Designing Asynchronous Communication Tools for Optimization of Patient-Clinician Coordination

Jordan Eschler[1], Leslie S. Liu[1], Lisa M. Vizer, PhD[1], Jennifer B. McClure, PhD[2],
Paula Lozano, MD, MPH[2], Wanda Pratt, PhD[1], James D. Ralston, MD, MPH[2]
[1]University of Washington, Seattle, WA; [2]Group Health Research Institute, Seattle, WA

Abstract

Asynchronous communication outside the clinical setting has both enriched and complicated patient-clinician interactions. Many patients can now interact with a patient portal 24 hours a day, asking questions of their clinicians via secure message, checking lab results, ordering medication refills, or making appointments. However, the mode of communication (asynchronous) and the nature of the interaction (lacking tone or body language) strip valuable information from each side of patient-clinician asynchronous communication. Using interviews with 34 individuals who actively manage a chronic illness of their own, or for a child or partner, we elicited narratives about patients' experiences and expectations for using asynchronous communication to address medical issues with their clinicians. Based on these perspectives, we present opportunities for designing asynchronous communication tools to better facilitate understanding of and coordination around care activities between patients and clinicians.

Introduction

Asynchronous communication between patients or caregivers and members of their care teams (physicians, nurses, and medical assistants, herein referred to as "clinicians") has increased with the adoption of patient websites or portals. Patients may now interact with these electronic systems to manage basic health care needs, including filling prescriptions, receiving test results, being reminded of future screening and diagnostic testing, and sending secure communications to health-care providers[1]. Some of these services are also now part of Federal policy. To receive full payment for seeing patients with Medicare and Medicaid coverage, Stage 2 Federal meaningful use criteria for electronic health records (EHRs) require healthcare providers to support patient use of secure electronic messaging and the ability to view, download and transmit portions of the electronic medical record[2]. Several studies have shown the potential of these services to improve patient satisfaction and outcomes in patients with selected chronic conditions[3].

Despite the growing role of asynchronous communication between patients and healthcare providers via portals, patients have had limited involvement in their design and implementation. Asynchronous communication increasingly extends beyond secure electronic messaging and now includes reminders for preventive and chronic care tasks, notifications about medical test results, and patient uploads of survey and biometric data like home blood glucose and blood pressure readings. Outside of a few core features associated with high patient satisfaction[3,4], we understand little about what portal features can support the needs of patients for asynchronous communication and information, particularly for those living with chronic illnesses. Several underserved patient populations—including those from racial and ethnic minority backgrounds, and those with lower levels of education—are also less likely to use patient portals, raising concern that current portal design and implementations are not equitably accessible to those in need[3,5]. Finally, asynchronous communication over portals is largely limited by what is provided by commercial EHRs and the possibilities of integrating with existing models of care.

To improve asynchronous communication over patient portals, we must consider the patient's perspective of their use, effectiveness, and usability. The design of asynchronous communication should align with the Epstein et al.[6] vision for patient-centered care, where care should "explore patients' values and preferences; help patients and their families make clinical decisions; facilitate access to appropriate care; and enable patients to follow through with often difficult behavioral changes needed to maintain or improve health." To this end, we elicit experiences from patients and caregivers in their use of patient portal asynchronous communication tools. To gather perspectives of patients who have ongoing health needs and are most likely to benefit from asynchronous communication, we recruited adult patients with diabetes and mothers of children with asthma. We oversampled racial and ethnic minorities and ensured an adequate sample of those with lower educational status to identify potential portal features that would engage these populations in asynchronous communication. Our study contributions are twofold: first, we present themes in patient experiences of asynchronous communication tools. Then, we suggest design implications for asynchronous communication tools to better facilitate coordination of care between patients and clinicians between office visits.

Background

We frame our approach to eliciting patient experiences in using asynchronous communication tools as just one factor in chronic illness management and in the larger relationship with clinicians to support such management. Similarly, Abaidoo and Larweh[7] situate information and communication technology in clinical practice as "[a] conduit for channeling health information to consumers" for two purposes: (1) making informed shared decisions, and (2) tailoring clinical interventions appropriately through timely communication. This definition conveys agency in decision-making to both patient *and* clinician, underlining the importance of understanding care activities and their priority in the patient-clinician relationship. Thus, communication facilitated by technology is one factor that can help a clinician and her patient negotiate goals, establish benchmarks of wellness, and manage health and/or chronic conditions. Patient access to medical information and communication tools is, accordingly, an important tenet of the Institute of Medicine's recommendations to "cross the quality chasm" in health care[8].

Fowles et al.[9] found that 80% of patients—regardless of health status, education, and income—had at least some interest in viewing the information in their medical record; respondents to the survey in this study were motivated by wanting to be more involved in their health care and by a desire to understand their medical conditions more thoroughly. Therefore, patients do desire to engage with their health information through tools such as patient portals. These tools have the potential to increase patients' engagement in their own care, improve patient experience of care and, potentially, improve patient outcomes[10]. A systematic review by Goldzweig et al.[3] found that patients had generally positive attitudes towards secure messaging and access to the online medical record. The authors further found improved outcomes for certain chronic conditions when secure messaging and other functions of the portal were coupled with case management. However, the review also identified the importance of further evidence on the specifics of context and implementation in evaluations of portal functions. Much of the evidence of for patient benefit has come from implementations and studies in a limited number of settings.

Clinician-focused evaluations of asynchronous messaging systems assess clinician engagement, associated workload, and billing. In a meta-review of such evaluations, Wallwiener et al.[11] found that physicians were slow to take up using secure messaging, but found benefits—such as less time spent on the phone and higher measured patient satisfaction—outweighed costs, particularly burdens on physicians' clinic time (also supported by Kummervold and Johnsen[12]). Goldzweig et al.[3], however, found insufficient evidence that patient portals change costs or traditional forms of utilization. Tufano et al.[13] highlighted the importance of aligning the organization and financing of care for providers to sustainably meet patients' needs for access over secure messaging.

Benefits of asynchronous communication tools to both patients and patient-clinician relationships are multiple. Andreassen et al.[14] found that benefits to patients included: "emancipation" of the patient-clinician relationship from the constraints of space and time during office visits; a valuable mechanism for "transferring responsibility" to the doctor for an issue once communicated; and a modality (writing) that helps patients to reflect and synthesize health information. Another benefit of asynchronous messaging cited by Sun et al.[15] is the allowance for patients and doctors to communicate directly. As a result, the authors argue, "accuracy and authenticity" of patient messages was increased, a worthwhile tradeoff for the added time on the clinicians' part spent addressing patient messages.

However, individual patient experience with asynchronous communication tools have principally been studied by quantifying engagement with and use of the system through patient message volume[16], and surveys of patients to examine use, expectations, and experience [4,17-20]. Our qualitative study examines asynchronous communication tools as one aspect of all elements of care in managing chronic illness, a process that involves clinicians but takes place largely in the patients' home and between office visits.[21]

Methods

To inform our methods, we referred to recent workshop reports in the areas of human-computer interaction and medical informatics, which call for framing inquiry into patient-clinician communication from a patient-centered point of view[22,23]. That is, we are interested in the patient experience of "asynchronous, remote" modes of communication[22] in the context of the larger patient-clinician relationship. In shaping our interviews with patients and caregivers, we also emphasized "shared decision-making"[23] between patients/caregivers and clinicians. In sum, we sought to answer:

How do individuals characterize their experiences of and expectations for using asynchronous communication strategies to coordinate health care with clinicians?

We recruited 34 participants from Group Health Cooperative, a large integrated healthcare delivery system in Washington State. All participants had a primary care provider in a Group Health owned and operated clinic. Participants included 16 mothers with children under 12 years of age who were diagnosed with asthma and being treated for asthma, and 18 adults diagnosed with Type 2 diabetes. Mothers of children with diabetes (mean age 38.3) were younger than patients with diabetes (mean age 73.0; also see Table 1). We oversampled racial and ethnic minorities (16 of 34 enrollees, the greatest proportion of whom were Black participants). Nine participants had a high school or lower educational level. We purposively sampled 26 (76%) of the overall interview sample to be current users of the patient portal. We defined *portal use* as having used one or more of the eight key services of the portal on two occasions separated by 30 days or more in the previous two years. These services included: viewing medical test results, visit summaries, immunization lists, allergy lists, medical condition lists; exchanging secure messaging with providers; ordering medication refills; and scheduling an in-person appointment.

In the case of diabetes patients with a close caregiver, the caregiver participated in the research interviews where possible and appropriate. These two cohorts were chosen because each is responsible for daily self-care related to the management of a chronic disease, each has frequent contact with health care providers and health care systems (e.g., scheduling appointments, filling prescriptions, scheduling lab tests, etc.), and all have regular opportunity and need to use communicate with their healthcare providers. Asthma cohort participants are denoted with A# identifiers and diabetes cohort participants have D# identifiers in the quotes highlighted in results.

Table 1: Demographics of study participants

		Asthma cohort		**Diabetes cohort**
Female		16		9
Male		-		9
Average Age (years)		38.3		73.0
Education				
Up to HS/GED		2		7
Some College/AA		3		4
4 Year Degree		6		3
More than 4 year degree		5		4
Race & ethnicity				
Asian		-		2
Black		6		6
White (Non-Hispanic)		9		8
White (No ethnicity given)		-		1
Other (Hispanic)		1		1

We conducted 2 interviews each with all of the 34 individuals who were each managing a chronic condition of their own or for a young child. Interviews took place approximately six months apart, were conducted in the participants' homes, and ranged in length from 30 minutes to 90 minutes. The semi-structured interviews inquired about patients' health goals, priorities for completing health tasks, and examined patient-centered workflow in attaining health goals and completing related tasks. The research design was approved by institutional IRB, and researchers used a semi-structured script to guide the sessions in both interview instances. Interviews were audio recorded; after transcription, audio files were destroyed. We had approximately 1,300 pages of interview transcriptions as our dataset for this study.

Analysis

The group of researchers conducting interviews and those coding the transcripts overlapped; thus, as interviews were being conducted - particularly in the second round - researchers tracked themes emerging in real time (as described in the qualitative research approach by Strauss and Corbin[24]). One author (JE) performed open coding on six pairs of interviews, using a list of potential themes identified during the interview period to seek patterns and name and define potential codes. Three other coders (LMV, LSL, KO) were trained with the codebook and tested its use on four pairs of interviews each. The four coders then met to revise and finalize the codebook for its use in pursuing themes to address the research question.

Given the variation in our populations of interest and their technology use, we were careful to inquire about multiple possible modalities of communication between patient and clinician (not only asynchronous), to obtain a full picture of the patient experience. Therefore, we were able to assess themes that emerged around the patient-clinician relationship, as well as patient motivations for utilizing their modalities of choice in coordinating with health care providers. We examine below two characterizations of patient experiences: themes that emerge in satisfactory patient-clinician asynchronous communication and those that coincide with unsatisfactory communication.

Results: Characteristics of satisfactory asynchronous communication

We grouped themes of asynchronous communication tool use that were consistent with positive or satisfactory patient experiences. Themes in satisfactory communication experiences included experiences where asynchronous communication enhances care, reduces patient uncertainty, and provides "health archives."

Enhances care with follow-up

Participants contextualized their asynchronous messaging experiences in the relationship with their doctors. D07 described his doctor as someone who followed up diligently: "*I had expressed a concern to her and she checked into it and wanted to know if I was still having a problem and she e-mailed me and I e-mailed her back."* Another participant used e-mail as a trusted communication medium because the doctor was skillful in judging when to follow up. *"Some things require a response and others are just for their information, it depends."* (D03).

Participants felt that asynchronous communication was particularly beneficial when the communication complemented care received during a clinic visit, particularly when communicating between clinic visits also elevated the sense of patients' responsibility for managing their conditions. For example, D09 expressed that "*if you don't answer [clinician e-mails], that would be inappropriate and certainly not taking care of yourself.*"

The additional modality offered by asynchronous communication (i.e., writing) also assisted patients in following up more effectively. Participants who were satisfied with the asynchronous communication system tended to indicate comfort with expressing themselves in writing; this echoes previous research findings[25,26]. D15 stated, "*I can sit down and express myself more."* One participant in the diabetes cohort felt less pressure in office visits to cover all concerns, and felt more control over her health when able to follow up post-visit:

I've already left the doctor, I'm feeling a certain kind of way. I don't know that my inadequate feeling is enough to make another appointment so it depends what it is that I'm feeling and then I can go ahead if I need to contact them, to do the email [secure messaging]. I'm just so pleased they got the email thing. (D03)

Asynchronous communication tools were also key to managing complex family arrangements, such as when non-custodial parents brought children to the doctor for a checkup. Asynchronous communication tools were used, in following up clinic care, to keep the custodial parent "in the loop." In one case, a custodial parent used secure messaging to (1) tell the doctor ahead of time that the other parent would be accompanying the child, (2) send along health concerns in her absence, and (3) follow up with questions between custodial and non-custodial parents after the appointment. This participant, A09, explained: *"It's my control issue, this is what I need [the doctor] to cover, or could you just answer this for me or know this information when you talk [to the other parent]."*

Reduces uncertainty in the plan of care

Participants also used e-mail to resolve uncertainty in the plan of care, such as questions that remained after an office visit. In some cases, the participants felt as though they needed less assistance from clinicians because they could access archived reports (such as after-visit summaries) and messages through the patient portal: *"When I feel I need follow up I can check there, which is really nice that they have the online summaries."* (A16)

One participant with diabetes frequently used the patient portal's secure messaging function to discuss his lab test results with clinicians. This not only reduced uncertainty, but increased his feeling of "buy-in" on engagement in his care. He felt his clinicians emphasized their responsibility to make sure the patient was adherent by using secure messaging frequently: *"I don't get by with ignoring anything,"* he told us (D01). In another example, one patient on Warfarin had frequent contact with consulting nurses and indicated that the secure messaging was both informative and an indicator of the seriousness with which the participant should be managing his health: *"I'm very happy that they follow up so diligently, because previously I didn't think [the Warfarin monitoring] was that serious a thing, really"* (D09).

Provides automatic "health archives"

Participants also acknowledged that using asynchronous communication systems, such as secure messaging, had the advantage of automatically archiving their communication with clinicians, which they could review at a later date to inform their care management. Like many participants, A06 told us, *"I don't save paper notifications, but everything else is stored online."* The online archive of messages can also help patients understand their condition better. Caregivers also used the e-mail archives to access information as part of their responsibilities. One caregiver of a partner with diabetes (D10) told us, *"Sometimes I check his [patient portal messages] because I know he doesn't do it."* In this case, the archive of information facilitated social sharing of information that helps the patient manage his condition.

Results: Characteristics of unsatisfactory communication

The themes below were identified as characterizing unsatisfactory patient experiences with asynchronous communication tools on the portal, and included: failing to track issues in a coherent way, and exposing patients to inconsistent communication patterns.

Fails to track issues

Participants indicated that they had, in some cases, been "conditioned" by the system about expectations, such as response time on secure messages or lab test results. *"I just go into [the patient portal] when I expect [lab results] should be done, and check it and see if it's done"* (D07). However, some of the conditioning by the system trained participants to believe that "no news is good news," and if they never heard back from the doctor, the issue was not only no longer open, but in fact a non-issue. As one diabetes caregiver to participant D16 explained, *"Unless there's something really out of whack, and then [the doctor's] office will call…[but my husband] is actually really well stabilized."* The uncertainty in these cases led participants to assume the burden was on clinicians to follow up as needed, but this is not ideal for optimum understanding of and coordination around illness management activities.

Participants also cited the inability to act on reminders to revisit an issue after a certain period of time. For example, a mother of a child with asthma is often advised to visit the child's allergy specialist in 6-month intervals, but the mother is unable to schedule that far ahead on the patient portal system. Instead, she tries to call for an appointment immediately; if that tactic fails, she implements a reminder-to-remind system:

If I go in for an appointment and the doctor says, 'okay, we need to see [the children] back in six months,' I'll usually get home, I'll call the next day, even though it's six months out – sometimes their calendars don't even, they're not even that far out. But I call the next day because I might forget so well, I'll just call and say, 'okay, are you scheduling this far out?' (A07)

A related problem was the lack of status indicators for unresolved issues, where communication tools on the patient portal were either "read" or "unread," or had no useful status to keep participants informed of ongoing tasks associated with open issues. A15 wished for open medical orders and pending lab results to be flagged as open issues on the patient portal; she stated that such status information would give her "*peace of mind."*

Secure messaging can be part of overall unsatisfactory communication leading to severed relationships between the patient or caregiver and clinicians. In one such episode, the mother of a child with asthma and a comorbid sleep disorder described a lack of follow-up from a provider on an expensive sleep study. *"They did ask, do you prefer [a secure message] or [a] phone call? I said 'either one,' and we never received anything. And in turn, with that specialty…we have gone out of network." (A04)* Had the patient portal offered a way to track the status of issues associated with the sleep study, the clinician would have been notified that the issue remained open for the caregivers and patient.

Exposes Patients to Inconsistent Communication Patterns

Some participants were confused about how asynchronous communication tools in the patient portal worked within the larger health care information system. The patient portal, along with the multiple modalities of communication available to clinicians, formed a "black box" of a system where patients were not always certain what to expect. One patient never knew how she would hear about test results: "*I think my mammogram, they never called me for that - they do send you a letter, so they aren't consistent*" (D01).

In a similar vein, another patient noted that although medical orders are being executed, there is no communication with the patient to ensure an order is completed: *"They put [the lab test order] on the computer, but they don't tell you to go in and have it done"* (D13). Uncertainty in communication even affected the frequency of in-person office visits, confusing the patient and leading to potential lapses in illness management: "*I haven't seen [doctor] for six months. I don't know when I'm going to see her again...Maybe I don't need to, I don't know*." (D13)

In the following section, we synthesize what we have learned about successful and unsuccessful patient experiences with asynchronous communication tools. We suggest design opportunities for such tools that could improve the patient experience, and increase patient-clinician understanding of care activities to manage chronic illness.

Discussion of Design Opportunities

Based on our findings, we have identified two major design opportunities for enhancing patient-clinician coordination when using asynchronous communication systems. First, incorporating patient preferences for communication modality in a transparent manner within the patient portal would facilitate a greater match between clinician efforts to remind and patient ability to receive and act on reminders. This is relevant to supporting Meaningful Use Stage 2 guidelines[2], which include patient communication preference incorporation to improve patient access to information and online health content. Second, incorporating "status indicators" in the asynchronous communication system, giving both the patient and clinician the ability to indicate a range of statuses for individual care issues, such as "unresolved," "under clinician review," "awaiting clinician response," and "resolved," would give patients and clinicians a signaling system for prioritizing future tasks and indicating agreement on clinical tasks and issues.

To demonstrate that implementation of functions related to these design opportunities would improve patient-clinician and caregiver-clinician communication and coordination, we use the model proposed by Wilcox et al.[24] to delineate benefits to care. Specifically, Wilcox et al. called for research to focus on three "communication goals" between patients and clinicians: (1) clinician awareness of patient symptoms, (2) patient awareness of care activities, and (3) shared decision-making. An overview of our design recommendations and their benefits according to this framework are presented in Table 2, and we further detail design recommendations in the following subsections.

Incorporating patient preferences

We found that preferences for different modalities varied within our sample cohorts, and preferences were highly individualized. This supports the requirement that providers begin to collect patient modality preferences (e.g., secure messaging, phone) as part of Meaningful Use Stage 2[2], as the act of incorporating preferences seems to be a formidable opportunity to improve the patient-clinician communication loop. For example, some of the patients with diabetes strongly preferred messaging to using the phone, due to the low time pressure of writing messages and the assumed convenience to clinicians. "*On the phone, the guy's got to be there and on the e-mail, once you send it, you send it and you know he's got the message*" (D08).

However, some mothers of children with asthma preferred never to check their patient portal messages and many described their difficulty with remembering yet another password for an online account. Instead, mothers who spent a great deal of time traveling in the car, for example, preferred to see the clinic main number pop up on their smartphones, which acted as a reminder in and of itself:

Interviewer: It sounds like you don't get the calls from [all of your doctors] right now. Would you prefer texts over calls in general?

Participant: I really don't have an opinion. I mean if you can get the information out in a text, why not? But if not, then a call is fine too. At least I can see the missed number and recognize the number so I mean - you know what? Even saying that out loud, it sounds like I would prefer the visual, so yeah, I would prefer text. (A09)

These variations in modality preferences for non-urgent communications indicate that customizing modalities for asynchronous communication would offer a great benefit to clinicians (saving them time on communication issues) and to patients or caregivers (reducing uncertainty around how communication with clinicians would occur). In times of greater need, such as with an asthma exacerbation or worsening complications from diabetes, the benefit may be amplified further.

Table 2. Delineating benefits to design opportunities identified in the Wilcox et al.[24] patient-centered communication framework

		Design Opportunities Identified	
		Incorporate patient preferences for modality of non-urgent information exchange	**Incorporating status indicators in the asynchronous communication system**
Wilcox et al. Model elements	**(1) Clinician awareness of patient symptoms**	**Patient** more likely to follow up with open issues when communication uses preferred modality. **Clinicians** will have better information to act upon to help patients.	**Patient** can input or update symptom information to open, or re-open, clinical issues and alert clinicians. **Clinicians** will have better information to act upon to help patients manage conditions.
	(2) Patient awareness of care activities	**Patient** more likely to receive and act upon reminders for care activities through preferred modality. **Clinicians** will benefit from improved efficiency in reminding patients about care activities.	**Patient** is able to review open issues and prioritize and engage in care activities. **Clinicians** can incorporate patient input to status indicators, receiving updates in real time about open issues.
	(3) Shared decision-making	**Patients** and **clinicians** are more likely to connect efficiently over the patient's preferred modality to make shared decisions.	**Patients** and **clinicians** will have a shared list of open issues which will inform both parties as to shared decision making.

The reduction of uncertainty to patient expectations would in turn increase the coherence of communication through the patient portal. Rather than the confusing "black box" mental model, patients would be able to expect a phone call or secure message – depending on their preferences – and the stress of awaiting information from clinicians could be reduced, particularly around test results:

"They send you a letter telling you what your [lab test] results were, but it's not on [the patient portal]. Like it's totally separate, and they don't do it through e-mail, which is annoying because I don't like to call people and bug them." (D01)

This patient with diabetes did not know what to expect when awaiting test results; as with the "black box" problem before, the confidence in knowing what to expect can be troublesome for building trust in the patient-clinician relationship. Thus, we see an opportunity to let patients determine their preferences in a way that they can see in the system, such as a dashboard to view and update preferences about communication for various tasks, like receiving test results or receiving appointment reminders.

Finally, there are situations in which asynchronous communication simply may not work well. For example, one of our participants has been visually impaired since birth. This individual stated that she preferred phone calls with clinicians to any kind of asynchronous communication, such as secure messages or U.S. Mail (which required a software screen reader, or a paid human reading assistant, to convey this sensitive information). Although an edge case in terms of context, we point to this individual's experience to illustrate a case in which the utility and efficacy of notifications could be improved significantly by incorporating patient preferences:

Interviewer: Have you ever considered tools that might be helpful to [remember upcoming appointments]?
Participant: I've asked them to call me ahead of time to remind me, and they said they don't send reminder calls.
Interviewer: That's surprising to hear, actually. That was something you asked the front desk about?
Participant: Yes.
Interviewer: Did you ask your doctor directly about it as well?
Participant: I think I did, I don't recall if I did or not. (D17)

The examples above are intended to highlight the frustrations patients experience when their preferences cannot be incorporated into patient-clinician communication. This is the first design opportunity we identified in our data analysis; the second design opportunity is that of using status indicators to signal open, in-process, and closed issues between the patient and clinician.

Indicating Status

Failures and frustrations with asynchronous communication between participants and clinicians largely stemmed from the participants' uncertainty about the status of a given issue. It is often unclear to patients whether the lack of follow-up or response from a clinician indicates "no news is good news" or simply a lack of resolution. The most radical aspect of this design recommendation is, perhaps, giving patients the ability to change and control the status indication. Both the patient and clinician would be able to view and add information to open issues. However, the patient would indicate when an issue was resolved satisfactorily.

By empowering patients to send clear signals about whether an issue is open or closed, clinicians will be better able to understand a patient's state of mind regarding medical concerns, and can prioritize issues that patients needed further assistance to close. For example, A15 brought up an instance where she did not hear back about sensitive lab test results over a long weekend. She stated she would have felt better to have just known from the clinician "*we're looking at your test results*." In this case, the participant would have benefited from a status indicator system that would have flagged the issue as unresolved, but in-process at the clinic level, to reduce her uncertainty regarding the open issue. Such feedback has been noted from parents managing children's health care through patient portals in previous studies, where even a "read receipt" type feedback mechanism would have been a helpful system feature in the caregiver- or patient-clinician communication loop[27]. Additionally, previous studies have shown that patients managing a chronic illness are willing to engage with online health management, though clear communication "closed loops" between patients and clinicians would improve the patient experience[28].

Often, participants wished for a way to notify clinicians that the issue remained open, despite the clinician having moved on. D08 shared an anecdote about attempting to get referred for foot care, but described an e-mail exchange with his primary care physician that was "never successful" (i.e., resolved) - and he continued to go without foot care or a reason for no referral.

Interviewer: How can [your doctor] be there for you? Tell me more, I want to get more insight there.

Caregiver: To share a lot more knowledge and let us know why decisions are made. We've asked him – 'oh, I'll check on it,' but we never heard back from him on it. Every time we go there, we ask the same question – 'why was it denied, is there something you can do?' It doesn't seem to be one of his top priorities. (D16)

In this case, the patient would benefit from being able to indicate that an issue was not satisfactorily closed, ensuring they receive all of the information needed to move on to other care issues and reducing damage to the patient-clinician relationship.

We suggest testing the addition of status indicators to issues opened by patients or clinicians, whether it arises during an office visit and subsequently requires follow-up (lab tests), treatment (new medications, therapies), or monitoring (ongoing lab tests, such as an A1c, or home measurement of peak flow meter). Open issues could be tracked, and the corresponding information and related tasks grouped, for the convenience of both the patient and the clinician; we recommend prototype testing to maximize the benefit of status indicators and to avoid alert fatigue among either patients or clinicians. This design feature could also indicate the state of the issue, such as if the next task required input from the patient or clinician, clarifying expectations of both parties. Having a signaling system between the patient and clinician could both reduce uncertainty and impart shared, but clear, responsibilities to each party regarding resolution of the issue.

Status indicators could assist patients in following through with standing orders for regular labs, such as the A1c for patients with diabetes. In the current system, as D01 told us, *"The A1c has been a little bit of a problem because my doctor has set it up so that I can go every three months, but if that time passes...they just discard it if you don't use it."* In a future system, with status indicators for open issues, this participant could log into the patient portal and see she had an open status item to complete: she could then visit the lab, so as not to waste the standing order. This feature would underscore the importance of teamwork between patients and clinicians, and conveys a sense of responsibility to the patient in managing symptoms or problems.

Limitations

The study findings are limited by the sample size, qualitative nature of the data, and inclusion of participants from a single health care system who all have access to the same communication systems and patient portal. However, the findings suggest opportunities for improving patient-provider communication and systems diverse health care settings.

Conclusion

As evidenced by our analysis, the patient experience in using asynchronous messaging tools could be improved to enhance coordination between patients and clinicians. Our sample included individuals from populations who have been less likely to engage in patient portals, those who avoided or reluctantly used technology, as well as avid smartphone users, to give a range of viewpoints on asynchronous communication tool use in the health care context. We found that the positive aspects of patient experience with asynchronous communication tools support the ability to supplement in-clinic communication. This support included: follow-up with care activities, reduction of patient uncertainty about care plans, and availability of "health archives" online. Negative aspects of using such tools, however, included lack of consistent patterns of use in patient communication and uncertainty about resolution to issues addressed through the tools. We present design opportunities to reduce the uncertainty that patients experience in managing chronic illnesses, while also strengthening roles and responsibilities between patients and clinicians in managing issues that arise in monitoring chronic conditions. We use our findings to provide practical, actionable changes to the design of asynchronous communication tools to improve the patient experience and facilitate the balance of work and responsibility in the patient-clinician relationship.

Acknowledgements

This project was supported by grant #R01HS021590 from the Agency for Healthcare Research & Quality (AHRQ).

References

1. White, CB, Moyer, CA, Stern, DT, et al. A content analysis of e-mail communication between patients and their providers: patients get the message. Journal of the American Medical Informatics Association. 2004; 11(4): 260-267.
2. Centers for Medicare & Medicaid Services (CMS), HHS. Medicare and Medicaid programs; electronic health record incentive program--stage 2. Final rule. Federal register, 2012; 77(171): 53967.
3. Goldzweig, CL, Orshansky, G, Paige, NM, et al. Electronic patient portals: evidence on health outcomes, satisfaction, efficiency, and attitudes: a systematic review. [Research Support, U.S. Gov't, Non-P.H.S. Review]. Ann Intern Med. 2013; 159(10): 677-687. doi: 10.7326/0003-4819-159-10-201311190-00006
4. Ralston, JD, Carrell, D, Reid, R, et al. Patient web services integrated with a shared medical record: patient use and satisfaction. [Research Support, N.I.H., Extramural Research Support, Non-U.S. Gov't]. J Am Med Inform Assoc. 2007; 14(6): 798-806. doi: 10.1197/jamia.M2302
5. Lyles, CR, Harris, LT, Jordan, L, et al. Patient race/ethnicity and shared medical record use among diabetes patients. [Research Support, U.S. Gov't, P.H.S.]. Med Care. 2012; 50(5): 434-440. doi: 10.1097/MLR.0b013e318249d81b
6. Epstein, RM, Fiscella, K, Lesser, CS, et al. Why the nation needs a policy push on patient-centered health care. Health Affairs. 2010; 29(8): 1489-1495.
7. Abaidoo, B, & Larweh, BT. Consumer Health Informatics: The Application Of ICT In Improving Patient-Provider Partnership For A Better Health Care. Online journal of public health informatics. 2014; 6(2).

8. Committee on Quality of Health Care in America. Crossing the quality chasm: a new health system for the 21st century. Washington, DC: National Academy Press; 2001.
9. Fowles, JB, Kind, AC, Craft, C, et al. Patients' interest in reading their medical record: relation with clinical and sociodemographic characteristics and patients' approach to health care. Archives of Internal Medicine. 2004; 164(7): 793-800.
10. Street Jr, RL, Makoul, G, Arora,NK, et al. How does communication heal? Pathways linking clinician–patient communication to health outcomes. Patient education and counseling. 2009; 74(3): 295-301.
11. Wallwiener, M, Wallwiener, CW, Kansy, JK, et al. Impact of electronic messaging on the patient-physician interaction. Journal of telemedicine and telecare. 2009; 15(5): 243-250.
12. Kummervold, PE, & Johnsen, JAK. Physician response time when communicating with patients over the Internet. Journal of medical Internet research. 2011; 13(4).
13. Tufano, JT, Ralston, JD, & Martin, DP. Providers' experience with an organizational redesign initiative to promote patient-centered access: a qualitative study. J Gen Intern Med. 2008; 23(11): 1778-1783. doi: 10.1007/s11606-008-0761-3
14. Andreassen,HK, Trondsen, M, Kummervold, PE, et al. Patients who use e-mediated communication with their doctor: new constructions of trust in the patient-doctor relationship. Qualitative health research. 2006; 16(2): 238-248.
15. Sun, S, Zhou, X, Denny, JC, et al. Messaging to your doctors: understanding patient-provider communications via a portal system. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. 2013, April: 1739-1748.
16. Byrne, JM, Elliott, S, & Firek, A. Initial experience with patient-clinician secure messaging at a VA medical center. Journal of the American Medical Informatics Association. 2009; 16(2): 267-270.
17. Riippa, I, Linna, M, & Rönkkö, I. The Effect of a Patient Portal with Electronic Messaging on Patient Activation among Chronically Ill Patients: Controlled Before-and-After Study. Journal of medical Internet research. 2014; 16(11).
18. Couchman, GR, Forjuoh, SN, Rascoe, TG, et al. E-mail communications in primary care: what are patients' expectations for specific test results? International journal of medical informatics. 2005; 74(1): 21-30.
19. Lyles, CR, Grothaus, L, Reid, RJ. Communication about diabetes risk factors during between-visit encounters. [Research Support, U.S. Gov't, P.H.S.]. Am J Manag Care. 2012; 18(12): 807-815.
20. Schickedanz, A, Huang, D, Lopez, A, et al. Access, interest, and attitudes toward electronic communication for health care among patients in the medical safety net. J Gen Intern Med. 2013; 28(7): 914-920. doi: 10.1007/s11606-012-2329-5
21. Strauss, AL, & Corbin, JM. Shaping a new health care system: The explosion of chronic illness as a catalyst for change. Jossey-Bass; 1988.
22. Chen, Y, Cheng, K, Tang, C, et al. Is my doctor listening to me?: impact of health it systems on patient-provider interaction. In CHI'13 Extended Abstracts on Human Factors in Computing Systems. 2013, April: 2419-2426.
23. Wilcox, L, Patel, R, Back, A, et al. Patient-clinician communication: the roadmap for HCI. In CHI'13 Extended Abstracts on Human Factors in Computing Systems. 2013, April: 3291-3294).
24. Strauss, A, & Corbin, J. Basics of qualitative research: Procedures and techniques for developing grounded theory. Thousand Oaks, CA: Sage, 1998.
25. Roter, DL, Larson, S, Sands, DZ, et al. Can e-mail messages between patients and physicians be patient-centered? Health communication. 2008; 23(1): 80-86.
26. Ye, J, Rust, G, Fry-Johnson, Y, et al. E-mail in patient–provider communication: A systematic review. Patient education and counseling. 2010; 80(2): 266-273.
27. Britto, MT, Hesse, EA, Kamdar, OJ, et al. Parents' perceptions of a patient portal for managing their child's chronic illness. The Journal of pediatrics. 2013; 163(1): 280-281.
28. Ralston, JD, Revere, D, Robins, LS, et al. Patients' experience with a diabetes support programme based on an interactive electronic medical record: qualitative study. BMJ. 2004; 328(7449): 1159.