Supporting Effective Sharing of Health Information among Intergenerational Family Members

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ABSTRACT

Family relationships are resources to foster healthy behaviors in family contexts. However, we have little understanding of ways to leverage intergenerational communication between elderly parents and adult children to improve family health and the roles technology plays in supporting this process. In this study, we examine how intergenerational family relationships and technology use influence health communication and collaboration among family members, from which we identify design opportunities to promote a culture of health within the family. We conducted 10 focus group interviews with independent living elderly parents (n = 12) and adult children (n = 25). We present different types of health information sharing and motivations to curate what health-related information to be shared. We also explore how family members deal with obstacles in health information sharing. Based on our findings, we suggest design implications to promote effective sharing, to support different types of sharing, and to enhance family sharing to build a culture of health within the family.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; *Empirical studies in collaborative and social computing*; *Collaborative interaction*; *HCI theory, concepts and models*;

KEYWORDS

Health; family communication; collaboration; information sharing; intergenerational

1 INTRODUCTION

Family members have the intrinsic desire to communicate and stay aware of one another's health and well-being [16, 25, 29]. An example of this phenomenon is when a mother checks on her daughter to see whether she is settling in at her new job in a remote place and eating healthy; the daughter worries if her aging parents are getting moderate exercise during winter time. Generally, distributed families use technology to overcome the challenge of maintaining regular communication (e.g., telephone, emails, text messages [2]). Many researchers and industries have developed technological means to support families' need for communication and awareness, such as using videos to share experiences [14, 17] or day-to-day activities [24] among family members. Besides assisting families to share general information, there has been a growing interest in developing innovative technology to promote family engagement in health and well-being [5, 8, 9]. Given that family engagement plays a significant role in promoting a healthy lifestyle and improving family wellness [5, 7], we want to understand how intergenerational health communication is conducted in the family context to better support this practice. The family context has the means and the potential to help individuals make choices that lead to a healthy life. For example, one member may engage other family members in healthy behaviors and provide supports, placing well-being at the center of family life—a practice we refer to as *building a culture of health* within the family [8, 15].

Most studies on intergenerational family communication support activities of grandparents/parents with underage children. Some researchers have turned their focus on examining intergenerational family communication—specifically between elderly parents and adult children. However, these literatures typically address intergenerational families' burden on informal caregiving duties rather than looking closely at current practices, needs, and concerns regarding intergenerational health communication [12, 13]. In this study, we complement previous research by examining how intergenerational family members—specifically elderly parents and adult children—communicate health, what is being shared, and what obstacles exist with respect to health communication and information sharing. By addressing these questions, our goal is to expand the understanding

of current practices regarding intergenerational health communication, and to identify opportunities to design technology to promote a culture of health within the family. We propose the following research questions to guide this work:

- RQ1: How do family members currently talk about health-related issues?
- RQ2: What do family members share about health?
- RQ3: How do family members deal with some obstacles regarding health-related discussions?

To answer these research questions, we conducted scenario-based focus-group interviews with 37 participants (12 elderly parents, 25 adult children). Based on the findings, we propose design implications to support individuals' efforts on effectively communicating health and customization for different family contexts, such as collocated or distributed ones, with the goal of building a culture of health within the family.

The specific contributions of our research are as follows:

(1) An understanding of:
   (a) the reasons why family members choose (or do not choose) to communicate about health;
   (b) how they communicate and share health information;
   (c) the content of shared information;
   (d) the challenges family members face in health-information sharing.
(2) Examining how sharing personal health information enhances communication and collaboration among family members.
(3) Proposing potential design insights that will ultimately benefit both elderly parents and adult children to communicate about health and support intergenerational health collaboration within the family.

2 RELATED WORK

In this section, we provide related work on how family communication is practiced with technological support, how technology use affects family members on communicating health with one another, and how transitions in family structures as well as different family contexts may play a role in health communication within the family.

2.1 Family Communication and Technological Support

Researchers have explored different forms of technology to support family conversations as family members seek pervasive communication, coordination, and connection with one another [29]. For example, displaying information about the current state of an extended family member (e.g., Digital Family Portrait [24]), sharing experiences among distributed family members (e.g., Experiences2Go [14]), and supporting storytelling with location-based games (e.g., GEMS [27]). Besides supporting general communication, researchers have also proposed designs to support affective communication among family members by *caring-through-data* as a means to foster empathy and togetherness [19] through probing conversations about their emotional experiences [20]. Promoting

family communication about "care" is important to evoke a positive collaboration towards the family's health-related goals [19].

As family interaction plays an important role in helping members achieve long-term health-related goals [5, 8], understanding practices in health communication and collaboration is necessary when designing tools to support the goals. Researchers have investigated technology use to support family members on health management in the context of chronic disease. For example, Eschler et al. [7] proposed the use of shared calendars for families who managed chronic health conditions at home to support their daily schedule management and health care activities. Other works have proposed technology use beyond diseases; for example, Escobedo et al. [8] developed the SHINE-L system, which aims to empower families to actively engage in behavioral changes for healthy lifestyles and family wellness. The SHINE-L system uses mobile phones/smartwatch sensors to track family routines, and the information tracked (e.g., sleep) is shared within the family through ambient displays. Similarly, Colineau et al. [5] investigated the requirements for a collaborative family weight management site to promote lifestyle changes, specifically by engaging family members to support one another in weight management. Although the literature suggests to encourage family members to actively support one another in health-related goals, more research is necessary to explore how to better assist intergenerational communication and interaction within the family.

Intergenerational interaction between elderly parents and adult children is important because as elderly parents age and adult children transition into informal caregivers for their elderly parents, adult children are the first line of support and care to their elderly parents [33, 34]. Meanwhile, elderly parents also continue to care about their adult children's health. How to balance between providing care and respecting one another's independence is key in these types of intergenerational dynamics. Most studies on intergenerational communication have focused on the communication and interaction between underage children and their parents [9, 11, 35] or grandparents and grandchildren [10, 22, 36]. Some studies have made the effort to increase the understanding of the cooperative nature of informal elderly caregiving [12, 13] and technology has been proposed to support the relationship of intergenerational families (e.g., elderly and younger relatives) across countries [31]. Though previous literature touch on different intergenerational family dynamics, it is important to clearly understand how intergenerational families discuss health and their existing needs and concerns regarding health information sharing.

In this study, we complement previous research by examining how intergenerational family members (i.e., elderly parents and adult children) communicate and share health information.

2.2 Ever-changing Family Structures

Family members have the inherent desire to maintain constant communication and awareness of one another's lives as well as to collaborate on their family's common good [34]. Many consider family as a source of support in which family members reciprocate and help one another at times of necessity, such as during the treatment of a chronic disease [26] and to engage in behavioral

changes for healthy lifestyle [5]. These kind of support can be affected by demographic change, geographical distance, and aging.

Among young adults in the U.S., 37% provide the most help to their elderly parents aging 65 or older [2] with housework or medical and other forms of physical care. 47% of those young adults are in their 40s and 50s [2], which means the majority of those young adults are either raising a young child or financially supporting a grown child (age 18 or older). These adults are referred to as the "Sandwich Generation" because they are an adult child to their parents and a parent to their adult child. The Sandwich generation faces the challenge of caring for multiple generations of family members [2]. Moreover, 61% of adult-children caregivers in the U.S. are employed [3], suggesting that an adult child needs to manage his/her job and the care-giving responsibilities. Under such circumstance, examining how intergenerational family members currently communicate and what obstacles they face in talking about health may provide a new perspective on communication and collaboration among family members.

In addition to changes in demographic structure, it has become increasingly common for family members to be distributed by temporal or spatial distances due to work or educational opportunities, or simply because of lifestyle preferences [16]. Despite the distance, family members still want to stay connected and be aware of one another's current situation [25, 31]. Generally, those families use technology as a way to maintain regular communication (e.g., telephone, emails, texting [2]). Our study focuses on understanding how arrangements due to temporal and spatial differences affect intergenerational health communication and how technology use plays a role in the process.

Lastly, finding living arrangements for an elderly parent who can no longer live independently is one aspect that comes with aging. Among older adults in the U.S., 17% said they would opt to live in an assisted living facility, while only 8% say they would move in with a family member [4]. The challenges imposed by aging may enhance family members' inherent desire to stay connected and be aware of one another's life [16, 25, 29]. Leveraging this desire among family members is one potential approach to foster healthy behaviors within the family.

In this study, we examine intergenerational family communication between elderly parents and adult children on how they talk about health and how to better support individuals' efforts to engage in building the culture of health within the family. We aim to identify opportunities to augment their positive experience and reduce occurrences of obstacles through technological design.

3   METHODS

We conducted in-person, semi-structured, scenario-based, focus-group sessions. Focus group is an adequate design to encourage participants to express ideas and experiences related to a given issue [21]. We used scenarios as a resource to facilitate the group brainstorming, to develop further alternatives, and to raise questions about the assumptions behind the scenarios [30].

Through this method, we hope to collect participants' current practices and learn their existing obstacles with respect to health information sharing.

3.1   Participants

To study intergenerational health collaboration, we featured elderly parents and adult children as our target participants to learn about their current practices, needs, concerns, and visions in the context of health communication within the family. Our participant inclusion criteria for both adult children and elderly parents included financial independence and independent living. We did not impose any age restrictions on either group.

We used different types of channels to recruit our participants, such as sending emails through university listservs, distributing flyers in public spaces (e.g., public library, YMCA, local churches, etc.), posting a recruitment request at the local university research website, Craigslist, and Facebook. We offered compensation of $ 20 USD to each participant.

A total of 37 people participated in our study: 18 Adult Children (7 males and 11 females; referred to as AC), 7 Sandwich Generation (all female; referred to as SG), and 12 Elderly Parents (6 males and 6 females; referred to as EP) were recruited from a small town in the eastern U.S. The age range of the AC participants was 21–60 years old (M = 30.94, SD = 5.68); the EP participants' age range was 58–91 years old (M = 77.63, SD = 12.01; one participant age information is missing); and the SG participants' age range was 40–60 years old (M = 52.71, SD = 7.01). None of the participants were from the same family. The EP participants had a variety of living arrangements, including assisted living community and independent housing. The profile of the participants presented different variations in terms of geographical distance of their living, ranging from living close by (e.g., same neighborhood), living across the country (e.g., west coast to east coast), to across countries (e.g., the U.S. and South Korea, Switzerland). Table 1 reports participants characteristics by generation.

Table 1: Descriptive data for participants classified by identified generation.

	Adult Children	Sandwich Generation	Elderly Parent
Number (n)	18	7	12
Age range (years old)	21–60 M = 30.94 SD = 5.68	40–60 M = 52.71 SD = 7.01	58–91* M = 77.63 SD = 12.01
Gender (Male/Female)	M: 7 F: 11	M: 0 F: 7	M: 6 F: 6
Geographical distance	12 miles to 4,089 miles (Switzerland)	1 mile to 250 miles	14 miles to 6,889 miles (South Korea)

*Note: one EP participant age information is missing.

3.2 Study materials: Scenarios

We designed three scenarios based on a previous pilot interview study. In each scenario, we considered the following: family relationship, geographical distance, children's/parents' health conditions, and technology use influence people's practice of health communication and collaboration. Each scenario aims to prompt participants to think about communicating and sharing health information. The first scenario taps into a mutual concern between elderly parents and adult children regarding what to do to know more about each other without being perceived as prying. The second scenario wants to prompt reflection on ways to get emotional support. And the third scenario probes ways to "break the ice" in difficult family relationships.

The three scenarios were used as discussion probes to investigate adult children's and elderly parents' health sharing practices and experiences. By using scenarios, our goal was to gain insights on:

(1) What participants consider as important with regards to various health and well-being information;
(2) What participants care about knowing regarding the other party's health and well-being;
(3) Participants' willingness to mutually share health-related information and if they have any privacy concerns.

3.3 Data collection

We had ten focus group sessions with 25 AC/SG participants (2 or 3 participants per session) and three focus group sessions with 12 EP participants (2 to 5 participants per session). The session was conducted either at a university lab or at a public space in the assistive care community with which we worked closely. During the discussion, the moderator asked approximately 8–12 open ended questions to guide the participants through an in-depth exploration of the topic. All focus group sessions were audio-recorded and transcribed. Each session lasted about 60 minutes. During each session, at least two members of our research group were present to moderate and to take notes from the discussion.

We gathered participants' information such as age, gender, family relations, and level of education using a pre-study demographic survey. We also asked the participants about their background information and current health management practices, such as use of health tracking devices or self-monitoring applications. For participants who have both elderly parents and adult children (i.e., Sandwich generation), we asked them to describe their level of interaction and relationships across different generations.

3.4 Study procedure

First, the moderator presented introductory comments with a brief explanation about the study and the consent form. Second, the moderator employed a pre-study demographic survey to gather participants' information. After the survey, the moderator established a common ground among the group members by asking how far away the participants' parents/children live, how frequent the participants talk with their parents/children, and which communication means they prefer using (e.g., phone, Skype).

Then, the moderator started the discussion by presenting a scenario and asked if the participants could relate with the situation as an introductory question, followed by transition questions according to the discussion flow. Some examples of the questions are: "Can you imagine yourself sharing health information with your parents/children?"; "What type of health information would you be willing to share?"; "Is there any privacy concern in sharing health information?"; "Is there any challenge that you see by using technology to share health information?".

In the end, the moderator presented closing comments, thanked the participants for their contribution, and gave the compensation.

3.5 Data analysis

We used thematic analysis and followed the six phases of analysis proposed by Braun and Clark [1]: familiarization with the data, coding, searching for themes, reviewing themes, defining and naming themes, and writing up.

Throughout the focus group sessions, our research team met regularly to discuss and refine the emergent themes and corroborate findings to ensure the quality of our data. Each research team member independently reviewed the same transcripts and looked deeper into the transcripts for interesting or unusual findings. The emergent themes include how the strength of relationships between the children and their parents influences their health information sharing, current practices and ways of communication, willingness to share, issues and families' workaround in information sharing.

4 FINDINGS

We begin this section by describing interesting and unique ways that families share health information. Then, we present two central factors—newsworthiness and emotional valence—that influence the content of shared information among family members. Finally, we describe existing obstacles that prevent family members from sharing health information and how they deal with the mentioned obstacles.

We refer our participants using the following scheme: a letter prefix to indicate the generation (EP for Elderly Parent, AC for Adult Children, and SG for Sandwich Generation) followed by the participant number.

4.1 Types of health sharing

During the scenario-based discussions, participants were prompted to reflect on their current practices of family communication.

Our data revealed that our participants routinely talked about health and well-being with their family members. We learned that diet is one typical topic for intergenerational health conversation, such as sharing healthy recipes. Participant AC-3, for instance, said: "*When I talk to my mom, usually we'll talk about an exciting thing like, 'Oh yeah, I just tried this new recipe and I'm pretty excited about it.' Like, 'I made a new lentil dish.'*" (AC-3)

We found that our participants share health information with family members in interesting and unique ways, and we have developed a preliminary framework to capture these different ways of sharing. The framework includes: person-to-person sharing, person relayed sharing, broadcasting sharing, and permitted sharing. Our participants mixed these different ways of communicating health information. We distinguish them here for clarity.

4.1.1   Person-to-person sharing. It occurs when family members have direct conversations about their health face-to-face or via technology such as phone and email.

According to our data, this type was most common in families with a fully connected family network which means intergenerational family members mutually share the same level of openness to talk about health. For example, participant AC-11 affirmed that he directly asks about his parents' health conditions and said: *"I'll ask how my dad's diabetes - What his glucose number is." (AC-11)*

Participant AC-4 mentioned that she routinely talks with her parents about her activities: *"Right now, we just talk. My parents are like, 'What did you do today?' I'm like, 'I went to the doctor and I went to the gym and I did this', because I talk to them so much." (AC-4)*

Our participants considered the practice of direct sharing a result of strong family relationships: *"I would just ask. I would feel comfortable asking my parents. That's the relationship I have with them, so I wouldn't feel uncomfortable asking." (AC-6) "My relationship is strong and I can talk with my parents about their health." (SG-5)*

Person-to-person sharing may be done through the mediation of different types of technology. Participants mentioned that they used phone calls to *"just to catch up, and more so if something happened." (AC-2)*

Other participants used text messaging to share information on the fly: *"I text my daughter every day and she texts me every day so we do keep in contact. I know when she went to the dentist and if she had cavities and same with us. It was just yesterday." (EP-4)*

Email is also a frequently used tool to *"get pictures from my kids" (EP-3)* and share information. Participant AC-12 said: *"I have to email pictures so we don't text pictures. So I email a picture. She'll say, 'Well what does your friend, Dora, look like with the pumpkins and the wreath?' And I'm like, 'Okay, so I take a picture, and then attach it to an email.'" (AC-12)*

Video chatting, such as Skype or Facetime, is used by family members living far away from each other, *"I do some Skyping with our family in Switzerland." (EP-9)* According to participant AC-14, video chatting is a very effective way to get health information: *"...because sometimes you can directly see the health situation from their face and from their movement and even from the voice, they talk. You know if they are happy, healthy, or if they are strong or not." (AC-14)*

4.1.2   Person relayed sharing. It occurs in two ways depending on the family context. First, when a family does *not* present a fully connected network, members rely on a specific person (e.g., mother) to keep track of others' health situations. In this case, a person relayed sharing happens when family members do not share the same level of openness to talk about health. Direct conversations are less likely to happen among some members (e.g., children less likely to discuss about health with dad). Therefore, members rely on a "facilitator" to connect members and share information. For example, participant SG-1 mentioned that her son would ask her about his dad's health: *"My husband has more health issues, so he'll [adult son] ask me, and then I'll be relaying information." (SG-1)*

Second, person relayed sharing may also occur when family members seek to verify or reaffirm information obtained from person-to-person sharing with other family members such as siblings. As participant SG-6 explained, she asks her sister about her mom's status in addition to a direct conversation with her mom because: *"My mom usually downplays things, where I feel like my sister will give me a real honest answer because my mom's not really going to say she's real tired." (SG-6)*

4.1.3   Broadcasting sharing. It occurs when family members share generic information using a broadcast channel such as Facebook, enabling other members to receive and check updated information about their current activities when they see fit. It happens mostly with other types of sharing as a way to support awareness within the family.

Participant EP-8 said: *"You can post pictures, you can post some texts with it and things like that. That would be helpful to keep up with information to see how people look, what they're doing, those kinds of things." (EP-8)*

Other participants used Instagram and family groups on Google: *"Basically we share on Instagram. We do have a family group on Google where we share a lot of information that way." (SG-7)*

Some elderly parents participants mentioned that they love receiving information from a broadcast channel but they are hesitant on posting. For example, participant EP-10 said: *"I personally, I love Facebook, but I would never post on there. I don't like that information going out everywhere." (EP-10)*

Participant EP-11 explained that despite being amazed by all the information received, she just uses the broadcast channel to keep up with her kids, not to share information: *"We too have Facebook, and I like seeing what their doing, updates with pictures, and things like that. But we will not put anything on Facebook either. But I'm amazed by seeing all these things, and we just got on Facebook to keep up with the kids." (EP-11)*

4.1.4   Permitted sharing. It occurs specifically when adult children learn about elderly parents' health situations without taking the action to engage in direct conversations or visit them in-person. It usually happens with elderly participants who opted to live in a Continuing Care Retirement Community (CCRC) and their adult children receive information about their parents' health from the facility.

CCRC offers continued care for residents by providing a range of health care and supportive or assistive services. CCRC residents are usually comfortable being monitored and they permit their family members to access and receive health reports about their current situation without in-person visitation. According to participant EP-4, *"I have a printout form every time we go to the doctor's, they give us a printout statement. I made a copy and my daughter gets that copy so she knows all about our medications, what we're taking and also our health problems. We have a blood test at the hospital, and also when we go to the hospital, we put her as a contact so they know to inform her." (EP-4)*

Because of the type of health care provided to CCRC's residents, family members delegate monitoring tasks to the doctor or the institute. As participant EP-10 said, his children present low levels of concern about his health care: *"...because they know that we have an easy access to health care. So it's not as much of a concern for them. Obviously, they're concerned about our health, but they know that we have easy access." (EP-10)*

4.2 Content of shared information - What do families share?

The previous section documented our participants' current practices on information sharing. We also used scenarios to prompt our participants to think about what kind of health information they current share and what they consider relevant to share. We identify two factors, including the importance of the events and its emotional valence.

4.2.1 Newsworthiness. Our participants used the term *"news-worthy"* to describe events that deserve to be shared among family members. Routine activities or minor health issues may not be newsworthy enough to share: *"if I saw a doctor because of a stomach pain, I just avoid talking with them [parents], I don't tell them."* *(AC-14)* *"going to the doctor for a checkup isn't newsworthy." (AC-2)* Participants explained that sharing such events may cause unnecessary negative reactions, for example: *"Even if I get a cold, sometimes, she thinks I'm dying. I'm like, 'Mom, it's a seasonal cold. Everyone is sick right now. It's totally fine.' " (AC-3)*

If a major health event happens, the participants would share this information with their family members: *"But if it's a major problem, for example a concussion, then I told them immediately in our conversation, because I think this is important that they should know." (AC-14) "If it was life threatening, I certainly would share." (EP-6)*

Some participants reported that their family members or themselves purposely delay sharing for different reasons. For example, participant AC-9 described how he and his father have nice conversations regularly. But his dad may not share timely information with him: *"Oh, a week ago I forgot to tell you, but I woke up and I could barely talk and I was drooling." (AC-9)* According to participant AC-9, his dad was having a mini-stroke and should have gone to a doctor then: *"It's not like we would avoid talking about what was going on, but you never really just brought it up in casual conversation at a distance." (AC-9)*

In participant AC-14's case, he explained when he is busy with deadlines, he would probably sleep poorly and he would not have enough time to eat healthy food. During that period of time, he would delay the information from his parents: *"So one of the things is that I don't want to hide everything for a month or something like that, but just for a small moment, it would be very helpful for my parents not to concern about that." (AC-14)*

Some individuals prefer to share a health-related event at the last minute to avoid extra worries within the family. Participant AC-13 mentioned that her father shared about his upcoming wrist surgery with only a few days notice: *"I think it's because he didn't want me, or my siblings, to be worried. Because my dad was in a big motorcycle accident years and years ago, and so, he already had a bunch of surgery. That's why there was slightly more risk with this surgery, because his wrist was already messed up." (AC-13)*

4.2.2 Emotional valence. In addition to the newsworthiness of the events, emotional valence also influences people's decision to share information. As participant AC-2 explained, she usually cooks a lot and she enjoys telling her parents if she cooks something good or horrible: *"I would end up just sharing the things that are meals, not like, 'Yeah, and then at 11 p.m. I ate three cupcakes that were in the fridge.' I wouldn't think to share that. I would be like, 'I baked a cake,' or 'I made this delicious dinner,' not 'Then I binged on 12 bags of Doritos.' " (AC-2)*

In general, participants argued that they prefer to share positive events instead of negative ones such as being sick. Participant AC-12 said: *"I tell them [parents] all the good, happy things, or how exercise is going, but I don't share as much about being sick because I don't want them to know, or to worry." (AC-12)* Participant EP-12 mentioned that his family currently uses photo sharing in a positive manner, so members usually exchange really happy pictures with one another: *"...to build everybody up and make them feel good and keep a good attitude and be happy and enjoy life. We kind of avoid all those talking about, 'Oh, I didn't want to get out of bed.' " (EP-12)*

As participant EP-2 explained, in his opinion, it is better not for his children to know more about what is happening to him because his children *"probably have enough things on their own that they have to solve and take care of." (EP-2)*

4.3 Obstacles in health information sharing

One scenario tapped into ways to "break the ice" in difficult family relationships. From this scenario, we learned from our participants that they have faced obstacles in terms of sharing health-related information.

4.3.1 Change of roles in family. Participants explained that sharing health information among family members could be challenging because of role changing.

As children have grown up and as young adults are able to make decisions on their own, elderly parents attempt to find balance between showing care and prying for information. Similarly, as elderly parents grow older, adult children's struggle is between staying independent and receiving care.

Adult children participants asserted their independence. Therefore, they feel annoyed when their parents ask a lot of questions: *"Sometimes my mom will say, 'What are you eating tonight?' I'll be like, 'I don't know.' Sometimes I'll get annoyed when she asks. It's like, 'I don't know, mom. I ate chicken yesterday. I'll probably just eat that again.' " (AC-4)*

Need for privacy is another characteristic of independence. SG-4 pointed out that she felt being grilled when her mom asked for information: *"I am a grown person with three kids of my own now. You still want a little bit of that privacy. You want to share what you think is necessary to share." (SG-4)*

On the other hand, elderly parents try to strike a balance between showing care and prying for information when they want to know about their adult children's health. Participant EP-11 explained how hard this situation was for her as a parent: *"...because it's hard for a parent, you know like, you want them to be independent, but you don't want to pry too much. And a lot of the times, I think a child sees their parent as prying and being very parental, still trying to hover over them when they're an adult." (EP-11)*

From the children's perspective, elderly parents presented resistance in accepting their care as well. Participant SG-4 said that her mother would not want her to interfere with her health: *"...because she's still the mom and she would think that's not my business." (SG-4)*

According to participant AC-5, her parents are resistant because they want to be independent and not babysat by their children. In

other words, the need for a sense of independence is mutual: *"They know what's good for them.'You're my kid. You're not supposed to want to take care of me.' It has to be something where it's more not like you're babysitting but more you're just trying to help."* (AC-5)

Adult children sometimes do not have effective ways to persuade their parents. According to participant AC-16, his father is aware that he needs help but would not budge. He wishes he could do more to motivate and encourage his father to have a healthier lifestyle: *"...because he's the one that took me to all my sports events and encouraged me to work out, showed me training techniques, it was 10-12 years ago."* (AC-16) He tried to argue with his father and tell him what to do, but his father presented an adverse reaction.

4.3.2 Families' workaround. Our participants deal with the above-mentioned obstacles through several approaches.

First, some participants nudge family members into behavioral change by asking questions in a subtle way. For example, participant AC-17 said that her father has arthritis and he was complaining about his shoulder pain. Participant AC-17 handled the situation by asking questions and making sure he was fine despite his resistance to visit a doctor: *"My dad, he's very hard headed, he doesn't like going to the doctor's and he needs to go figure out what's wrong with him and stuff. So I usually just ask to make sure everything's okay, so I just try to like: 'Is everything okay at home?' "* (AC-17)

Likewise, participant AC-16 said his father had a stent put in about 15 years ago. His family members make sure that his father stays healthy without making him think that they are nagging. The family members ask questions instead of telling him what to do: *"...it's more questions about how you're doing more than 'hey, go do this.' So that's how we're working with him. He [father] doesn't want to hear me tell him 'Do this training or do this.' I try to walk carefully with telling him what to do. I just, again, more ask questions."* (AC-16)

Second, some participants mentioned they encouraged their family members to keep healthy habits by using family influence and passing down a healthy living style. For example, participant AC-5 said her mother did not like to see doctors or go to medical checkups. Therefore, she decided to motivate her mother to go check her health by offering a family trip together as reward: *"I did get her to get her blood checked and all that a couple years ago, but that was the best I could do to convince her, 'Okay, if you get it done, then we can go on a trip together', and she agreed to it."* (AC-5)

Further, participant AC-5 mentioned that her father has cholesterol problems. So, she decided to buy a blender as a Christmas gift to encourage her parents to eat more healthy food: *"...buying them [parents] something so they'll be more willing to use it and do something."* (AC-5) According to participant AC-5, giving her parents a gift helped the family to initiate conversations and give her a chance to check in her parents in a subtle way:*"If you Skype with your parents and you see in the background that there's a blender, so you can maybe ask questions. You can go, 'What's that?' That would be more beneficial than texting or calling because maybe something would catch your eye that you'd be able to spark a conversation about."* (AC-5)

Similarly, participant SG-5 decided to pass down her healthy life style to her extended family:*"I have the Fitbit and I got one for my husband, my younger daughter and my older daughter has one."* (SG-5) And she involved the whole family for step count challenge during the week. She bought a Fitbit for her mom as a way to share health information and expand the culture of health within the family: *"I have thought about buying one for my mom. I haven't bought one but I could see myself using it with both my mom and my sister probably. We should get one and then we can all share it. It will become a challenge."* (SG-5)

5 DISCUSSION

Our findings reveal the experiences and obstacles of intergenerational health information sharing within the family as well as provide instructive lens for examining how we can promote effective sharing among family members, and to better support their different contexts. Below, we discuss on family communication about "care" and how this approach can contribute to support positive reciprocal health sharing among family members.

5.1 Promoting effective sharing with positive care

According to our data, family members share general information with one another, including health. However, family members may face obstacles while sharing health-related information. Most of those obstacles emerged because of the way the information was shared. If sharing is construed or framed as opening to criticism, sharing behavior cannot be fostered. For example, some participants mentioned feeling annoyed by family members when they nagged them with questions. If sharing can be considered as receiving care and positive feedback, it fulfills an individual's need for care and increases his/her emotional well-being [19].

In order to avoid negative connotations, we discovered some participants used *family's workaround.* When family members decided to pass down a "healthy life style" to the other party, for example by giving a blender or Fitbit as a gift, they showed care towards one another and effectively encouraged one another to become active and healthy. The gift helps one member to initiate conversations with others and opens the space to check others in a subtle way. Also, the gift offers the opportunity to promote a culture of health by embodying a healthy artifact in the family context. So, by using this approach, family members can engage in a positive manner on discussing health without incurring negative impressions.

Previous studies have examined how technology can support family relationships considering care and emotions [19, 20, 31]. Waycott et al., [37] suggests that social technologies could be used to build emotional connections and to enhance sharing with care. Our findings are in agreement to these previous studies since we observed in our analysis that, in fact, it is important to enhance the family relationship and facilitate the inherent sense of care (e.g., send/receive positive care). We complement prior work by introducing the approach of passing down a "healthy life style" to the other party. We argued that this novel approach could be a useful framework for the design of technology aiming to support family sharing with positive care.

As follows, we describe design implications for researchers designing technologies to promote positive mutual sharing and to support health communication within the family.

5.2 Design Implications

5.2.1 Supporting positive mutual sharing. Given the ways families' are dealing with obstacles while sharing health information, designers then could examine innovative approaches to leverage and strengthen this family interaction. In particular, we call attention to family members trying to pass down "healthy life style" to the other party by giving a Fitbit as a gift. One effective route may be to design technologies that support social features on Fitbit's app such as allowing to create family groups and add family members as a team to support goal achievements and stay encouraged to overcome challenges in recognizing that they are already using this device. This is supported by literature that affirms the importance of family encouragement to achieve health-related goals [5, 7]. Then, when one individual sends his/her step counts within family, he/she would receive encouragement from the family members through comments or visual metaphors (e.g., active pets, blossom flowers). This design idea could help the development of effective family health collaboration and has the potential to enhance family interactions.

5.2.2 Supporting the types of sharing. Our findings suggest that families use multiple types of sharing to keep members informed about one another's lives according to the family's needs. It is important to support different types of sharing as it can contribute to increasing family collaboration and evoke a positive collaboration towards the family's health-related goals as well as enhancing willingness to have regular conversations about health topics.

When a family has strong and fully connected relationship, family members mostly engage in direct conversations about their health either face-to-face or via technology (e.g., email, video chat). This family context shows that family members are already open to talk about health; therefore, designers could further investigate opportunities to enhance those existing family conversations. For example, researchers have used photos [37] and storytelling [27] to encourage family communication. In this study, we observed that our participants currently use photos to share health information (e.g., photos of meals, physical activities) within the family as a way to build family relationships up and make them feel good. Our finders suggest that it might be beneficial for designers to explore ways of leveraging photos and photo sharing in order to facilitate conversations around health topics. Designers, for instance, could develop a photo sharing system using a digital photo frame in which photos could be automatically populated from social media without the need to manually upload them. This photo frame could be used to increase family awareness about one another's lives/health status in a less intrusive way. Designing to encourage sharing with photos is effective because it provides implicit information and supports family relationships [23].

However, there are cases where members rely on a facilitator (e.g., mother or siblings) to gather and distribute health information among family members. The facilitator can give extra information or reaffirmation to other members. When these families rely on one individual to relay information and bridge connections, they may deal with a lack of resilience within the family network. A possible design solution to this family context is to highlight the values of multi-family connections. For instance, previous studies on family sharing systems have focused on maintaining a dyadic (between two family members) awareness of experience [14] and well-being [24] of each other on an ongoing basis. A multi-family (triads or more) design space, such as Family Portals [16], can help maintaining awareness within an extended family and facilitate the creation of stronger ties within the family network. The Family Portals [16] study contributed with valuable insights into how to connect family member's through video sharing, and allow sharing of everyday life over extended periods of time between multiple locations. Our study complement prior work by introducing the idea of a multi-family design space to encourage direct conversations about the family health's. We argue that supporting multiple and distinct family members to acquire and distribute health-related information may be a way to increase family collaboration on health management.

Our participants also reported using broadcast channels (e.g., Facebook) with other ways of sharing to inform the family on their current activities. We observed that broadcasting sharing depends on whether members would like to initiate and curate shared information. If they decide not to broadcast anything, no content will be shared within the family. In other words, family members who depend on this type of sharing deal with communication asymmetry within the family. Oftentimes, only younger family members share information. This situation suggests design opportunities to create platforms to encourage reciprocal sharing. We portray *reciprocal sharing* as a two-way sharing: people both share and receive information. For instance, a daughter shares her running activity, while her elderly parents share a healthy recipe. Previous studies have developed applications using social media that integrate and simplify different communication channels to help balance family communication asymmetry [6, 23]. While it is possible that incorporating other functions might increase people's willingness to share information, including health-topics, it is also possible that people might decide to stay away from new technologies. This points to question whether adding communication capabilities to broadcasting channels will encourage reciprocal sharing of health-related information, or, whether only receiving information from these channels is what is desired. Our analysis contributes to an ongoing dialogue around the need to respect individual's decision to share (or does not share) information in platforms that aim to keep constant communication with one another [18].

Last, in the situation of permitted sharing, CCRC residents showed comfort in authorizing the institute to send health reports to their family. Although CCRC residents were comfortable with permitting health information shared within the family, considering occasions when they may not want to share is important. Reeder [28] suggests that when developing technologies for intergenerational families, support for withholding information is imperative. Individuals as active users should be able to decide what and when to share information so as to foster meaningful engagement and effective interaction among intergenerational family members [32].

6 LIMITATIONS AND FUTURE WORK

We tried to cover different types of intergenerational relationships in our sample; however, we did not have a full range of family dynamics. In future work, it would be good to consider different family dynamics including elderly parents and adult children living

together or low income family. Furthermore, both elderly parents and adult children self-reported their family members' current practices. Their perspectives may not represent other members' viewpoints. In future work, we hope to complement our current work by adding perspectives from both sides of the same family. Also, it may be helpful to collect a broader and diverse set of data by using a survey.

7 CONCLUSION

Family relationships offer potential to help individuals make choices that lead to a healthy life. In this study, we examine how family relationships, geographical distance, and technology use influence individuals' practice of health communication and collaboration. With findings from scenario-based discussions with independently living elderly parents and adult children, we found that family members use different ways to share health information depending on the family's needs. Additionally, we presented existing obstacles in family health information sharing. Finally, based on our findings, we provided a set of design implications to support different types of sharing, promote effective sharing, and enhance family sharing to build a culture of health within the family.

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