Wearable Health Monitors and Physician-Patient Communication: The Physician’s Perspective

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Abstract
Studies have shown that effective physician-patient communication can result in improved health outcomes. Wearable health monitors, which are steadily growing in adoption, may help to improve this communication. In this paper we report the findings of a survey conducted among physicians, in which we assessed their views on the potential integration of wearables into patient care. Our analysis suggests that physicians think of wearables in terms of getting accurate information on patient compliance and the efficacy of treatment to inform their decision-making. Respondents expressed interest in whether wearables would be convenient, feasible, and applicable. They also showed concern for regulations, intrusiveness, and interruptions. If integrated into physician-patient communication and interaction, wearables may be more effective to improve health and to have lasting effects. This study is a first step in understanding how this might be realized and how issues surrounding integration might be investigated.

1. Introduction
Chronic diseases are among the most common and costly of all health problems, with nearly half of all adults in the United States living with at least one chronic illness. They are also the most preventable [6]. Prevention of chronic disease has become a major focus for the United States Centers for Disease Control (CDC), which highlights addressing risk factors, such as poor diet and physical inactivity, at both the individual patient and population levels [3].

Personal health monitoring through tracking may help to increase healthy behaviors, such as increasing physical activity, and thus might contribute to reducing chronic disease [31]. Seven in 10 adults in the United States say they track at least one health indicator, such as weight, diet, or exercise [25]. Further, 40 percent of individuals who track health indicators say that the tracking has led them to ask a doctor new questions or to get a second opinion [25], and 46 percent of trackers say that the activity has changed their overall approach to their own healthcare maintenance or the health of someone for whom they provide care [25].

With consumerization of information technology (IT) placing relatively inexpensive yet sophisticated devices in their hands, more people are looking to IT to help them monitor their health. Wearable IT makes tracking health-related behaviors easier. Use is gaining momentum among individuals, with projected sales for wearable devices for 2015 expected to increase 61% from 2014 [10]. Analysts have estimated that wearable health IT use will grow at a compound annual rate of 35 percent over the next five years [12]. If these devices are effective for promoting healthy behaviors, there is a great potential for improving citizen health and reducing preventable chronic disease.

However, there are multiple aspects to consider when assessing if wearable health monitors (henceforth “wearables”) could be effective in the improvement of an individual’s health and of population-wide health. At the individual level, one must consider reception/use and social frame, such as caregivers and friends. Looking at health maintenance and improvement in chronic disease rates holistically, an individual’s healthcare providers, insurance providers, employers, and even the wearable IT firm may all play a role. Ultimately, to achieve lasting and sustainable improvements, these factors should work as a network of interrelated connections to encourage individuals’ actions to improve their health.

Much healthcare research points to the importance of physician-patient communication in how care is delivered and how physicians influence patients’ behaviors [8-9]. Whether and how patients’ use of wearables might influence physician-patient communication and whether this would affect patient behaviors and health outcomes are therefore important questions. In this study, we address one aspect of this larger question: the physician perspective on
incorporating patient-generated information from wearables into patient care.

2. Related research

To investigate the potential implications of wearables to improve health outcomes, we consider briefly how wearables may influence behavior, particularly for patients with chronic conditions and in relation to research on physician-patient communication.

2.1 Wearables and health behavior change

Earlier studies found that using IT for health and activity monitoring can be effective in enhancing physical activity and other health outcomes [4; 11; 31]. Early forms of hip-based pedometers, for instance, have been associated with significant increases in physical activity, of about 2,000 more steps per day for pedometer users versus nonusers, and other healthy outcomes, such as reductions in weight and blood pressure [4]. This feedback can lead to perceptions of enhanced self-efficacy, which is one of the most powerful factors in successful adoption of a new behavior [2]. However these early wearables also posed issues, such as inaccuracy for individuals using assistive devices like walkers [31].

Wearables have evolved significantly since these studies. Current wearables are usually wrist-based, incorporate the use of online functionalities and connectivity with others via smartphone applications and websites, and measure items like steps taken, sleep quality, and calories burned [16]. Most have eight attributes: (1) constant, meaning they are always on; (2) unrestrictive, meaning a user can do other things while using them; (3) not monopolizing, meaning they do not require undivided attention; (4) observable, meaning they can attract a user’s attention; (5) controllable, meaning they are responsive; (6) attentive, meaning they are environmentally aware; (7) communicative, meaning they can be used as a communication medium; and (8) personal, meaning they entwine individual human action with computer features [20]. Some also allow individuals to track, visualize, and compare data with social networks [16].

The design of these devices, which incorporate tailored, realistic goals and achievements [16], can give a patient more self-efficacy in terms of health, which can lead to positive health behavior change [2]. Enhanced informational and social capabilities may also be associated with positive behavior change resulting from heightened extrinsic motivation, intrinsic motivation, and social comparison [14].

2.2 Integration of wearables with healthcare

Thus far, many people who adopt wearables are healthy, fitness-minded individuals. Whether these health IT can be effective interventions to prevent or control chronic diseases requires that we consider the broader healthcare services setting as well as individual-level adoption and use.

With rapid consumer adoption of wearables [10], there is the potential to incorporate the data collected by these devices into healthcare processes. Patient-generated health data (PGHD) refers to any health-related data that are created, recorded, or gathered by or from patients (or caregivers) to address a health concern [18]. Increasingly, such data are generated by IT devices such as activity monitors or medical devices with embedded IT capabilities. PGHD can supplement existing clinical data to provide more comprehensive care [18]. The main distinctions between PGHD and data gathered in clinical settings are: patients are primarily responsible for capturing the data, and patients decide how to share that data [18]. There are different types of PGHD. For instance, some are specific to health conditions that require close monitoring, such as those for telehealth or remote home monitoring, and others are intended for a large range of patients for general health and wellness promotion. The latter is the focus of this study.

A previous study of PGHD [23] found that health providers perceived benefits to a text-message-based diabetes self-management program in which PGHD was generated from patient responses to self-assessment questions delivered via text message and relayed. This study shows promise in the integration of PGHD and healthcare, but the intervention placed the burden of generating the health data on the patient through answering questions, which raises potential issues with adherence and accuracy. Wearables may help address these issues by providing less intrusive and disruptive means of gathering data about health behaviors, which can be synchronized wirelessly and shared automatically with providers [16].

2.3 Physician-patient communication

Studies on wearables have focused primarily on how patients view these devices and how their use affects individuals’ physical activity [4; 11; 31]. Physicians’ willingness to integrate data from these IT devices into their interactions with patients is also important for their application in healthcare. In this regard, effective physician-patient communication serves three major purposes: creating a good interpersonal relationship between physicians and
The quality of physician-patient communication influences the healthcare relationship. Studies have indicated that effective physician-patient communication results in several important outcomes, such as patient satisfaction, patient compliance/adherence to treatment, patient recall, and understanding of information, and patients' health outcomes/psychiatric morbidity [24]. For instance, one study found that physicians viewed patients more favorably if those patients were more involved and expressed positive affect [30]. This perception resulted in physicians not only providing more information with those patients, but also providing those patients with more patient-centered care overall. However, these researchers also found that physicians tended to be more contentious with black patients, whom they perceived as having less effective communication and less satisfaction. This finding was paralleled by Johnson et al. [19], who found that physicians tended to perceive white patients as more engaged and compliant in their healthcare compared to black patients, which led to physicians offering more patient-centered care and more information to those patients. Outcomes associated with this patient-centered communication included better patient recall of information, treatment adherence, and satisfaction.

Physicians use information supplied by their patients (including self-reports of between-visit health issues) in their diagnosis, treatment, and overall management of health [24]. This involves patients providing information about symptoms and physicians actively seeking out relevant information [24]. Much of the exchanged information is based on patient recall (or articulation on behalf of the patient). This can also be problematic, as one survey found that 38% of patients lied or “stretched the truth” about doctors’ orders, 32% lied about diet and/or exercise, and 22% lied about smoking [15]. Still, physicians rely on this information in diagnosis and treatment.

Technology has come in to play a part in the physician-patient communication between visits. First came the telephone. Initially physicians saw phone interactions as intrusive (and some still do), but they began to use the telephone to their advantage to communicate with patients, altering the physician-patient relationship and communication [28]. Now, the use of the telephone is complemented with the use of other technologies, such as email, text messaging, and secure Web portals [1]. Using computer-mediated communication to stay connected between visits has thus become a more routine aspect of practice in many healthcare systems. Information exchange is generally required to preserve patients’ privacy. (In the United States patient data and IT-mediated communication is regulated under the Health Insurance Portability and Accountability Act (HIPAA) [32].)

Researchers are finding that computer-mediated communication between visits can have a positive effect on care. For instance, researchers found that remote patient monitoring can allow healthcare providers to make treatment decisions up to 17.4 days sooner than with in-office visits alone [22]. With electronic health records and increased digital data gathering and logging, the use of electronically exchanged data is becoming the preferred method of care for some physicians, who point to the potential for using that data for forecasting which patients are likely going to get sick and need to be called in and which are doing well [8]. The transtheoretical model and stages of change (TTM) [27] posits that behavior unfolds through a series of changes, and processes are used to progress through the stages. Of note is that in TTM, the matching of interventions to the stage in which participants lie is of utmost importance. PGHD through the use of wearable (or other) monitoring devices may give healthcare providers insight into which stage a patient may lie so that they can match treatments, such as behavior modifications, with a potentially higher chance of adoption on the part of a patient.

2.4 Summary and research motivation

To summarize, use of PGHD shows promise for improving the quality of healthcare services and health outcomes. Some healthcare systems are already implementing the use of wearable technology with care, with one case running a vital-sign monitoring system showing a decrease in mortality rates of 35% in the first four years [22]. Moreover, one in five United States consumers owns a wearable device, and many (54 percent) trust their primary care doctors with their data [26]. However, integration of individuals’ use of wearables and caregiving by healthcare professionals is not yet widely adopted. Research on physician-patient communication highlights components of effective communication, such as positive affect and engagement, and outcomes of that communication, such as patient satisfaction and improved health [19, 24, 30]. However, these studies generally focus narrowly on how physicians can improve their communication skills to be more satisfying for the patients (cf. [17]). Research on what physicians find useful and acceptable in terms of patients’ sharing of self-monitoring information is lacking, particularly related to how physicians might incorporate PGHD, such as data gathered from wearables [26], into their communication with patients and their practices.
This exploratory study on how PGHD from wearables might influence physician-patient communication, from the physician perspective, is a first step. Therefore, the following general research questions guided the study: (i) Would adoption of wearables likely affect patient-provider communication in ways that benefit patients’ health outcomes? (ii) Would physicians be willing to incorporate the data from wearables into their practices?

4. Methodology

In this study we used an online survey to gain insight into the physician perspective on wearables. Because these phenomena are recent and developing rapidly we undertook an exploratory study to inform our own and future studies, using a convenience sample to gather data for initial analysis. An online survey was chosen to solicit open-ended comments from a geographically distributed and heterogeneous group of physicians. (Because of this distribution, in-person or phone interviews were impractical.) The survey was distributed to an email listserv of physicians who graduated from a large medical school in Manila, Philippines. There are 150 subscribers on the listserv, of which about 60 users actively participate by corresponding regularly, according to the list’s moderator. The group sampled comprised a diverse array of medical specialties, years of practice, and locations of practice, thus maximizing the potential variety of data collected.

A total of 39 surveys were completed. Respondents were diverse in age with 21 (56%) 56 and older, and 17 (45%) under 35. Males made up 54% of respondents. Specialties were diverse, with 2 (5%) in ob/gyn, 6 (15%) in family practice, 8 (21%) in internal medicine, and 11 (28%) in a medical specialty, such as neurology, while 9 (24%) categorized themselves as having other specialties not listed, such as occupational medicine. The size of practice varied with 15 (41%) in solo practice, 10 (27%) practicing with two to five physicians, 4 (11%) in a practice with 11 to 30, and 8 (22%) with more than 30. Years in practice varied, with 17 (44%) practicing five years or less, 7 (18%) for 21 to 20 years, and 15 (38%) in practice for more than 31 years. Geographically, 21 (54%) practice in North America (19 in United States), and 18 (46%) in Asia.

The survey included a mix of 23 closed and open-ended questions, which flowed from questions specific to physician gathering of patient data to information about their views on wearables. For instance, to gain insight as to how useful physicians might view information gleaned from wearables, respondents were first asked a series of questions about what types of information they typically gather from patients as well as what they ask patients to monitor themselves, how that information is reported, and how that information is used in treatment and diagnosis. To gain insight into how physicians view wearables, respondents were asked questions about their own awareness, use, and discussions with others regarding these devices as well as patients’ use and discussions with physicians about these devices. In order for wearables to be integrated into healthcare, physicians would have to use the information gathered from the devices. Certain factors, such as FDA approvals or automatic transmission of that data may affect physician perspectives of incorporating this information. Therefore, respondents were asked about factors a wearable would have to have for use in healthcare. To get a general sense of physician perspectives of patient sharing of information from a wearable, respondents were asked how they would react if a patient wanted to share that information with them.

In addition to closed-ended questions, we included open-ended questions in each category to encourage physicians to voice their perspective. (The complete survey is available from authors.) Questions were:

- Self-report data: How useful is self-monitored information to your treatment and/or diagnosis?
- Personal experience: Please explain personal use/awareness of wearable health monitors.
- Patient experience: Please explain your patients’ use/awareness of wearable health monitors.
- Relevance to practice: Please explain how useful you would find information from wearable health monitors if provided by patients.
- Acceptance: How would you react if one of your patients asked to share data from a wearable health monitor for health with you?
- General comments: We welcome any comments or suggestions you have on this topic.

Because this was a small convenience sample, we did not use statistical tests to assess closed-ended questions and we make no claims for representation of physicians generally. We found the open-ended responses of physicians most useful to gain insight into potential practical and theoretical issues. To analyze these data two authors coded comments according to categories that incorporated constructs from the literature on physician-patient communication as well as grounded coding from the data. The results are examined below. Numbers are presented as counts of comments that were coded into respective categories. Percentages refer to the percent of comments fitting that particular code (134 comments total with 282 codes). There are more codes than comments because many of the comments covered multiple categories and were thus given up to three codes. Comments are given as examples to illustrate the types of responses given
particular codes. Because these are direct quotes, spelling and other grammatical errors are unchanged.

5. Findings & Analysis

As discussed above, Ong et al. [24] list three major purposes for physician-patient communication: exchanging information, making treatment decisions, and creating an interpersonal relationship. We organized analysis of findings around these three themes. The fourth theme highlights concepts related to physicians’ perceptions of wearables specifically.

5.1 Exchanging information

Exchanging information involves communication from the patient that can inform diagnosis and treatment plans. Two analytic categories of comments fall under this classification: compliance and accuracy.

5.1.1. Compliance. This term refers to the patient’s adherence to prescribed treatments [24]. Respondents mentioned compliance in 23 comments (17.2%). Physicians depend on patients’ self-reports of compliance in their day-to-day activities and between encounters (such as office visits) to assess the efficacy of treatment or to make modifications, if necessary. One respondent commented, “you can have an idea how your patients comply with the do’s and do not’s with activities relevant to your treatment.” Another respondent pointed out the importance of compliance to the treatment plan: “It is very useful, as noncompliance to lifestyle modification is the most common reason morbid conditions continue to be unstable. Only the patient knows if he or she is compliant, so these reports are all physicians can rely on.” Overall, respondents expressed that the patients’ self-reports on compliance are crucial to inform diagnoses and treatment plans. Respondents also mentioned that the use of wearables might be beneficial in communicating compliance objectively.

5.1.2. Accuracy. This refers to the correctness of information provided from patients [17]. Respondents mentioned accuracy in 15 comments (11.1%). Accuracy is important because physicians use patient-reported information to make diagnoses and treatment decisions. Physicians rely on patients to provide accurate information by recording and reporting activities. One problem with this form of communication is recall, as 48% of respondents said they have patients record information via mental notes and 86% said that information is reported by answering questions during subsequent visits. One respondent noted the difficulty in relying on recall to provide accurate information, “It’s [self-reported information] very useful if the patient remembers the data. There will be instances, however, when patients didn’t record the data or they have problems recalling some of the information. That’s when it becomes a problem.”

Another problem is that studies have shown that many patients tend to lie to their physicians [20]. Some respondents noted concerns that reflected what the literature tells us about patient honesty in reporting information [15] in comments about the subjective and unreliable nature of patient-reported information. Self-monitoring can also be burdensome, as one respondent pointed out, “Self-monitoring is very subjective. It would help to have objective records in monitoring health parameters. Also, it takes off the burden of self-monitoring for patients.” Such comments suggested that physicians expect that patients do not supply accurate data reliably, that wearable technology is more trustworthy and objective, and that wearables could help with accuracy by providing unobtrusive, objective data from patients to their physicians.

5.2 Making treatment-related decisions

After exchanging information, physicians and patients make treatment-related decisions. This process has evolved from a paternalistic, top-down approach to more of a shared decision-making strategy [24]. Three analytical categories related to this aspect of physician-patient communication: decision-making, treatment, and management.

5.2.1. Decision-making. This term refers to how physicians use information provided by patients to contribute to diagnosis or other medical decision-making [24]. Respondents mentioned decision-making in 23 comments (17.2%). In general, respondents noted that self-reported information is incredibly useful in making diagnoses and treatment-related decisions. In discussing self-reported information in general, one respondent noted the usefulness of this information, “10 in scale of 1 to 10. The Infos help so much in making a correct diagnosis, in modifying n monitoring treatment efficacy.” Another respondent discussed, “It becomes the basis for any change in present medication; additional medications, and forms part of over all management of patient’s treatment.”

5.2.2. Treatment. This term refers to the use of information to monitor a patient’s response to treatment or a treatment’s overall effectiveness [24]. Respondents mentioned treatment in 20 comments (14.9%). Information that patients provide directly informs treatment. Monitoring the effects of treatment,
such as medication, contributes to decisions regarding continuation or modification of that treatment. One respondent discussed patient-provided information, “Very useful in monitoring response to treatment.” Another respondent discussed the importance of a patient’s communication, “It is important because the patient plays a vital role in the treatment and not just solely the physician.” This comment also reflects the movement to shared decision-making with both physician and patient [24].

5.2.3. Management. This refers to the overall health plan for the patient. It comprises any information that is used for managing health through activities or monitoring progress and overall health between visits [24]. Respondents mentioned management in 53 comments (39.6%). One respondent discussed the usefulness of self-monitored information in terms of management, “This will help us assess our patients’ symptom progression and state of health.” In relation to the use of wearables, one respondent noted, “Keeping track of patient’s activity would give us an overview on how the patients are once they step out of the clinic.” One respondent commented on the efficacy of health management plans and the use of wearables: “The management that we give our patients will not be effective if they do not follow them. Self-monitoring is essential to verify if they indeed follow our advice. It also allows us to identify areas in which we can adjust or even add more medications.” (This last comment is an example of one that fits multiple codes: management, compliance, and treatment.)

5.3 Creating an interpersonal relationship

Ong et al. [24] note “a good interpersonal relationship can be regarded as a prerequisite for optimal medical care.” The importance of a good interpersonal relationship between patient and physician is also noted in concepts such as patient-centered care and the focus on patient satisfaction. Street et al. [30] discussed the importance of a good relationship in their finding that physicians gave more information and more patient-centered care to patients they perceived as having positive affect. In this study, two codes comprised this category: honesty and relationship.

5.3.1. Honesty. This term refers to the ways in which patient-reported information might contribute to trust toward the patient or providing truthful information [15]. Respondents mentioned honesty in 6 comments (4.5%). Even though much of a patient’s healthcare relies on patient-provided information, patients are still not always honest and truthful in their communication with providers [15]. One respondent noted, “Only the patient knows if he or she is compliant, so these reports are all physicians can rely on.”

5.3.2. Relationship. This term refers to respondents’ perceptions of patient communication that would lend toward positive (or negative) affect [30]. This is important because a physician’s favorable view of a patient may result in more patient-centered care and better healthcare overall [24; 30]. Respondents mentioned relationship in 6 comments (4.5%).

One respondent in this study noted that if a patient wanted to share information from his/her wearable, “It would be appreciated with much gratitude … This shows us the patients’ dedication in improving their health status and their cooperation in managing their condition.” Another respondent discussed how he would react if a patient wanted to share information from a wearable, “I would like nothing more than to see my prs take control of their healthcare and use us and the expertise to assist them in achieving their goal.” Another respondent noted, “By just them telling us that they have the health monitor we already know that they are making an effort.” Such comments suggest that patients’ use of wearables may act as signals to their physicians of engagement with health and in this way contribute to a more positive, supportive relationship with physicians.

5.4 Physician views about wearables

The literature on physician-patient communication does not yet explicitly deal with the roles of wearables or PGHD in interactions. Thus, the constructs in this section are grounded from our analysis as follows. In our survey, physicians’ responses suggest their overall interest in and openness regarding the use of information from wearables in physician-patient communication, whether during in-person encounters or between visits. However, comments about incorporating data from wearables into their practices highlighted several issues that might affect that acceptance. The categories favorability and caution reflect physicians’ general views of this technology. The categories feasibility, intrusiveness, and convenience relate to use practices (patient and physician). Applicability and regulation refer to the general context of health IT.

5.4.1. Favorability. This term refers to acceptance or perceived usefulness of wearables in physician-patient communication. Respondents mentioned favorability in 80 comments (59.7%). Respondents described perceiving information shared from wearables as “very useful” and “very important.” Some respondents
elaborated further by discussing what they perceived as useful. For example, one respondent said, “Very useful because if you are interested in the parameter that is being measured by the device, you don’t need the patient to manual record data, and the results are most likely to be complete and reported in a fashion that is easy to analyse.” As evident in the latter comment, this category overlaps other categories, such as decision-making, management, and accuracy, as favorability may have been due to perceptions of the technology enhancing these facets of physician-patient communication.

5.4.2. Caution. This refers to respondents’ critical consideration in acceptance of wearables for use in physician-patient communication. Respondents mentioned caution in 6 comments (4.5%). One respondent expressed both favorability and caution in accepting information from a patient’s wearable: “This can also backfire, however, if the patient has a ‘borderline hypochondriacal’ air on him or her. I think the gadget would only fuel his or her fervor in finding something wrong with him or her. In that case, I think the gadget would only be detrimental to this patient’s situation.”

5.4.3. Feasibility. This refers to physicians’ expectations about the perceived ease of use or difficulty patients might have with wearables. Respondents mentioned feasibility in 6 comments (4.5%). For instance, one respondent expressed skepticism about a patient’s ability to use wearables properly, “Most of my patients are geriatrics. They can barely take their meds.” Another mentioned cost as a factor affecting patient use, “It’s probably useful for active patients who can afford the expense of buying one.” One respondent also discussed cost among other factors: “one thing to consider too is the cost of wearing these devices just in case. And also the concern of the patients on how to properly use them.”

5.4.4. Intrusiveness. This refers to the unwanted sharing of information either at inconvenient times or by taking up too much time during visits. Respondents mentioned intrusiveness in 5 comments (3.7%). As noted, most respondents rely on verbal communication of monitored information in subsequent visits, which infers few instances of communication with patients between visits. In contrast, wearables may be able to collect data and communicate automatically, frequently and ongoing in between visits. Therefore, some respondents expressed concern for the perceived abilities of wearables to communicate with them at inconvenient times. For instance, one respondent mentioned, “I would be more than happy to accept the data. I would prefer schedule sharing however, as I don’t want to be burdened by beeps in the middle of downtime days.”

5.4.5. Convenience. This refers to the efficiency that creating, sharing, or viewing of information from patients using a wearable might provide over traditional methods of gathering and sharing similar information. Convenience refers to use on the part of both the patient and the physician. Respondents mentioned convenience in 8 comments (6%). For instance, for the physician, one respondent discussed, “It would actually be a more convenient way to track certain parameters as necessary.” Another made note of perceptions of patients creating and/or logging information, “easier for them to keep track.”

5.4.6. Applicability. Some respondents mentioned that the use of wearables would depend on the type of patient and the practice of the physician. As such, these devices would not be applicable for all physicians or for all patients. Respondents mentioned applicability in 32 comments (23.9%). One respondent discussed that wearables would be useful “in patients who are high risk for cardiovascular problems or have the metabolic syndrome.” Others mentioned that because these types of devices monitor certain parameters, they would not be useful in all specialties. For example, one respondent said, “I am in ob-gyn and info I have to track are qualitative rather than quantitative // Periodic observations suffice.”

5.4.7. Regulations. This refers to concerns for rules, protections, or standards for information gathered and shared through the use of these devices. Respondents mentioned regulations in 6 comments (4.5%). One respondent discussed how regulations might help with concerns for privacy, “Wireless transmission could be of concern re privacy. FDA guidelines to ensure the device actually did what it was purported to do.” Comments complemented answers to closed-ended questions, which showed that factors such as FDA approval and compliance with health data privacy standards are the most important considerations for physicians, followed by compatibility with electronic medical records and data being collected and transmitted automatically.

6. Discussion

In this paper, we reported results of a survey of physicians’ views of wearables and how those devices might fit with their practices for patient communication and care. Our analysis highlighted several interrelated
analytic categories, which reflect not only physicians’ perceptions of wearables but also earlier research on patient-provider communication generally. Consistent with these earlier studies, we found that physicians think about use of these devices in terms of getting accurate information on patient compliance and the efficacy of treatment to inform their decision-making and overall patient management. Not surprising, physicians were generally interested in whether wearables would be convenient for them and feasible for patients. As with other physician-patient computer-mediated communication studied in the past, physicians also expressed some concerns about regulations, intrusiveness, and interruption as well as caution about unintended consequences for their patients. Survey respondents’ comments suggested implications for interpersonal relationships with patients and communication-related honesty. These various factors could have synergistic effects for both physicians and patients, as scholars [30] have posited that positive or negative communication from physician or patient will give rise to similar responses from the other.

This initial exploratory study has some notable limitations. The sample of respondents had only direct experience with wearables used in practice. Thus, their responses reflect only their expectations and perceptions, not actual use. The study employed the use of a convenience sample and therefore cannot be generalized or claim to represent specific physician populations. It can, however, provide a first step to guide future studies.

6.1 Future research

Complemented by calls for more research in this area [10], our study highlights key areas for future studies:

(1) Can wearables improve physician-patient communication and the physician-patient relationship, and, if so, how? As Street et al. [30] found, physicians exhibited more patient-centered care and communication to patients they perceived as more involved in their health. Survey respondents’ favorable comments suggested patients’ use of wearables could have this effect. Observational studies and surveys could assess whether physicians associate patients’ use of wearables with their engagement and whether this in turn improves physician-patient relationships.

(2) Could use and non-use of these technologies potentially create disparities if some patients do not (or cannot afford to) adopt these devices? If patients’ use of wearables contributes to physicians’ perceptions of patient engagement and therefore increases their patient-centered care, the partial diffusion of these devices may have implications for healthcare service disparities. For instance Street et al. [30] and Johnson et al. [19] report disparities in physician-patient communication based on race, which often also correlates to socio-economic factors. Further research might examine whether access to wearables by more affluent patients heights such disparities, or conversely, whether wearable use could improve physicians’ impressions of and relationships with patients they may (unintentionally) view less favorably due to socio-economic factors.

(3) Will patient sharing of information with physicians improve patient compliance with treatments as well as continued use of wearables for health monitoring? Studies show that effective physician-patient communication is important to improved patient self-care outcomes, namely through increased patient satisfaction on the part of the patient and increased patient-centered communication on the part of the physician [24]. Ong et al. note that patient-reported compliance has been shown to improve with effective physician-patient communication, and that this can be a start to improved health outcomes as well [24]. To the extent that wearables can improve physician-patient communication (question 1), their use may also contribute to these outcomes. Additionally, wearable vendor studies have shown that individuals often give up the monitor within months of purchase [26]. Comparative studies of patient adopters who share or do not share PGHD from devices with physicians could help to determine if sharing increases patients’ long-term monitoring behaviors.

(4) How practical are wearables to implement in healthcare? What is the impact on workflows and work demands of caregivers? What design implications need to be considered? Although physicians surveyed were generally favorable about sharing PGHD from wearables, they also voiced concerns about these data being shared. While other studies have shown physicians’ overall favorable attitudes to adopting health IT [5; 9], Buntin et al. [5] point to the human element being critical to implementation, noting that leaders and staff in healthcare organizations must “buy into” the use of new technologies in order for those organizations to see benefits. In this study, respondents showed concern for the applicability of the wearables to their practice and the feasibility of successful adoption of the devices on the part of their patients, noting factors such as cost and/or understanding of how to use the device as potential barriers. However, most respondents did not have personal experience with wearable devices, as users or with their patients.

To investigate these questions, organizational communication theories could deepen our understanding of the dynamics underlying these
possible effects and inform research on the broader change implications of computer-mediated communication via wearables between patients and physicians. One promising theoretical lens is genre of organizational communication [33]. Yates and Orlikowski [33, 1992, p. 301] define genre of organizational communication as "...a typified communicative action invoked in response to a recurrent situation. The recurrent situation or socially defined need includes the history and nature of established practices, social relations, and communication media within organizations." [33]. For example, Davidson [13] utilized organizational genre theory to examine how hospital clinical information systems influenced the communication patterns between physicians and other staff, leading to clearer but more highly structured and limited communication, in some instances. An organizational genre analysis of physician-patient communication in which PGHD from wearables played an important role would consider the social functions for the communication (such as monitoring compliance in a routine office visit), structural features such as artifacts and settings (e.g., activity displays used in consultations), communication medium (such as automated updates into EMRs), and language or symbols (e.g., standard measurements such as “steps” built into devices). Such an approach could incorporate multiple actors in communicative genre, including the patient, physician, and staff members, as well as less obvious participants who nonetheless influence the genre, such as patients’ caregivers (parents or adult children) and IT firms that provide the wearables and collect and repackage data.

Another theoretical approach, which addresses population-level dynamics of preventable chronic disease management, is the social-ecological model [21]. This model focuses on both individual and social environmental factors in improving population health and calls attention to the importance of directing interventions at multiple levels: interpersonal, organizational, community, and public policy. Changes in the environment are interrelated to changes in individuals, and support is essential for the implementation of those environmental changes [21]. Stokols [29] uses the social-ecological model to develop guidelines for community health promotion, in which he points out that the theory “offers clear implementation guidelines for maximizing the health, economic, and societal benefits (social validity) of health promotion programs” [29, 1996, p. 295]. With wearables and physician-patient communication, the social-ecological model can provide a broader framework for insights into how diffusion and adoption of these devices might be used as part of sustainable interventions to address pervasive yet preventable chronic diseases by considering implications of their use among multiple actors, such as the individual and family members, healthcare provider organizations, and community resources.

7. Concluding remarks

The CDC notes that chronic diseases and conditions along with the health risks that cause them account for most healthcare costs in the United States, with 86 percent of all healthcare spending in 2010 going toward people with one or more chronic conditions [7]. Health information technology (HIT) and its consumerization via wearables, hold promise to help reduce the costs and incidence of chronic diseases. However, these technologies also lead to the question of whether the devices will contribute to sustained improvements in health and healthcare or be a passing fad. As we continue to make social and financial investments in these technologies, we must also investigate their potential and real outcomes. We suggest that if integrated in physician-patient communication and interaction effectively, wearables may be more promising to improve health and to have lasting effects across a wider spectrum of citizens, particularly individuals with chronic health problems. It is therefore important to understand how these effects are realized and how issues surrounding these technologies and their integration into healthcare can be overcome. This study is a first step in that direction.

8. References


