New to a Country: Barriers for International Students to Access Health Services and Opportunities for Design

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ABSTRACT
Newcomers to a country often face difficulties in adapting to the new healthcare system. Understanding their perceived barriers in utilizing healthcare services in the host country is crucial for designing health IT to meet their health needs. In this paper, we present an interview study of 30 international students attending a U.S. university. We identified barriers that hindered them from accessing health services in the host country – difficulties in understanding health services information, high healthcare costs, unfamiliar and cumbersome health practices, negative beliefs toward western medicine, and communication and language barrier. We also uncovered their alternative solutions by actively seeking health services information, adopting preventive measures, and self-diagnosing and self-treating with medicine brought from their home countries. Finally, we derived implications for designing health IT and services to better support international students' healthcare.

Author Keywords
Newcomers; barriers; coping strategies; international students; health services; acculturation.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Healthcare systems vary greatly in countries with respect to their health expenditures, financing models, service provisions, and access regulations [2,39]. For example, some healthcare systems insure all their citizens through universal plans, but access to care is regulated, while other healthcare systems require patients to be responsible for copayments but they have flexible access to and choice of physicians [2]. Such disparity in healthcare makes it necessary for newcomers to a country, such as international students, refugees, and immigrants, to learn and adapt to a healthcare system different from what they were accustomed to in their home countries. Worse, the transition is often filled with uncertainty, ambiguity, even fear, and is associated with multifaceted challenges to newcomers when seeking health services that they need.

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Newcomers' transition and adaptation to a new healthcare system is understudied, with a few exceptions that examined immigrants and refugees' health-related issues [6,38] while international students received little attention. A few studies focused on international students [15] to explore their communication practices. To our knowledge, how international students seek health services is a topic that has not been explored in prior pervasive health studies.

A significant number of international students are enrolled in tertiary education in many developed countries such as the United States, the United Kingdom, Germany, and Australia [37]. In the U.S. alone, the number of international students attending colleges and universities has increased to over one million in 2015-2016 [17]. Yet, international students are an underserved and vulnerable population [35]. They also experience cultural shock and acculturative stress (e.g., loneliness and discrimination) [37] similar to immigrants and refugees. In addition, they often face unique challenges of academic difficulties [37]. These challenges constitute the *"foreign student syndrome"* [30], which may increase psychological stress among international students and lead to various health issues [32].

Currently much research has focused on mental health of international students, such as what psychological stress they faced, and whether they sought counseling service. But seldom has research looked into their physical health. Besides, the underlying barriers that hindered them from obtaining physical health services, and the alternative solutions they adopted to cope with these barriers have not been examined. Thus, this paper aims to report the unique challenges and problems international students face while seeking and utilizing health services. We also strive to identify opportunities for technology design, which in turn may benefit other newcomers' health management as well.

In this paper, we focus on two important, interrelated issues related to international students' healthcare: the barriers they perceived in utilizing the new healthcare system, and the alternative solutions they used to cope with these barriers. We conducted semi-structured interviews with 30 international university students. We found the international students encountered difficulties in understanding the local healthcare information and services, and were intimidated by the high healthcare costs so they resisted seeking medical help when they were sick. Instead, they self-diagnosed and self-treated with ethnic medicines and remedies they brought from their home countries. Based on our findings, we discussed how their perceived barriers hindered them from searching, understanding, selecting, and utilizing healthcare services in the host country, and how their cultural beliefs and customs led to their resistance to western medicine. We further derive design implications to better support their health needs. Our study contributes to the body of literature in studying and designing for people with vulnerabilities [32], enriches our understanding toward the design of health services for newcomers, and add to the limited knowledge on international students' challenges.

RELATED WORK

Health Services and International Students

Prior research has examined international students' health issues, mostly on their mental health problems [9,26] and utilization of mental health services, particularly counseling services. They focused on mental health primarily because of the acculturative stress international students face in their daily lives, including linguistic, academic, interpersonal, financial, and discrimination-related stress [26,37], which may also be coupled with depressive disorders and anxiety [37]. Yet, mental health services were notably underused by international students [37] because many of their cultures condemned counseling [24] and disclosing personal problems is considered a sign of immaturity and weakness, and even a disgrace. Some also feared that they would be sent home as failures if they sought counseling services [26]. On the other hand, many international students were unaware of the counseling services available on campus [26], and their limited language skills also discouraged them from seeking counseling services [23]. Therefore counseling was typically their last resort [24,26].

A paucity of research has explored whether and why international students underused the university physical health services. International students in the U.S. were found to seek health services only when they could not resolve the medical issues by themselves, because they could not afford missing a class and because of their disparate health beliefs toward western medicine [10]. A survey study also found that a majority of international students did not use health services due to the complicated insurance policies and co-payments [21] and their physical health worsened after coming to the U.S. – the longer they stayed in the U.S., the more their physical health declined.

Our study makes positive contributions to research on international students' use of physical health services. Our study examined the reasons for their underuse of physical health services, and the alternative solutions they actively used to mitigate their perceived barriers and to manage their health. We also propose technology design to help them seek and utilize health services.

Newcomers' Transition to New Lives

As described above, newcomers encounter a variety of challenges. Thus, how they transition and adjust to their new homes have drawn increasing attention, with a focus on understanding and designing for their information and communication practices. Much research has examined newcomers' information seeking and sharing practices [20,28] of either a particular ethnicity, e.g., Korean immigrant mothers of young children [22], or students in an academic discipline, e.g., international medical graduates [31]. Interventions to help support communication between newcomers and local people through social ties and to assist newcomers to adapt to local culture have been introduced. For example, new platforms and services to allow language interpretation [7,16] and communication among newcomers through social media [29] have been designed.

While prior research has studied newcomers' general information and communication practices, their access to and utilization of health services are understudied. This is an important topic because adapting to a new healthcare system and being able to utilize health services in the host country are critical to newcomers' health and wellbeing. The literature review above indicated that a specific type of newcomers, namely international students, had to deal with mental stress and physical health issues in the new country. Yet, they seldom utilized health services available to them. In fact, the barriers that hindered newcomers from accessing health services in the host countries were not fully understood, although a few studies have examined the underlying reasons behind their resistance to health services [6,25,38], For instance, Morales and Zhou [25] studied the barriers that a Mexican immigrant community in New Jersey, U.S. faced while attempting to continue their way of living as in their home country. They found three types of barriers: environmental barriers (e.g., lack of and high costs of fresh food, and lack of space for children to play outside); communication barriers (e.g., healthcare providers' lack of compassion, manners, and respect for the Mexican cultural differences); and systemic barriers (e.g., complexity of the interdependence of the healthcare system and social service programs). Immigrant women from the Caribbean living in U.S. were also unable to receive needed health services because of the challenges in accessing insurance and unsatisfactory patient-doctor relationships [6]. These findings revealed the need to design for newcomers of different ethnicity to access and utilize health services in the host countries.

In summary, the paucity of pervasive health research that examined newcomers' access to and use of health services in the host countries offers a great opportunity for researchers because designing for newcomers' transition to a new healthcare system could have significant impact on their health and wellbeing. Moreover, technologies have long been viewed as capable of empowering vulnerable populations [8] like newcomers. Our study aims to narrow this gap by studying a particular type of newcomers, international students, through examining their perceived barriers in accessing and utilizing physical health services and the alternative solutions they adopted to cope with these barriers. Our study provides insights for designing systems that can empower international students to adapt to the new healthcare system, and access health services.

METHODOLOGY

We conducted a qualitative study to examine how international students accessed health services in the U.S. and their perceived barriers in utilizing the services.

Data Collection. Semi-structured interviews were conducted with 30 international students attending an urban university in mid-western U.S. During the interviews, we asked questions regarding how they sought health information and services in the U.S., the challenges they encountered in seeking health services, and the alternative solutions they adopted to address their healthcare needs. All the interviews were audiotaped and transcribed.

Participants. The participants were recruited through the International Center of the university, several ethnic student organizations, and snowball sampling. The participants were 21 males and 9 females with an average age of 22.5 years. They came from nine different countries/regions: 13 from India, 4 from China, 4 from Nigeria, 3 from Saudi Arabia, and 1 each from Taiwan, Korea, Malaysia, Morocco, Jordan, and Egypt. The participants were majoring in diverse academic disciplines. All participants have been living in the U.S. from 4 months to 3 years.

Data Analysis. The transcribed interviews were analyzed iteratively using open coding [14]. Two researchers independently examined and coded the data, e.g., their activities, medicines they brought from home, how they sought local health information and services, problems they encountered, and their corresponding solutions. The two researchers met weekly to discuss the collected data and codes, and iteratively identify salient themes in health information seeking and health behaviors, as well as challenges encountered. The interview questions were revised when necessary, for example, when gaps were identified in the collected data or more information was needed to answer specific research questions. Data saturation has reached when no new themes emerged. Finally, another researcher independently reviewed the data to verify and revise the identified themes as needed.

FINDINGS

International students in our study pointed out a variety of differences between the healthcare systems in the U.S. and their home countries. They perceived barriers in understanding, accessing, and utilizing health services in the U.S. and they adopted various alternative solutions to circumvent the barriers.

Barriers to Adapting to a Different Healthcare System

The barriers perceived by our participants included difficulty in understanding information related to local health system and services, high costs of health services, unfamiliar and cumbersome healthcare practices, negative health beliefs toward western medicine, and communication and language issues. As such, 20 participants have never visited a doctor in the U.S.

Difficulty in understanding health services information

Health insurance requirements for international students vary among U.S. schools because there is no specific insurance required of them by law [41]. Some schools provide school-sponsored health insurance plans, either mandatory or optional, whereas other schools do not provide any. In schools that do not mandate a health insurance plan, students can choose their own plan.

The university that our participants attended offered an optional school-sponsored health insurance plan. Thus, they could either choose this plan or find a different one. This flexibility led to the students' foremost need for information pertaining to health insurance, such as terms of coverage, costs, options and limitations. Many of our participants began to pursue such information long before leaving their home countries, and continued to do so after arriving in the U.S. In addition to learning about the school-sponsored insurance plan, most participants had enquired for other insurance plans, largely for finding a more affordable one.

In the course of seeking a desirable health insurance plan, all but one participant (P24) found it difficult and frustrating to understand the health-related information. First, although the university website and pamphlets available contained information of the school-sponsored plan, most participants found the information insufficient, unclear, and even confusing. Hence many of them had to look for clarification such as what services were covered and where services were available. Second, the staff at the International Center was not trained to offer advice on health insurance, thus unable to offer practical help and clarification. Third, our participants have never been exposed to the U.S. healthcare system and the complicated insurance terms and terminology. They were unsure of what and where health services were available to them with their health insurance. As P28 said, *"the insurance [policy] should include what diseases are covered, like which hospital can take care of that. If we go, where we can enquire? Which diseases are going to be covered in which hospital? Like in India, certain diseases are only covered in certain hospitals."* Therefore, many students were reluctant

to seek medical help even with enrollment in a health insurance plan because they found the healthcare coverage information ambiguous and the healthcare practices in the U.S. very different from those in their home countries.

Intimidating costs of health services

The high cost of health services in the U.S. is another major barrier for all our participants, even with health insurance. As P4 commented, "*it is indeed easy to get medical help in the United States, but not in terms of money*." Some participants were even more intimidated after hearing their peers' experiences of high costs incurred after receiving health services. For instance, three of P6's friends received large medical bills after their medical treatments, even with health insurance. Thus she decided not to see a doctor in the U.S. in order to avoid unexpected medical bills.

Unfamiliar and cumbersome healthcare practices

Among all 30 participants, only 10 have visited a doctor or a hospital in the U.S. once or twice. Not only were they unfamiliar with the healthcare practices in the U.S., they also found them cumbersome. Hence seeking help from a local western doctor was their last resort if they got sick.

Our participants pointed out huge differences between the healthcare practices in the U.S. and in their home countries. For example, many of them could just walk in any clinic or hospital in their home countries without having to first make an appointment. P23 from China described why he did not see a doctor in the U.S. *"I don't think it is easy to get medical services here. To see a doctor here, you need to make appointment and doctors usually off work so early".* They could also see any doctors, including specialists, they preferred back home, but in the U.S., their insurance mandated them to select from a certain network of doctors only, and to get a referral from their primary care physician before they could visit a specialist.

Similar to Lartey et al.'s finding [21], some of our participants found the U.S. cost-sharing model with copays and deductibles hard to understand and predict. Hence they often worried about the unexpected costs of doctor appointments, prescriptions, and other health services. P2 commented, "*In my country, insurance company pays all the bills. In the United State, there is a limit, insurance doesn't cover everything. They will only cover certain amount*." The copay model was totally new to him.

Our participants also found the process of getting medication and reimbursement in the U.S. different and cumbersome. The participants commented that they were able to receive the medication they needed right after their clinical consultation in their home countries, but in the U.S. they had to go to a pharmacy to fill their prescriptions after a doctor's visit. P6 said, *"we cannot get medicines after we are done…the doctor and pharmacy are separate, that is different from Taiwan…It is not easy. No car to go to the pharmacy. In Taiwan, we get the medicines from clinics. In Taiwan prescriptions are for a longer time, in USA it is only once. There's a huge transportation problem."* Thus, the separation of medical consultation and prescription services in the U.S. added more challenges and often caused delays in receiving appropriate care since they would need to find additional transportation help to get prescriptions after medical appointments. In fact, medications like antibiotics can be readily obtained over the counter without a prescription in their home countries, but such medications are only available through prescriptions in the U.S. Thus, the unfamiliar healthcare practices contributed to their resistance to local health services.

Negative health beliefs toward western medicine

Six participants strongly believed that only their own ethnic herbal medicine would work for them because that was what they have taken their entire lives. For example, P24 from Morocco was raised with the belief that western medicine was toxic and would only be harmful to his body. P6 also shared with us, *"My grandfather is a doctor; he cures all the illness with natural medicines, without using western medicines."* Since these participants grew up with their ethnic medicine that has also been effective for their illness, they were skeptical toward western medicine.

Communication and language issues

Similar to many non-native English-speaking immigrants, e.g., [18], our participants also faced communication and language barriers, despite receiving higher education in the U.S. While these participants were able to communicate in everyday English and in their studies, they were unfamiliar with the terminology and language used in healthcare. As described earlier, many found insurance policies difficult to understand and confusing. *"The medical terminology is tricky"* (P29) and *"Terminology, the language and the presentation are tricky, only English"* (P26). They also had trouble using proper terms as search queries when searching health services information online. Yet, they were reluctant to call their insurance company because of the automated phone system and the potential long wait. They were also worried about not being able to communicate with the insurance agent over the phone.

The participants' language constraints also refrained them from seeing a doctor, as they perceived that the doctor would likely be a native speaker and they might not be able to communicate their health concerns clearly. For example, 3 of the 4 Chinese participants expressed a fear of visiting a doctor because they were worried about not being able to articulate their symptoms and understand what the doctor was telling them: *"I prefer China's health system, because I can describe my symptoms well. After all, English is not my first language"* (P22), and *"It is not easy for me. Sometimes I'm afraid I cannot describe my health condition very well to the doctor using English"* (P13).

In summary, our participants found it difficult to understand and access health services. They were also intimidated by the costs of health services, and unfamiliar and cumbersome healthcare practices. Moreover, their negative health beliefs toward western medicine and barriers in communication and language all contributed to their under/non-utilization of U.S. health services.

Alternative Solutions to Manage Physical Health

To manage their own health without using health services in the U.S., our participants adopted various alternative solutions, such as seeking health services information online and through their own social networks, undertaking preventive measures, bringing medicine from their home countries, and conducting self-diagnosis and self-treatment.

Actively seeking health services information

Since the International Center and its website contained only information of the school-sponsored insurance, most our participants have actively searched for information on insurance options online or via their own social networks to find a health insurance plan that suited their own needs. However, because of the barriers described earlier that hindered them from speaking with an insurance agent, they mostly searched online for alternative providers. Two participants did not engage in any insurance search and decided to purchase the school-sponsored insurance because they did not believe that they would fall sick and they could rely on the *"back-up medicine"* they brought from home when they did become sick.

Our participants also actively sought information and advice from their social networks. As examples, several participants contacted their relatives or friends who lived in the U.S. for advice on health insurance and services, and many reached out to respective ethnic student organizations at the university through social media before they arrived and made friends with current students and alumni of the same ethnic background. They were also able to learn about their ethnic peers' firsthand experiences. Since current websites of these ethnic student organizations did not contain information on the students' personal experiences in health-related matters, several participants suggested a designated website for students to blog their experiences with healthcare including insurance options and coverage, as well as health services and costs. In this way, new students can learn about their practical experiences.

Undertaking preventive measures

All of our participants expressed that they made a conscious effort to stay healthy after they arrived in the U.S because of the many challenges they perceived in obtaining health services in the U.S. In particular, many emphasized how they paid attention to dressing for the much colder climate in the U.S. They also purchased and wore warmer clothing to prevent from getting sick, as P17 and P1 said respectively, *"it is a cultural shock, not habituated to weather*" and "*I wear warm clothes for not getting sick.*"

Different from previous research that Korean immigrants were less concerned with diet in their health regimen [18], our participants recognized the perceived benefit of adhering to a healthy diet in the new environment. As said by an Indian student, "*[I] did not follow any particular diet in India, here it is needed to follow diet"* (P17). Most of our participants were not good at cooking because they were quite young and did not learn to cook before coming to the U.S. as their parents took care of their meals at home. Yet, they tried to search for and made trips to ethnic stores despite the long distances in order to purchase specific ingredients for preparing ethnic meals that they considered healthier, even though they found it very time-consuming.

Many students also searched online to learn about healthy life styles and several attended health-related workshops offered by the university. For instance, a computer science student said, *"I attended obesity campaign and sessions on occupational illnesses like back pain, because they are common among software developers"* (P5). They found out about these workshops through the promotional materials like pamphlets at the International Center and university emails, and they attended these workshops because they did not want to be sick in the new country. Four participants used low-cost technology – a wristband and mobile apps – to track their health conditions like steps and heart rate. They believed that these self-tracking measures could help them stay healthy and consequently allow them to avoid local health services.

Bringing medicine from home

Twenty-seven participants brought medications from their home countries when they came to study; only 3 participants did not bring any medication from home because they claimed to have been in good health, and did not expect to get sick during their stay in the U.S. However, all our participants stated they would always do home remedies when they were sick by taking the medicine or herbs they brought from home first, or by resting and drinking plenty of water if they did not have their home medicine, instead of seeking health services. When their supplies ran out, all the 27 participants have asked their family or friends to send more medications and some of them also tried to find similar traditional medicines locally. Our participants believed that having medicine brought from home was an effective strategy to tackle the barriers described above. Some of them had strong beliefs that their home medications would cure or relieve their illness more effectively than medications in the U.S. They also said that bringing medicine from home was more cost-effective and convenient than getting medication in the U.S.

Although the consumption of traditional medicine has been reported among international high-school students in previous research [10], no details were provided with regard to the source and kinds of medicine they consumed. Below, we describe two types of medicines that our participants brought from home (Figure 1): western

medicines, which include over-the-counter (OTC) and prescribed medicine, and traditional medicine.

Western medicines include OTC medications for common illnesses like common cold, cough, fever, and headache (Figure 1a). The prescribed western medicines (Figure 1b) that our participants brought along were specific to the diseases for the individuals' medical history or for a geographical region they came from, and were prescribed by doctors in their home countries. For example, a participant from China who has had asthma since his childhood brought prescribed medicine for his chronic condition, and an Indian student who has had several recurrences of tonsillitis brought her prescribed medicine to be used on an *"as needed"* basis. Likewise, 3 of the 4 participants from Nigeria brought prescribed medicine for malaria prevention, since malaria is a common, widespread disease in Nigeria. Two participants from Nigeria and India also brought over-the-counter antibiotics, which they regarded as a panacea for more severe illness. Although some of these medications were also available at U.S. pharmacies, the challenges of obtaining them, such as high-cost, complicated reimbursement process, and a need for prescriptions, have prevented them from getting medications locally. Thus, they continued to ask their family or friends to send them the required medications from their home countries.

The second type of medicines brought by our participants from home was primarily ethnic-specific, traditional medicine. Traditional medicine brought by our participants included Chinese herbal medicine (Figure 1c), Ayurveda, Moroccan herbs, and Korean-made traditional medicine. As the Jordanian participant said, *"I brought with me herbs for asthma, eczema, back-pain, tooth pain, stomachache etc. I brought many herbs and natural remedies."* While 27 participants brought different types of medications from their home countries, 8 participants brought only traditional medicine, which was strongly related to their positive health beliefs and beneficial experiences with non-western medicine. Similarly, a participant who has always been under the care of Ayurveda doctors brought basic spices such as turmeric and masala to prepare her own Ayurvedic medicine if she became ill. She added that she has purchased the same spices from a local store in the U.S. but they did not work for her. When she was asked to explain why the locally bought spices did not work, she just said, *"they felt different, not like those from home."* Thus, she has always asked her friends to bring her the spices when they came to visit her. In short, our participants relied on the medicine brought from home for their healthcare.

Figure 1: Examples of medicines that our participants brought from their home country. (a) Over-the-counter medicine, (b) Prescribed medicine from Taiwan, (c) Traditional herbal medicine from China.

Conducting self-diagnosis and self-treatment

The practice of bringing medications, whether ethnic-specific traditional medicine, OTC, or prescribed western medicine, from home countries pointed to an underlying, worrisome phenomenon among international students. Although many of the participants always visited healthcare providers when they were sick back home, they avoided health services when living in the new country by practicing self-diagnosis and self-treatment with their home-brought medicines, mainly for overcoming the barriers in utilizing local health services. All of our participants engaged in such self-diagnosis and self-treatment based on the information they gathered from family, friends, and the Internet. They *"talk to family, discuss with them, use home remedies"* (P17). They searched for similar symptoms on the Internet, and even used social media platforms like Facebook to solicit advice from their peers. As P23 described, *"I make decisions based on what most people say"*. After self-diagnosing, students would treat themselves with the medications they brought from home. P13 said, *"First, I will eat some correct pills. If I still feel discomfort, I may go to see the doctor*." Even the participants who did not bring medicines from home shared home remedies their friends brought from the same country/region when they were sick, and have also asked their family to mail them ethnic medicines from home. Clearly, visiting a doctor was the last resort for our participants, and only happened if their own medicine did not make them feel better in a few days.

However, such self-diagnosis and self-treatment can be harmful. For example, P7 from Saudi Arabia had trouble locating medical services in the U.S., so he chose to avoid doctors altogether and adhere to his own traditional home remedy. One time, he had to be rushed to the hospital for an emergency surgery because he was only taking a home remedy without realizing the severity of his illness. *"I wait for a while until it goes really bad, then I go to see a doctor. It is not a good thing to do, as the last time this happened, it got really bad and I ended up going into surgery to remove my appendix."*

When self-diagnosis and self-treatment failed or did not work as a *"quick fix"* desired by the participants, or just avoiding seeing a doctor, some participants turned to OTC medications they could get without a prescription in a pharmacy. Since most of them did not have a medical background and were unfamiliar with medicine available in the U.S., these newcomers would consult a pharmacist for assistance with OTC medication. However when the pharmacist suggested the students to see a doctor, they might still adhere to their own medicine and remedy. For example, P26, who brought Ayurveda from home, shared

his experience at a pharmacy when he tried to acquire local western medicine for a *"quick fix"*. *"I was suffering from cold and I went to a pharmacy, they asked how long have I had the cold, and he said if it's more than three or more days, you need to consult a physician and then come back for the prescription, and then I went back home and I had my Ayurveda medicine that I brought from India."* As this case showed, even with the pharmacist's professional advice, this student was unwilling to see a doctor; rather, he chose to continue with his home medicine.

DISCUSSION

Our study findings suggest that international students, as newcomers, faced barriers in seeking and utilizing health services, and adopted alternative solutions to manage their health. The barriers and corresponding strategies point to two important insights for the design of health information systems and services for newcomers: to lower navigational barriers and to enhance cultural competence.

Beyond Health Literacy: Barriers in Health Navigation

Health literacy, defined as the "degree to which individuals can obtain, process, understand, and communicate about health-related information needed to make informed health decisions" [4], has been identified to be limited among immigrants and refugees, and is a major factor that hindered them from accessing textual information and engaging in health promotion activities [40]. Despite being critical, we found in our study that health literacy was not the primary barrier that hindered our participants from utilizing health services, since most of them were able to perform self-diagnosis and self-treatment, and to engage in preventive efforts to stay healthy. These practices indicated considerable health literacy of the international students. While health conditions, illnesses, symptoms and even treatments may be similar, the healthcare system's organizational structure, service and payment procedures, and insurance coverage in the new country are radically different from those in the newcomers' home countries. Thus, they either had to spend excessive time and effort to search, learn, and coordinate various services within the new healthcare environment, or as found in our study, chose not to utilize the health services entirely. Hence, what prevents our participants from accessing and utilizing health services is rooted in their perceived ***navigational barriers*** associated with searching, understanding, selecting, and utilizing healthcare services in the host country.

The navigational barriers encountered by our participants included their perceived psychological, practical, and financial barriers. For example, they needed to make substantial efforts to become aware of insurance options and to understand the insurance terminology; they perceived the procedures required to visit a healthcare provider in the U.S. highly complex; they found the healthcare costs intimidating (even after spending much effort in choosing a presumably cost-effective health insurance). Therefore, different from previous research [21] on the barriers that international students encountered in seeking and utilizing health services, our study found that their perceived barriers of navigating health system and services was a key reason that prevented them from utilizing health services in the host country.

There has not been sufficient attention to helping newcomers navigate the complex healthcare system and alleviate their perceived navigational barriers. As shown in our study, the insufficient, unclear, and even confusing information on the university website aggravated the international students' perceived navigational barriers. On the other hand, while health service practices are innate to people who grow up in the host country, such as medicine only being dispensed in a pharmacy instead of a physician's office, these practices could intimidate international students into staying away from health services.

In addition, physical navigational barriers, similar to previous findings [21], exist that prevent newcomers from receiving health services. Specifically, the physical environment made it difficult for newcomers to navigate and access health services, partly because they were unfamiliar with the geographical locations and partly because most U.S. cities do not have a well-developed public transit so people generally commute by car. As newcomers, international students may not have access to an automobile and even if they do, driving in an unfamiliar environment can be daunting. Thus without social support from family or friends in proximity to help with transportation also increased their challenge of getting to and back from doctors' offices, pharmacy, and other services. Thus the time and efforts they spent in navigating the unfamiliar physical environment for accessing health services can be a non-trivial navigational barrier.

Our findings also point to another important navigational barrier – costs such as financial cost, time, cognitive and physical efforts incurred during the navigation process. As revealed in our study, our participants considered it high cost to miss two classes, travel three hours by bus, pay for medical bills, feel stressed from online information search, and learn new insurance policies and terminology. As such, they preferred their familiar, low-cost alternative medicines brought from their home country to meet their healthcare needs when their perceived costs exceed the perceived benefits of getting professional health services.

Designing to Lower Navigational Barriers. To help international students overcome the challenges they perceived or encountered in navigating the new healthcare system, we argue that it is important to lower their navigational barriers. Possible design opportunities include developing interventions to help them understand insurance policies and terminology, service coverage, physician networks, deductibles, copayments, and prescription. All such information can impact their perception of local healthcare system and services. In lieu of presenting such information in textual format, we propose an application,

ideally mobile, that provides a variety of video snippets depicting common health seeking scenarios. For example, an introductory video explains commonly used terminology like deductibles and copayments, and different types of healthcare facilities and services, and a video that shows what one needs to do when having a cold can portray the steps of identifying a primary care physician within the healthcare network, documents to present at the clinic, and places to fill prescriptions. Yet, this type of intervention may not address navigational barriers arose during impromptu situations such as when a newcomer requires medical attention in an unfamiliar location. Therefore, in addition to pre-made videos, the application should store the users' health insurance information and provide a query feature for real-time searches so that targeted instructions can be provided to guide newcomers in navigating local healthcare system and services on demand. The user can specify the issue and suggestions will be displayed with a link to a map application based on the user's geographical location and current time. To illustrate, if the user enters "diarrhea" as the issue after hours, the application will show what the user needs to do, e.g., bring your insurance card and go to the Urgent Care Center at the specified address shown on the map. In this way, the user can receive clear step-by-step instructions for addressing spontaneous medical issues.

To further facilitate international students' health navigation, universities can offer trained medical interpreters in their health centers and help students navigate the healthcare system and services. Despite more costly, this practice has been found to be effective in prior research where trained medical interpreters and bilingual health care providers can positively impact the quality of care and patient satisfaction [13].

We also recommend a cost-effective technological social infrastructure to provide language and communication assistance to international students. As shown in prior research, social media can be leveraged to support communication among newcomers [29] and to provide language interpretation [7,16] that can help scaffold communication between newcomers and local residents, which may also facilitate newcomers' navigation of the new healthcare system.

Cultural Resistance to Western Medicine

It has been argued that health beliefs play a critical role in newcomers' decision-making and utilization of healthcare systems in the host country [10,38]. In our study, we also identified cultural resistance toward western medicine as another key factor that refrained newcomers from receiving local health services.

When newcomers, including international students, arrived in the host countries, they often bring their deep-rooted cultural practices, belief systems, and traditional values to the new environment. They are then faced with a transition period marked by cultural differences, triggering a form of cultural shock including disparity in healthcare systems and practices. Newcomers also often experience a psychological process known as acculturation when adapting to the new culture and environment during transition. Newcomers have been found to adopt different acculturation strategies during their transitions. For example, Chinese immigrants were found to adopt a separation strategy by using only Chinese language sites when seeking health information online [1]. Similar separation strategy was also found in the health practices of our participants of diverse ethnicity. They continued to use their home medicine and remedies that they have used their entire lives after arriving in the host country because they have repeatedly experienced the benefits of their home medications and remedies over the years. Consequently, they brought them from home as preventive measures – *"back-up"* medicine as said by several participants.

Further, our study showed that most international students were unwilling to let go of their home medicine. When their home medicine ran out, they tried to replenish their supply so that they could continue to self-diagnose and self-treat with their ethnic medicines and remedies. From the viewpoint of acculturation [5], they exhibited a strong adherence to the separation strategy. This practice also allows newcomers to preserve ties to their homeland, similar to previous findings [19]. However, unlike the use of languages, adopting separation strategy in healthcare practices require much more effort and may lead to adverse outcomes, such as the life-threatening consequence happened to P7 in our study. Such delay in treatment due to self-diagnosis and self-treatment thus calls for an urgent need to close this gap for newcomers.

Designing to Enhance Cultural Competence. Our study confirms the need to enhance healthcare providers' cultural competence for meeting the diverse cultural needs of newcomers like international students. Existing medical research and educational practices show that healthcare providers' cultural competence can be enhanced via training and hiring transcultural providers to help deliver culturally-congruent care to patients of diverse cultural backgrounds [11,34,36]. Since video games can facilitate the immersion of users in a variety of cultural settings which would otherwise be challenging to provide in the real world, we recommend designing video games similar to *CultureCopia* for training nurses' transcultural competence [12] to help improve healthcare providers' cultural competence. In this way, newcomers would feel more comfortable with culturally competent healthcare providers when seeking medical help in the new healthcare system. We further propose a policy change to allow healthcare providers to offer culturally appropriate [33] and clinically monitored healthcare services to ethnic patients so that newcomers can receive familiar medications and remedies under the supervision of qualified practitioners. Enhancing healthcare providers' cultural competence can benefit not only newcomers but also the general public, given

approximately 38% of adults and 12% of children seeking complementary and alternative medicine in the U.S. [27].

Our findings also point to design opportunities to empower international students and other newcomers. Healthcare consumers are no longer passive receivers; they are often active participants in their own healthcare. We recognize patients' own agency and the potential benefits of patient empowerment, and thus advocate the need to enhance their cultural competence. Enhancing patients' cultural competence can empower them to better understand the host country's culture (including healthcare culture), and the cultural differences between their origin and the host country. To this end, opportunities exist for designing training and education, and technological interventions similar to the game application designed for enhancing healthcare providers' cultural competence [3] to help newcomers expand their cultural horizon, understand the social context of the host country, assess cross-cultural differences and similarities, become aware of the interaction and conflicts of their health beliefs and behaviors from the host country, and make better-informed decisions. Thus, it is high time we embarked on new research and design efforts to empower newcomers with improved cultural competence so that they can better adapt to the new environment including the healthcare system.

CONCLUSION

Our study examined international students' perceived barriers of utilizing healthcare services in the host country and alternative solutions they adopted to manage their health. We found that both their perceived and physical navigational barriers, and their cultural resistance toward western medicine were major factors that hindered them from using health services in the host country. The alternative solutions they adopted also indicated their strong health beliefs and social ties with their culture. Finally, based on our study findings, we derived implications for health information technology design.

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