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Practice and Patient Characteristics Associated with Primary Care Physicians' Use of Electronic Consults with Their Patients

Timothy Kenneth Eng

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APPROVAL PAGE

Master of Public Health Thesis

Practice and Patient Characteristics Associated with Primary Care Physicians' Use of Electronic Consults with Their Patients

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Abstract

Electronic consults (e-consults) are types of communications systems used between physicians and their patients to communicate outside the medical office. While nothing can replace the traditional face-to-face interaction, e-consults can be used to help manage patient queue, share non-urgent information, and provide an alternative avenue of communication while recording electronic copies. Literature reveals that lack of a standardized reimbursement system, uncertain workloads, and perceived risks to patient confidentiality are barriers to mainstream adoption of e-consult systems. The purpose of this study is to investigate the practice and patient characteristics of the use of e-consults between primary care physicians and their patients using the 2010 National Ambulatory Medical Care Survey (NAMCS).

The analysis reveals that practicing in an HMO and having long patient wait times for an appointment for a routine medical exam are associated with PCPs' use of e-consults. Findings also indicate that the use of e-consults was associated with patients experiencing a new health problem that occurred within 3 months, and patients that have private insurance ($P<0.05$). These findings suggest that the infrastructure of the medical practice and patients' needs are key drivers of whether a PCP uses e-consults in his or her practice. Primary care physicians who use e-consults spend an extra 1.6 minutes in face-to-face time with their patients (20.3 minutes vs. 18.7 minutes). However, further analysis indicates that it is inconclusive to determine whether the use of e-consults affects the amount of time spent the physician spends face-to-face with the patients.

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Introduction

Effective communication is vital in the relationship between primary care physicians or practitioners (PCPs) and their patients. Telephone messaging and the use of mail has been the traditional method of communication between PCPs and their patients outside of the patient visit. However, new advances in electronic technology are opening the door to different methods of communication in medical practice. Among these technology developments are electronic consultations (e-consults). E-consults include telemedicine, electronic messages (e-mail), patient portals, messaging, virtual consultations, and other forms of electronic communication beyond the use of a telephone to communicate with patients outside the physician's office (Fortney, Burgess, Bosworth, Booth, & Kaboli, 2011).

The purpose of this research is to investigate the practice and patient characteristics of the use of e-consults between PCPs and their patients. First, the study will identify the association between select characteristics and the use of electronic consults between PCPs and their patients. Second, this study will examine whether the amount of time PCPs spend with their patients is associated with the use of electronic consults. This study will use data from the 2010 National Ambulatory Medical Care Survey (NAMCS) to examine both physician practice characteristics and patient characteristics.

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Review of the Literature

The use of technology in health care (such as electronic health records (EHRs)) has significantly increased within the past decade, yet only about one in ten physicians report the use of e-consults as a form of communication with their patients. Previous studies based on the NAMCS show that in the United States, the frequency of visits to physicians who reported using e-consults was fewer than 10% from 2001 to 2003 (Sciamanna, 2007) and in 2008 (Mu, 2012). In comparison, 54% of PCPs in office-based practices had adopted Electronic Health Records (EHRs) by 2011 (Jamoom, Beatty, Bercovitz, Woodwell, Palso, & Rechtsteiner, 2012). With increased use of technology in other aspects of health care, such as EHRs and medical treatments, e-consults between a PCP and his/her patient is an area in health care where technology has potential that remains to be realized.

Over the past five years, federal policymakers have supported the increased use of Health Information Technology (HIT) through executive orders, regulatory reforms, and legislation in recognition of its potential to decrease costs, improve health outcomes, coordinate care, and improve public health (Goldstein & Hyatt, 2010). With the Health Information Technology for Economic and Clinical Health (HITECH) Act, the federal government has set a goal to establish EHRs for most Americans by 2014 in order to create a more efficient working environment for health care professionals (Schilling, 2011). Pressures to further adopt technology to facilitate efficiency in a working environment will continue as shortages in the health care provider workforce occur and health care providers are faced with an increasingly elderly population presenting with

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multiple chronic diseases. Research shows that the adoption of technology in health care settings will continue to increase as the state and federal government uses monetary incentives to encourage practices to embrace the technology available (Xierali, et al., 2013). As more patients become comfortable with the use of health information technology, the use of e-consults will become more accepted (Moyer, Stern, Dobias, Cox, & Katz, 2002). In a survey conducted in 2007, 10% of PCPs listed a public e-mail address and 4.5% of those who did not list a public e-mail address reported that they used e-mail to communicate with patients (Anderson, Asher, & Wilson, 2007).

As technology becomes more user-friendly, PCPs can provide a new service that has potential benefits that can help deliver better quality of care and promote effective time management within the office. Patients are becoming increasingly computer-literate and are more open to adopt electronic forms of communication with their health care providers. While technology can never replace traditional face-to-face interaction, it can be used to facilitate lines of communication outside of the office or hospital. A study found that about 50% of the surveyed patients indicated that they would be interested in using e-consults if their PCP would offer the service (Shaw, Farboud, Trinidade, & Kothari, 2012).

Role of electronic communication

Traditionally, PCPs rely on telephones and mail when communicating with patients outside their office. With the introduction of the internet and HIT, PCPs have the potential to communicate with their patients through many types of communication channels. Benefits of e-consults include appointment reminders, treatment reminders,

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information for managing drug side effects, information on clinical trials, reviewing health care experience, and sharing referrals to other health care professionals (Pennic, 2013). According to the American College of Physicians (Gorden, 2003), other benefits include reducing unnecessary office visits, serving patients' medical needs without the necessity and cost of an office visit, performing follow-up care, and providing oversight for chronic care patients easier and more effective. Patients can avoid sick days and lost worker productivity for office visits, the efficiency of care provided in the office can be improved, and waiting times for appointments and in the office could potentially be reduced. The use of e-consults may lower the cost of ambulatory care by screening out patients who do not require a costly office visit. Many health care organizations provide information to their patients on how they can reach – mostly through e-mail and telephone numbers – staff members (Berman & Kozier, 2012). E-mails enable physicians to answer medical questions faster when compared to telephone messaging (Rosen & Kwoh, 2007).

Several studies have examined practice experiences in using electronic communications. One study that compared physicians who used e-mail to physicians did not found that the workload using e-mails and the workload using conventional telephone communication was equal, but that satisfaction by both patients and physicians was better in the e-mail group (Leong, Gingrich, Lewis, Mauger, & George, 2005). However, the study's findings also suggested that additional support staff would be required to effectively manage the e-mail messages from patients, thus potentially impacting the workload outside the physician's examination room. According to a meta-analysis of Kaiser Permanente's experiences with patient-physician e-mail communication, secure

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messaging has been associated with a decrease in office visits, an increase in measurable quality outcomes in primary care, such as glucose, hypertension, low density lipoprotein control, and screening for nephropathies and retinopathy among diabetic patients, and excellent patient satisfaction (Baer, 2011). Furthermore, when physicians experience face-to-face interaction with their patients, those who use e-consults can focus on medical procedures requiring physical proximity and tactile contact (Fortney, Burgess, Bosworth, Booth, & Kaboli, 2011) because preliminary questions may be asked and answered through e-consults.

Challenges to E-consults

There are, however, barriers to the use of e-consults, which have resulted in a slow adoption of the practice. The absence of consistent, comprehensive reimbursement policies has discouraged use of e-consults among health care professionals. Nevertheless, the American College of Physicians (Gorden, 2003) has argued for reimbursement by Medicare for online patient care. The Balanced Budget Act of 1997 has authorized partial reimbursement for Medicare for e-consult services (Remibursement Overview, 2011) and allows some state Medicaid programs to offer reimbursement that are covered by the provision of health care related transportation costs (due to the ability of e-consults to offer transportation cost savings) while other states pay claims regardless of whether the encounter as in person or via e-consults. Essentially, there are a variety of guidelines for fee-for-service and managed care reimbursements when it comes to e-consults.

Concerns about data security are another limiting factor to the greater use of electronic communication. Any type of information transfer presents the risk of breaking

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patient-provider confidentiality under the Health Insurance Portability and Accountability Act (HIPPA). Protection of client privacy is an issue when transferring information electronically (Reid & Wagner, 2008). The risk to client confidentiality is a large factor that discourages the use of electronic mail and an argument used to support the use of paper record keeping. HIPAA laws require organizations to apply "reasonable and appropriate safeguards" to protect against disclosure (Health Resources and Services Administration, 2013). Using electronic software, encryption can be applied which usually prevents access to the information without the use of a password. The use of electronic software also allows the tracking of who accessed the record and when it happens. Nevertheless, Lack of e-consult usage by PCPs can also be the result of corporate policies that limit the physician's ability to communicate electronically with their patients. Although both the American Medical Association and American Medical Informatics Association provide guidelines for clinicians using e-consults to communicate with their patients (Lobb, 2011), health care agencies can develop their own guidelines in the use of e-consults.

A communication system should be developed to meet the patient's needs and e-consults may not be the most effective tool to use among certain types of patients or under certain situations. Patients with low computer literacy levels or who have cognitive problems, such as elderly patients or severely mentally ill patients, may not be appropriate candidates for e-consults. If patients provide inaccurate data, liability for an adverse event could fall on the physician or hospital for making mistakes based on incorrect data (Garder, 2011). In a face-to-face visit, physicians have more opportunity to clarify confusions or unclear statements. This is an example in which PCPs should

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ensure that their patients understand the importance of providing accurate data and that the patient is competent enough to deliver the information. During time sensitive or medically urgent situations, physicians should be available to see the patient or recommend the patient to emergency services (Massachuselts Medical Society, 2012). In addition, physicians who have not seen their client in over a year should have the client come in so they can deliver health care face-to-face although they may use e-consults for scheduling.

Digital divide

According to the International Telecommunications Union (2013), 18% of the world population was internet users in 2006. This number increased to 35% in 2011 and 41% in 2013. In the United States, internet usage reached 81.0% in 2012, compared to 73% for all developed countries (Pew Internet & American Life Project, 2013). Clearly not all populations have access to the internet. Those of low socioeconomic status and the elderly were more likely to report lack access to the internet.

Known as the "digital divide", lower income populations have historically lagged in access to and use of electronic technologies (Zach, Dalrymple, Rogers, & Williver-Farr, 2012). People with low incomes may not have the financial means of purchasing a computer and may have less knowledge in the use of electronic technology. This inequality can affect populations in terms of access to health care if an electronic-based communication system is implemented. According to one study conducted in 2006 among patients visiting an academic family practice, 26% reported that they had no e-mail addresses (Virji, et al., 2006).. It was noted that patients in this study without e-mails

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were more likely to be insured through Medicaid Yet in a more recent survey of parents or guardians of children who visited the Emergency Department of a pediatric hospital located in a low income community, the vast majority (96.9%) reported that they had an e-mail account (Saidinejad, Teach, & Chamberlain, 2012).

Age is believed to be another factor in the digital divide. Younger individuals have higher education and income, and report better health have been found to have greater internet usage (Kruse, et al., 2012). In contrast, patients who came of age in the pre-computer era often struggle to adapt to the usage of computers (Cresci, Yarandi, & Morrell, 2010). Younger individuals have had more exposure to computers and thus are more likely to be comfortable with newer technology. As the general population ages and technology becomes more embedded in society, the digital divide gap between people of different ages is expected to close (Rogers, 2013). For instance, older and chronically ill patients may increasingly use the internet as a resource to help them understand the symptoms and remedies to their illness in addition to a physician's recommendations.

The reluctance of some PCPs to consider e-consults as a form of communication with their patients is linked to concerns about workload, safety, and lack of proximity with patients (Atherton, 2013). Small practices, particularly those that provide services to underserved communities, lack access to capital to implement an EMR system, demonstrates lower ability to handle the productivity challenges that adoption of new technologies create, and are less likely to purchase an e-consult system (Torda, Han, & Scholle, 2010).

Time and Quality of Care

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Research suggests that patient satisfaction is related to the amount of time they spend with their physician. One study of cancer patients showed that patients perceive that the amount of time spent with the physician is associated with quality of care (Shin, Park, Shim, Hahm, & Park, 2012). Less trust in their physician, lower overall satisfaction, and lower adherence rates were reported by those patients who felt that the time spent face-to-face was less than they preferred. Another study indicated that modest relationships were noted between the visit duration and quality of care (Chen, Farwell, & Jha, 2009). This study analyzed the NAMCS data for adults 18 years or older who were surveyed between 1997 and 2005 and investigated how increases in the duration of office visits were related to the quality of care, using screening and medication provided during these visits as quality of care indicators. The findings indicated that older patients and patients with complex chronic conditions are more likely to spend more time in face-to-face interactions with their providers.

Time spent in direct communication between PCPs and their patients is an important factor in determining quality of care in a number of respects (Dugdale, Epstein, & Pantilat, 1999). These include patient satisfaction, adequacy of diagnosis and treatment, outcomes of diseases, physician satisfaction, and risk of malpractice claims. Research shows that patients are more likely to be satisfied with visits if they spend time being educated about their health and their specific therapeutic interventions (Robbins, Bertakis, Helms, Azari, Callahan, & Creten, 1993). Patients have ranked the importance of exchanging health related information second only to clinical skill (Laine, et al., 1996).

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An increase in time that PCPs spend with their patients could result in more effective information exchange and opportunities for expression of concerns and clarification. Office visits with more effective information gathering by patients, more information provided by physicians, more conversation by patients with the physician, and more expression of affect have all been associated with better health and functional status (Kaplan, Greenfield, & Ware, 1989). The risk of malpractice claims by patients decreases with an increase in time spent with PCPs (Levinson, Roter, Mulloly, Dull, & Frankel, 1997). When PCPs spend more time with their patients, patients can become more open to disclosing sensitive information and more comfortable with their provider. In addition, limiting the amount of time a PCP spends with his/her patient may reduce the patient's capacity to comply with preventive services recommendations (Yarnall, Pollak, Ostbye, Krause, & Michener, 2003). Research shows that communication in medical care is positively correlated with patient adherence with medical recommendations (Zolnierek & Dimatteo, 2009), thus time that PCPs spend with their patients is an important factor in determining the quality of care and the satisfaction of medical care.

The current study will examine the use of e-consults in primary care practice. Several hypotheses will be tested in this study regarding the relationship between certain practice and patient characteristics with PCP use of e-consults. Physicians who work in team-oriented settings (HMOs, academic institutions) are hypothesized to be more likely to use e-consults because of the availability of resources of scale that provides access to computer software that allows the use of electronic communication. Long wait times are also expected to be associated with an increased likelihood that providers will use electronic consults. Due to the digital divide, PCPs who provide services to people of low

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socioeconomic status, such as those who use Medicaid or are older, are expected to be less likely to use electronic communication with their patients. Patients who have chronic illnesses are expected to be more likely to have access to a physician who uses e-consults because electronic communication allows continuous monitoring of their health status without frequent visits to the physician's office. Finally, it is hypothesized that PCPs who use electronic communication will have more face-to-face time with their patients because practices that use electronic consults can operate more efficiently and using e-consults outside the office room creates dialogue that can be used inside the physician's office.

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Research Methods

This cross-sectional study compared the practice and patient characteristics of PCPs who use e-consults and those who do not. Further, it investigated whether there are differences in the amount of time spent face-to-face between the PCPs and their patients associated with physician use of e-consults. It is based on a secondary analysis of the 2010 NAMCS data which contains information about the practices of health care providers and their patients (Centers for Disease Control (CDC), 2013). The dataset was created by the National Center for Health Statistics (NCHS) and is available to the public on the CDC website.

The NCHS has conducted the NAMCS annually since 1989 to collect data on the utilization and provision of ambulatory care services in hospital emergency and outpatient departments. The survey was created to answer questions that are relevant to health care policy-makers, public health officials, and researchers. The results of the survey can influence the use of health care resources and quality of health care, and identify disparities in health care services provided to the public.

Study Population

The primary sampling unit (PSU) of the 2010 NAMCS is the physician-patient interaction (PPI) in office-based patient care settings, as defined by the American Medical Association (AMA) and the American Osteopathic Association (AOA). Visits to offices of physicians that are employed by the federal government, visits in hospital settings (unless the practice is located within a hospital), visits made to institutional settings by physicians to patients for whom the institution has primary responsibility over

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time (such as nursing homes), and visits made for administrative purposes were excluded, including physicians specializing in anesthesiology, pathology, and radiology. Visits by patients who cancelled or who did not show up for their schedule appointment was also not included. Both scheduled and unscheduled PPIs were included. For more information, visit: http://www.cdc.gov/nchs/ahcd.htm.

For this study, PPIs between primary care physicians and their patients are used in the analysis. Only PPIs featuring the interaction between the main primary care provider and the patient (including but not limited to specialties in pediatrics, family practice, internal medicine, obstetrics and gynecology) were included. Physicians who did not report a response under the question of whether they used e-consults are omitted from the final analysis. In addition, children under the age of 1 and those who spent 0 minutes with the PCP were omitted from the final analysis. Due to the sampling method of the NAMCS, results can be generalized to interactions between primary care physicians and their patients practicing within the United States.

Sampling Method

For the NAMCS, the samples were randomly selected through three stages involving probability samples of PSUs, physician samples, and patient visits within practices. In the first stage, 112 geographic segments composed of counties, groups of counties, towns and townships within the 50 States and District of Columbia were randomly sampled. The second stage included a probability sample of practicing physicians who are members of the AMA and the AOA. Physicians were placed into 15 categories based on their specialty: general and family practice, osteopathy, internal medicine, pediatrics, general surgery, obstetrics and gynecology, orthopedic surgery,

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cardiovascular diseases, dermatology, urology, psychiatry, neurology, ophthalmology, otolaryngology, and all other specialties. The third included the selection of patient visits within the selected and participating practices of physicians. Trained interviewers visited the physicians who agree to participate in the survey and provide instructions to complete the surveys. The physician sample was divided into 52 random subsamples and each was assigned a number from 1 to 52, corresponding to the week in the survey year. Thirty PPIs were randomly selected by the physician during the selected reporting week.

The HIPAA Privacy Rule permits the disclosure of protected health information without patient consent to researchers as long as they are approved by an Institutional Review Board (IRB). Patients are notified and aware that their health data may be used for research and/or public health purposes. The Census Bureau staff collected the data for NCHS. Patients signed an affidavit notifying them of the Privacy Act, the Public Health Service Act, and other laws that require the protection of data. The NAMCS has been consistent in protecting patient information. Patients were not contacted by the NCHS during data collection. No personal identifiable information was released and physicians had the option for selecting "N/A" as a response. The survey under the Public Health Service Act (42 USC 242m) assures the confidentiality of the data collected.

The IRB at the University of Connecticut Health Center determined that this secondary analysis was not human subjects research and there was no HIPPA risk. The dataset was downloaded from the CDC Website and analyzed using Statistical Analysis System (SAS) Software (SAS Institute Inc., 2010).

Data Collection

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This study analyzed data from the Physician Induction Interview Form and Patient Record Forms A and B of the 2010 NAMCS. The Physician Induction Interview Form was administered to sampled physicians to determine characteristics of physician practices. The Patient Record Forms was used to measure the characteristics of patients who visit the office or practice of the corresponding physician during the target study period. The data forms were completed either by the physician or the physician's staff, or by Census field representatives. Each patient form represents an interaction between the health care provider and the patient.

Patient Record Forms were filled out in accordance to each interaction while the Physician Induction Interview Form was filled out at the point when the practicing health care provider consented to participate in the NAMCS surveillance program. As a result, the variables measured by the Physician Interview Form (practice characteristics) apply to all of the patients seen by that physician. Variables that were determined by the Patient Record Forms (patient characteristics) vary by patient, even though they came from the same health care provider.

The dependent variable, use of e-consults, was based on responses to a question in the Physician Induction Interview Form (see Figure 1). While the answer to the question is measured in counts, for this analysis the variable was categorized into those who reported use internet/email consults and those who did not.

The first part of the analysis focused on whether characteristics of the physician's practice were associated with the use of email consults and to what extent. The variables analyzed included the type of office setting and the amount of time to get an appointment

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for a routine medical exam. These variables were chosen because the type of practice can influence a PCP's preference for the use of electronic consults. The Physician Induction Interview Form measurement of the type of office setting in which the PCP practices (see Figure 2a) included private practice, freestanding clinics, community health centers, hospital outpatient centers, and others. For the analysis, responses of nonfederal government clinic, family planning clinic, and faculty practice were recoded as 'other.' In order to determine the amount of time to get an appointment for a routine medical exam, the Physician Induction Interview Form (Figure 2b) asks, "On average, about how long does it take to get an appointment for a routine medical exam?" Responses to this question include "within 1 week," "1-2 weeks," "3-4 weeks," "1-2 months," "3 or more months." Responses "doesn't provide routine medical exams" or "does not know" were recoded as missing data.

The study also assessed whether the characteristics of the physician's patient(s) also helped predict physicians' use of e-consults and to what extent. These characteristics include: the median household income in the patient's zip code, percentage of adults with a bachelor's degree or higher in the patient's zip code, reason for the patient visit, method of payment, and age of the patient. These variables were chosen because they may be related to the patient's access to a PCP who may use e-consults. The zip code of the patient was recorded on the 2010 NAMCS patient record form (Figure 3a) and used to determine the median household income within the geographical area. As shown in Figure 3c, the response categories for the major reason for the patient's visit include: new problem onset within 3 months, routine chronic problem, flare-up chronic problem, pre/post-surgery, and preventive care. Figure 3b shows that the sources of payment for

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the visit include: private insurance, Medicare, Medicaid. Other categories such as worker's compensation, self-pay, and no charge/charity and unknown recoded as 'other.' Age of the patient was derived from the patient's date of birth (Figure 3a).

The analysis also sought to determine whether time spent with the primary care provider was associated with the use of e-consults (Figure 4). In the survey, the responses to this question ranged from zero (if no provider was seen) to as much as two hours. For this analysis, responses to this item that were 0 were excluded. It is assumed that the value given is an estimate of the amount of time that the patient actually spent with the provider. The variable is recoded into five categories: 1-15 minutes, 16-30 minutes, 31-45 minutes, 46-60 minutes, and 60 or more minutes.

Statistical Analysis

Odds ratios were calculated to determine the odds of patients having access to a PCP who uses e-consults. In order to determine statistical significance, each category for each independent variable was compared to all other categories combined and a chi square test was conducted. All patient variables were recoded into dichotomous variables and two by two contingency tables were constructed for each one. Odds ratios were calculated to determine the correlation of those variables to the use of e-consults. In order to determine statistical significance, each category for each independent variable is compared to all other categories combined and a chi square (χ^2) test is conducted.

The relationship between time spent with the physician and physician use of e-consults was analyzed using the chi square (χ^2) test. An analysis was conducted to measure the mean time of the interaction between the health care provider and the patient

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while adjusting for type of office setting, amount of time required scheduling an appointment, income levels within the patient's zip code, method of payment, age of the patient, and the reason for the visit. In order to account for the probability of a type I error due to multiple testing, a Bonferroni-corrected P value (0.05/n), where n equals the number of indicators, was used to test for significance.

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Results

A total of 9,115 (29.2%) physician-patient interactions (PPIs), out of 31,229 potential samples in the dataset, were analyzed in this study. Out of 31,299 PPIs in the dataset, 19,914 PPIs (63.8%) were excluded because they were not the patient's primary care physician. One thousand three hundred and forty six PPIs (4.3%) were excluded because physicians did not respond whether they used e-consults or not. Eight hundred fifty four PPIs (2.7%) were excluded because patients did not spend any time (0 minutes) with the physician. Eight hundred forty five PPIs (2.8%) were excluded because patients were under the age of 1. Of the PPIs remaining in the analysis, 10.6% involved with a PCP who used e-consults as a form of communication in his/her office practice (n=962).

Physician Practice Characteristics

Approximately two-thirds (65.9%) of the PPIs occurred in private practices. Federally Qualified Health Centers account for 25.4% of all PPIs that occurred in office settings. Other office settings included freestanding clinics (3.7%), family planning clinics (0.2%), nonfederal government clinics (0.5%), and faculty practices (0.4%). Health Maintenance Organizations (HMOs) accounted for 3.8% of the PPIs.

In 2010, the majority (78.4%) of PPIs took place in non-solo practice settings, and only 21.5% took place in solo practice settings. More than half (54.3%) of PPIs had a short wait time (within 1 week) for an appointment for a routine medical exam. Another 28% waited only one to two weeks to see their PCPs. Less than five percent had wait times longer than one month.

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A majority of PPIs featured patients who paid for their health care with private insurance, Medicare, or Medicaid. The largest percentage (45.2%) of patient interactions in this study was covered by private insurance. Almost one-fifth (23.3%) of the PPIs were covered through Medicaid and 17.3% through Medicare.

Patients whose major reason for seeing the PCP was the development of a new problem within the past three months made up 40.0% of the sampled PPIs. Patients seen for preventive care made up of 27.1% of the sampled PPIs, and visits due to a chronic problem made up of 23.8% of all PPIs. Other reasons included flare-ups to a chronic problem (6.8%) and pre/post-surgery visits (1.2%).

On average, PCPs in the 2010 NAMCS reported that they spent 19.99 minutes (standard deviation: 11.11) in face-to-face interactions with their patients. However, the skewness statistic of the data occurs higher than 1 (5.494), implying that the data were not normally distributed (Figure 5a). In order to normalize the data, a linear log transformation of the raw values was conducted and used in the analysis to predict length of time in face-to-face visits(Figure 5b).

Physician Practice Settings

The type of practice setting was associated with the likelihood that a PCP would report the use of e-consults ($\chi^2(6)$, $p<0.001$). When compared to other groups combined, PCPs who worked in HMOs were most likely to report use of e-consults ($\chi^2(1)$, $p<0.001$); more than half of PPIs (60.6%) occurring within HMOs featured PCPs who used e-consults. Less than one percent of PPIs at free standing clinics that were not part of hospitals or outpatient departments occurred with a physician who used e-consults to

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communicate with their patients ($p<0.001$). Less than five percent (4.7%) of PPIs occurring at a Federal Qualified Health Center featured physicians who communicated with their patients through e-consults ($p<0.001$). There was no statistical difference between solo and non-solo practices in the probability that a PPI featured a PCP who used e-consults ($p=0.11$).

The length of time to get an appointment for a routine medical exam was associated with the use of e-consults by PCPs ($\chi^2(4)$, $p<0.001$). Practices that averaged three or more months of waiting time for a routine exam were more likely to use e-consults between patients and PCPs ($\chi^2(1)$, $p<0.001$). Conversely, practices averaging three to four weeks for appointments were less likely to use e-consults ($\chi^2(1)$, $p=0.020$). Patients who waited more than a month experienced a significant increase in access to physicians who used e-consults.

Patient Characteristics

The method of payment was associated with the use of e-consults ($\chi^2(8)$, $p<0.001$). When compared to the rest of the sample, PPIs that featured patients whose visit was covered by private insurance were associated with a physician practice that uses e-consults ($\chi^2(1)$, $p<0.001$). The use of electronic consults as a form of electronic communication by a PCP with their patient occurs less often if Medicaid was used to pay for the PPI ($\chi^2(1)$, $p<0.001$).

Median household income of the patient's zip code was also associated with the use of e-consults ($\chi^2(3)$, $p<0.001$). As shown in Table 5, 9.3% of PPIs with patients who lived in an area where median income was between $32,794 and $40,626 had access to a

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PCPs who used e-consults ($\chi^2(1)$, p=0.04). Patients living in an area where median income exceeded $52,388 were most likely (13.4%) to have access to a PCP who used e-consults ($\chi^2(1)$, p<0.001). Slightly more than one in ten (10.4%) of PPIs with patients whose zip code was located in an area where median household income was below $32,793 had PCPs who used e-consults.

The major reported reason for the patient visit was associated with the use of e-consults by PCPs ($\chi^2(4)$, p<0.001). Patients seen for a new problem that developed within the last 3 months, were significantly more likely to have a PCP who used e-consults. ($\chi^2(1)$, p=0.024). PPIs featuring patients who had a chronic problem and made routine visits to the doctor were least likely to occur with PCPs who uses e-consults ($\chi^2(1)$, p<0.001).

Contrary to expectations, age of the patient was not associated with physician use of e-consults (df=5, p=0.36).

Use of Electronic Consults and Time Spent with the Physician

Only 8.4% of PPIs involving 15 minutes or less in face-to-face time occurred with PCPs who used to e-consults. Patients who spent 16-30 minutes and 31-45 minutes were significantly more likely to have PCP who used e-consults (12.7% and 16.2% respectively).

The distribution of the variable measuring time spent face-to-face between a physician and his or her patient was skewed to the right. As a result, a linear log transformation was calculated from this variable to establish a parameter that was distributed normally. With the use of e-consults as the dependent variable, and

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controlling for type of office, the length of time required to wait for a scheduled appointment, the method of payment by patients, patient's income, major reason for visit, and age, the mean time spent with patients was found to be significantly different between the two groups ($p<0.001$). These values remained statistically significant after meeting the Bonferroni-corrected threshold of significance ($p<0.0071$). But the r^2 value demonstrated that the use of e-consults accounted for less than one percent of the difference in the length of visits. The major reason for the visit accounted for two percent of the difference. The median household income at the patient's zip code was not associated with a significant difference in the time spent with the provider ($p=0.63$). Overall, the average time that a PCP who used e-consults spent interacting with his or her patient was 1.6 minutes higher than a PCP who did not. PPIs that featured a PCP who used e-consults averaged 20.3 minutes, while PPIs that featured a PCP who did not use e-consults averaged 18.7 minutes. A t-test was conducted and detected a significant difference in the average of the time the patient spent with his or her PCP according to the use of e-consults ($p<0.001$).

In summary, PCPs were more likely to use e-consults to communicate with their patients when they were worked in HMOs and when they worked in practices that experienced three or more months wait time for a routine exam. PCPs were also less likely to use e-consults when they worked in free standing clinics that were not part of a hospital or an outpatient department. PCPs seeing patients covered by private insurance were more likely to use e-consults. Contrary to the recommendations in the literature, patients routinely visiting their PCPs for chronic problems were less likely to have access to PCPs who used e-consults. There was no correlation between access to a PCP who

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used e-consults and patient age and median household income of patient's home zip code. There was a significant difference in the time spent in face-to-face visits and the use of e-consults at the physician's practice, but high variability was detected in the amount of time.

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Discussion

The purpose of this paper was to look at extent in which e-consults were used in primary care practice and with patient characteristics. The secondary analysis of the 2010 NAMCS found that 10.6% of PPIs featured PCPs using e-consults with patients and detected a significant difference in the time spent face-to-face between patients and their PCPs (20.3 minutes for PCPs who use e-consults vs. 18.7 for PCPs who do not). After controlling for the type of office, the length of time required to wait for a scheduled appointment, the method of payment by patients, patient's income, major reason for visit, and age, this analysis showed that the mean time spent with patients remained significantly different between the physician practices that used e-consults and those that did not. However, the use of e-consults accounted for less than one percent of the difference in time spent in face-to-face visits. Findings also reported that e-consults were most likely to be used in HMO practices and practices that featured long patient wait times for an appointment for a routine medical exam. Physician use of e-consults was more frequently found when patients were being seen for a new health problem that occurred within the past 3 months and with patients who use private insurance. Contrary to expectations, age and income did not demonstrate any association with the use of e-consults.

The rate of e-consult use in primary care corresponds to other published research. In the Health Information National Trends study, 10% of internet users in 2003 and 2005 reported that they communicated with their PCP through the use of electronic consults (Beckford, et al., 2007). This value is considered low when compared to other adopted health technologies, such as EMR/EHR, use of office scheduling programs and

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population data management. In addition, since the post baby boomer generation are the main users of digital communication and are not likely to seek health care, and current health seekers lack literacy in technology, health care providers might be delaying the application of e-consults in their practices. Other explanations include a lack of a standardized reimbursement program, concerns of legal liability, and resistance to change in business models.

This study reported survey findings from 2010. However, the rapid adoption of information technology has dramatically increased in the years that followed, particularly in health care. In addition, due to the use of internet based insurance exchanges, the U.S. government has provided a form of infrastructure (in addition to EMR/EHR systems) that allows easy adoption of e-consult systems in health care practices. Current adoption trends of e-consults may be attributed to the fact that there are less individualized practices as the shift to health care based systems are expected. The need to communicate with different practices and networking systems creates a need for adoption of e-consults in primary care practices.

The increase in time spent face to face between PCPs and their patients may be attributed to many different factors. It is possible that physicians who use e-consults may receive new patients and the time that it would take for an initial exam would be disproportionately higher. Furthermore, since e-consults could be used to monitor patients or provide prescription instead of having the patient come into the office, short visits are probably less likely to occur. In addition, since e-consults allow PCPs to gather information prior to the face-to-face encounter, PCPs may develop more comprehensive questions for the patient or have a predetermined agenda which could lead to longer face-

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to-face times. For instance, appointments with patients experiencing new symptoms throughout the day can possibly result in an increase in the average amount of time that physicians spend with each patient.

System based practices (where large numbers of physicians are employed) usually have the infrastructure that allows physicians to access to resources that provides technological support during the delivery of health care. For instance, a comprehensive EMR/EHR system is usually a vital tool in systems based practices. In addition, physicians practicing in group style practices (HMOs, FQHCs, non-solo practices) enjoy a flexible schedule while physicians in solo practices are not able to spend too much time continuously on email responses (Mu, 2012). Nevertheless, as the shift to systems based practices occurs due to the change in health care policies are implemented, it is expected that use of e-consults may increase in the near future.

Although HMOs account for less than 4% of the sampled data, it demonstrates the highest rate of e-consult use by PCP. According to the Kaiser Family Foundation (2013), HMOs offer health care coverage for services with specific providers using a fixed payment structure. HMO plans are extremely diverse. Physicians are often salaried if they work for HMOs, thus removing the concern on reimbursement for using e-consults. As new applicants in HMOs are required to choose a physician from the HMO network as their primary care provider, many PCPs in the network may offer e-consults as a form of initial contact. These are motivational factors that may contribute to the increase in the use of e-consults. Many HMOs are employer based insurance and many patients are salaried employees. In order to create an efficient business model, employers may encourage certain insurance plans to cover e-consults so that their employees can avoid

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missing a work day and communicate digitally with their PCPs. HMOs operate as system based practices, which requires that PCPs network with other health care providers thus providing infrastructure for the adoption and use of technology in the delivery of health care.

Physicians are not likely to use e-consults if their workplace do not support it or do not have the funds to implement it. For instance, the likelihood of adopting EHRs in most community health centers and FQHCs depend on public funding (Centers for Medicare and Medicaid, 2013). Unavailable costs to implement an electronic communications system might result in a lack of resources to teach patients and train physicians on the use of e-consults. Maintenance costs and annual upgrades on equipment must be taken into account when computers and other forms of technology becomes part of annual budgets for all types of businesses. However, in a study of a rural underserved area, telemedicine (a form of e-consult) was estimated to considerable economic savings of over $150 per patient visit when screening costs, travel, work-time missed, overhead, and billing considerations were taken into account (Richardson, Fry, & Krasnow, 2013), presenting a possibility that e-consults could offset the costs by providing economic benefits in the long run. High turnover rates in health centers may also contribute to the low frequency of e-consult use by PCPs. Physicians often use e-consults to establish a relationship with their patients, but if physicians are unable to do so, they see no need for an e-consult system. The fear of legal liability and data mismanagement may also prompt health centers to alter their policy to restrict the use of e-consults in the practice of health care.

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Physicians in community health centers and FQHCs are less likely to use e-consults, primarily due to the needs of the population that they serve. Community health centers and FQHCs typically serves patients who face employment issues, poor nutrition, poor living conditions, poor chronic illnesses, uninsured, and high exposures to risk factors (Department of Health and Human Services, 2013). Essentially, community health centers and FQHCs treat patients who are disproportionately poor and are likely to be covered under Medicaid. These patients may present more complex health problems that require being seen instead of using telemedicine or other forms of digital communication. Nevertheless, popularity of smart phones, and the inclusion of internet access as vital utility allows poorer patients to access e-consults (Brenner, 2013), although this does not provide a solution for low health literacy. Overall, physicians are hesitant to provide advanced forms of health care (such as e-consults) if the patient faces a steep learning curve. Since health centers target a disproportionately poor population, using e-consults may not be the appropriate approach to delivering high quality of care. (Zach, Dalrymple, Rogers, & Williver-Farr, 2012).

Reimbursement for using e-consults remains a significant concern for many physicians, particularly those in primary care. Some private insurances plan may allow physicians to be reimbursed for their use of e-consults particularly for long-term care and community health providers (Robert J. Waters Center for Telehealth & e-health Law, 2011), which may explain why patients with private insurance are more likely to see a PCP who uses e-consults. Private insurance may also seek to provide innovative approaches in delivering health care as a way to increase its customer base. E-consults may be offered for younger patients who may not even see their PCP that frequently as a

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way for insurance companies to mitigate costs that are deemed unnecessary. For instance, a PCP may receive incentives to use e-consults so that they can dedicate more time to deliver health care to patients facing more complex illnesses. This may lead to an overall increase in quality of care provided, which may result in increased profits for insurers. Overall, a consistent, comprehensive, reimbursement program could result in the widespread embrace of electronic communication systems in health care (Robert J. Waters Center for Telehealth & e-health Law, 2011).

Older patients are used to contact via mail or telephone, thus PCPs may be more inclined to use this method to facilitate communication. However, this study shows that elderly patients and those who pay with Medicare are not significantly different from other populations groups. In fact, Medicare reimbursement has been approved for e-consult services in remote patient face-to-face services via live video conferencing, non-face-to-face services that can be conducted either through live video conferencing or via store and forward telecommunication services, or home telehealth services (American Telemedicine Association, 2013), thus driving some PCPs to provide e-consults in their practice. Older individuals may communicate with their PCPs more often, however, due to scheduling efforts, prescription refills, or monitoring of vitals (Cresci, Yarandi, & Morrell, 2010). It is possible that these types of practices in health care are associated with an increase in the usage of e-consults. Nevertheless, the perception that elderly patients are not literate in the use of electronic devices may result in the reluctance of PCPs using e-consults with patients covered under Medicare.

High patient queues may push health care providers to use e-consult to communicate with patients because it is stored with the date and time and provides easy

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access to the messages that are being exchanged. For instance, telemedicine has been used to manage patient queue in a high volume health care setting. According to a study known as the Emergency Department Telemedicine Initiative to Rapidly Accommodate in Times of Emergency (EDTITRATE), telemedicine improved time-management and efficiency but managing the workflow was challenging (Guss & Tolia, 2013). Patients who have not seen their PCP in an extended amount of time may seek multiple avenues to reach out to their health care provider. By providing e-consult services, such as e-mail, physicians are able to provide a communication avenue that allows patients to set up appointment and ask prescreening questions and physicians are better prepared for the examination.

Many studies have concluded that e-consults are an effective tool in treating patients with chronic illnesses due to the ability to communicate daily, provide motivation, and data collection. Wan and his colleagues (2012) have argued for the use of electronic communication as a monitoring system for chronically ill patients. A research study on diabetes patients who had access to e-consults (program known as the Diabeo system) were found to be related to significant improvements in blood sugar level (Franc, et al., 2013). However, this study found that patients making visits for routine chronic problems were least likely to be seen by a physician who reported using e-consults. It is possible that since a persistent chronic problem requires constant communication between the health care provider and the patient, both parties see each other enough such that the use of e-consults were not perceived as being needed. Nevertheless, as scientific literature demonstrates the association of improvement in chronic care management and

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the use of e-consults, more physicians will accept this as a practical and cost effective approach to patient communication.

There are several limitations to this study. This study is a secondary analysis and the data have been collected for a different purpose. The NAMCS is a national survey designed to meet the need for objective, reliable information about the provision and use of ambulatory medical care services in the United States. Even though information was collected about physician use of electronic consultation, it was not designed to examine that practice in depth. The face-to-face visit time measurement in this study demonstrated high variability and skewness of the data. Even after normalizing the frequency distribution, the findings are difficult to interpret due to the use of recoding the raw values. In addition, frequency of time measured increases in 5 minute intervals, suggesting that physicians may be estimating the time when filling out the survey. Because the difference in the time measured is 1.6 minutes, the validity of the actual difference is in question.

Another weakness to this study is the broad definition of the term "electronic consults". This term might refer to the use of electronic mail, patient portals, tele-health, and other modes of communication. The practical use of e-consults also varies greatly among physicians. It does not guarantee that the physician used e-consults with each patient sampled. The same physician data applies to multiple patient visits. For instance, patients under a single physician share the same characteristics in terms of physician specialty, ownership, and other variables. Physicians may report using e-consults in their practice but this does not translate to using e-consults with all their patients. This study identifies the characteristics of physician practices and patient characteristics that are

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most likely to report access to e-consults. Nevertheless, the many different types of e-consults may confound the results of this study.

While the results of this study suggest that PCP practices that use e-consults associated with an increase the amount to face-to-face time, it is not possible to determine if there is a casual relationship between these variable. Since this is a cross-sectional study, it is difficult to establish causality. The amount of time spent with physicians face-to-face may be due to the patient's condition or preferences, and the use of e-consults may be due to the same practice factors.

Although practices that reported use of e-consults had longer patient time with the physician, this analysis of the NAMCS data cannot determine if the use of e-consults is associated with higher quality of care. Further research is recommended to further analyze the conditions under which e-consults are used and their effectiveness in improving patient care and outcomes. One method to begin assessing this question could be the use of focus groups. Surveys that compare those physicians who use e-consults and those who do not to measure patient perceptions regarding the quality of care (e.g., health outcomes, patient satisfaction) is another plausible and inexpensive method. Another approach would investigate quality measures before and after the implementation of e-consults to establish whether introduction of that method of doctor-patient communication impacted quality of care and outcomes. This type of study might provide support for the implementation of e-consults in practice as long as the data show that the use of e-consults did lead to better quality of care.

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The use of electronic consults remains at a low level despite the rapid advances of electronic technology applications in medicine. There are issues in regards to the use of electronic consults between PCPs and their patients. It is a vital element of medical practice to ensure that patient privacy is protected. Nothing ensures privacy as much as the traditional practice of disseminating information face-to-face behind closed doors at the PCP's office. However, with the support of a secure EHR system, health care providers should begin to consider the use of electronic consults when communicating with their patients outside the office (Bashur, 2013). This represents an opportunity for improvement as the Affordable Care Act implements universal coverage particularly for younger Americans. Physicians seeking to reach out to a younger population group are more likely to use e-consults due to the acceptance of technology in the post baby boomer generation.

As medical care become more technology sophisticated, patients may begin to request receiving health-related messages through the use of e-mails or other forms of electronic communication (Nijland, vanGermert-Pijnen, Boer, Steehouder, & Seydel, 2009). Traditional face-to-face encounters will likely remain the cornerstone of health care delivery, but changes in reimbursement policies may create financial incentives for PCP to embrace electronic communication with their patients (Fortney, Burgess, Bosworth, Booth, & Kaboli, 2011). Furthermore, increased demand for health care due to implementation of universal health care coverage may encourage a shift to the use of electronic communication as an effective means to accommodate the expected increase in patient traffic.

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As the frequency in internet usage increases with time, one can expect the number of subscribers to electronic communication media to increase. According to the Pew Research Center, ownership of cellphone usage increased from 73% in 2006 to 91% in 2013 (Brenner, 2013). In 2013, 63% of adult cell owners reported that they use their phones to access the internet. With 3G access and free wireless hotspots, more people are connected to the internet infrastructure. Expectations of an electronic communication system in health care will continue to take shape if people demand it. Health care professionals should take the initiative to meet those growing demands and invest in an effective and secure communications system.

More research is needed to understand the conditions under which e-consults are used and their effectiveness in improving patient care and outcomes. Literature review has shown support for adopting electronic consults as a method of improving quality of health care and management of chronic diseases. However, according to the secondary analysis, only one-in-ten primary care practitioners reported using e-consults, which demonstrates that there is a potential for PCPs (particularly younger physicians) to take advantage of innovative techniques in delivering care. The findings suggest that the existing infrastructure of the medical practice and main population clientele are key drivers of whether a PCP uses e-consults in his or her practice. The analysis did indicate that PCPs who use e-consults did spend longer face-to-face time with their patients, after controlling for certain practice and patient characteristics, but the variability of the time variable questions the validity of the findings.

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Appendix

Table 1: Physician Office & Patient Characteristics	
Characteristic	Description
Use of electronic consults	Includes telemedicine, electronic messages (e-mail), patient portals, test messaging, and other forms of electronic communication beyond the use of a telephone to communicate with patients outside the physician's office. This variable is the independent variable.
Type of Office setting	Office settings has shown to be associated with the use of electronic consults (Mu, 2012)
Time to get an appointment for a routine medical exam	E-consults may be used to maintain communication with patients whose primary care provider
Median household income in patient's zip code	The assumption of the digital divide creates an assumption that populations of low socioeconomic are more likely to lack access to electronic consults (Zach, Dalrymple, Rogers, & Williver-Farr, 2012).
Major Reason for visit	E-consults may be used to maintain communication with patients who are seeking initial contact with their primary care provider. Literature supports the use of e-consults for chronically-ill patients (Holland, 2013)
Method of Payment	Payment methods has shown to be associated with the use of e-consults (Mu, 2012)
Patient's age	Due to the digital divide, elderly patients are not as likely to use e-consults (Cresci, Yarandi, & Morrell, 2010). However, literature has shown that e-consults are increasingly being used in elderly population as a form of monitoring chronic conditions, consultation without limiting factors (transportation, time ECT), and cost-effectiveness (Esterle & Mathieu-Fritz, 2013).
Time spent face-to-face between primary care provider and patients	E-consults have shown to be effective in the maintenance of patient queue, eliminating unnecessary costs and restrictions (data management, transportation ECT) and time management (scheduling) (Gorden, 2003). In physician-patient interactions, more time spent face-to-face may be associated with the use of e-consults.

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Table 2: Physician-Patient Interactions by Primary Care Physician Characteristics, NAMCS, 2010 (N=9115)		
	N	%
Type of office setting		
Private practice	6,011	65.9%
Freestanding clinic	338	3.7%
Federally Qualified Health Center	2,318	25.4%
HMO	350	3.8%
Other (Nonfederal government clinic, Family planning clinic, Faculty practice)	98	1.1%
Solo vs Non-solo practices		
Solo	1,962	21.5%
Non-solo	7,149	78.4%
Missing	4	<0.01%
Time to get an appointment for a routine medical exam		
Within 1 week	4,954	54.3%
1-2 weeks	2,549	28.0%
3-4 weeks	1,047	11.5%
1-2months	341	3.7%
3 or more months	103	1.1%
Missing	121	1.3%

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Table 3: Physician-Patient Interactions by Patient Characteristics: NAMCS, 2010 (N=9115)		
	N	%
Method of Payment		
Private insurance	4,122	45.2%
Medicare	1,580	17.3%
Medicaid	2,124	23.3%
Other (Worker's Comp, Self-pay, No charge)	923	10.1%
Missing	366	4.0%
Median household income		
$32,793 or less	2,208	24.2%
$32,794-40,626	1,936	21.2%
$40,627-52,387	2,150	23.6%
$52,388 or above	2,289	25.1%
Missing	532	5.8%
Major Reason for visit		
New problem (less than 3 months)	3,842	40.0%
Chronic problem, routine visit	2,168	23.8%
Chronic problem, flare-up	622	6.8%
Pre/post-surgery	110	1.2%
Preventative care	2,466	27.1%
Missing	107	1.2%
Patient's Age		
under 15 years	2,269	24.9%
15-24 years	811	8.9%
22-44 years	1,999	21.9%
45-64 years	2,513	27.6%
65-74 years	779	8.5%
over 75 years	744	8.2%

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Table 4: Physician Practice Setting and the Use of Electronic Consults: NAMCS, 2010[2]					
	N	% with	χ^2	p	OR[1]
Type of office setting					
Private practice	6,011	10.8%	1.40	0.23	
Freestanding clinic	349	0.9%	34.7	<0.001	0.07
Federally Qualified Health Center	2,318	4.1%	135.4	<0.001	0.30
HMO	350	60.6%	964.6	<0.001	16.42
Solo vs Non-solo practices					
Solo	1,962	9.6%	2.50	0.11	
Non-solo	7,149	10.8%			
Time for an appointment for a routine exam					
Within 1 week	4,954	8.6%	43.93	<0.001	0.64
1-2 weeks	2,529	12.4%	12.73	<0.001	1.30
3-4 weeks	1,047	9.6%	1.26	0.26	
1-2 months	341	15.8%	10.47	0.001	1.63
3 or more months	103	37.9%	18.54	<0.001	1.34

[1]Odds ratios define the likelihood to have access to a PCP who uses e-consult. Odds ratios are constructed when statistical significance is detected (alpha=0.05)

[2]Degrees of freedom for all variables are 1. This means that the category is compared to the combination of all other categories combined.

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Table 5: Patient Characteristics and Physician Use of Electronic Consults: NAMCS, 2010[2]					
	N	% with e-	χ^2	p	OR [1]
Median household income					
$32,793 or less	2,208	10.4%	0.10	0.75	
$32,794-40,626	1,936	9.3%	4.11	0.04	0.84
$40,627-52,387	2,150	8.0%	20.16	<0.001	0.67
$52,388 or above	2,289	13.4%	22.2	<0.001	1.46
Major Reason for visit					
New problem (less	3,642	11.6%	6.50	0.01	1.19
Chronic problem,	2,168	8.7%	10.16	0.002	0.76
Chronic problem,	622	11.6%	0.74	0.39	
Pre/post-surgery	110	9.1%	0.25	0.62	
Preventative care	2,466	10.9%	0.35	0.55	
Method of Payment					
Private insurance	4,122	12.4%	18.54	<0.001	1.34
Medicare	1,580	9.6%	1.77	0.26	
Medicaid	2,124	6.9%	33.81	<0.001	0.60
Patient's Age					
under 15 years	2,269	10.3%	0.26	0.61	
15-24 years	811	9.0%	2.27	0.13	
22-44 years	1,999	10.3%	0.17	0.71	
45-64 years	2,513	10.7%	0.08	0.77	
65-74 years	779	12.2%	2.43	0.12	
over 75 years	744	11.6%	0.87	0.35	

[1]Odds ratios define the likelihood to have access to a PCP who uses e-consult. Odds ratios are constructed when statistical significance is detected (alpha=0.05)

[2]Degrees of freedom for all variables are 1. This means that the category is compared to the combination of all other categories combined.

Table 6: Time Spent in Face-to-Face Interactions and Physician Use of Electronic Consults: NAMCS, 2010[2]					
	N	% with e-consults	χ^2	p	OR [1]
1-15 minutes	4867	8.4%	52.1	<0.001	0.61
16-30 minutes	3584	12.7%	28.7	<0.001	1.45
31-45 minutes	501	16.2%	17.7	<0.001	1.69
46-60 minutes	114	11.4%	0.1	0.767	
60+ minutes	49	10.2%	0.0	0.936	

[1]Odds ratios define the likelihood to have access to a PCP who uses e-consult. Odds ratios are constructed when statistical significance is detected (alpha=0.05)
[2]Degrees of freedom for all variables are 1. This means that the category is compared to the combination of all other categories combined.

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Table 7: Analysis of Physician Use of Electronic Consults and the Average Time a Patient Spent with Provider: NAMCS, 2010.				
Source	df	F	p	Partial η^2
Model	35	12030.790	<0.001	.98
Type of office setting	6	5.808	<0.001	.004
Time to get an appointment for a routine medical exam	5	3.521	.004	.002
Method of payment	8	2.818	.004	.002
Median household income	4	.652	.63	.000
Major reason for visit	5	36.164	<0.001	.020
Patient's age	5	13.221	<0.001	.007
Use of electronic consults	1	32.169	<0.001	.004

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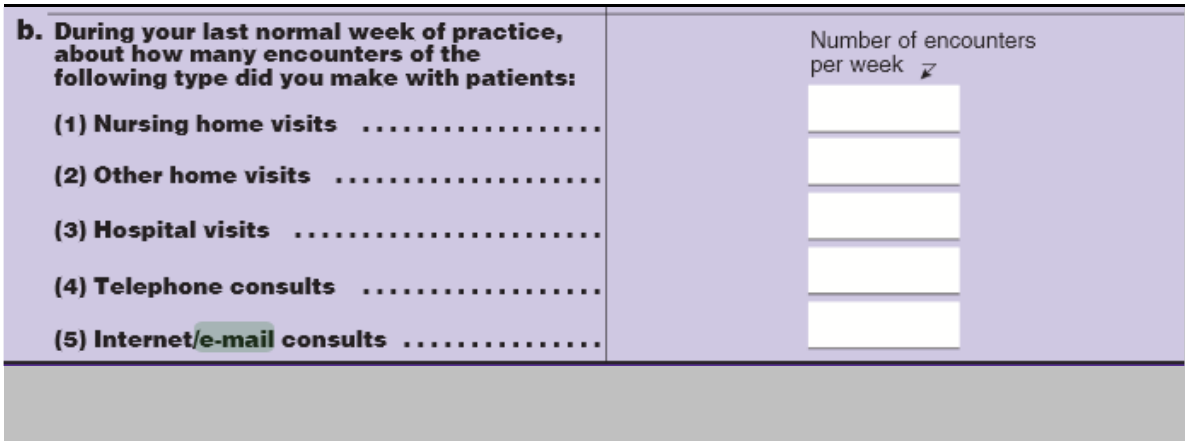
Figure 1: Use of Electronic Consults Variable[1]



Source: 2010 NAMCS Physician Induction Form

[1]Internet/e-mail consults variable is categorized into those who do use internet/email consults and those who do not .

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Figure 2: Type of Physician Practice Variable

a.[1]

16b. *Give FLASHCARD A (p. 15 Flashcard Booklet) and ask* ***Looking at this list, choose ALL of the type(s) of settings that describe each location where you work.*** *For each location mark all setting types that apply. For each location, also mark the appropriate "scope" status. If any even numbered settings are marked, then mark location as out-of-scope.*

FLASHCARD A

(1) Private solo or group practice	**(2) Hospital emergency department**
(3) Freestanding clinic/urgicenter (not part of a hospital outpatient department)	**(4) Hospital outpatient department**
(5) Community Health Center (e.g., Federally Qualified Health Center (FQHC), federally funded clinics or 'look alike' clinics)	**(6) Ambulatory surgicenter**
(7) Mental health center	**(8) Institutional setting (school infirma nursing home, prison)**
(9) Non-federal Government clinic (e.g., state, county, city, maternal and child health, etc.)	**(10) Industrial outpatient facility**
(11) Family planning clinic (including Planned Parenthood)	**(12) Federal Government operated clinic (e.g., VA, military, etc.)**
(13) Health maintenance organization or other prepaid practice (e.g., Kaiser Permanente)	**(14) Laser vision surgery**
(15) Faculty Practice Plan	

b.[2]

c. On average, about how long does it take to get an appointment for a routine medical exam?

1 ☐ Within 1 week
2 ☐ 1–2 weeks
3 ☐ 3–4 weeks
4 ☐ 1–2 months
5 ☐ 3 or more months
6 ☐ Do not provide routine medical exams
7 ☐ Don't know

Source: Physician Induction Form

[1]Reponses of nonfederal government clinic, family planning clinic, and faculty practice were recoded as other.

[2] Responses "doesn't provide routine medical exams" or "does not know" were recoded as missing data.

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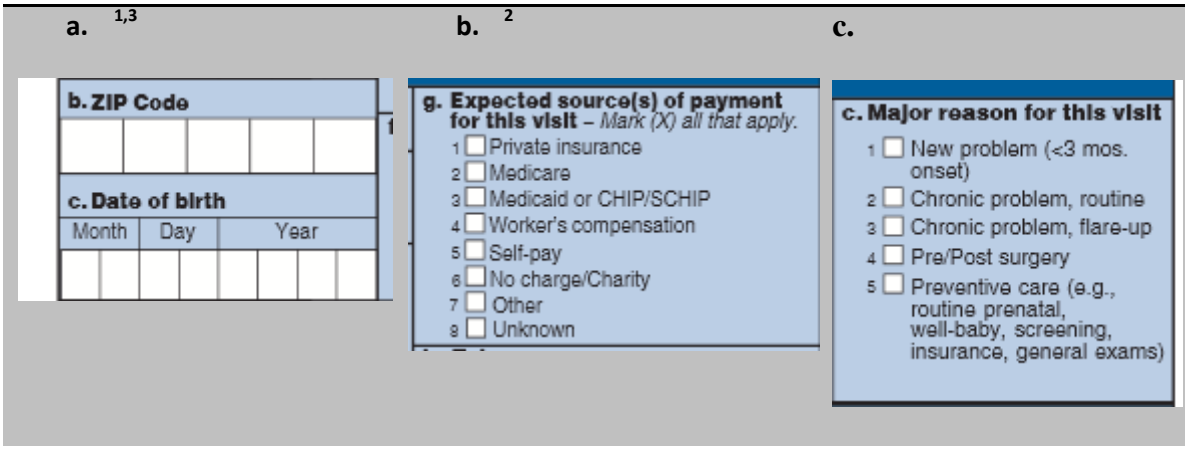
Figure 3: Patient Characteristics Variables



Source: Patient Record Form

[1] The zip code of the patient is used to determine the median household income

[2] Reponses of worker's compensation, self-pay, and no charge/charity, unknown are recoded as others.

[3] Age of the patient is derived from the patient's date of birth.

Figure 4: Fate-to-face time spent between physician and patient variable[1]

Source: Patient Record Form

[1]The variable is recoded into 4 separate categories: 1-15 minutes, 16-30 minutes, 31-45 minutes, 46-60 minutes, and 60+ minutes

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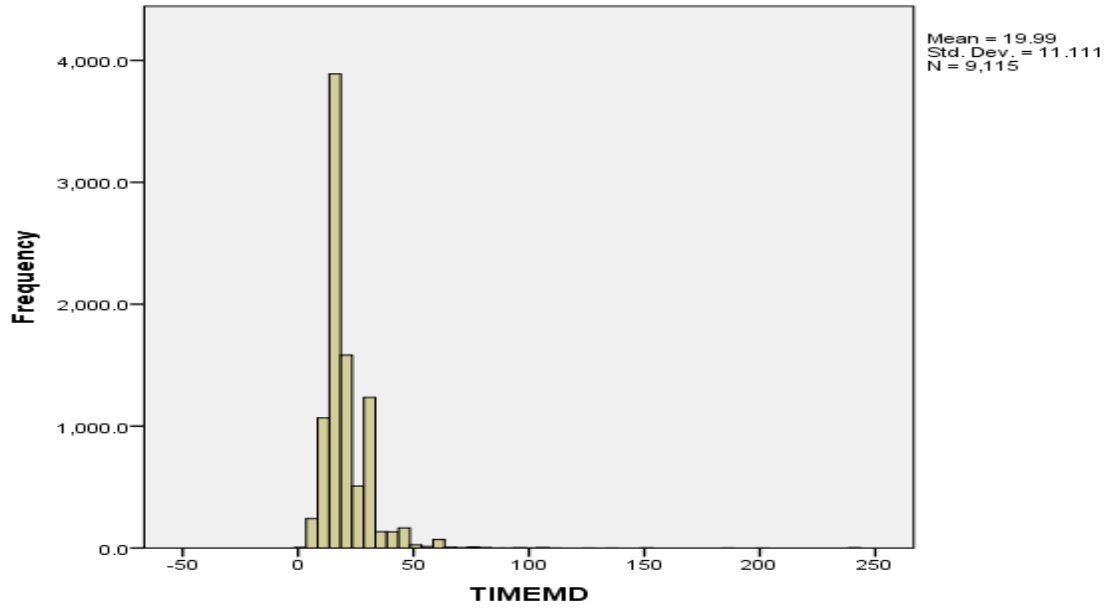
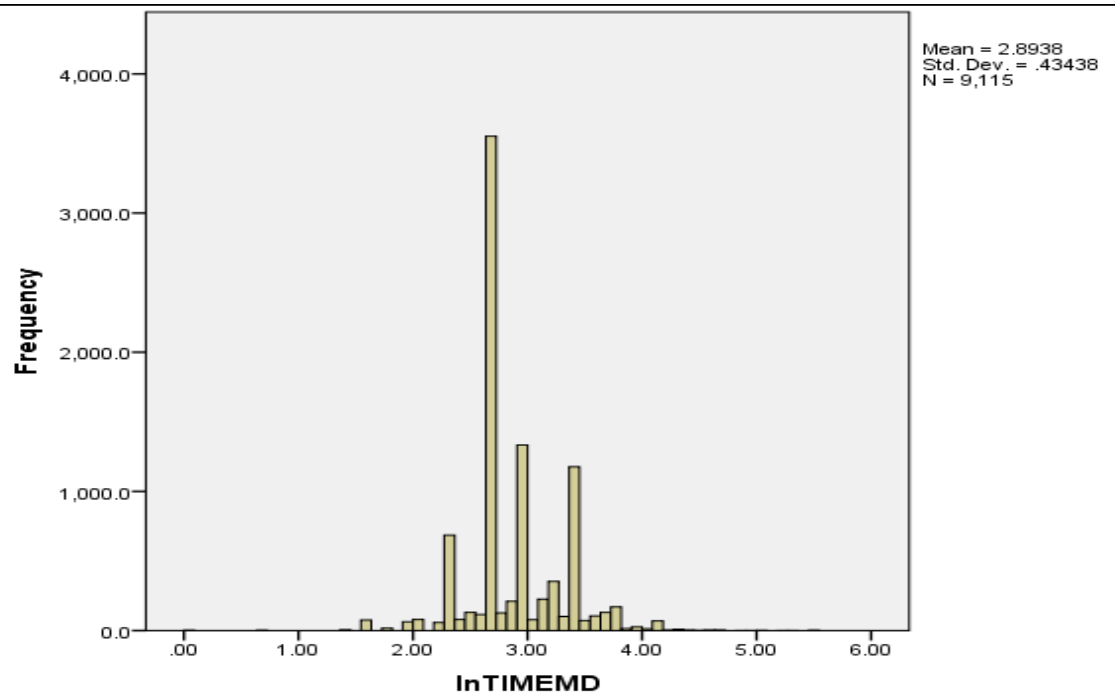
Figure 5: Frequency and Distribution of Face-to-Face Time between PCPs and Their Patients: NAMCS, 2010





[1]A frequency analysis of the time spent face-to-face (TIMEMD) demonstrates a skewness and high variability (S.D.=11.11). [2]The recoded varible (lnTIMEMD) shows the linear log transformation of the raw values of TIMEMD represents a normally distribution.

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