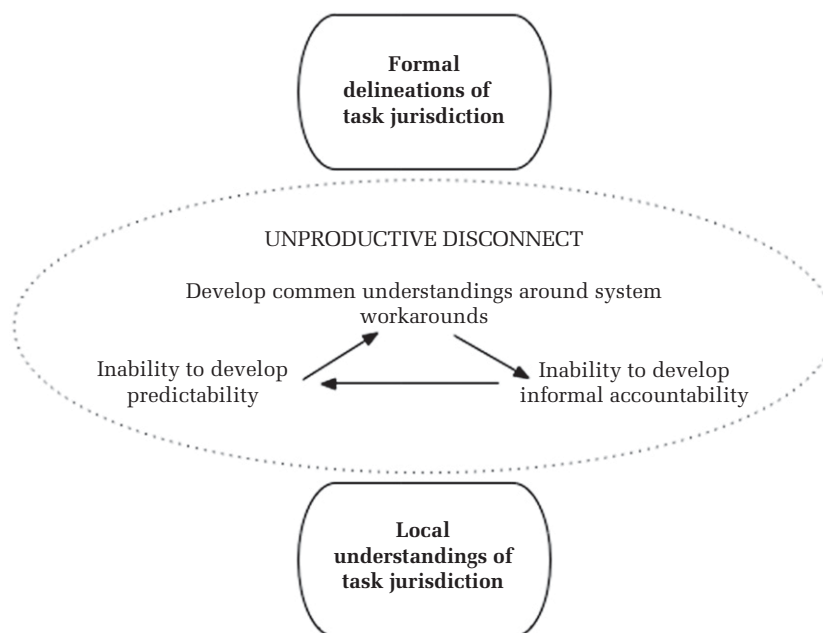
In artful coordinating, predictability arose from ongoing negotiations of common understanding in different circumstances over time. Such negotiations result in a shared generalized knowledge of how particular groups of specialists should operate in particular circumstances under particular conditions. In contorted coordinating, common understanding is focused around not only apprehending contexts and situated conditions, but also in effectively working around formal logics of work process. These data suggest that the ongoing strain imposed by this situation, coupled with the fact that the work system disrupted relationships between specialists, precluded the achievement of effective predictability. This situation is outlined in Figure 2.

As formal delineations of action intruded into situated discretion to flexibly navigate intra-occupational task jurisdiction for order entry, nurses were faced with several unappealing options. Either they could expend tremendous amounts of time and energy to work around the system or they could violate locally understood professional norms in order to strong-arm doctors into taking more initiative in managing the work process system. We witnessed both of these outcomes in our data. Thankfully, we did not see obvious examples of a third option—nurses ignoring immediate concerns of patients or willfully undermining hospital protocols around ordering. However, the difficulty in taking effective action under the heavy hand of the EHR may render it more appealing for some nurses to simply ignore immediate concerns rather than address them. EHR systems are designed with the notion that medical errors occur when personnel take inappropriate action. Our data suggest that mistakes might also arise when nurses are compelled to avoid actions that are appropriate but formally against the rules. The data presented here reveal how situated discretion to flexibly coordinate order entry tasks between occupational groups is critical for effective patient care and hospital functioning.

## DISCUSSION AND IMPLICATIONS

Rapid advances in digitalization over the past few decades (e.g., the development of enterprise resource planning (ERP), EHR, and related systems) promise

**FIGURE 2**  
**Contorted Coordinating: Post-EHR**



unprecedented levels of visibility and end-to-end management of complex interconnected work. Systems attempt to place formal logics of work (often based on “evidence-based” principles of work practice) at the core of daily organizational functioning. In this paper, we use ethnographic data in a hospital setting to show how engaging with such a system disrupted the micro practices of work, upended an artful form of coordinating, and engendered a contorted form of coordinating among healthcare specialists.

We contribute to current conversations around integrating conditions that enable coordination and provide new insight into how such conditions work together to produce different forms of coordinating. Using Okhuysen and Bechky’s integrative model of coordination as a starting point, we explore how the integrating conditions for coordinating (accountability, predictability, and common understanding) are achieved before and after the introduction of a comprehensive workflow system. We thus move beyond Okhuysen and Beckhy’s seminal work by exploring in empirical detail multiple ways through which integrating conditions can be achieved and showing what happens when coordination is realized through different instantiations of accountability, predictability, and common understanding.

In sum, we find that when integrating conditions and the relationship between them are transformed, so is the form of ongoing coordinating that emerges. This

insight goes beyond a shift in daily practices necessary for people to coordinate with each other. We find that these different forms of coordinating serve different goals and ideals, and in serving these ideals, carry very different implications for organizations.

The artful coordination that existed pre-EHR served immediate patient needs and did not hinder dynamic responsiveness to immediate conditions. Common understanding was based on active attempts to bring formal procedures into alignment with situated contingencies and relied on a productive disconnect between formal logics of action and daily practice. Formal accountability under artful coordinating was achieved through a priori development of protocols to scaffold work based on prevailing institutional logics for task jurisdiction. Nevertheless, in artful coordination we found variation in the way that formal accounts were recorded and deployed. In contorted coordinating, however, the role of formal logics of action in coordinating practices took on a different valence. In order for formal work systems to take a more centralized role in managing end-to-end work processes, work processes were broken into distinct sequences of steps and the digital work system was programmed to channel sequences of steps in particular orders and to prevent steps taken out-of-order or by the “wrong” personnel. Engaging with such systems, accounts indicated adherence to formal logics of work

process; however, the inevitable disconnect between formal logics and situated practice undermined this apparent alignment.

These data suggest that in complex, unpredictable, and time sensitive work, formal accountability cannot be the foremost integrating condition; common understanding negotiated in response to situated contingencies will inevitably lead to sequences of action that depart from formal delineations, that is, workarounds. As noted above, this disconnect becomes unproductive when time and attention is spent working around the formal system rather than attending to the tasks at hand. Specialists coordinating in an environment of unproductive disconnect must use ongoing, effortful interaction to determine appropriate courses of action and to work around the formal institutional logics reified by the digitized work process system. Interrogating the implicit goals of contorted coordinating, it becomes clear that this form of coordinating serves external ideals around cost efficiency, legal accountability, and standardized care.

One implication of this research is that ramifications of these different forms of coordinating are often masked to outsiders. From the perspective of hospital administrators, policymakers, and quality improvement stakeholders, the formal accounts of work created by the EHR can make it appear as if the work system enables a form of coordinating that it, in fact, does not. This is because work systems are designed to bind work activity to the production of systematized accounts that result in depictions of clean, systematic, and rule-abiding work processes. Audit practices produce reports based on these sanitized depictions of work. Yet, the work system does not allow for substitutions, recombining of sequences of action, or informal migrations of authority. In other words, it cannot produce anything but “perfect” depictions of work. The accuracy of these depictions of work is not a topic investigated by oversight bodies (Pine & Mazmanian, 2014).

### Interrelationships among Integrating Conditions

Conditions that produce coordinating are inter-related. Okhuysen and Bechky note, “in most situations where coordination is necessary, we see combinations of all three integrating conditions present simultaneously. Importantly, though, work contexts differ with regard to which conditions are in the forefront of coordinating activities” (2009: 489). Specifically, Okhuysen and Bechky argue that accountability supports predictability because making associations, interdependencies, and progress on tasks visible promotes predictability across

groups. They cite Edmondson, Bohmer, and Pisano (2001) and Reagans, Argote, L., and Brooks (2005) findings that accountability and common understandings have an additive effect; that is, coordination is improved when both accountability and common understanding are present.

The third and final point about interrelationships put forth by Okhuysen and Bechky is that integrating conditions can substitute for one another; specifically, common understanding and predictability can be made interchangeable such that predictability may negate the need for common understanding. Our findings show that common understanding is not only critical, but is the focal integrating condition in complex, unpredictable, and time sensitive work.

In both artful and contorted coordinating, common understanding was the essential integrating condition that specialists had to realize in order to perform complex sequences of action. However, we found that relationships between integrating conditions were quite different in artful and contorted coordinating. In artful coordinating, the actions that produced common understanding also resulted in informal accountability (social norms) and predictability over time. In contrast, in contorted coordinating, the interactions that produced common understanding (workarounds) resulted in less robust social norms (because imposition of formal logics of action resulted in less opportunity to negotiate task delineation in situ and increased ongoing inter-occupational conflict) and undermined the achievement of predictability (because working around the system in order to respond to immediate needs made it difficult for specialists to develop shared expectations about how to proceed in any given scenario). Thus, in contrast to previous literature (i.e., Edmondson et al., 2001; Reagans et al., 2005), we found that accountability does not necessarily support predictability. Perversely, it made work less predictable. This is because the sequences of action that the digital work process system expects and directs specialists to perform often depart from the sequences of action that the specialists actually perform in response to situated contingencies. Such in-the-moment improvisations necessary to get work done are unpredictable, undocumented, and not fully aligned with “evidence-based medicine” or institutional logics around task jurisdiction.

### Beyond Workarounds

IT enabled work systems that embed formal models in software programming are assumed to

benefit organizations by enhancing the power of these models to direct action and ensure uniform and predictable work practice. Yet, it is well known that users work around the mandates of IT enabled workflow systems in unintended and unanticipated ways (Boudreau & Robey, 2005; Koppel, Wetterneck, Telles, & Karsh, 2008; Markus & Robey, 1988; Strong & Volkoff, 2010; Supachayanont, 2011). While a plethora of studies document the existence of workarounds and the problems that such actions incur for effective implementation of workflow systems, these studies fall short of explaining why and how workarounds occur.

Such studies assume that workarounds are an unfortunate aspect of the implementation and adaptation process. The conclusion of these studies is that workarounds can be properly dealt with by better aligning systems design to existing workflows and ensuring adequate time to engage in system redesign (Germonprez, Hovorka, & Gal, 2011). Alternately, scholars from a human agency orientation (i.e., Orlikowski, 1996, 2000; DeSanctis & Poole, 1994) theorize workarounds as a normal aspect of resisting, adapting, and reinventing technology in practice (Boudreau & Robey, 2005). Our findings do not undermine these perspectives on workarounds. We too demonstrate how adept humans are at finding ways to get on with work despite constraints imposed by technology. Further, we agree that improving primary and secondary design of work process systems is valuable. However, this research goes beyond prior research by delimiting how integrating conditions are brought to bear in ongoing coordinating, thus providing insight into the underlying dynamic that produces workarounds: the creation of unproductive disconnects which require people to engage in workarounds. Thus, these data suggest that when working with certain digital work process systems, workarounds are an integral part of coordinating rather than a phase of implementation.

We argue that if organizational scholars fail to grasp these underlying dynamics, we will continue to struggle to design, implement, and manage work process systems that engage productively with existing organizational dynamics and preserve effective organizational functioning. This research suggests that work process systems, whether they are IT enabled comprehensive work process systems or local organizational policies, should provide space for people to flexibly adapt and navigate discretion in practice—particularly in uncertain and complex work environments. This finding coheres with a body of organizational research showing that

coordination mechanisms are re-worked in practice (Faraj & Xiao, 2006; Malone & Crowston, 1994) and arguing for a move to study the practices around ongoing coordinating rather than a reified and static view of coordination (Jarzabkowski et al., 2012).

Research has shown that sources of knowledge and authority to act are often misaligned in formal models of the work process, and effective functioning in uncertain contexts requires flexible migration of discretion (Suparamaniam & Dekker, 2003). Our data support this finding and suggest that not only is artful coordinating reliant on flexible judgments of who ought to do what across occupational boundaries, but that heavy-handed formal logics designed into work process systems create additional work that must be effortlessly navigated. Further, the pressing need to pacify the system undermines the ability of organizational members to engage in delicate and socially nuanced processes of navigating work relationships, occupational boundaries, and task jurisdiction, i.e., developing common understanding around how to get the job done.

Taken together, our findings suggest that the organizational literature on workarounds would benefit by looking closer at coordinating what is happening on the ground in order to identify whether “workarounds” are occurring because the disconnect between formal logics of action and situated practice has, in fact, become unproductive. In other words, are specialists spending individual and organizational resources developing common understandings about how to work around and pacify the system in order to respond to local context and demands of the situation at hand? And is this new form of work likely to continue even as people adjust to the new system? If so, we argue that such effortful accomplishment to work in terms of a comprehensive work process system is more than a “workaround”—it is a new form of ongoing coordinating.

### **Practical Implications and Future Work**

Our data suggest that scholars should attend to the design of work process systems and interrogate how formal models of action affect everyday practices of ongoing coordinating. Given the number of these systems, and the variety of complex workplaces now operating with such tools, it is clear that the implications of this study go far beyond medical settings.

For a work process system to function well in complex, unpredictable, and time sensitive environments, it needs to have some ability to adapt, and

possibly even subvert formal models of action encapsulated in its design. The promise of visibility, managerial control, and adherence to an institutional mandate for best practice means that workflow systems are often designed with the intent of imposing formal logics of action onto situated practice. Accountability is a crucial goal for organizations in all sectors. Yet, we show that formal accountability is not the primary integrating condition on the ground; formal accountability must remain a resource (rather than a blockade) to the achievement of common understanding around how to flexibly navigate task jurisdiction and dynamically respond to immediate needs. While we have shown the organizational costs that such designs can incur, more research is needed to investigate how tools might be designed to accommodate multiple logics of action and accountability, and promote common understanding around doing the work rather than working around the system.

The role of accountability in the interplay between formal and informal logics of action, situated negotiations around task jurisdiction, and technologies that create formal records of organizational process is another aspect of this research that could be explored further. Research in other fields has pointed out that workflow technologies are dual-function artifacts, intended to both coordinate lines of work and account for work that has been completed (Dourish, 2001; Pine & Mazmanian, 2014; Suchman, 1995). EHR is such a system. These tools not only strive to direct action, they also record and create official accounts of action. These accounts serve multiple functions for the organization and health system more broadly: serving as data for research; the basis of challenging legal claims; and assessments of hospital quality. Thus, the incentive to create “perfect” records that suggest linear action in line with best practices is high. Yet, as shown in these data, the costs of producing idealized records are also high.

## CONCLUSION

This research provides a new lens for understanding the relationship between formal logics of action embedded in work process systems and ongoing coordinating. We investigate what happens in the space of misalignment, or inevitable disconnect, between formal logics of how work should proceed and situated practices that emerge when specialists are dynamically coordinating work across occupational boundaries in complex, time sensitive, and uncertain conditions. Using Okhuysen and Bechky's (2009)

integrative perspective on coordinating in organizations, we explore how key integrating conditions for coordinating are achieved prior to and after the introduction of an electronic health records system. In attempting to direct flows of action with a heavy hand, we find that the EHR served to transform a “productive disconnect” between formal logics of action and situated practice into an “unproductive disconnect.” In the pre-EHR mode of coordinating, which we call “artful coordinating,” specialists drew upon formal and informal resources in order to dynamically respond to local conditions and immediate needs. In contrast, the “contorted coordinating” that emerged after the EHR was characterized by a lack of predictability, effortful workarounds, and strained inter-occupational relations. Further, we find that each form of coordinating served different organizational goals.

Artful coordinating served the goals of responding to direct patient needs, informal migrations of expertise and authority, and balancing institutional accountability with local norms and situated contingencies. Contorted coordinating, in contrast, served the goals of proving organizational accountability to institutional and legal standards of quality and safety and centralizing end-to-end control of work processes. Taking these findings as an object lesson, we argue for the importance of fostering a “productive disconnect” between formal logics of action embedded in work systems and situated practice. Finally, we demonstrate the substantial effects of contorted coordinating on organizational effectiveness and patient care.

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