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Complexity of Medical Decision-Making in Care Provided by Surgeons Through Patient Portals

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Abstract

Introduction—Patient portals are online applications that allow patients to interact with healthcare organizations and information. Portal messages exchanged between patients and providers contain diverse types of communications, including delivery of medical care. The types of communications and complexity of medical decision-making in portal messages sent to surgeons has not been studied.

Materials and Methods—We obtained all message threads initiated by patients and exchanged with surgical providers through the Vanderbilt University Medical Center patient portal from June 1 to December 31, 2014. Five hundred randomly selected messages were manually analyzed by two research team members to determine the types of communication (i.e., informational, medical,

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Author Contributions:

GP Jackson conceived the work, reviewed data, supervised the project, and assisted in manuscript preparation. A Valentine assisted in data review and analysis. C Carney provided outpatient billing expertise for data analysis and interpretation. D Fabbri obtained the surgical message data. JR Robinson assisted in conception of the work, data analysis, and prepared the manuscript. All authors reviewed and approved the final manuscript.

Disclosures

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logistical, or social), whether medical care was delivered, and complexity of medical decision-making as defined for outpatient billing in each message thread.

Results—9,408 message threads were sent to 401 surgical providers during the study period. In the 500 threads selected for detailed analysis, 1,293 distinct issues were communicated, with an average of 2.6 issues per thread. Medical care was delivered in 453 message threads (90.6%). Of these, 339 (67.8%) of message threads contained medical decision-making. Overall complexity of medical decision-making was straightforward in 210 messages (62%), low in 102 messages (30%), and moderate in 27 messages (8%). No highly complex decisions were made over portal messaging.

Conclusions—Through patient portal messages, surgeons deliver substantial medical care with varied levels of medical complexity. Models for compensation of online care must be developed as consumer and surgeon adoption of these technologies increases.

Keywords

patient portal; health information technology; consumer health informatics; evaluation and management billing

Introduction

Patient portals are online applications that enable patients and their caregivers to interact with healthcare providers and view health information.[1–3] The United States government defines a patient portal as “a secure online website that gives patients convenient 24-hour access to personal health information from anywhere with an Internet connection.”[1] Implementation of patient portals by healthcare systems is increasing in response to consumer demand and government incentives such as the Meaningful Use criteria created by the Health Information Technology for Economic and Clinical Health (HITECH) Act.[4–8] Patient portals are typically managed by a healthcare institution and allow patients to have access to personal health information, including recent doctor visits, discharge summaries, medications, immunizations, allergies, and laboratory results. Most advanced portals enable patients to exchange secure messages with their providers, and secure messaging is one of the most popular functions of patient portals.[5]

Little research has focused on the classification or description of secure messaging through patient portals, and most prior work has been performed in primary care or medical specialty settings.[9, 10] North and colleagues manually classified 323 messages in the primary care setting at a large academic medical center, demonstrating that 91% of messages were related to the direct medical care of the patient, including medication, symptom, or test-related content.[9] Another study of 1207 patient portal messages sent to an adult multi-specialty neurology clinic revealed that 45% contained clinical questions, 35% consisted of administrative questions, and the remainder addressed refill requests or non-clinical issues. [11] A small mixed-methods study of veterans’ experiences using secure messaging in the My HealtheVet patient portal characterized 66 messages sent by 18 unique participants into four user-selected categories (i.e., general, appointment, medication, and test). Ninety-four percent of messages contained content from at least one of these categories, but patient-

chosen categories were found to be inconsistent.[12] One study of 3253 patient portal messages from a large academic medical center including all clinical specialties found that 72% involved medical needs or communications.[13, 14] It is unknown if these findings are representative of secure messaging content in acute care or surgical specialty settings.

Prior research has demonstrated that after broad deployment of a patient portal across clinical specialties, surgeons were the second most frequent specialty to participate in patient-provider messaging.[15] Further, messaging adoption by surgical patients and providers grew rapidly across surgical subspecialties.[16] Although providers conduct growing numbers of online encounters by exchanging messages with patients through such portals, the nature of such communications has not been analyzed for surgery.[16, 17]

Utilization of technologies has been proposed as a central method of optimizing performance and reducing costs of the healthcare system.[18, 19] Although the HITECH Act encouraged healthcare organizations to implement health information technologies such as patient portals, models for characterizing the utilization and evaluating the effectiveness of patient portals are lacking. As patient portal and secure messaging adoption increases, understanding the nature of portal messaging interactions and their implications for provider workload becomes important. With expanding integration of health technology into patient care and as payment models evolve, nonconventional forms of care must be identified and quantified to support potential reimbursement strategies. We therefore sought to characterize the types of communications in secure messaging, amount of medical care provided, and complexity of medical decision-making in the care delivered through patient portal messaging by surgical providers at an academic medical center to examine the potential for reimbursable care provided through portal messaging.

Materials and Methods

Setting

The study was performed at Vanderbilt University Medical Center (VUMC), a private, non-profit institution that provides primary and regional referral care to over 500,000 patients annually with over 900 inpatient beds and more than 1 million outpatient visits per year. VUMC consists of both Vanderbilt University Hospital (VUH), which cares for primarily adults, and Monroe Carell Jr. Children's Hospital at Vanderbilt (MCJCHV).

In 2005, VUMC launched a patient portal, My Health at Vanderbilt (MHAV), for adult patients and deployed the portal widely across all clinical specialties.[17] In 2007, accounts for pediatric patients and their parents or guardians were made available. MHAV provides a collection of common patient portal functions including access to selected portions of the electronic medical record, appointment scheduling, secure messaging with healthcare providers, account and bill management, and delivery of personalized health information. [20] Meaningful Use financial incentives have increased the national implementation of patient portals. Although many institutions have adopted patient portals to meet Meaningful Use criteria, MHAV was developed well prior to the American Recovery and Reinvestment Act of 2009, which created Meaningful Use, and has been promoted as a means of patient engagement since development. Secure messaging was a core function of MHAV present at

release and has been avidly adopted by MHAV users without any specific promotion related to Meaningful Use. MHAV has had stable overall patient adoption of 25–30% since 2010.

Secure messaging is one of the most utilized functions of MHAV, with patients sending over 32,000 new messages to VUMC providers each month.[21] Within MHAV, messages are directed to inboxes called *message baskets*, which may serve individual providers, specialty groups, or other clinical entities. These message baskets are typically managed by clinical care teams, which may include physicians, nurses, and allied health professionals within the same division, department, or other clinical unit. Each clinical unit routes incoming messages with a process tailored to align with specialty workflow and provider preferences. While some clinicians answer their own messages, others utilize support staff such as medical assistants or nursing personnel to triage messages and respond. The flexibility allowed in the management of portal secure messages was designed to encourage provider adoption and maximize the incorporation of the technology in varying medical settings.

Study Population

We examined all patient-initiated message threads sent to surgical providers at VUMC between June 1 and December 31, 2014. *Message threads* are collections of messages exchanged between MHAV users and VUMC healthcare providers (i.e., the initial message and all replies). *MHAV users* consist of VUMC patients who have registered for MHAV; individuals whom a patient designates to access MHAV on their behalf, termed *delegates*; and, parents or guardians who have access to their children's health information through MHAV, called *surrogates*. This study was approved by the VUMC Institutional Review Board.

Measures

For all message threads during the study period, we collected the initial message date, patient demographics (i.e., age, sex, and race), recipient provider, role of the message sender (i.e., self, delegate, or surrogate), receiving VUMC provider, and specialty of the recipient provider. The clinical specialty for each thread was determined by the specialty of the recipient. Surgical specialties reflected the departmental organization at VUMC and included 12 surgery specialties: general, vascular, oral, plastic, dermatology, cardiothoracic, urology, ophthalmology, otolaryngology, orthopedic, neurological, and all pediatric surgery. Each specialty consisted of all relevant subspecialty divisions. For example, general surgery included colorectal, trauma, hepatobiliary, kidney transplant, and surgical oncology. The research team assigned each MHAV message basket to one of the 12 surgical specialty categories enumerated above. Multidisciplinary and administrative VUMC message baskets that could not be assigned to a single specialty were excluded.

Analysis

We calculated the total number of message threads, patients using messaging, and recipient message baskets for each month of the study period. We constructed descriptive distributions and summary statistics of the demographics of the patients about whom messages were sent. Continuous variables were summarized with medians and inter-quartile ranges. Categorical variables were summarized as counts and frequencies. We explored differences in messaging

usage by surgical specialty. We determined differences in both the frequency of messages received between surgical subspecialties with and without accounting for the number of providers receiving messages within the specialty. This was performed in attempt to control for the number of providers per specialty, as some specialties are larger than others. All analyses were conducted in R version 3.0.1.[22]

Of the messages during the time period, 500 were randomly selected for detailed content analysis. Message content was classified using a validated consumer health taxonomy developed by the research team and is shown in Figure 1. This taxonomy has been employed to categorize questions from patient journals and patient portal messages, and it has been validated with inter-rater reliability of its application.[13, 23] The taxonomy can be applied to describe both consumer health questions (i.e., needs) and the answers to those questions (i.e., communications). The taxonomy provides a comprehensive model of the semantic types of consumer health information needs and communications and divides interactions into five main categories: informational, medical, logistical, social, and other. *Informational* needs are questions that require clinical knowledge, such as information about the side effect of a drug or the prognosis for a disease. *Medical* needs are requests for delivery of medical care, such as the expression of a new symptom requiring management or an inquiry about a test result. *Logistical* needs are requests for pragmatic information, such as the location of a clinic or the copy of a medical record. The *social* category includes personal communications such as an expression of gratitude or a complaint. The *other* category covers communications that are incomplete or unintelligible.

Portal messages can contain more than one type of need or communication. For each message thread, at least two members of the research team independently assigned all applicable categories. Discrepancies were discussed, and consensus was achieved.

Complexity of Medical Decision-Making Analysis

Within each thread, we determined the complexity of medical decision-making, one of the three defined elements of outpatient billing, according to the Center for Medicare and Medicaid Services (CMS) Evaluation and Management (E/M) guidelines (Table 1a).[24, 25] Complexity of medical decision-making is based upon three factors, including diagnoses, amount of data reviewed, and risk of complications (Table 1b). Each message thread was classified based upon these three criteria to determine the overall medical complexity. There is a point system to establish the level of diagnoses or management, with new problems or multiple ongoing established diagnoses receiving higher point values. Similarly, CMS has a point system for measuring the amount of reviewed data, with higher points for increasing complexity of data ordered or reviewed. Level of medical risk is determined by the highest level of risk in one of three categories: presenting problems, diagnostic procedures ordered, or management options.[25, 26] Calculation of the overall complexity of medical decision-making was performed by scoring each of the three categories separately (type and number of diagnoses, complexity of data elements, and medical risk). At least 2 of the 3 criteria must be met to qualify for a certain level of medical decision-making (Table 1b). Discrepancies in category assignments between coders were discussed to reach consensus.

Results

During the study period, 9,408 message threads about 9,259 unique patients were sent to 401 surgical providers. Patients about whom messages were sent were more likely to be female (5,319, 57%) and white (8,455, 90%) with mean age of 52.8 years (range: newborn to 98 years) as in Table 2. The distribution of ages of the patients is in Figure 2.

Individual surgical providers received a wide range of portal messages, from 0.2 to 135.1 threads/provider/month, with an average of 3.4 threads/provider/month. The breakdown of message threads per surgical specialty is in Table 3. Specialties receiving the most threads were general surgery (3,134), neurosurgery (1,601), and orthopedics (1,577). Specialties with the most threads/provider/month were neurosurgery (5.1), ophthalmology (4.7), and general surgery (4.4). Specialties with the fewest threads/provider/month were pediatric surgery (1.0), plastic surgery (1.0), and oral surgery (1.1).

Of the 500 randomly selected message threads, 1,293 distinct issues were communicated, with an average of 2.6 issues per thread. The overall categorization of the issues according to the consumer health taxonomy is displayed in Figure 3a. The majority of the issues communicated were medical concerns (70%). Although 70% of the needs communicated were medical, multiple needs could be communicated per message. Therefore, of the 500 message threads, medical care was delivered in 453 message threads (90.6%). The types of medical care are described in Table 4 with 32.6% of patient-initiated messages (18% of all medical needs communicated) conveying new or worsening medical concerns. The most frequently expressed medical needs consisted of the need to schedule appointments (212 threads; 42.4%), communicate new or worsening problems (163 threads; 32.6%), and need for prescriptions (139 threads; 27.8%). The breakdown of all medical needs expressed within message threads is visualized in Figure 3b. Logistical needs, such as contact information or insurance questions, were addressed in 150 threads (30.0%); informational needs, referring to knowledge often available in a reference textbook (e.g., what a medical diagnosis is), in 77 threads (15.4%); and social communications, such as complaints or emotional needs (e.g., expressing gratitude or complaints) in 62 threads (12.4%).

In the 500 message threads selected for content analysis, 339 (67.8%) contained medical decision-making, and the level of risk was minimal in 35 (10.3%), low in 171 (50.4%) moderate in 132 (38.9%), and high in 1 (0.03%). The overall complexity of medical decision-making, as determined by the level of risk as well as presenting diagnoses and data reviewed, was straightforward in 62% (210 messages), low in 30% (102 messages), and moderate in 8% (27 messages). Straightforward medical decisions included refilling or adjusting prescriptions and formulating plans based upon laboratory or radiology results with established patients. For example, one patient messaged her provider postoperatively from a thyroidectomy to discuss recent calcium levels. The provider reviewed the laboratory results, diagnosed the patient with mild hypercalcemia, and communicated to the patient to decrease her calcium dosage. Medical decision-making of low complexity included the medical care of acute problems, along with the decision to order and review laboratory tests or consultations. In one portal message thread, a patient reported new and increasing abdominal pain and constipation, for which the provider ordered and scheduled a

gastroenterology appointment. Moderately complex medical decision-making included communications regarding undiagnosed new problems and the decision to review clinical tests and perform procedures. One such moderately complex portal message interaction involved the patient communicating with his provider after receiving a laboratory result in the portal of an elevated prostate specific antigen (PSA) level and the provider subsequently choosing to schedule a prostate biopsy. Another included a patient messaging his provider with new-onset, shooting right leg pain with a history of left hip degenerative changes. The provider reviewed previously ordered plain films and ordered lumber spine magnetic resonance imaging (MRI). No highly complex decisions (e.g., scheduling major surgery with risk factors) were made over portal messaging.

Discussion

This research study is one of the first to conduct a detailed analysis of the types of communications and medical care delivered by surgical providers through patient portal messages and is the first study to associate the types of care with elements required for outpatient billing. We found that over 90% of message threads between surgical providers and patients involved the delivery of medical care, such as the management of new findings, ordering of tests, prescription of new medications, and referrals to specialists. A prior study of a random sample of 3253 MHAV messages found that approximately 72% involved medical needs or communications, but this study only analyzed individual patient-initiated messages, not the entire threads, and involved all clinical specialties, not just those messages sent to surgeons.[13, 14] We know that the majority of patient-initiated MHAV messages are received by primary care or medicine specialty providers [17], so it is not clear whether the higher percentage involving medical care found in this study was due to differences in portal messaging use across specialties or the richness of the full message threads. However, in both studies, a critical finding was that substantial medical care was being delivered through patient portal messages.

To further characterize the nature of the care being delivered, we analyzed each message thread for the level of risk and complexity of the medical decision-making performed by providers. We found that most portal-based decision-making had low or moderate levels of risk with overall straightforward or low levels of complexity, although high levels of risk and moderate level of complexity were seen in some message threads. Messaging is not currently recognized as a billable form of outpatient interaction, and thus, these portal message threads represent a significant volume of uncompensated care provided by surgeons and their staff. The complexity of medical decision-making is only one component of the CMS E/M guidelines for coding outpatient encounters, which also include history and physical examination components (Table 2). Although these components were not assessed in this study, MHAV only allows users to send messages to providers with whom they have an established relationship. Thus, portal message encounters would involve return patients, and only two of the three key components must be met in order to charge for an established patient encounter, which in these messages would include history and medical decision making (Table 1a).[27] Portal message encounters do not involve a physical examination, but most message threads provided a rich history and detailed plan, and thus, the final encounter code would predominately rely on the level of risk and complexity of medical

decision-making within each interaction. If physicians could bill for the care they provide through patient portal message threads as outpatient encounters, this study provides some insights into the levels of outpatient encounters that are being delivered through patient portals by surgeons.

This study also confirmed that surgeons continue to receive substantial numbers of messages from patients through patient portals and deliver care using this emerging technology. Earlier research has shown rapid growth in the use of MHAV portal messaging amongst surgeons in the initial years of after patient portal deployment with significant variation across all clinical specialties and surgical subspecialties.[16, 17] This study corroborates the persistent variability in the use of messaging across surgical specialties and demonstrates shifts in the utilization of messaging beyond the early adoption phase of patient portals. Our study shows that most surgical specialties frequently received portal messages from patients, and many surgical providers often interact with patients through the portal, yet some specialties, such as pediatric surgery and trauma rarely, if at all, utilize patient-provider messaging in the portal. Our study is limited in that only patient-initiated message threads were examined, and thus, may underestimate total messaging use. However, this approach was used to ensure the message threads involved interaction with a patient. Portal utilization has changed from the early phases of MHAV adoption in which the specialties receiving the most messages from patients were orthopedic surgery, otolaryngology, and urology. This study shows that general surgery and neurosurgery were the specialties managing the most message threads in more recent years. In both studies, pediatric surgical providers received the fewest portal messages. Reasons for the limited use of portal messaging in the pediatric surgery group include additional privacy procedures for access to pediatric patient information, including the need for the parent or caregiver to also have a separate MHAV account, as well as reduced provider adoption in the pediatric surgical specialties.

Although most payers do not currently reimburse for patient portal encounters, there are many prospective benefits of caring for patients online. With rising costs of medical care in the United States, some office visits could be avoided by managing lower complexity issues online, potentially lowering operating costs for low level visits. This shift could enhance efficiency and productivity by increasing the complexity of care provided during in-person visits.[28] In 2004, a survey of primary care physicians found that more than two-thirds would be willing to increase email communication with patients if they were offered reimbursement for this service.[29] The American College of Physicians stated in 2003 that Medicare's system for reimbursing physicians has failed to keep pace with the rising use of computers and time spent communicating and monitoring patients over the Internet.[28] Our study provides evidence that portal messages deliver care with predominantly straightforward and low risk, with occasional moderate risk decision-making. Handling these concerns online can benefit both patients, saving travel and office waiting time, and providers, by making available in-person clinic visits for the high complexity medical care that might be best done face to face.

Anecdotally, many surgeons who frequently utilize the MHAV portal report the ability to manage low-acuity concerns through portal messages. When such concerns are addressed within a global period after surgery, both patient and provider benefit. The patient saves time

and money associated with travel, and the provider can potentially replace an uncompensated postoperative visit with a compensated new patient evaluation. If care is delivered through portal messaging outside of the global pay period, the opportunity for a compensated office visit is lost. Our study did not determine whether portal messages were sent within a global pay period, and thus, we were not able to measure potential benefits and losses. What is evident from our study is that surgeons deliver substantial volumes of care of varied complexity through portal messages, and currently, these surgical provider efforts are unaccounted for or compensated. This study is the first to analyze the care delivered through portal messages using traditional elements of billing in the hope that recognition might prompt development of appropriate models for compensation.

Meaningful Use requirements and financial incentives, have increased the national implementation of patient portals.[30] Providers who frequently utilize the portal may potentially be reducing office visit reimbursement by caring for patients electronically. However, in the current model, there is no method to account for this lost compensation and obtain reimbursement for the care provided. One of the criteria needed to achieve Stage 2 Meaningful Use during 2017 is that a secure message must be sent (i.e., either an initial message or reply to a patient message) to over 5 percent of unique patients seen by the provider during a year.[3, 31] It is unclear if these Meaningful Use financial incentives are currently adequate to balance the potential losses in compensation from care provided online rather than in-person. However, the Meaningful Use financial incentives are for a limited time period, whereas volume of uncompensated online care is likely to continue to rise with increasing utilization of patient portals.

Our research did not examine whether portal messaging between surgeons and their patients influenced clinical outcomes. Only a limited number of studies have analyzed the effects of portal usage on clinical outcomes, and nearly all involved the management of chronic diseases such as diabetes, hypertension, and depression. Use of patient portals has been shown to improve satisfaction, enhance communication, and improve clinical outcomes in primary care or medical specialty settings.[32–41] Only one study by Broman et al has investigated the effects of online care in surgery. In this study, online care was delivered by sending patients MHAV messages with web links to post-operative surveys using REDCap (Research Electronic Data Capture).[42] Any concerns discovered through the surveys were discussed between the patient and provider over portal messaging. This study compared the online versus in-person post-operative follow-up in 50 patients after ventral hernia repair and showed that online follow-up recognized all potential complications that were confirmed in the in-person clinic visits.[43] Further, three-quarters of patients reported that they would be satisfied with follow-up performed solely online. Analyzing the effects of portal message on clinical outcomes is a focus of ongoing research for our group. As the volume of care delivered through portal messages increased, it will be crucial for our surgical community to determine both its clinical and economic effects.

Similar to barriers facing telehealth adoption, reimbursement for the care provided during portal message interactions and time necessary to deliver that care is lagging behind resource utilization.[44] Implementation of patient portals by healthcare systems will continue to increase in response to consumer demand and regulatory pressures such as

Meaningful Use. Models for compensation of online care should be developed to alleviate the burden on providers and promote widespread adoption these technologies by surgeons.

Conclusions

Surgical providers use secure messaging through patient portals to meet a wide variety of needs for their patients, and actual medical care with varying levels of risk and complexity is delivered in over 90% of patient portal message threads exchanged with surgeons. These portal messages represent a large volume of rich outpatient encounters for which surgeons are not reimbursed and an increasing proportion of the outpatient care provided by surgeons. Models for compensation for such online care should be developed.

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References

1. HealthIT.gov. What is a patient portal?.
2. [Accessed February 29, 2016] Patient portal. https://en.wikipedia.org/wiki/Patient_portal
3. Otte-Trojel T, de Bont A, van de Klundert J, Rundall TG. Characteristics of patient portals developed in the context of health information exchanges: early policy effects of incentives in the meaningful use program in the United States. *J Med Internet Res*. 2014; 16:e258. [PubMed: 25447837]
4. Goldzweig CL, Orshansky G, Paige NM, Towfigh AA, Haggstrom DA, et al. Electronic patient portals: evidence on health outcomes, satisfaction, efficiency, and attitudes: a systematic review. *Ann Intern Med*. 2013; 159:677–687. [PubMed: 24247673]
5. Kruse CS, Bolton K, Freriks G. The effect of patient portals on quality outcomes and its implications to meaningful use: a systematic review. *J Med Internet Res*. 2015; 17:e44. [PubMed: 25669240]
6. Blumenthal D, Tavenner M. The “meaningful use” regulation for electronic health records. *N Engl J Med*. 2010; 363:501–504. [PubMed: 20647183]
7. 2015 Edition Health Information Technology (Health IT) Certification Criteria, 2015 Edition Base Electronic Health Record (EHR) Definition, and ONC Health IT Certification Program Modifications. Final rule. *Fed Regist*. 2015; 80:62601–62759. [PubMed: 26477063]
8. Gold M, Hossain M, Mangum A. Consumer Engagement in Health IT: Distinguishing Rhetoric from Reality. *EGEMS (Washington, DC)*. 2015; 3:1190.
9. North F, Crane SJ, Stroebel RJ, Cha SS, Edell ES, et al. Patient-generated secure messages and eVisits on a patient portal: are patients at risk? *J Am Med Inform Assoc*. 2013; 20:1143–1149. [PubMed: 23703826]
10. Haun JN, Lind JD, Shimada SL, Martin TL, Gosline RM, et al. Evaluating user experiences of the secure messaging tool on the Veterans Affairs’ patient portal system. *J Med Internet Res*. 2014; 16.
11. Boffa M, Weathers A, Ouyang B. Analysis of Patient Portal Message Content in an Academic Multi-specialty Neurology Practice (S11.005). *Neurology*. 2015; 84. [PubMed: 25982050]
12. Haun JN, Lind JD, Shimada SL, Martin TL, Gosline RM, et al. Evaluating user experiences of the secure messaging tool on the Veterans Affairs’ patient portal system. *J Med Internet Res*. 2014; 16:e75. [PubMed: 24610454]
13. Cronin RM, Fabbri D, Denny JC, Jackson GP. Automated Classification of Consumer Health Information Needs in Patient Portal Messages. *AMIA Annu Symp Proc*. 2015; 2015:1861–1870. [PubMed: 26958285]

14. Cronin, RM. Automatic Classification of Patient-Generated Messages From a Patient Portal. Department of Biomedical Informatics; Nashville, TN: Vanderbilt University; 2015.
15. Cronin R, Davis S, Shenson J, Chen Q, Rosenbloom S, et al. Growth of Secure Messaging Through a Patient Portal as a Form of Outpatient Interaction across Clinical Specialties. *Appl Clin Inform.* 2015; 6:288–304. [PubMed: 26171076]
16. Shenson JA, Cronin RM, Davis SE, Chen Q, Jackson GP. Rapid growth in surgeons' use of secure messaging in a patient portal. *Surgical endoscopy.* 2015
17. Cronin RM, Davis SE, Shenson JA, Chen Q, Rosenbloom ST, et al. Growth of Secure Messaging Through a Patient Portal as a Form of Outpatient Interaction across Clinical Specialties. *Appl Clin Inform.* 2015; 6:288–304. [PubMed: 26171076]
18. Agboola SO, Bates DW, Kvedar JC. Digital Health and Patient Safety. *Jama.* 2016; 315:1697–1698. [PubMed: 27115372]
19. Institute of Medicine. Health IT and Patient Safety: Building Safer Systems for Better Care. Nov. 2011
20. Osborn CY, Rosenbloom ST, Stenner SP, Anders S, Muse S, et al. MyHealthAtVanderbilt: policies and procedures governing patient portal functionality. *J Am Med Inform Assoc.* 2011; 18(Suppl 1):i18–23. [PubMed: 21807648]
21. Robinson JR, Davis SE, Cronin RM, Jackson GP. Use of a Patient Portal During Hospital Admissions to Surgical Services. *AMIA Annu Symp Proc.* 2016:1967–1976. [PubMed: 28269956]
22. Team RC. R: A language and environment for statistical computing. R Foundation for Statistical Computing; Vienna, Austria: 2015. <http://www.R-project.org/>
23. Shenson JA, Ingram E, Colon N, Jackson GP. Application of a Consumer Health Information Needs Taxonomy to Questions in Maternal-Fetal Care. *AMIA Annu Symp Proc.* 2015; 2015:1148–1156. [PubMed: 26958254]
24. Staiger TO, Chew LD, Helenius I. A case-based approach to outpatient evaluation and management service coding. *Postgraduate medicine.* 2008; 120:101–106.
25. Evaluation and Management Services. Department of Health and Human Services, Centers for Medicare and Medicaid Services; 2016.
26. Edsall RL, Moore KJ. Thinking on paper: documenting decision making. *Family practice management.* 2010; 17:10–15.
27. Hill E. Understanding when to use the new patient E/M codes. *Family practice management.* 2003; 10:33–36.
28. American College of Physicians. The Changing Face of Ambulatory Medicine—Reimbursing Physicians for Computer-Based Care: ACP Analysis and Recommendations to Assure Fair Reimbursement for Physician Care Rendered Online. Philadelphia: American College of Physicians; 2003. Policy Paper
29. Kittler AF, Carlson GL, Harris C, Lippincott M, Pizziferri L, et al. Primary care physician attitudes towards using a secure web-based portal designed to facilitate electronic communication with patients. *Inform Prim Care.* 2004; 12:129–138. [PubMed: 15606985]
30. CMS. [Accessed Jan 3, 2017] Eligible Professional's Guide to STAGE 2 of the EHR Incentive Programs. https://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/downloads/stage2_guide_eps_9_23_13.pdf
31. CMS. [Accessed Jan 4, 2017] EHR Incentive Programs: 2015 through 2017 (Modified Stage 2) Overview. https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/2015_EHR2015_2017.pdf
32. Tang CH, Li CC, Chang GH, Chang P. Implementing a personalized portal combined with workflow management tools used in diabetes care. *AMIA Annu Symp Proc.* 2003:1026. [PubMed: 14728529]
33. Quinn CC, Clough SS, Minor JM, Lender D, Okafor MC, et al. WellDoc mobile diabetes management randomized controlled trial: change in clinical and behavioral outcomes and patient and physician satisfaction. *Diabetes technology & therapeutics.* 2008; 10:160–168. [PubMed: 18473689]

34. Nordqvist C, Hanberger L, Timpka T, Nordfeldt S. Health professionals' attitudes towards using a Web 2.0 portal for child and adolescent diabetes care: qualitative study. *J Med Internet Res*. 2009; 11:e12. [PubMed: 19403464]
35. Ma C, Warren J, Phillips P, Stanek J. Empowering patients with essential information and communication support in the context of diabetes. *Int J Med Inform*. 2006; 75:577–596. [PubMed: 16213783]
36. Bryce CL, Zickmund S, Hess R, McTigue KM, Olshansky E, et al. Value versus user fees: perspectives of patients before and after using a web-based portal for management of diabetes. *Telemed J E Health*. 2008; 14:1035–1043. [PubMed: 19119825]
37. Hess R, Bryce CL, Paone S, Fischer G, McTigue KM, et al. Exploring challenges and potentials of personal health records in diabetes self-management: implementation and initial assessment. *Telemed J E Health*. 2007; 13:509–517. [PubMed: 17999613]
38. Agrawal A, Mayo-Smith MF. Adherence to computerized clinical reminders in a large healthcare delivery network. *Stud Health Technol Inform*. 2004; 107:111–114. [PubMed: 15360785]
39. Grant RW, Wald JS, Poon EG, Schnipper JL, Gandhi TK, et al. Design and implementation of a web-based patient portal linked to an ambulatory care electronic health record: patient gateway for diabetes collaborative care. *Diabetes technology & therapeutics*. 2006; 8:576–586. [PubMed: 17037972]
40. McCarrier KP, Ralston JD, Hirsch IB, Lewis G, Martin DP, et al. Web-based collaborative care for type 1 diabetes: a pilot randomized trial. *Diabetes technology & therapeutics*. 2009; 11:211–217. [PubMed: 19344195]
41. Ralston JD, Hirsch IB, Hoath J, Mullen M, Cheadle A, et al. Web-based collaborative care for type 2 diabetes: a pilot randomized trial. *Diabetes Care*. 2009; 32:234–239. [PubMed: 19017773]
42. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009; 42:377–381. [PubMed: 18929686]
43. Kummerow Broman K, Oyefule OO, Phillips SE, Baucom RB, Holzman MD, et al. Postoperative Care Using a Secure Online Patient Portal: Changing the (Inter)Face of General Surgery. *Journal of the American College of Surgeons*. 2015; 221:1057–1066. [PubMed: 26453260]
44. Adler-Milstein J, Kvedar J, Bates DW. Telehealth among US hospitals: several factors, including state reimbursement and licensure policies, influence adoption. *Health Aff (Millwood)*. 2014; 33:207–215. [PubMed: 24493762]

I. Informational Needs or Communications**A. Normal Anatomy and Physiology****B. Problems (Diseases or Observations)**

1. Definition
2. Epidemiology
3. Risk factors
4. Etiology
5. Pathogenesis/natural history
6. Clinical presentation
7. Differential diagnosis
8. Related diagnoses
9. Prognosis

C. Management

1. Goals/strategy
2. Tests
3. Interventions
4. Sequence/timing
5. Personnel/setting

D. Tests

1. Definition
2. Goals
3. Physiologic basis
4. Efficacy
5. Indications/contraindications
6. Preparation
7. Technique/administration

8. Interpretation

9. Post-test care

10. Advantages/benefits

11. Costs /disadvantages

12. Adverse effects

D. Interventions

1. Definition
2. Goals
3. Mechanism of action
4. Efficacy
5. Indications/contraindications
6. Preparation
7. Technique/administration
8. Monitoring
9. Post-intervention care
10. Advantages/benefits
11. Costs/disadvantages
12. Adverse effects

II. Medical Needs or Communications

- A. Appointments/scheduling
- B. Medical equipment
- C. Personnel/referrals
- D. Prescriptions
- E. Problems
- F. Follow-up
- G. Management
- H. Tests
- I. Interventions

III. Logistical Needs or Communications

- A. Contact information/communication
- B. Facility/policies
- C. Insurance/billing
- D. Medical records
- E. Personal documentation
- F. Health information technologies
- G. Tests
- H. Interventions
- I. Transportation

IV. Social Needs or Communications

- A. Acknowledgment
- B. Complaints
- C. Emotional need or expression
- D. Relationship communication
- E. Miscellaneous

V. Other**Figure 1. Taxonomy of consumer health needs and communications**

The taxonomy is used to categorize consumer health needs and communications within the portal messages into 5 categories, including informational, medical, logistical, social, or other.

Figure 2. Age distribution of patients who initiated portal messages to surgical providers

The majority of the patients who initiate messages to surgical providers through the patient portal are middle age, with a median of 55 years (IQR 43–64 years).

A.

B.

Figure 3. A. Types of Needs in Portal Messages to Surgical Providers

The majority (70%) of needs or communications within messages sent via the patient portal to surgical providers were related to medical needs of the patients.

B. Types of Medical Needs in Portal Messages to Surgical Providers.

The types of medical needs or communications in messages sent to surgical providers were most commonly regarding the need for scheduling of appointments (24%), medical problems (18%), and the need for prescriptions (16%).

Table 1a

Components of an Established Patient Visit

	History	Exam	Medical Decision Making
Level 1	Not required	Not required	Not required
Level 2	Problem-focused	Problem-focused	Straightforward
Level 3	Expanded problem-focused	Expanded problem-focused	Low
Level 4	Detailed	Detailed	Moderate
Level 5	Comprehensive	Comprehensive	High

* Only two of the three components (history, exam, medical decision making) are required for established patient visit outpatient compensation

Table 1b

Elements of Medical Decision-Making

Diagnoses or Management Options	Amount and Complexity of Data	Level of Risk of Complications	Complexity of Medical Decision-Making [*]
Minimal	Minimal or None	Minimal	Straightforward
Limited	Limited	Low	Low
Multiple	Moderate	Moderate	Moderate
Extensive	Extensive	High	High

^{*} The complexity of medical decision-making is based on 3 categories: diagnoses or management options, amount and complexity of data, and level of risk. To meet a certain level of complexity, at least 2 of the 3 categories must be met.

Table 2

Demographics of patients for whom portal messages were sent to surgical providers

	Number of patients (%)
Sex	
Female	5319 (57%)
Male	4088 (43%)
Race	
White	8455 (90%)
Black	678 (7%)
Other	189 (2%)
Unknown	86 (1%)
Ethnicity	
Non-Hispanic	9046 (96%)
Hispanic	146 (2%)
Unknown	216 (2%)
Age (mean, SD)	52.8, 16.1

Table 3

Patient-initiated message threads per surgery specialty

Surgical Specialty	# Message Threads (n = 9408)	% of Total Messages	# Recipient Providers (n = 401)	# Threads/Provider/Month
General Surgery	3152	33.50	102	4.4
Neurosurgery	1601	17.02	45	5.1
Orthopedic Surgery	1577	16.76	55	4.1
Otolaryngology	954	10.14	43	3.2
Ophthalmology	656	6.97	29	4.7
Urology	413	4.39	18	3.2
Pediatric-ALL specialties	376	4.00	54	1.0
Cardiothoracic Surgery	347	3.69	26	1.9
Dermatology	189	2.01	10	2.7
Plastic Surgery	72	.77	10	1.0
Oral Surgery	71	.75	9	1.1

Table 4

Types of medical care delivered by surgeons in patient-initiated message threads

Types of Medical Care Delivered	# Message Threads (n = 500)	% of Total Messages
Appointments/Scheduling	212	42.4
New or worsening problems	163	32.6
Prescriptions ordered	139	27.8
Tests or Interventions	182	36.4
Referrals	51	10.2