

**Physician Satisfaction: The Role of E-mail Communication
in the Practice of Medicine**

By

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ABSTRACT

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Communication between a physician and a patient is an integral part to the healthcare delivery system. E-mail has the power to fully utilize a physician's medical expertise for the good of the patient. However, many physicians do not offer this service to their patients in the United States. This study analyzes factors that impact e-mail utilization among physicians and whether e-mail use contributes to career satisfaction of physicians using the 2008 Health Tracking and Physician Survey. Controlling for the effect of physician and practice characteristics, such as financial incentive for providing services, gender, specialty, practice type, and reliance on Medicaid revenue, this study suggests that qualities like specializing have a significant positive effect, while working in a solo practice has a negative effect on e-mail use by physicians. Financial incentives to expand medical services have a significant positive effect on e-mail use. This study also suggests that e-mail utilization has a positive effect on career satisfaction of physicians. Physicians preferred to spend more time e-mailing other physicians than their patients. Thus, to enhance coordination and outcomes, financial incentives should be put into place.

Table of Contents

List of Tables	iv
Chapter One: Introduction	1
A. Theoretical Basis of Career Satisfaction	1
B. Differences Among Information Technology and E-mail	1
C. The Purpose of the Paper	3
Chapter Two: A Review of E-mail Utilization and Physician Satisfaction	4
A. Pros and Cons of E-mail Usage	4
B. Prevalence of E-mail Usage	6
C. Anecdotal Evidence Pertaining to E-mail in Physician's Jobs	8
D. Determinants of Physician Satisfaction	9
E. E-mail Impact on Physician Satisfaction	13
F. Contributions of this Paper	14
Chapter Three: E-mail Utilization and Physician Satisfaction	
Estimation Models	15
A. The Econometric Model	15
B. Expected Effects	18
Chapter Four: Sample Selection and Descriptive Statistics from the 2008 Health Tracking Physician Survey	21
A. Overview of the 2008 Health Tracking and Physician Survey	21
B. Sample Selection and Descriptive Statistics	22
Chapter Five: Estimation Results: Quantifying E-mail Utilization and Physician Satisfaction	24
A. The Effect of the Control Variables on E-mail Utilization	24
B. The Effect of E-mail Utilization on Physician Satisfaction	26
Chapter Six: Conclusions	30
A. Summary of the Findings	30
B. Policy Implications	31
C. Suggestions for Future Research	32
Bibliography	33
Tables/Appendix	36

List of Tables

Table 1: Descriptive statistics for variables that can influence physician satisfaction	36
Table 2: Estimates for the model regressions that use time physicians spend e-mailing patients and other physicians as the dependent variables	38
Table 3: Estimates for the model regression that uses physician career satisfaction as the dependent variable	41

Chapter 1

Introduction

A. Theoretical Basis of Career Satisfaction

The economic theory behind the significance of job satisfaction is that satisfaction affects employee behavior. Personal dispositions, tasks and roles, supervisor and co-worker relationships, and pay and benefits are potential influences on career satisfaction (Noe et al., 2011). Personal dispositions are typically negative emotional experiences that are felt by individuals. Tasks and roles are considered the set of behavior that are expected of people during their jobs. People become dissatisfied with jobs that are not related to something they value. Therefore, role conflict and ambiguity tend to lower job satisfaction. Moreover, relationships among co-workers will impact job satisfaction (Noe et al., 2011). Physicians generally have some degree of autonomy and control over their patients, so the supervisor role does not impact them as it does in other fields. Pay is a descriptor to society of a person's worth and status. Pay differences between members of an organization will likely cause discrepancies in job satisfaction.

B. Differences Among Information Technology and E-mail

Information technology systems make a physician's tasks easier to accomplish. Physicians are expected to know how to navigate around the health care system, stay updated on research, and keep track of the latest technology (Davis et al., 2009). Both health information technology and e-mail provide

similar benefits, but these tools are used for different purposes. Advancements in health information technology allow physicians to send patient reminders, prescribe and refill medications, order and receive laboratory test results, share information with a specialist or hospital, and reduce errors (Davis et al. 2009; Elder et al. 2010). E-mail communication allows for the asynchronous transmission of messages by using computer networks. The messages can include sending reminders and sharing test results with patients and other physicians. This distinction is what separates health information technology from e-mail.

Although health information technology systems have a broader base than e-mail, both have low utilization rates in the United States. For example, nearly all of the physicians in the Netherlands use IT while about 20% of physicians in the United States used it (Davis et al., 2009). The application of e-mail use was low in the United States as well. Patients were less likely to receive alerts for test results and reminder notices for preventative care appointments in the United States than other countries. Additionally, practices that have lower capacity for using IT and e-mail are less likely to document patient experience data for quality improvement efforts.

The large proportion of physicians that do not use e-mail communication in their practice may have a debilitating effect in the pursuit of high quality care. Previous studies have shown that patient demand for using e-mail to communicate with their physician exists (Couchman et al., 2005). Empirical studies indicate that e-mail use is positively associated with physician career

satisfaction (Elder et al., 2010). Examining the impact of e-mail communication on satisfaction is important because physician satisfaction has been found to correlate with patient satisfaction and positive outcomes.

C. The Purpose of the Paper

Using cross-sectional data from the 2008 Health Tracking Physician Survey, this study analyzes factors that impact e-mail utilization among physicians and whether e-mail use contributes to career satisfaction of physicians. Unlike previous studies, this paper identifies factors that are associated with e-mail utilization by regression analysis. These and other factors served as control variables for the satisfaction model. Thus, factors that have a positive effect on e-mail utilization and satisfaction are identified. This paper controls for any financial incentives physicians may have for expanding or reducing their services, as well. After controlling for physician characteristics and practice characteristics, this study finds that physician satisfaction varies with time spent on e-mail communication. There is a positive effect associated with e-mail use within specific time intervals and physician career satisfaction.

The organization of the paper is as follows. Chapter Two provides a review of the existing literature regarding e-mail utilization and physician career satisfaction. Chapter Three presents the econometrics models used for the analysis. Chapter Four provides a description of the dataset used to evaluate the effect of e-mail use on physician satisfaction. Chapter Five presents the results of the regression analysis, and Chapter Six draws conclusions.

Chapter 2

A Review of E-mail Utilization and Physician Satisfaction

A. Pros and Cons of E-mail Usage

Researchers acknowledge that technology is changing the practice of medicine. E-mail and health information systems are slowly becoming available for the modern practice. However, this transition of establishing electronic health records and e-mail in physician offices has been slow in the United States due to barriers of utilization. Most of the primary care physicians in the Netherlands use these tools on a daily basis while about 28% utilize it in the United States (Davis et al., 2009). E-mail communication between patient and physician adds benefits to the physician-patient relationship. Physicians that use e-mail believe that it is a convenient form of communication for non-urgent messages and appointment reminders (Leong et al., 2005). Other providers believe that e-mail helps improve health care, especially with chronic disease management (Patt et al., 2003). Patients think that e-mail increases access to their physician and improves their quality of care (Rosen and Kwoh, 2007). Other benefits include that patients feel more comfortable about asking questions and that both provider and patient can save the messages (Sands et al. 2003). Both stakeholders benefit when e-mail communication offers these advantages.

Economists can see the value of health information technology in a physician's practice, but it does not seem like the United States will fully utilize it

in the near future. E-mail is not common in a physician's practice (Liebhaber and Grossman, 2006). Providers and patients have identified barriers that prevent them from utilizing e-mail in their practices. Kleiner et al. (2002) found that parents of pediatric patients were concerned with preserving confidentiality. On the other hand, physicians that choose to not use e-mail state they are concerned with privacy, liability issues, time management, and miscommunication (Kagan et al. 2005). These barriers explain why patients and physicians do not use e-mail. Other barriers include concern over patient confidentiality, amount of workload, amount of time, and total payment (Kleiner et al., 2002; Hobbs et al., 2003; Sands et al., 2003; Kagan et al., 2005; Patt et al., 2003). These barriers introduce the damaging concepts of role ambiguity, tasks and roles, and pay into career satisfaction. These barriers are alarming because it discourages physicians from using e-mail communication with their patients.

Despite some of these disadvantages to e-mail utilization, the demand for using e-mail communication for addressing health issues exists. In one study by Neill et al. (1994), 85% of patients believed e-mail "would be a good way for a patient to communicate with his/her physician." An early study claimed that only 17% of patients interviewed used e-mail once to correspond with their physician (Houston et al., 2004). Another study conducted by Couchman et al. (2005) surveyed 2,314 patients in 19 general health clinics. They found that although over half of the patients reported having current e-mail access and were willing to use it for communication, only 5.8% reported having ever used e-mail to communicate with their provider.

B. Prevalence of E-mail Usage

Providers and patients have different roles and involvement when it comes to e-mail communication. Within the literature, there have been highly variable rates in physician participation with e-mail communication. For example, Gaster et al. (2003) found that seventy-two percent of physicians reported using e-mail to communicate with patients among the 283 physicians that were surveyed. Their sample consisted of physicians that practice in a wide range of clinical settings at the University of Washington and Seattle area. Another study performed by Brooks and Menachemi (2006) found that only about three percent of physicians used e-mail with patients frequently among the 4203 providers who returned questionnaires. Schiamanna et al. (2007) observed that about seven percent of patient visits were with a provider who conducted e-mail consults. The variation is most likely due to the sample selection from each study. Gaster et al. (2003) looked at a large university medical system that probably encourages e-mail use. All physicians in the study had access to individual office computers, private e-mail accounts, and electronic medical records. The other two studies used a larger geographical area for their sample selection. Brooks and Menachemi (2006) analyzed the primary care physicians in the state of Florida, while Schiamanna et al. (2007) utilized the National Ambulatory Medical Care Survey from 2001 until 2003. The latter studies provide a better representation of frequent e-mail utilization among the provider population.

Certain population groups are more likely to utilize e-mail than others. Houston et al. (2005) determined patient characteristics that use e-mail regularly. The patients are typically higher educated, younger, female, and white. Sands et al. (2004) found that patients that used e-mail with providers were twice as likely to have a college degree, were younger, were less frequently ethnic minorities, and more frequently reported having lower health status. Provider groups utilize e-mail differently, as well. Primary care physicians have higher utilization rates than specialists (Schiamanna et al., 2007). Grant et al. (2006) reported that providers that graduate from an American or Canadian medical school and work in an academic setting are more likely to use e-mail. Physicians that worked in larger practices used e-mail more, but less for physicians of Asian-American descent (Brooks and Menachemi, 2006). Physicians who are located in community-based primary care settings are less likely to engage in e-mail communication than hospital-based locations (Gaster et al., 2003). When comparing the patient and physician groups, some trends are noticeable. For example, patients that use e-mail to contact their physician more frequently report having a lower health status. Physicians that utilize e-mail frequently state that it is helpful for managing chronic disease.

C. Anecdotal Evidence Pertaining to E-mail in Physician's Jobs

E-mail is controversial as a medium for communication between physicians and patients. Opponents argue that important signals can be missed when they are not in face-to-face communication with patients (Kvedar and Bierstock, 2012). Additionally, there is concern about the security around e-mail and the potential liability placed on physicians. Proponents believe that it is a valuable tool in building a relationship between the doctor and patient (Kvedar and Bierstock, 2012). Physicians are more accessible and certain information can be shared over e-mail. They also argue that security can be managed through strict protocols and firewalls.

Healthcare tends to be slow at adapting new procedures for the workplace. E-mail is used for simple tasks like scheduling appointments and sending reminders. Privacy should be a concern for any other mode of communication, and safety nets such as encryption can keep e-mails safe. Joseph Kvedar and Bierstock (2012) claim that their availability over e-mail gives their patients a sense of direct access to them and builds a relationship that has tangible health benefits. E-mail allows physicians to give clear treatment instructions and physicians can follow-up on their patients after an office visit. It also allows easy corrections for treatment plans and the patient can go back and refer to the message. E-mail is convenient because physicians do not have to rely on timing in order to get the message to their patients. E-mail is more effective than phone calls because it avoids unnecessary phone tag and practices can receive less voice-mails (Terry, 2008). This also puts added responsibility on the

patient since they have to be monitoring their e-mail. E-mail can help in patient retention and be viewed as a “value-added” service.

The main concern that physicians have is the litigation risk from patients. Dr. Sam Bierstock claims that an attorney will use any excuse to try to make a litigation case (Kvedar and Bierstock, 2012). Another point he makes against e-mail use is the scenario when someone who is not the physician’s patient e-mails with a question. I would suggest that the physician should only e-mail his patients to avoid such a situation. Additionally, physicians are concerned with breaking HIPPA compliance, the law that protects patients’ privacy (Terry, 2008).

D. Determinants of Physician Satisfaction

Physician satisfaction is important to investigate in order to attract physicians to areas of low healthcare needs. Additionally, physicians who are satisfied with their careers provide better overall healthcare compared to dissatisfied physicians, and satisfied physicians are more likely to stay in their practice (Landon et al., 2006). Older studies have analyzed significant changes in the field of medicine such as the transition to managed care. Baker and Cantor (1993) found that physicians who worked under HMOs were just as satisfied or more satisfied as physicians who did not. This was an interesting finding because popular opinion thought that part of a physician’s autonomy was lost. Although e-mail use is not as radical a change as the transition to managed care, e-mail utilization may provide additional satisfaction for physicians.

Excellent communication between physicians and patients is essential for a successful physician-patient relationship. This mutual affiliation contributes to higher rates of improved clinical outcomes, patient satisfaction, and physician satisfaction. E-mail has the ability to enhance communication between these stakeholders in an efficient manner. Phone and e-mail communication is a practical way of conducting follow up questions for patients. For example, patients do not have to miss work and can ask what they want to know without the embarrassment of a face-to-face conversation. Physicians can give high-quality care to more people in this manner.

Currently, the United States faces a shortage of primary care physicians. Overall, satisfaction of physicians has been relatively high, however, primary care physicians (PCP) have consistently been ranked at the lowest level (Deshpande and DeMello, 2010). These doctors are in a position to lower costs because they act as gatekeepers for the healthcare system and focus on preventative medicine. Role conflict and ambiguity are limiting PCP's satisfaction since they work longer days and face administrative burdens that prevent them from spending the proper amount of time in direct patient care (Deshpande and DeMello, 2010). Specialists are more satisfied with their careers because they have less role conflict or ambiguity than PCP. Pediatricians and dermatologists tend to rank at high levels while measuring for career satisfaction. Patients tend to be younger, they are more joyful to work with, and most recover from their illness. These physicians encounter less work-induced stress, work stable hours, and have more prosperous opportunities (Leigh et al., 2009).

Previous studies that analyzed physician satisfaction have examined the effects of specialty, age, gender, race, board certification, use of health information technology, and graduation from a foreign or domestic medical school, ownership, threat of malpractice, income, experience, and patient interaction (Elder et al., 2010; Leigh et al., 2009; Deshpande and DeMello 2010). These variables control for some of the theoretical concepts of job satisfaction like roles, pay, and relationship with co-workers. Elder et al. (2010) found that specialists were more satisfied with their careers than primary care physicians. The threat of malpractice lawsuits significantly lowered career satisfaction while patient interaction and income significantly increased career satisfaction of internal medicine physicians and pediatricians (Deshpande and DeMello 2010). They also showed that use of health information technology in the areas of practice, patient information, and prescription drugs had no impact on career satisfaction.

Additional communication between a physician and patient may add benefit to their relationship (Leong et al., 2005). This could hold true for improving relationships among other physicians. Elder et al. (2010) used a cross-sectional dataset: the Community Tracking Study Physician Survey, 2004-2005. After controlling for physician practice characteristics, the patient mix, and physician characteristics, they found that the specialists were more satisfied because specialists have higher incomes and generally do not see as many patients as primary care physicians.

Using data from the 2008 Health Tracking and Physician Survey, Deshpande, S. P. and S. S. Deshpande (2011) examined factors that impact surgeon satisfaction. They wanted to understand the factors that will retain surgeons in their practices because they expected a shortage of general surgeons in the future. After controlling for price-related factors, compensation-related factors, practice location, patient race, and surgeon demographics they found that surgeons were highly satisfied when they believed they were providing high quality care for their patients. The threat of malpractice and amount of time they spend with patients influenced career satisfaction as well. Leigh et al. (2009) obtained similar results: they concluded that career satisfaction was positively related to income and employment in a medical school for specialists. Career dissatisfaction was associated with working more than fifty hours per week, being a solo practitioner, having great reliance on managed care revenue, and having a relatively uncontrollable lifestyle. Information technology and e-mail did not have a statistically significant positive or negative association in these two studies.

E. E-mail Impact on Physician Satisfaction

In a small study with eight physicians, six of them believed that patients should be allowed to e-mail their physicians (Leong et al., 2005). They found that there was a positive correlation associated with e-mail use by patients and physicians, but it was not statistically significant for physicians. This study was a controlled experiment. The level of satisfaction among patients increased in the e-mail group for convenience of communicating with their physician. E-mail has the potential to improve the doctor-patient relationship, but the sample used in this study was too small to apply the results to other physician populations. However, Elder et al. (2010) found a positive relationship between e-mail use and physician satisfaction. They used a logistic regression to determine how some types of health information technology are associated with physician satisfaction. Other findings included a negative association between using information technology to write prescription and physician satisfaction. Additionally, using more information technology was a positive indicator of physician career satisfaction.

F. Contributions of this Paper

This proposed study investigates whether e-mail communication between physicians and their patients enhances physician career satisfaction. The study analyzed national, cross-sectional data from the 2008 Health Tracking Physician Survey. Elder et al. (2010) focused on how different types of health information technology may effect physician satisfaction. Unlike previous studies, this paper identifies factors that are associated with e-mail utilization by regression analysis. These factors served as control variables for the satisfaction model. Thus, factors that have a positive effect on e-mail utilization and satisfaction are identified.

Chapter 3

E-mail Utilization and Physician Satisfaction Estimation Models

A. The Econometric Model

Model Statement

These models utilize survey data from the 2008 Health Tracking Physician Survey

- Model I:** $TMEMLPT = \beta_0 + \beta_1 INCENT + \beta_2 AGE + \beta_3 Female + \beta_4 INCCAT + \beta_5 RACE + \beta_6 CHRNPT + \beta_7 MEDICAID + \beta_8 MEDSPECIALTY + \beta_9 HOURSWORKED + \beta_{10} TYPE + \varepsilon$
- Model II:** $TMEMLDR = \beta_0 + \beta_1 INCENT + \beta_2 AGE + \beta_3 Female + \beta_4 INCCAT + \beta_5 RACE + \beta_6 CHRNPT + \beta_7 MEDICAID + \beta_8 MEDSPECIALTY + \beta_9 HOURSWORKED + \beta_{10} TYPE + \varepsilon$
- Model III:** $PHYSICIANSATISFACTION = \beta_0 + \beta_1 TMEMLPT + \beta_2 TMEMLDR + \beta_3 INCENT + \beta_4 AGE + \beta_5 Female + \beta_6 INCCAT + \beta_7 RACE + \beta_8 CHRNPT + \beta_9 MEDICAID + \beta_{10} MEDSPECIALTY + \beta_{11} HOURSWORKED + \beta_{12} TYPE + \varepsilon$

Dependent Variables

TMEMLPT	This serves as the time physicians spent e-mailing patients outcome variable. This was a response to the survey question: during a typical work day, how much time do you spend on e-mail communication with patients and their families? Variable was coded as none (0), less than ½ hour (1), ½ hour-1 hour (2), 1-2 hours (3), or more than 2 hours (4).
TMEMLDR	This serves as the time physicians spent e-mailing other physicians outcome variable. This was a response to the survey question: during a typical workday, how much time do you spend on e-mail communications with physicians and other

clinicians? Variable was coded as none (0), less than ½ hour (1), ½ hour-1 hour (2), 1-2 hours (3), or more than 2 hours (4).

PHYSICIANSATISFACTION This is the satisfaction outcome variable and is the answer to the following question: Thinking very generally about your satisfaction with your overall career in medicine, would you say that you are currently very dissatisfied (1), somewhat dissatisfied (2), neither satisfied nor dissatisfied (3), somewhat satisfied (4), or very satisfied (5)? Satisfaction was measured on a Likert Scale, 1 to 5. Coding remained as is with 5 regarded as “best.”

Independent Variables

TMEMLPT	The reference category was none.
TMEMLDR	The reference category was none.
INCENT	A set of dummy variables that indicate whether a physician has any personal financial incentive to expand or limit services. Groups include reducing services, expanding services, and favoring neither. The reference category was favoring neither.
Female	A set of dummy variables that indicate whether the physician is female. The reference category was male.
AGE	A set of dummy variables that indicate the age of the physician based on the year they were born. Groups include born before and in 1950, between 1951-1970, and after and in 1971. The reference category was those born between 1951-1970.
INCCAT	A set of dummy variables that capture different levels of physician income. The groups include less than \$150,000, \$150,000-\$300,000, and greater than \$300,000. The reference category was \$150,000-\$300,000.
RACE	A set of dummy variables that indicate the physician’s race. The groups include Hispanic, Black, White, and Asian, and other. The reference category was White.
CHRNPT	A dummy variable that indicates if more than half of a physician’s patients have a chronic medical condition. The reference category was if physicians had less than half of patients with a chronic condition.
MEDICAID	A set of dummy variables that indicate the proportion of revenue that is generated from Medicaid. The group of dummies include less than or

MEDSPECIALTY	<p>equal to 25% and greater than 25%. The reference category was include less than or equal to 25%.</p> <p>A set of dummy variables that capture 7 different specialties: Internal Medicine, Family Practice, Pediatrics, Medical Specialties, Surgical Specialties, Psychiatry, and OGByn. The reference category was Family Practice.</p>
HOURSWORKED	<p>A set of dummy variables that indicate the hours physicians spent on medically related activities. Groups include 0-39, 40-49, 50-59, 60-69, 70-79, and 80+. The reference category was 40-49 hours.</p>
TYPE	<p>A set of dummy variables that indicate the type of practice the physician work at. Groups include solo, group, hospital-based, medical school-based, an HMO, and other. The reference category was group practices.</p>

B. Expected Effects

An ordered probit model will be used to analyze the dependent variables that describe e-mail utilization and physician career satisfaction. The e-mail utilization variables were described as a function of time, and the time periods were coded as discrete variables (see Model Statements, pages 15-17). The ordered probit model allows the dependent variable to assume values, which are ordinal in nature. For the satisfaction variable, the “very satisfied” option is qualitatively better than the other options, but it is not easy to determine how much better off these physicians are. For example, the “distance” between somewhat satisfied and satisfied is probably different from the “distance” between somewhat satisfied and very satisfied in regards to job satisfaction. An ordered probit is typically used for ordinal dependent variables. This analysis tool applies to the e-mail utilization model, too.

The key independent variables are the time physicians spend e-mailing patients and other physicians. Physicians that spend more time interacting with their patients ultimately are more satisfied with their job (Deshpande and DeMello, 2010). E-mail allows for additional patient interaction and more opportunity to develop a strong physician-patient relationship. Thus, I predict that physicians who engage in e-mail communication more frequently will be more satisfied with their profession.

The incentive variable captures if physicians have financial incentives to expand services. Deshpande and Deshpande (2011) found that physicians who had an incentive to expand services were more satisfied with their careers. Also,

physicians that are willing to expand services would have more time and resources to adopt e-mail communication. If physicians have to limit services, they may be spending too much time doing administrative tasks or are seeing too many patients. Furthermore, Medicaid reimbursement has the potential to impact satisfaction. Many physicians cannot afford to accept new Medicaid patients because the reimbursement rates are so low that many doctors lose money while caring for them. Thus, if a larger portion of a physician's income is closely tied to Medicaid, they are less likely to be satisfied with their jobs.

The demographic control variables like gender, race, and age serve to control for physician characteristics on physician's satisfaction. Males will probably be more satisfied as well as older physicians who have more control over their lifestyle. The reference group for the age variable is the group of physicians that were born between the years 1951-1970. Brooks et al. (2006) found that Asian-American physicians were less likely to use e-mail with their patients than white physicians. Therefore, Asian American physicians may be less likely to use e-mail during their jobs. Another physician characteristic is medical specialty. The 2008 Health Tracking Physician Survey contains data from seven different medical specialties. I expect specialists to be more satisfied than other physicians (Leigh et al., 2009; Deshpande and DeMello 2010).

A physician's work environment should influence career satisfaction. For example, physicians should be dissatisfied if they work over sixty hours a week compared to physicians that work between forty to forty-nine hours. People enjoy having free time to spend with their family or participating in leisure

activities. The size of the practice can also impact satisfaction. Physicians in group practices are more likely to be satisfied because they can share the workload and financial burdens with other physicians. Physicians in a group practice are probably more likely to use e-mail to communicate within their practice than a solo practitioner due to sharing information. The proportion of chronically ill patients a physician cares for should impact job satisfaction. I expect that physicians that see a large proportion of chronically ill patients will be less satisfied. These physicians may not be able to completely treat and cure a majority of their patients.

The proposed model contains some limitations. The results may be biased due to an endogeneity issue. Physicians that use e-mail may do so for other reasons, not because they are more satisfied with medicine. Confounding effects are present that can manipulate the results and cause inappropriate interpretations. An instrumental variable may be able to make the results unbiased, but instruments are difficult to generate. The data set is also a few years old, so there could be an increase in e-mail communication today.

Chapter 4

Sample Selection and Descriptive Statistics from the 2008 Health Tracking Physician Survey

A. Overview of the 2008 Health Tracking Physician Survey

This study utilizes cross-sectional data from the 2008 Health Tracking Physician Survey (HTPS) to investigate the effect of reimbursement for time spent on e-mail communication on physician career satisfaction. The survey is conducted by the Health Systems Change (HSC) organization, and it is a national representation of non-federal physicians who spend at least 20 hours a week in direct patient care. The HSC, a nonpartisan organization, conducts studies about the US health care system with the objective of ensuring that reliable and unbiased information is available to those making policy decisions. This survey contains information from more than 4,700 physicians across the country and was conducted by mail. This survey excludes federal employees, specialists in fields where the primary focus is not direct patient care, foreign medical school graduates who are only temporarily licensed to practice in the U.S., and residents and fellows.

Another objective of this survey was to establish a new baseline to track how physicians organize and practice medicine. The 2008 survey contained questions pertaining to the areas of coordination of care, physician ownership of equipment and hospitals, malpractice, compensation, and information

technology in medicine. The survey differentiated between primary care physicians (PCPs) and specialists. PCPs were defined as physicians that specialized in family practice, general practice, general internal medicine, internal medicine/pediatrics, or general pediatrics while specialists included other specialties.

B. Sample Selection and Descriptive Statistics

The complete 2008 Health Tracking and Physician Survey contains 4,720 physicians across the United States. Physicians that did not answer survey questions that are either key independent or control variables in the model equation were excluded from the study. After excluding these observations, 4,396 physicians were eligible for the regression analysis. The survey sample included analysis weights to adjust for differences in selection probabilities.

Table 1 (Appendix page 36-37) shows the descriptive statistics for the 4,396 physicians used in this study from the 2008 Health Tracking Physician Survey. The average physician rated their profession a 4, or were “somewhat satisfied” with medicine. Roughly seventy-four percent of physicians did not use e-mail to communicate with their patients. However, about half of the physicians utilized e-mail to communicate with other physicians. Thirty-six percent of physicians claimed they had financial incentives to expand services while about ten percent had incentives to reduce services.

At the time of the survey, seventy-two percent of the physicians were males. Most of the physicians surveyed were born between 1950 and 1970. At

the time of the survey, these doctors were between the ages of 48-68. The older physicians probably have rarely used information technology during their training and current practices. Many older people are set in their ways and do not want to adapt to utilize things such as e-mail. Interestingly, about half of the physicians surveyed responded that most of their patient population had a chronic condition. About one in five physicians rely on Medicaid patients for twenty-five percent of their practice revenues. This variable should provide some insight into how the patient's income affects e-mail use.

The next group of variables gives some insight about the physician's practice. Nearly half of physicians specialized in some sort of medical or surgical specialty. General practitioners and internal medical doctors made up the next large group, seventeen and fourteen percent, respectively. Pediatricians, psychiatrists, and obstetricians were other primary care oriented specialties in the survey. Most physicians worked forty to fifty-nine hours per week, but about thirty percent of physicians work more than sixty hours per week. Physicians primarily worked in solo or group practices. Only twenty-five percent of physicians worked at an HMO, hospital, or medical school.

Chapter 5

Estimation Results: Quantifying E-mail Utilization and Physician Satisfaction

This chapter presents the regression results for e-mail usage and physician satisfaction. The first section uses e-mail use as the dependent variable regressed with the control variables. The second section discusses the effect of e-mail utilization on physician career satisfaction.

A. The Effect of the Control Variables on E-mail Utilization

This paper estimates the econometric model using an ordered probit regression. The ordered probit analysis is used because the dependent variables, e-mail utilization, are not continuous variables and have more than two ordinal outcomes. Both of the e-mail variables were coded the same way with five possible outcomes. These outcomes are available in Table 1 (Appendix page 36-37). The regression outputs are located in Table 2 in the Appendix on pages 38-40. The purpose of these models is to identify factors that are associated with using e-mail. Conclusions and policy decisions can be drawn from recognizing the factors that encourage and deter e-mail use. In the following regressions I control for physician and practice characteristics. The physician characteristics included the gender, age, income, ethnicity, and specialty. The practice characteristics comprised of financial incentives, rate of patients that had

chronic conditions, number of hours worked per week, and the type of practice. The marginal effects are presented in the Appendix (pages 38-43) for each independent variable in order to determine the impact of an average unit change in the independent variables on the expected change in the dependent variables. The coefficients in the ordered probit model did not show the marginal effects, so this additional test had to be done.

The amount of time spent e-mailing other patients and physicians had some overlapping results from the ordered probit regression. On average, physicians were significantly less likely to use e-mail if they were born before 1950 than those born from 1951 to 1970 after controlling for other factors. Physicians that had a financial incentive to expand services, on average, were significantly more likely to utilize e-mail than physicians without an incentive. Interestingly, income levels had no effect on e-mail usage. Another unanticipated finding was that there was no effect on e-mail use for physicians that mainly had patients with chronic conditions. Patt et al. (2003) suggested that e-mail was useful for managing chronic conditions. On average, psychiatrists were more likely use e-mail to communicate with their patients and other physicians than general practitioners while controlling for other factors. Physicians that worked between sixty and seventy-nine hours were, on average, more likely to utilize e-mail as well than physicians that worked from forty to forty-nine hours per week. The physicians that worked longer hours were probably younger ones that were more technologically savvy. These physicians had more time to use e-mail since they were working more, as well. After controlling for other factors,

physicians that worked in a HMO were, on average, significantly more likely to use e-mail to communicate with both patients and other physicians than physicians that worked in a group practice. Being in an HMO contributed highly to the amount of time spent sending e-mails. Physicians that worked in a medical school setting, on average, were significantly more likely to spend time using e-mail compared to group practice physicians.

Some of the regression results from e-mailing other physicians and patients were different. Female physicians, on average, were significantly more likely to spend time e-mailing other physicians than males. Asian physicians, on average, were significantly less likely to spend time e-mailing other physicians than white physicians. Physicians that rely on Medicaid for over half of their revenues, on average, were less likely to e-mail their patients. Medicaid patients are in poverty and less likely to have access to the Internet on a regular basis. After controlling for other factors, physicians that worked in surgical and other medical specialties, on average, were more likely to e-mail other physicians. Physicians that worked in solo practices had a negative effect on the time spent sending e-mails to other physicians.

B. The Effect of E-mail Utilization on Physician Satisfaction

Similarly to e-mail utilization, the dependent variable physician career satisfaction is not continuous and has more than two possible outcomes. The satisfaction variable was coded with five possible outcomes. These outcomes are presented in Table 1, which is in the Appendix on pages 36-37. The ordered

probit regression results along with marginal effects are presented in Table 3, located in the Appendix on pages 41-43, with physician satisfaction as the dependent variable. The key independent variables are the amount of time physicians spend e-mailing their patients and other physicians. In the following regression I control for physician and practice characteristics. The physician characteristics included the gender, age, income, ethnicity, and specialty. The practice characteristics comprised of financial incentives, rate of patients that had chronic conditions, number of hours worked per week, and the type of practice.

On average, e-mailing patients up until about an hour during a workday had a significant, positive effect on physician career satisfaction compared to physicians that did not e-mail after controlling for other factors. Part of a physician's job is to serve other people and help them by treating or managing illness. E-mail allows doctors to extend their services with minimal boundaries. However, if physicians spend an immense amount time e-mailing they will lose valuable time from direct patient interactions. Physicians can answer non-urgent matters over e-mail, but other issues should be addressed in person (Ye et al., 2010). Nonetheless, e-mailing other physicians between thirty minutes up until one hundred and twenty minutes during a workday had a significant, positive effect on physician career satisfaction while controlling for other factors. It is surprising that spending fewer than thirty minutes e-mailing is not significant. E-mail communication between physicians may improve coworker relationships.

E-mail can keep other physicians informed about their patients to better coordinate care for better outcomes.

Financial incentives affect career satisfaction in different ways. On average, incentives that made physicians reduce the provisions of services had a significant negative effect on career satisfaction compared to physicians that faced no incentives to alter services. Physicians do not want to reduce their services because this reduces access for patients as well as earning potential for the physician. When physicians had the chance to increase services, on average, it had a positive significant effect on satisfaction after controlling for other factors. Birth before 1950 and after 1971 had a significant, positive effect on satisfaction among physicians in contrast with those born between 1951 and 1970. On average, physicians that earned less than \$150,000 in a year were less satisfied than those that earned between \$150,000-300,000. Additionally, physicians that earned more than \$300,000, on average, were more satisfied than those that earned between \$150,000-300,000. Hispanic physicians were, on average, dissatisfied with their careers compared to their white counterparts. This was the only race that had a significant effect on satisfaction, and this group comprised of five percent of the sample.

Different specialties were impacted differently regarding satisfaction levels. Pediatricians, on average, were significantly more satisfied than general practitioners. This result is consistent with the findings of Schiamanna et al. (2007). As expected, physicians that worked fifty or more hours per week were dissatisfied compared to physicians that worked between forty and forty-nine

hours after controlling for other factors. On average, physicians that worked in medical schools were significantly more satisfied with their careers than physicians that worked in a group practice after controlling for other factors. On the other hand, physicians that worked in hospitals were less satisfied than physicians that worked in a group practice. Physicians that work in hospitals have less autonomy, and may have to work with patient populations that rely on the emergency department for primary care.

Chapter 6

Conclusions

A. Summary of the Findings

Using the 2008 Health Tracking and Physician Survey, this paper analyzes whether e-mail use contributes to career satisfaction and factors that impact e-mail utilization. This study breaks down whom the physicians e-mail and the factors that encourage and deter e-mail utilization.

This analysis finds that some of the factors that have a significant positive effect on e-mail utilization. These are financial incentives, psychiatry specialty, longer work hours, HMO workplace, and medical school workplace. Factors that negatively impact e-mail usage are older physicians, Asian physicians, a reliance on Medicaid revenue, and solo practitioners. Other important findings include the factors that affect physician satisfaction. E-mailing patients less than an hour, e-mailing other physicians between half an hour and two hours, being nearly any age, having incentives to expand services, being a pediatrician, and working in a medical school had a positive and significant effect on career satisfaction. Reducing services, being Hispanic, making less money, working more hours, and working in a hospital had a negative and significant effect on career satisfaction.

B. Policy Implications

The proposed model is faced with some limitations. The results may be biased due to an endogeneity issue. Physicians that use e-mail may do because they are more satisfied with medicine. An instrumental variable may be able to correct this, but they are difficult to generate. The data set is a few years old, so there might be an increase in the prevalence in e-mail communication today.

Not many physicians utilize e-mail communication for patient interactions. However, nearly half of physicians use e-mail to communicate with other physicians. Physicians should be incentivized to utilize e-mail to communicate within their practices. This can serve to aid in the transition of Obamacare where physicians will be held accountable for cost containment. E-mail can also serve to enable physicians to better coordinate a patient's care. This study shows that the physicians that use e-mail are happy with it, and the physicians that do not use it may not have the proper settings or protocols in place. Some form of payment would incentivize physicians to offer e-mail and would prevent patients from overutilization. E-mail communication is supposed to strengthen the physician-patient relationship. It allows patients to save time and is convenient in terms of time. They do not have to forgo wages for missing work for an office visit. Additionally, patients can receive higher quality care for common health concerns. E-mail communication can place an emphasis on preventative medicine. Utilization of e-mail for non-urgent advice could have a significant health benefit. Once an electronic health record is established on a

large scale in the United States the setup for a reimbursement system for the e-mail service should be feasible.

C. Suggestions for Future Research

The 2008 data set is out of date and many more healthcare facilities are adopting technologies like electronic health records. An instrumental variable could alleviate the endogeneity issue. Future research should target physicians that charge a fee for the e-mail service and measure performance. Additionally, alleged barriers to e-mail use like litigation and privacy concerns could be quantified in order to analyze their impact on e-mail utilization in a physician's practice today.

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Tables/Appendix

Table 1. Descriptive statistics for variables that can influence physician satisfaction

Variable	Mean	Standard Error	Min	Max
Physician Satisfaction	4.02	0.02	1	5
Time spent e-mailing patients per day				
0 minutes**	0.74	0.007	0	1
Less than a half hour	0.18	0.006	0	1
1/2 to 1 hour	0.06	0.004	0	1
1-2 hours	0.02	0.002	0	1
More than 2 hours	0.01	0.001	0	1
Time spent e-mailing other physicians per day				
0 minutes**	0.45	0.007	0	1
Less than a half hour	0.32	0.007	0	1
1/2 to 1 hour	0.15	0.005	0	1
1-2 hours	0.06	0.004	0	1
More than 2 hours	0.02	0.002	0	1
Gender of physician				
Male**	0.72	0.007	0	1
Female	0.28	0.007	0	1
Age groups				
Born before 1950	0.23	0.006	0	1
Born between 1950 and 1970**	0.66	0.007	0	1
Born after 1971	0.11	0.005	0	1
Financial incentives that impact utilization of services				
Reduce	0.11	0.005	0	1
Expand	0.36	0.007	0	1
Neither**	0.53	0.008	0	1
Income level				
Less than 150K	0.34	0.007	0	1
Between 150-300K**	0.46	0.008	0	1
Greater than 300K	0.20	0.006	0	1
Ethnicity				
Hispanic	0.05	0.003	0	1
White**	0.74	0.007	0	1
Black	0.04	0.003	0	1
Asian	0.15	0.006	0	1
Other	0.01	0.002	0	1

Percentage of patients with a chronic illness				
50% or less**	0.49	0.008	0	1
Over 50%	0.51	0.008	0	1
Percentage of revenues from Medicaid services				
25% or less**	0.79	0.006	0	1
Over 25%	0.21	0.006	0	1
Specialty groups				
Internal Medicine	0.14	0.005	0	1
General/Family Practitioner**	0.17	0.006	0	1
Pediatrics	0.08	0.004	0	1
Medical Specialties	0.28	0.007	0	1
Surgical Specialties	0.19	0.006	0	1
Psychiatry	0.07	0.004	0	1
OBGYN	0.07	0.004	0	1
Number of hours worked per week				
0-39	0.18	0.006	0	1
40-49**	0.26	0.007	0	1
50-59	0.26	0.007	0	1
60-69	0.17	0.006	0	1
70-79	0.07	0.004	0	1
80+	0.06	0.004	0	1
Type of practice				
Solo/2 physicians	0.32	0.007	0	1
Group	0.39	0.007	0	1
HMO	0.04	0.003	0	1
Medical School	0.08	0.004	0	1
Hospital-based	0.13	0.005	0	1
Other	0.04	0.004	0	1

Note: The reported values are the means and standard errors. The estimates are weighted according to the survey weights provided by the 2008 Health and Physician Tracking Survey. The total number of observations is 4,396.

** represents the reference group for the regression results in Tables 2 and 3

Table 2. Estimates for the model regressions that use time physicians spend e-mailing patients and other physicians as the dependent variables.

Independent Variables	Dependent Variables			
	Time spent e-mailing patients		Time spent e-mailing other physicians	
	(1)		(2)	
	Ordered Probit	Marginal Effects	Ordered Probit	Marginal Effects
Gender of physician				
Female	0.072 (0.050)	0.001 (0.001)	0.147*** (0.044)	0.007*** (0.002)
Age				
Born before 1950	-0.193*** (0.052)	-0.003*** (0.001)	-0.219*** (0.043)	-0.011*** (0.002)
Born after 1971	-0.001 (0.064)	-0.000 (0.001)	-0.007 (0.054)	-0.000 (0.003)
Financial incentives that impact availability of services				
Incentive to Reduce	0.040 (0.068)	0.001 (0.001)	0.044 (0.059)	0.002 (0.003)
Incentive to Expand	0.120*** (0.045)	0.002** (0.001)	0.108*** (0.038)	0.005*** (0.002)
Income level				
Less than 150K	0.044 (0.050)	0.001 (0.001)	-0.004 (0.044)	-0.000 (0.002)
Greater than 300K	-0.085 (0.058)	-0.001 (0.001)	-0.034 (0.049)	-0.002 (0.002)
Ethnicity				
Hispanic	-0.076 (0.096)	-0.001 (0.002)	0.043 (0.081)	0.002 (0.004)
Black	0.036 (0.116)	0.001 (0.002)	0.066 (0.101)	0.003 (0.005)
Asian	-0.065 (0.061)	-0.001 (0.001)	-0.128** (0.053)	-0.006** (0.003)
Other	0.363** (0.172)	0.006** (0.003)	0.188 (0.138)	0.009 (0.007)
Practice characteristics				

Over 50% of patients have chronic condition	-0.067 (0.045)	-0.001 (0.001)	0.008 (0.039)	0.000 (0.002)
Over 50% of practice revenue from Medicaid	-0.135** (0.058)	-0.002** (0.001)	0.054 (0.048)	0.003 (0.002)
Specialty areas				
Internal medicine	0.015 (0.078)	0.000 (0.001)	0.057 (0.066)	0.003 (0.003)
Pediatrics	-0.118 (0.091)	-0.002 (0.002)	0.097 (0.075)	0.005 (0.004)
Medical specialties	-0.103 (0.068)	-0.002 (0.001)	0.172*** (0.060)	0.008*** (0.003)
Surgical specialties	0.046 (0.071)	0.001 (0.001)	0.279*** (0.063)	0.014*** (0.003)
Psychiatry	0.297*** (0.092)	0.005*** (0.002)	0.435*** (0.081)	0.021*** (0.004)
OB-GYN	-0.126 (0.098)	-0.002 (0.002)	0.025 (0.086)	0.001 (0.004)
Hours worked per week				
0-39	-0.056 (0.066)	-0.001 (0.001)	-0.132** (0.055)	-0.006** (0.003)
50-59	0.105* (0.057)	0.002* (0.001)	0.076 (0.048)	0.004 (0.002)
60-69	0.130** (0.063)	0.002** (0.001)	0.200*** (0.055)	0.010*** (0.003)
70-79	0.192** (0.085)	0.003** (0.001)	0.179** (0.073)	0.009** (0.004)
80+	0.085 (0.092)	0.001 (0.002)	0.157* (0.083)	0.008* (0.004)
Practice type				
Solo/2 physicians	-0.050 (0.052)	-0.001 (0.001)	-0.451*** (0.045)	-0.022*** (0.003)
HMO	1.275*** (0.089)	0.021*** (0.004)	0.831*** (0.082)	0.040*** (0.005)
Medical school	0.858*** (0.068)	0.014*** (0.002)	0.994*** (0.062)	0.048*** (0.005)
Hospital	0.002 (0.073)	0.000 (0.001)	0.409*** (0.058)	0.020*** (0.003)

Other	-0.155 (0.131)	-0.003 (0.002)	0.070 (0.092)	0.003 (0.004)
Observations	4,396			
cut1				
Constant	0.752*** (0.081)		0.101 (0.068)	
cut2				
Constant	1.605*** (0.085)		1.068*** (0.069)	
cut3				
Constant	2.242*** (0.093)		1.819*** (0.074)	
cut4				
Constant	2.807*** (0.117)		2.494*** (0.081)	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Estimates for the model regression that uses physician career satisfaction as the dependent variable.

Independent Variables	Dependent Variable	
	Physician Satisfaction	
	Ordered Probit	Marginal Effects
Time spent e-mailing patients per day		
Less than a half hour	0.128*** (0.047)	0.046*** (0.017)
1/2 to 1 hour	0.173** (0.080)	0.063** (0.029)
1-2 hours	-0.071 (0.141)	-0.026 (0.051)
More than 2 hours	-0.288 (0.243)	-0.104 (0.088)
Time spent e-mailing other physicians per day		
Less than a half hour	0.051 (0.043)	0.018 (0.015)
1/2 to 1 hour	0.175*** (0.058)	0.063*** (0.021)
1-2 hours	0.216*** (0.076)	0.078*** (0.027)
More than 2 hours	0.240* (0.132)	0.087* (0.048)
Gender of physician		
Female	-0.017 (0.042)	-0.006 (0.015)
Age		
Born before 1950	0.239*** (0.045)	0.086*** (0.016)
Born after 1971	0.140** (0.055)	0.051** (0.020)
Financial incentives that impact availability of services		
Reduce	-0.539*** (0.056)	-0.195*** (0.020)
Expand	0.087** (0.038)	0.031** (0.014)
Income level		
Less than 150K	-0.249*** (0.042)	-0.090*** (0.015)
Greater than 300K	0.236*** (0.050)	0.086*** (0.018)
Ethnicity		

Hispanic	-0.152** (0.075)	-0.055** (0.027)
Black	-0.044 (0.082)	-0.016 (0.030)
Asian	0.009 (0.048)	0.003 (0.017)
Other	-0.002 (0.138)	-0.001 (0.050)
Practice characteristics		
Over 50% of patients have chronic condition	-0.061 (0.038)	-0.022 (0.014)
Over 50% of patients have chronic condition	-0.006 (0.046)	-0.002 (0.017)
Specialty area		
Internal Medicine	-0.038 (0.062)	-0.014 (0.022)
Pediatrics	0.379*** (0.076)	0.137*** (0.027)
Medical Specialties	0.012 (0.056)	0.004 (0.020)
Surgical Specialties	-0.106* (0.063)	-0.038* (0.023)
Psychiatry	0.045 (0.080)	0.016 (0.029)
OB-GYN	-0.145* (0.080)	-0.052* (0.029)
Number of hours worked per week		
0-39	0.028 (0.055)	0.010 (0.020)
50-59	-0.150*** (0.047)	-0.054*** (0.017)
60-69	-0.216*** (0.054)	-0.078*** (0.019)
70-79	-0.347*** (0.072)	-0.125*** (0.026)
80+	-0.376*** (0.080)	-0.136*** (0.029)
Practice type		
Solo/2 physicians	-0.034 (0.043)	-0.012 (0.016)
HMO	-0.156 (0.099)	-0.056 (0.036)
Medical school	0.230*** (0.073)	0.083*** (0.026)

Hospital	-0.127** (0.058)	-0.046** (0.021)
Other	0.014 (0.092)	0.005 (0.033)
<hr/>		
cut1 Constant	-1.978*** (0.075)	
cut2 Constant	-1.200*** (0.069)	
cut3 Constant	-1.039*** (0.068)	
cut4 Constant	0.227*** (0.067)	
<hr/>		
Observations	4,396	4,396
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		