Electronic Medical Record System Avoidance in a Turbulent Environment

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ABSTRACT

We attempt to understand why and when physicians avoid electronic medical record (EMR) systems in a turbulent environment. Set in the context of the United States military's combat operations, we develop a research model based on theories of ambivalence in organizations and our particular context. We test our model with 30,677 data points collected from an EMR system. Our results show that avoidance is lower when the potential for information reusability is strong, yet avoidance is higher in urgent care situations. Our study has implications for research, practice, and policy in the area of turbulent health care environments.

Keywords: avoidance; IT use behavior; ambivalence; health IT; environmental turbulence; electronic medical record

INTRODUCTION

Physician use of electronic medical record (EMR) systems can improve continuity of care, reduce medical errors, enhance quality of patient care, cut costs, and facilitate availability of complete patient health information [33, 72]. This is especially true in turbulent healthcare environments, where knowing almost immediately whether a patient is receiving a particular medication, has visited three different medical facilities in the last week, or is undergoing psychiatric care would be very useful [8]. Yet despite the potential for EMR systems to generate substantial value in dynamic healthcare settings, evidence to date of information technology's (IT's) impact on healthcare outcomes is mixed [40, 43]. One challenge to realizing benefits of health IT is overcoming end user resistance or avoidance to EMR systems [61]. Although scholars have paid significant attention to the consequences of resistance to information systems (IS) in general [44, 49, 69] and IS avoidance in particular [39], we know little concerning why physicians avoid IS in the post-adoption stage, particularly in turbulent environments. The extent to which physicians avoid working with an IS may negatively affect quality of care [39]. Thus, it is important to understand antecedents of IS avoidance in a health IT setting.

Prior work on IS avoidance (and resistance in general) has been conducted mostly in stable environments, e.g., community hospitals [45]. Yet physicians work in a wide variety of dynamic and complex settings (e.g., post-disaster triage stations, war zones). EMR systems have the potential to provide numerous benefits in turbulent healthcare environments [13]. Physicians could access patient-specific clinical information, such as previous hospital encounters, triage results, and discharge summaries. Timely knowledge of a patient's medications, allergies, and test results can help physicians make more appropriate and better-informed clinical decisions [59]. Prompt access to patients' past clinical information is especially crucial for those with extensive medical histories who are unable to communicate their clinical history. EMR systems can also increase awareness of what others are doing within and outside the focal unit to help ensure that physicians' actions relating to patient care are coordinated [23]. However, these benefits cannot be achieved if physicians avoid EMR systems.

We seek to understand why and when physicians avoid EMR systems in a turbulent environment. We undertake our study in the context of the United States (U.S.) military's operations in a combat environment. EMR systems can play a valuable role in this setting. Consider the patient evacuation process as an illustration. During evacuation, patients may be transported to multiple medical facilities, some of which are located in hostile environments. For example, a military service member who suffers an injury from a roadside bomb in Afghanistan may be evacuated to the nearest hospital, then to Landstuhl Regional Medical Center in Germany, and possibly to the U.S. for further care. In theory, key patient information is collected during this evacuation process and recorded on paper and/or electronically in an EMR system. However, research shows that physicians in our context may be avoiding these EMR systems [51]. Effective treatment depends in part on medical staff having access to a patient's up-to-date

medical history. This historical documentation is incomplete when physicians avoid EMR systems. When this happens, quality of patient care and availability of patient health information at the point of care delivery can be jeopardized.

Environmental turbulence often creates ambivalence in organizational actors [73]. Furthermore, recent case studies show that physicians may be ambivalent toward clinical systems [35]. Thus, we concentrate on ambivalence as a major reason why physicians might avoid EMR systems. When ambivalent, physicians experience simultaneously positive and negative orientations toward an EMR system at their disposal. Resting firmly on recent theories of ambivalence in organizations [2] and organizational context [38], we identify two contextual conditions that tip the ‘ambivalence pendulum’ toward or away from IS avoidance. First, we argue that information reusability – the likelihood that patient information will be accessed at some future point in time – will be negatively related to IS avoidance. Specifically, physicians will be less likely to avoid EMR systems when a patient is diagnosed with a chronic condition. Second, we posit that situation urgency will be positively related to IS avoidance: physicians will be more likely to avoid EMR systems during urgent care situations. Taken together, our formal objective is *to understand how information reusability and situation urgency are related to physicians’ avoidance of EMR systems in a turbulent environment*. We test our model with 30,677 patient-physician encounter data points collected from an EMR system.

Our study makes several contributions. First, we directly incorporate healthcare contextual influences to inform our empirical analysis and extend IS theory with regard to IS avoidance in turbulent environments. Second, we introduce ambivalence and situational conditions as antecedents of IS avoidance. Finally, we test our research model with objective data collected from a unique setting – a military combat environment. Our manuscript proceeds

as follows. First, we discuss the nature of IS avoidance and environmental turbulence. Second, we describe a theory of ambivalence and develop our research hypotheses that we then test with secondary data collected from an EMR system. We discuss our findings, study limitations, implications for research and practice, and suggestions for future research.

THEORETICAL BACKGROUND AND RESEARCH MODEL

Literature Review: IS Avoidance in Healthcare

The IS field has recently witnessed a greater focus on understanding EMR use and implementation [1, 27, 61]. Most recently, the U.S. government has instituted a push driven by tax credits¹ to healthcare organizations to adopt these types of systems. Understanding the implementation process and key factors in the success or failure of these projects is imperative for the success of these organizations. Table 1 summarizes the findings of a literature review focused on identifying such factors. These articles are a subset of the 218 health IT articles recently identified by Romanow et al. [61]. We only included in our review those papers which identified key factors related to IT use, resistance, or avoidance of clinical healthcare systems. We also restricted our search to studies that investigated healthcare provider use/resistance to IT (e.g., we did not include studies that examined patient use of health IT).

¹ Health Information Technology for Economic and Clinical Health Act (2009), Patient Protection and Affordable Care Act (2010)

Table 1. Literature Review: Health IT Use and Avoidance

Article	Topic	Setting	IT Artifact	Unit of Analysis *	Findings
[4]	System use	Network of medical clinics	Clinical information System	Physicians (I)	User participation enhances psychological ownership of the system, which in turn drives perceived usefulness and perceived ease of use, ultimately enabling system use.
[9]	Intention to use after implementation	Large acute-care hospital	Healthcare information technology	Physicians (I)	Perceived compatibility enhances perceived usefulness (PU); related knowledge enhances perceived ease of use (PEOU) and perceived threat increases resistance to change (RC). PU and PEOU enhance, and RC reduces, intention to use HIT.
[10]	Inter-organizational system use	Hospitals, pharmacies	Electronic patient file system	IT and hospital managers, doctors, pharmacists, insurance, and government representatives (I)	Stakeholders form negative attitudes about system implementations based on expected impacts on routines, power, culture and finance. Stakeholders have power to resist system implementation.

[15]	Inter-organizational system use	Hospitals	Electronic medical records	Hospitals (O)	Hospitals' willingness to implement and engage in the exchange of electronic medical records with other hospitals is influenced by perceived benefits, uncertainty, influence and reciprocal investments.
[26]	System use	Hospital	Medical management information system	Clinical staff (doctors, nurses) and corporate staff (managers, IT personnel, and support staff) (I)	Power in stakeholder groups is a significant factor in implementation and use.
[28]	System implementation failure and turnaround	Ambulance dispatch	Computer-aided ambulance dispatch system	System developers and managers (I)	Interaction between supporters, project organization, environment and the information system drove a successful implementation to turnaround a previous systems implementation failure.
Article	Topic	Setting	IT Artifact	Unit of Analysis *	Findings
[30]	System use, benefits and outcomes	Hospitals	Electronic medical records	Physicians, nurses and staff/administrators (I)	Exploitative use of EMRs benefitted both clinicians and administrators, whereas explorative use of EMRS only benefitted clinicians.

[35]	System adoption	Hospitals	Electronic patient record system	Surgeons (I)	The systems adoption process contains a mutual relationship between IS and users, and users may hold both positive and negative attitude regarding the IS.
[36]	System implementation	Clinics	Electronic patient record system	Clinical observation and doctor interviews (I, G, O)	Organizational structures enable the transfer of mindsets from the organizational field to groups to individuals. Individual actors shape system use through their work behaviors.
[39]	IS avoidance following implementation	Health-care groups	Clinic information system	Observation and interviews (I, G)	IS avoidance is detrimental to patient care. Workflow network configuration may contribute to IS avoidance.
[44]	IT resistance during implementation	Three hospitals	Electronic medical records	Physicians, nurses, and administrators (I)	Individuals and groups resist system implementation if they perceive potential threatening consequences.
[45]	IT resistance during implementation	Three hospitals	Electronic medical records	Physicians, nurses, and administrators (I, G, O)	Factors at multiple levels influence EMR implementation.

[47]	System use	Three general hospitals	Computerized physician order entry system	Physicians (I)	Team climate impacts performance expectancy and subject norms regarding the information system. Performance expectancy, but not subjective norm, impacts system use.
[48]	System use	Medical school	Application service oriented medical records	Medical students (I)	Perceived usefulness and perceived service level influence intention to use application service oriented medical records among medical students.
[52]	System use	Thirty physician organizations	Electronic medical records	EMR managers and physician champions (I)	Interviews with EMR managers and physicians revealed a variety of benefits from using EMRs as well as an array of barriers inhibiting successful implementations.
Article	Topic	Setting	IT Artifact	Unit of Analysis *	Findings
[54]	Virtual collaboration relationship performance	Ten telemedicine projects	Healthcare delivery systems	Telemedicine relationship (G)	Interpersonal trust impacts performance levels in virtual collaboration relationships.

[69]	E-healthcare system use and patient satisfaction	Hospital	e-healthcare system	Doctors, nurses, and admin personnel, and patients (I, G)	Social network ties to doctors negatively affects system use, but ties to para-professionals and administrative personnel positively affects use. System use increases patient satisfaction.
* I = Individual; G = Group; O = Organization					

Although resistance to health IT has emerged as a research theme in the IS field [61], Table 1 shows that there is a lack of consideration of how contextual factors may influence IT resistance – particularly avoidance. Table 1 demonstrates that many individual level, group level, and to a lesser extent organizational level factors have been identified in this body of literature. Interestingly, we found little focus on contextual factors in these studies. For our study, we focus on IS avoidance and factors relevant to a turbulent environment.

While there are various types of IS resistance behaviors [44], we follow Kane and Labianca [39] and conceptualize IS avoidance as a specific type of post-adoption IS resistance. *IS avoidance* is defined as the extent to which an individual avoids working with an IS despite the need and opportunity to do so. We note three differences between IS avoidance and other types of IS resistance [39]: 1) avoidance suggests that resistance occurs after system implementation; 2) avoidance is a relatively mild response compared with extreme behaviors (e.g., sabotage, destruction); and 3) avoidance implies that while an individual has the opportunity and even the need to use the system, he/she consciously circumvents the system. We focus on IS avoidance for two reasons: 1) the EMR systems in our context (the U.S. military) have been implemented for a number of years, thus positioning our work in a post-adoption stage; and 2) evidence suggests that physicians in our context are avoiding EMR systems at their disposal [51]. Healthcare-related research on IS avoidance has mostly been conducted in stable environments, e.g., community hospitals [45], health-care groups [39], and large private hospitals [69]. We extend this research by investigating the nature of IS avoidance in turbulent healthcare environments.

Turbulent Healthcare Environments

Generally speaking, a turbulent environment is a dynamic, unpredictable, expanding, fluctuating setting in which the components are marked by change [42, p. 333]. Turbulent environments are

also characterized by increased complexity, greater uncertainty, unexpected directionality of occurrences, and continuous transition [3]. Much of the research in this area describes environmental turbulence as having two dimensions – dynamism and complexity [11, 24, 71]. Dynamism describes the extent to which elements of environmental components remain essentially the same over time or are in a continual process of change. For instance, in a dynamic healthcare environment we may find a rapid pace of work, fluctuations in workload demand, or a continuous turnover of physicians. Complexity refers to the number of elements within an environmental component and their relatedness. A healthcare system that offers a broad range of services, is confronted with a diverse mix of consumers, and is active in a variety of geographic areas functions in a complex environment. We apply the concepts of dynamism and complexity to our study context – the U.S. military's operations in a combat environment.

Physicians working in a combat environment face dynamic and strenuous conditions. Hospitals are located on forward operating bases subject to rocket and mortar attack. Thus, physicians are in close proximity to physical danger. There are frequently abrupt fluctuations in workload demand. For example, hospital staff must be prepared to deal with sudden heavy inflows of trauma patients during post-battle situations. Physicians face disrupted sleep cycles, multiple interruptions, and acute time constraints. Furthermore, they must institute medical interventions for patients according to limited historical and diagnostic information. Physicians, military commanders, and other personnel are constantly moving into and out of the environment. In fact, many physicians are deployed for only a few months. Despite high levels of pre-deployment training, high turnover rates make it difficult to establish consistent organizational routines and workflows.

Second, the environment is complex. The U.S. military health system offers a diverse range of services on a global scale. Injured patients not easily returned to duty are quickly evacuated from the theater of operations². A short amount of time in one hospital allows for a relatively brief period in which physicians can treat and fully document encounters with a patient. Hence, patient movement between medical facilities increases the interconnectedness and complexity of the operating environment. Physicians usually incorporate both subjective and objective information on patient condition into the assessment process and corresponding treatment plans [32]. In addition to time pressures, these information processing demands are challenged when physicians engage in care decisions for more than one patient simultaneously [20]. Furthermore, medical information systems in theater are designed with a store-and-forward capability to allow for uninterrupted electronic documentation locally, while transmitting to off-site locations (e.g., Afghanistan to U.S.) as connectivity and bandwidth allow. As a result, the ability to quickly share patient information can be hampered.

Environmental dynamism and complexity often create ambivalence in organizational actors [73]. Moreover, ambivalence has been linked to outcomes such as healthy eating behaviors [22], strategic decision making [58], and resistance to change [57]. Consistent with our examination of turbulent healthcare environments, we focus on ambivalence as a key reason why physicians avoid EMR systems.

Ambivalence

We leverage Ashforth et al.'s [2] theory of ambivalence in organizations to help us understand the nomological network surrounding ambivalence and IS avoidance. *Ambivalence* is defined as

² A theater of operations is a geographical area defined by the combatant commander for the conduct or support of specific military operations. See http://www.dtic.mil/doctrine/new_pubs/jp1_02.pdf for more information.

simultaneously positive and negative orientations toward an object. “Orientation” refers to an actor’s position with regard to an object, where a positive orientation represents attraction toward it and a negative orientation represents repulsion away from it. Ambivalence includes cognition and/or emotion [62]; as such, ambivalence occurs when cognitions clash, emotions clash, or cognitions and emotions clash. According to Ashforth et al., the extent to which an actor experiences opposing orientations increases that actor’s ambivalence toward an object. Intense ambivalence is often characterized by a sense of disequilibrium, confusion, apprehension, and loss of control [31]. The more intense ambivalence becomes, the more the actor will be motivated to take action to reduce the discomfort [60].

Ambivalence can be triggered by numerous situational factors, such as hybrid identities, role conflicts, dualities, multifaceted objects, and temporal aspects [2]. Several of these factors can be seen in our study context. For example, consider the role of conflicting system consequences. Many physicians expect the EMR system to increase clinical and administrative efficiency; however, the system is often more time-consuming than they anticipated, thereby lowering their productivity and potentially hindering clinical efficiency. Competing goals also contribute to feelings of ambivalence. Physicians must maintain high standards of patient care while also being efficient in their work activities. However, acquiring and developing proficiencies in EMR use can be difficult when trying to maintain quality patient care, especially when working in a turbulent combat environment.

Short rotation schedules also contribute to a feeling of ambivalence. Many specialist physicians (e.g., gastroenterologists) spend only 3-4 months at a time in a deployed environment. While these physicians may be familiar with the military’s EMR systems in the U.S., their short deployments to theater – as well as traditional work demands – provide little time for learning

and adapting to EMR systems in the field. This is important because the military's EMR systems in the U.S. are different from the military's EMR systems in a deployed environment (e.g., Afghanistan). These system-level differences may be substantial enough to cause unique changes in physician workflows. While physicians may recognize the benefits of using EMR systems, their abbreviated tours provide little incentive to adapt and incorporate these systems in their work activities while in a deployed environment. This is compounded by the fact that, unlike in the U.S., physicians cannot offload much of their EMR-related tasks to support staff ("coders") in a deployed setting.

These and other factors may trigger physician ambivalence toward EMR systems. For example, physicians may recognize a number of positive aspects of an EMR system at their disposal: the system allows physicians to link patient-physician encounter notes, diagnoses, and procedures to construct a single patient record; and it facilitates the ability to provide complete, accurate, and up-to-date healthcare documentation at every point of patient care. At the same time, the EMR system creates the potential for an increased monitoring of physicians' work activities, heavier workloads for physicians, and reduced quality of patient care in certain situations. Tension between positive orientations (e.g., the system provides access to patient information) and negative orientations (e.g., the system hinders patient care in urgent situations) can create an intolerable level of discomfort in physicians. This experience likely varies between situations for a given actor, suggesting that ambivalence could influence behavior during a particular situation [2]. Hence, our unit of analysis is a *patient-physician encounter*.

In our context, a patient-physician encounter represents a specific instance of contact between a patient and a physician who has responsibility for assessing and treating the patient at a given time, while exercising independent judgment (please see the appendix for further

information). Encounter-specific conditions may include the severity of the patient's wounds, whether or not the patient's injury would have long-term implications, or the likelihood that the patient would be evacuated to another medical facility. These conditions may influence the relationship between ambivalence and avoidance [2]. For example, if a physician is in a situation where she feels she does not have time to use the system, the 'ambivalence pendulum' may swing toward the negative orientation and result in higher levels of IS avoidance. However, if a physician believes that entering diagnosis information in the system might be useful in the long-term, the 'ambivalence pendulum' may swing toward the positive orientation and lead to lower levels of IS avoidance. We build on these ideas in the next section.

Hypotheses Development

We arrive at an important question: why do physicians adopt one orientation toward EMR systems and reject the other orientation during a particular encounter with a patient? Recognizing that Ashforth et al.'s [2] theory of ambivalence in organizations is a general theory, we paid special attention to our study context to help us answer this question. We define context as "situational opportunities and constraints that affect the occurrence and meaning of organizational behavior as well as functional relationships between variables" [38, p. 386]. As such, we followed recommended guidelines for context-specific theorizing [34, 38] and focused on two particularly critical aspect of our context – information reusability and situation urgency.

We define information reusability as the likelihood that information related to a specific patient-physician encounter will be accessed through the EMR system and leveraged for future patient care or other benefits. The rationale is that patient information will have value to someone (e.g., patient, physician) at some point in the future. Information reusability has been touted as one of the key benefits of EMR systems [1, 37]. Thus, assessing the likelihood that certain encounter information will be accessed at a future point in time is an additional factor that

physicians may consider when deciding whether or not to avoid the EMR system. Furthermore, since patient information is theoretically stored for the long-term, there could be multiple points at which the information could be of value.

Information reusability is especially useful when patients are diagnosed with a chronic condition, i.e., a condition that lasts 12 months or longer and meets one or both of the following tests: 1) it places limitations on self-care, independent living, and social interactions; and 2) it results in the need for ongoing intervention with medical products, services, and special equipment [56]. Examples of chronic conditions include heart disease, diabetes, hypertension, celiac, and most forms of mental illness. Effective chronic care requires continuity over time, multidisciplinary teamwork, and collaborations between medical and non-medical service providers [70]. EMR systems can play an important role in the treatment of long-term, chronic conditions. For example, when compared to the use of traditional paper records, EMR use is associated with significantly higher achievement of care, outcome standards, and improvement in diabetes care [14]. One primary goal of the U.S. military's EMR system is to develop the capability to collect and maintain information spanning a U.S. service member's military career (and eventually services provided through the Veterans Affairs Administration). Chronic conditions require ongoing interventions and treatments, often over the course of a person's lifetime. Thus, any information related to chronic diagnosis encounters would be especially valuable for long-term patient care.

Regarding information reusability, physicians may use coping mechanisms to deal with their ambivalence toward EMR systems. Coping mechanisms are typically a way of ignoring the importance of one orientation rather than denying its existence [2]. Rationalization constitutes one coping mechanism that is salient to our context. Through rationalization, physicians

convince themselves that one orientation is superior to the other, or trivialize an orientation until the favored one can be accomplished with greater ease [68]. With this in mind, we suggest that physicians may use coping mechanisms to reduce their ambivalence and convince themselves that – when diagnosing a patient with a chronic condition – the information will be reused for long-term patient care. In this situation, the ‘ambivalence pendulum’ swings toward a positive orientation, leading to lower levels of IS avoidance.

H1: IS avoidance is lower when patients are diagnosed with chronic conditions versus non-chronic conditions.

The potential for information reusability is high for many patient-physician encounters. However, some situations are not so clear cut. The patient evacuation process is one such situation. Consider two different patient-physician encounters. In one encounter, Madison meets with a physician to discuss Madison’s wrist pain. This would usually be considered a routine visit. As such, the physician may enter some or all of the appropriate encounter-related information in the EMR system. In another situation, Noah suffers from multiple gunshot wounds and is treated by a physician at a combat support hospital. Combat support hospitals in a deployed environment do not provide definitive care; thus, if Noah cannot be effectively treated within three days, he will be evacuated to another medical facility for follow-up care. Given Noah’s injuries, the situation is urgent, yet information entered in the EMR system at the combat support hospital could be accessed during the evacuation process. For example, if Noah is evacuated from Afghanistan to Germany, physicians in Germany can access the EMR system to determine how Noah was diagnosed and treated in Afghanistan. Such information can improve continuity in delivery of care, reduce medical errors, and enhance quality of patient care during the evacuation process. Thus, situation urgency and information reusability are both high.

Though physicians may be less likely to avoid EMR systems when they believe the information will be reused during the evacuation process, the urgent nature of the situation may override potential benefits associated with using the system. In this case, physicians may use defense mechanisms (i.e., nonconscious processes) to convince themselves that IS avoidance is an acceptable course of action [2]. One defense mechanism is response amplification, a process whereby a physician exaggerates positive or negative responses to the EMR system so as to override one orientation and thereby relieve ambivalence [5, 7]. For example, physicians may view the EMR system as simply a tool that lets commanders monitor work activities [21], essentially allowing the physicians to deny the system's potential for improving patient care. This form of response amplification may be heightened during urgent care situations. When dealing with a patient who has a severe injury that requires immediate attention, a physician may unconsciously amplify the EMR system's negative aspects and forgo the system's positive aspects. A physician may also believe that, since the patient will be evacuated, there is a strong possibility the physician will not see that patient again.

It is important to note that response amplification does not mean that the physician has permanently erased the positive orientation; rather, it may persist unconsciously [41]. That being said, ambivalence may prompt information processing that is biased toward whatever orientation (positive or negative) is initially stronger or more salient [18]. In this situation, we posit that the negative orientation will be stronger. Thus, physicians are more likely to convince themselves that IS avoidance is an acceptable course of action.

H2: IS avoidance is higher when patients are evacuated versus not evacuated.

RESEARCH METHOD

Data Collection

We collected and analyzed secondary archival data from AHLTA-T³ – an EMR system used in the U.S. military health system – to measure our constructs and test our research model.

Objective data allow us to capture situational factors and actual avoidance behavior at our specified unit of analysis (patient-physician encounter). A physician has the opportunity and need to use an EMR system during every encounter with a patient. Our data set includes encounter records entered in AHLTA-T between February 5, 2012, and July 7, 2012, at two combat support hospitals in Afghanistan. These two hospitals are similar in size, structure, and other characteristics. AHLTA-T is an outpatient⁴ EMR system; thus, we did not include inpatient records. This allows us to control for differences in inpatient/outpatient status. Our final data set included 30,677 encounter records.

Measures

We conducted interviews with eight physicians to gather information that helped us develop valid measures of our constructs. All of our interviewees had experience with the U.S. military's EMR systems in a combat environment. Each interview lasted approximately 45-60 minutes. We also relied on participant observation to collect information that helped us develop measures.

One of the authors had a long-term involvement as the Chief Information Officer for the medical command providing health service support and force health protection to U.S. and coalition forces, thus allowing firsthand observation of healthcare delivery in a combat environment. This author was able to witness and participate in healthcare delivery, meetings, combat support

³ See <http://www.mc4.army.mil/apps/AHLTA-T> for further information about AHLTA-T and the U.S. military's other healthcare applications.

⁴ An outpatient is an individual who is not hospitalized for 24 hours or more but who visits a hospital for diagnosis or treatment.

hospital operations, training sessions, and casual conversations over a nine month period. The author recorded field notes about EMR-related behavior and situational factors. We used this information to help us better understand our study context and create valid measures of our constructs.

Consistent with the information collected from these interviews, observations and previously validated measures of IS avoidance [39], we measured *IS avoidance* as the extent to which important system fields in an encounter record were not completed by the physician. A 2008 U.S. Central Command Health Information Systems policy describes minimum fields that must be completed in order for an encounter record to be considered complete. These fields include patient registration, vital signs, screening notes, patient assessment, and treatment plan. Our interviewees confirmed that these fields were important in our context. Patient registration is often completed by administrative staff when the patient is admitted; thus, we excluded this field from our measure. We then created an index that consists of the ratio of completed fields to all fields. For example, if a physician completed the screening-vital signs field and the assessment field in the EMR system (but not other fields), the ‘avoidance’ measure would be calculated as

$$IS\ avoidance = 1 - ((vital\ signs\ (1) + screening\ notes\ (0) + patient\ assessment\ (1) + treatment\ plan\ (0)) / 4) = 0.5$$

Physicians are required to select an ICD-9 code⁵ from a pre-populated list in the EMR system during a patient-physician encounter. We used this diagnosis field to create a *condition diagnosis* measure for chronic/non-chronic conditions. We applied the chronic condition

⁵ The International Statistical Classification of Diseases and Related Health Problems (commonly referred to as ICD) is a health care classification system that provides codes to classify diseases and a wide variety of signs, symptoms, abnormal findings, complaints, and external causes of injury or disease. The U.S. Military Health System used the ICD-9 system at the time of our study.

indicator⁶ to categorize ICD-9 diagnosis codes into one of two categories: chronic or not chronic. The chronic condition indicator has been validated and applied in academic research [16, 29].

Consistent with our hypotheses development, we relied on *discharge classification* as a measure for whether or not a patient was evacuated. In the AHLTA-T system, physicians are required to select a “disposition” code from a pre-populated list in the system at the conclusion of an encounter. The disposition field records the discharge status of the patient (e.g., return to duty, return to limited duty, evacuation to a different medical facility). We used the disposition field in the EMR to create a measure for *discharge classification*. Encounters were classified as either evacuation or non-evacuation.

Hypotheses Testing

Figure 1 illustrates the time series for number of encounters per day across the study time period. We used analysis of variance (ANOVA) techniques to test our hypotheses (see Table 2). Our results show that IS avoidance is significantly lower in encounters with chronic diagnoses (mean = 0.20) than encounters with non-chronic diagnoses (mean = 0.25). These results support H1. We also found that IS avoidance is significantly higher in encounters with evacuation discharges (mean = 0.29) than encounters with non-evacuation discharges (mean = 0.25). Hence, H2 is supported. Effect sizes ranged from 0.12 to 0.13 (considered to be a small size [19]).

⁶ <https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp>

Figure 1. Number of Encounters Recorded Over Time Study Period

Table 2. ANOVA Comparison of Means

Variable	N	IS Avoidance Mean (S.D.)	F	Effect Size
<i>Condition Diagnosis</i>				
Chronic	6051	0.20 (0.18)	470.69*	0.13
Non-chronic	24626	0.25 (0.20)		
<i>Discharge Classification</i>				
Evacuation	1276	0.29 (0.11)	59.82*	0.12
Non-evacuation	29401	0.25 (0.19)		

* $p < 0.001$

We conducted additional analyses to check the robustness of our results. In our context, battle injuries are typically life-threatening and require immediate attention. Thus, battle injuries create an urgent situation. Physicians use a field in the EMR to categorize encounters as either

battle injury or non-battle injury. Battle injuries such as bombings and shootings are not routine. Specifically, battle injuries are the direct result of hostile action, sustained in combat and related thereto, or sustained going to or returning from a combat mission provided that the occurrence was directly related to hostile action. We classified these encounters as “battle injuries”; all other encounter records were classified as “non-battle injuries”. We split our data file by injury type and conducted the original ANOVA analyses for each data set. Our results for both injury type data sets were consistent with our original data set (see Table 3).

Second, we tested for differences in results between the “non-fighting season” and the “fighting season” in Afghanistan. Resource levels in combat support hospitals do not vary across these time periods. The fighting season typically starts around May 1. Thus, we split our data file as two 11-week time periods (February 5, 2012 to April 21, 2012, and April 22, 2012 to July 7, 2012). We conducted the original ANOVA analyses for each data set. Our results for both 11-week data sets were consistent with our complete 22-week data set. Finally, we split our data file by the two hospitals and conducted the original ANOVA analyses for each data set. Our results for both hospital data sets were consistent with our complete data set. These analyses place further confidence in the robustness of our original results (see Table 3).

Table 3. Post-Hoc ANOVA Comparison of Means

Injury Differences				
Variable	Battle Injury		Non-Battle Injury	
	N	IS Avoidance Mean (S.D.)	N	IS Avoidance Mean (S.D.)
<i>Condition Diagnosis</i>				
Chronic	2294	0.23 (0.17)	3757	0.22 (0.17)
Non-chronic	3693	0.39 (0.21)	20933	0.25 (0.17)
<i>Discharge Classification</i>				
Evacuation	158	0.33 (0.14)	1118	0.30 (0.11)
Non-evacuation	5829	0.29 (0.22)	23572	0.25 (0.17)
Season Differences				
Variable	Non-Fighting Season		Fighting Season	
	N	IS Avoidance Mean (S.D.)	N	IS Avoidance Mean (S.D.)
<i>Condition Diagnosis</i>				
Chronic	2355	0.21 (0.18)	3696	0.19 (0.17)
Non-chronic	10292	0.26 (0.17)	14334	0.23 (0.18)
<i>Discharge Classification</i>				
Evacuation	569	0.29 (0.11)	707	0.30 (0.13)
Non-evacuation	12078	0.25 (0.17)	17323	0.24 (0.19)
Hospital Differences				
Variable	Hospital One		Hospital Two	
	N	IS Avoidance Mean (S.D.)	N	IS Avoidance Mean (S.D.)
<i>Condition Diagnosis</i>				
Chronic	2935	0.20 (0.18)	3116	0.20 (0.17)
Non-chronic	11084	0.25 (0.20)	13542	0.25 (0.19)
<i>Discharge Classification</i>				
Evacuation	579	0.29 (0.11)	697	0.30 (0.12)
Non-evacuation	14037	0.25 (0.19)	15364	0.25 (0.18)

DISCUSSION

Building on the concepts of ambivalence and environmental turbulence, we conceptualized and tested a research model that links situational conditions to IS avoidance. Our results show that certain contextual factors swing the ambivalence pendulum toward or away from IS avoidance behaviors. First, we recognize that the ability to store and provide ready access to a patient's medical information over the course of a patient's lifetime is a key benefit of EMR systems. Our results regarding the notion of information reusability provide interesting insight into how these benefits may or may not be realized. Namely, we found that IS avoidance behavior varies across

chronic and non-chronic diagnosis situations. In other words, the likelihood that patient information will be accessed for the purpose of long-term care does appear to influence decisions related to IS avoidance. This suggests that physicians may be adopting a long-term view of the patient's well-being in situations involving the diagnosis and treatment of chronic conditions. However, our findings regarding hypothesis two show that urgency looks to be a more powerful force than information reusability. Specifically, IS avoidance is higher when patients are evacuated (versus not evacuated). Although our data limit our conclusions, we speculate that the 'ambivalence pendulum' swings toward the negative orientation when negative forces (urgency) collide with positive forces (information reusability).

Future research should investigate other combinations of positive and negative situational factors that might influence IS avoidance, as well as possible interventions (e.g., system design) that reduce negative orientations toward IS. One potential avenue in this regard is to apply a functional affordance perspective. Functional affordances refer to the possibilities for goal-oriented action that technical objects offer to organizational actors [50]. Affordances arise from the relationship between object (system) properties and actor properties [46, 74]. Thus, an affordance perspective suggests that system design characteristics may enable or constrain an actor's pursuit toward achieving a particular goal. Applied to our context, a physician's goal is to treat patients effectively and efficiently; however, a physician may view the EMR system as affording (or not affording) him/her the possibility of achieving this goal in a timely manner. Qualitative research shows that affordances are readily apparent in EMR settings [67].

Our study is not without limitations, one of which is that we did not directly measure ambivalence or other individual-level constructs. Although data on individual differences would have generated substantial insight into our phenomenon, collecting survey-based data from

physicians in our setting (U.S. military operations in Afghanistan) would have been very difficult. However, we were able to capture actual behavior with the use of objective data measures. In doing so, we answer calls for research that measures post-adoptive IT behaviors with objective data [25, 55, 65, 66]. Second, we limited our investigation to two situational conditions – condition diagnosis and discharge classification. While these factors were relevant to our context, there may be other situational conditions that influence IS avoidance. In a similar vein, our control variables were fairly limited. Combat environments are complex and dynamic; as such, numerous factors could influence IS avoidance. Finally, our study was conducted in a vertically integrated health system (the U.S. Military Health System). Although our results may not hold in non-vertically integrated health systems, they may be applicable to single provider health systems in other contexts (e.g., the National Health Service in England).

Implications for Research and Practice

We incorporated a number of healthcare contextual influences – information reusability, situation urgency and IS avoidance at the patient-physician encounter level – in our research model and empirical analysis. In doing so, we extend IS theory with regard to IS avoidance in turbulent environments [17]. IS avoidance is an important but relatively new concept in the IS field. Our study builds on the IS avoidance literature in a number of ways. First, while prior work investigated avoidance at the individual and group levels [39], we found that avoidance at the patient-physician encounter level is important for a number of reasons: in our context, actual avoidance behavior occurs at the encounter level; avoidance behavior varies according to situational conditions; and EMR system avoidance at the encounter level has ripple effects throughout the broader EMR system. Our investigation of ambivalence at the individual level builds on qualitative studies [6, 35] and theories of ambivalence in organizations [2], and our examination of IS avoidance at the encounter level builds on multilevel perspectives of IT use

[12]. Future research should further investigate how ambivalence may result in IS avoidance – and other IT use behaviors – in other contexts and at different levels of analysis.

We also further our understanding of IS avoidance behaviors in turbulent environments. Organizational actors often have an opportunity to use IT under both stable and turbulent conditions. Fast-paced, dynamic environments often place greater demands on an actor's time. These demands may lower the benefits and priorities related to IT use in the short-term. Yet IS avoidance in the short-term may result in lower benefits in the long-term. Finding the balance between short-term priorities and long-term benefits regarding the use of IT in turbulent environments is a challenge for both academics and practitioners. We hope our work stimulates research that continues to address this challenge.

Our study generates a number of implications for practice and policy. First, managers and healthcare administrators should be aware that physicians may be ambivalent toward EMR systems at their disposal. While managers may often hear only one side of the story from physicians (e.g., physicians are constantly complaining about the EMR system), those same physicians may also have positive attitudes toward some aspects of the system. Research suggests that there is lower consistency between expressions of attitudes, intentions and behavior among individuals who experience higher levels of ambivalence [63]. Thus, managers who desire consistent IS-related behaviors from their subordinates should try to amplify the positive aspects of the system and make design or process changes as possible to minimize negative aspects, thus reducing the potential for ambivalence.

When dealing with individuals who are ambivalent toward the systems at their disposal, managers should try to understand the situational conditions that may be influencing IS avoidance behaviors. While conditions like environmental dynamism clearly have an effect on IS

avoidance, there may be other situational conditions that are not so obvious. Of course these conditions depend largely upon the organizational context. For example, one case study finds that making simple system design changes and addressing the social and personal needs of users can make substantial differences in IT use patterns [64]. Likewise, stakeholder groups may have conflicting technological frames surrounding the focal system [53]. We hope our study provides a stepping stone for future research in this important area.

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APPENDIX

A patient-physician encounter represents a specific instance of contact between a patient and a physician who has responsibility for assessing and treating the patient at a given time, while exercising independent judgment. For example, a physician creates a new electronic encounter record when meeting with a patient who is complaining about headaches and a fever. The physician may enter certain information in the EMR system during the patient visit, such as vital signs, diagnosis, and treatment plan. The physician then closes the electronic encounter record when the patient visit is complete. A physician avoids the system to the extent that he/she does not enter patient information in the system during a patient-physician encounter.

Avoidance at the encounter level can have ripple effects in the U.S. Military Health System's broader EMR and EHR systems. Each U.S. service member has one lifelong electronic health record (EHR). This EHR contains information from one or more EMRs an individual has had over his/her lifetime. Each EMR contains information from one or more patient-physician encounters and is tied to a specific medical facility. For example, suppose that Richard, a U.S. service member, suffers a foot injury while stationed in a remote location in Afghanistan. Richard is transported to the Craig Joint Theater Hospital in Bagram Airfield, Afghanistan, where he receives medical attention. During this time, medical personnel create an EMR specific to Richard's injury that contains various pieces of information collected through one or more encounters. The "foot injury" EMR is closed when Richard is released from this hospital, and this EMR becomes part of Richard's lifelong EHR. A similar process would occur if Richard were to suffer an arm injury at another point in time and in another location. The "arm injury" EMR would also become part of the larger EHR. Figure A1 depicts the relationships among encounters, EMRs, and EHRs in the U.S. Military Health System.

Figure A1. Relationships Among Encounters, EMRs, and EHRs