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Novel Telemedicine Technologies in Geriatric Chronic Non-Cancer Pain: Primary Care Providers' Perspectives

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Abstract

Objective—We sought to identify primary care providers' interest in, as well as perceived barriers and facilitators to, using novel telemedicine technologies (e.g., smartphones) for managing chronic non-cancer pain (CNCP) in older adults.

Design—Six focus groups were conducted with 25 primary care providers.

Setting—Two academically affiliated primary care practices serving older adults with CNCP in New York City.

Methods—The investigators used content analysis to analyze transcribed focus group data and identify specific themes.

Results—While most providers reported limited use of telemedicine, they expressed substantial interest in trying devices such as smartphones in the management of older patients with CNCP. Perceived barriers to implementation of telemedicine tools included information overload, lack of mobile device usability among patients and clinicians, liability issues, and cost. To overcome these barriers, participants suggested implementing electronic or human-based pre-analysis of data (e.g., a computer or a person that triages patient data), creating a low-cost and user-friendly mobile device design, and targeting appropriate user populations.

Conclusions—Primary care providers are interested in applying telemedicine when caring for older adults with CNCP. Although they perceived multiple barriers to device implementation, they offered innovative solutions to address these barriers. Providers felt that novel telemedicine technologies may improve the management of CNCP but wanted evidence that the devices were

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both cost- and time-efficient, and led to improved patient outcomes before adopting their use in practice.

Keywords

Telemedicine; Chronic Non-Cancer Pain; Older Adults; Primary Care

Introduction

Chronic non-cancer pain (CNCP) constitutes a major public health problem [1–3]. Despite its prevalence, CNCP remains undertreated for many reasons, including lack of provider education, provider concerns about the potential for causing harm as a consequence of treatment, too few specialty providers trained in pain medicine, and a reimbursement system that does not cover many nonpharmacological modalities [1]. Recognizing the financial, medical, and personal toll associated with CNCP, the Institute of Medicine recently called for "new tools and metrics with which to define, diagnose, and monitor pain and its consequences," as well as a "cultural transformation in the way pain is perceived and managed" 0[3].

Telemedicine constitutes one such tool that might lead to a cultural transformation in the way care is delivered to patients with CNCP. Commonly defined as the "delivery of health services, including consultative and diagnostic services, via remote telecommunications," telemedicine continues to transform the medical landscape, having evolved beyond stand-alone kiosks to include modalities such as cell phones, smartphones, and tablets. Given the expense, prevalence, and treatment barriers associated with the management of patients with CNCP, the portability, data storage capability, and interface options of the devices offer a potential solution to these challenges. A review of the literature shows a growing interest in the use of telemedicine devices when managing patient with CNCP [4–16]. Regarding treatment delivery, novel telemedicine tools have been found to facilitate consultation, talk therapy, and delivery of rehabilitation services [1,4–8,12,13,16–18]. Regarding education, these tools have been found to significantly increase access to information about pain, mostly via access to web-based resources [1,5,11,15]. Finally, regarding pain assessment, they have proven useful in the form of electronic diaries [1,9,10,14].

Studies of newer telemedicine technologies in CNCP management, however, have not focused specifically on older adults—a population with much to gain from use of the technology for many reasons. First, pain is one of the most common complaints among older adult populations [19]. This phenomenon may stem from the fact that certain CNCP disorders (e.g., osteoarthritis, postherpetic neuralgia, and back pain), disproportionately affect older adults compared to other age groups [20–22]. Second, the management of CNCP among older adults can be especially challenging because of age-related physiological changes that increase sensitivity to pain medications, as well as the problem of multimorbity that is common in later life [23]. Given the prevalence and treatment challenges associated with CNCP among older adults, new approaches are needed to address the problem. Telemedicine may provide such an approach and efforts are already well

underway to incorporate new telemedicine tools into the overall health care of geriatric populations [24,25].

Providers' management of older adults (i.e., those ages 65 and above) with CNCP might be enhanced by use of these technologies (e.g., smartphones and tablets) in several ways. Patients could use the devices to record information on pain level and treatment-related side effects, which in turn could immediately be sent to their provider, who is presumably also equipped with a smartphone or other receiving device or kiosk. A particularly appealing benefit of the devices would be the ability to record and transmit objective physical activity data (e.g., number of steps walked per day) and to correlate this outcome with pain intensity and treatment data. In addition, given the particular difficulty of initiating and titrating analgesic treatments—a particularly challenging aspect of geriatric CNCP care—this activity might especially benefit from the use of smartphone-based care delivery approaches [26]. Additionally, as is the case for non-geriatric populations, the device could also facilitate delivery of educational materials pertaining to CNCP.

While great in theory, the use of novel telemedicine technologies in geriatric CNCP management—or any area of medicine, for that matter—may not work in practice. Studies investigating these technologies, particularly in geriatric care, have shown that they can raise more challenges than they solve due to their expense, complexity, and ability to collect and transmit seemingly limitless amounts of data [25]. Prior studies have recommended that future research focus on identifying the best methods of integrating these technologies into clinicians' routine workflow [25]. With this goal in mind, this study sought to examine the perspectives of front-line clinicians, i.e., primary care providers, to determine their views about how novel telemedicine technologies, particularly smartphones, might be best used in the management of older adults with CNCP.

Methods

Study Sites

Focus groups were conducted at two urban academically affiliated institutions serving older adults: The Columbia-Presbyterian Allen Pavilion Division of Geriatrics, which serves a predominantly older Latino population; and the New York-Presbyterian-Weill Cornell Wright Center on Aging, which serves a predominantly older non-Hispanic Caucasian population. Most of the older adults served by these practices, both of which are located in New York City, live independently in the community. The Weill Cornell institutional review board approved the study.

Participant Recruitment

At the time of the study, 31 providers delivered care at the practices, and all were informed about the study and invited to participate. Of the 31 providers, 6 cited scheduling conflicts, while 25 (81%) participated. Of the 23 physician participants, 22 underwent residency training in internal medicine and 1 in family medicine. Twenty-one were board certified or board eligible in geriatric medicine at the time of the study, while the remaining two participants were board-certified gerontological nurse practitioners. Subjects participated in

the focus groups based on their availability to attend one of the focus groups and were not financially remunerated for their time or effort.

Focus Group Methodology

The first (ML) and last (MCR) author led each focus group, all of which were audiotape-recorded. One investigator introduced the study's purpose and objectives of each focus group, the focus group process, and moderated the discussions using a semistructured interview guide with follow-up probes. The second investigator present at each group took notes to capture concepts and ideas presented during each session. The interview guide was developed based on a review of the literature and discussions with pain and telemedicine content experts. We did not pilot the guide prior to conducting the focus groups.

Participants were first asked to discuss their awareness of and share their experiences (if any) using "telemedicine," which the investigators defined as "delivery of health services, including consultative and diagnostic services, via remote telecommunications, but not including traditional telephones." Although technically a type of telemedicine, traditional telephonic communication was deliberately excluded from the definition as it is already a part of the existing medical model. Participants were then asked to discuss their views on using telemedicine—specifically novel telemedicine technologies such as smartphones and tablets—in the management of CNCP among older adults. To facilitate the discussion, participants were asked to imagine a "device," resembling a mobile phone software application ("app"), that could record various pain-relevant clinical variables. Providers were specifically asked to voice their willingness to use such a device, delineate what clinical data they would want a device to capture, describe perceived barriers and facilitators to a device's implementation, and share other benefits of the device not already discussed.

Demographic and practice-relevant data were collected at the end of each focus group via a self-administered questionnaire. Of note, participants in each focus group were not aware of the responses generated by those in previous focus groups.

Analysis

All focus groups were audiotape-recorded, transcribed, and analyzed using content analysis [27]. NVivo8 qualitative software (QSR International, Inc., Doncaster, Australia) was used to organize the data [28]. Two investigators (ML and MCR) independently reviewed the focus group transcripts and notes taken at the time of each focus group, which led to a preliminary set of themes. The basic unit of analysis consisted of discrete sections of text that conveyed a concept or discrete idea. For example the phrase, "I'd be delighted to try the gadgets," was coded as "provider willing to try a telemedicine device."

After the fourth focus group, the two investigators came together to discuss their observations, interpretations, and preliminary themes. Each investigator then reread the transcripts, modifying the preliminary themes as appropriate, and met again to finalize the themes. Disagreements were resolved through discussion, resulting in a final list of themes.

After analyzing data from the fifth focus group, the authors identified no new themes. One additional focus group (sixth group) was conducted where no new themes emerged

suggesting that thematic saturation had been reached. The investigators triangulated their findings by presenting the results to the two non-coding researchers (JER and EG). The findings were also shared with a subsample of focus group participants as a form of member checking. Focus group participants agreed that the identified themes captured their thoughts and feelings shared at the time of their participation in a focus group, suggesting that the investigators' interpretation of the findings was credible.

Results

Focus Groups and Participants

Twenty-three geriatric primary care providers and two nurse practitioners from the two practices participated in one of six focus groups conducted between July 2011 and June 2012. Participants and non-participants did not significantly differ with respect to age, gender, race/ethnicity status, or years of clinical training. Each focus group ranged in size from three to seven participants and lasted up to 60 minutes in length. Participants had a mean age of 44 years, were predominantly female (64%), and had an average of 10 years of clinical experience providing care to older adults (Table 1).

Identified Themes

The primary study results are grouped into the following categories: provider awareness of and experience with telemedicine, willingness to try a novel telemedicine device in the management of older adults with CNCP, relevant clinical data to be captured by the device (listed by degree of endorsement, Table 2), perceived barriers and facilitators to device implementation (listed by the component of the telemedicine model that they affect, Table 3), and potential benefits of device use. Of note, themes did not vary by study site.

Awareness of and Experience with Telemedicine

All participants stated that they were aware of telemedicine use but reported limited experience using it in their respective practices. Forms of telemedicine encountered by participants included Holter monitors, blood pressure monitors, and electronic pillboxes. A few participants stated that they had brief experiences using "telemonitors," whereby they received regular electronic feedback on the status of a given patient.

A small group of participants also stated that they had in-depth experience with telemedicine in the research setting. One participant described her involvement in a home surveillance project that enabled family members to monitor an older adult from afar. Two other participants described being part of a prior study at another facility that used telemedicine to monitor blood pressure and serum glucose in older adults.

Of note, no participants reported use of telemedicine in the management of patients with CNCP.

Willingness to Try Novel Telemedicine Devices for Patients with CNCP

A majority of participants declared that they would be very willing to try a novel telemedicine device such as a smartphone in the management of their patients with CNCP.

Providers were quick to point out, however, that use of the device would depend on how the data would be presented to them (see Barriers and Facilitators later).

Types of Clinical Data Device Should Capture

All participants expressed a strong desire for a device to capture changes in a patient's pain level (Table 2). A moderate number of participants were also interested in capturing information on gait function and mobility, bowel function, mental status changes, and activities of daily living. A relatively small number of participants also expressed interest in using a telemedicine device to track patients' "quality of life," vital signs, appetite, and number of hours a patient slept over the course of a day. Interestingly, one physician stated that she wanted the device to not only capture negative data (e.g., side effects) but also beneficial treatment outcomes (e.g., whether the number of steps taken daily by a patient increases).

Perceived Barriers to Device Implementation

Information Overload—The most commonly endorsed barrier, mentioned by all participants, was their concern that they would not be able to effectively digest and address the large volumes of data that a telemedicine device would likely generate. As one participant explained:

> I think information overload is the number one thing … to have a lot more data coming in … would be a burden. …

For some participants, the volume of data was not only the most important issue, but it was also one of the most challenging to address:

> It's a really difficult question—far more difficult than the technology. What should we do with the information?

Patients or Caregivers Unable or Unwilling to Use the Device—Another commonly endorsed barrier was a concern that older adults with CNCP would not be able to use a telemedicine device correctly due to physical limitations or cognitive impairments. In addition, providers expressed concern that patients may lack the technological literacy to successfully use a device. As one participant stated:

> There will be tons of our patients who, because they're demented, or because they didn't do it ten years ago … or because they never learned to read … will not want to try [a telemedicine device].

Physicians Unable or Unwilling to Use the Device—Some participants expressed concern that certain physicians would not likely use the device. Like patients, some physicians might simply be too stubborn to change their practice patterns:

> But the doctors have to be willing to embrace the technology—look how hard it was to go from paper to computer. And there are still people who don't check their email. …

Other Perceived Barriers—A smaller number of participants also felt that physicians would be less willing to use a device if rules regarding reimbursement and liability were not worked out in advance:

> I think that the dark side of this is the liability issue. If an adverse event does happen [and a provider does not respond appropriately], does it come back to bite us?

Knowing that a device would be expensive, a small group of participants also wondered how the costs of buying and maintaining a device would be covered, as well as how theft could be prevented. Lastly, participants stated that a device might actually result in a loss of contact between the patient and the physician:

I think telemedicine is really good, but I can see how people would see it as one step further [removed] from their doctor. …

Perceived Facilitators to Device Implementation

Pre-Analysis of Data—All participants expressed a need for some type of "preanalysis" of telemedicine-generated data. As one participant described:

> Before the technology is offered, before we are responsible, we have to have some way to show what the measurements mean. I want to see an analysis [of the data] rather than the raw data.

Participants provided different ideas as to what form preanalysis of the data might take. Some explained that they would like a computer or the telemedicine device itself to be responsible. Instead of sending an alert following every report of a symptom or treatment outcome, a device would send an alert after a fixed number of reports.

In contrast with a computer-based system of data analysis, some participants expressed interest in having a person analyze the data, e.g., a trained health care practitioner. As one participant explained:

> … in an ideal world, there's a really smart nurse practitioner sitting in a room, who's waiting for these data to come across her desk, and she's processing it in a really smart way, and then maybe she [calls] … to say, "Do you think this is a good idea?" And I say, "Fabulous idea," and then she does it.

Low Cost and User-Friendly Design—Several participants emphasized the importance of low-cost devices with user-friendly design appropriate for the specific needs of older patients and clinicians. For patients, the device should be simple to use, resistant to breakage, and "fool-proof." In addition, as one participant explained, features that specifically address challenges faced by older patients, such as hearing and vision loss, would be especially helpful:

> A lot of elderly people have difficulty hearing, so if there's going to be some phone feedback, you have to make it easy for them to use. And if it can have any kind of computer screen to make it visual, so that they can see that information—to use different colors and sizes of fonts.

Growing Population of More Tech-Savvy Older Adults—Many participants stated that "baby-boomers," who are becoming increasingly tech-savvy, constitute a potentially ideal user group of telemedicine devices in the near future, if not now:

> … these younger [patients] who have chronic pain, whom we're trying to start the medications on—these might be some people to think about.

Proof of Utility—Some participants stated that physicians would be more likely to use a device if research demonstrated its utility, particularly around reducing adverse events:

> Would I be comfortable with it? Yes, if you show me data that demonstrate device use reduces adverse event rates. Right now it's theoretical—it sounds great on paper, but whether it can actually deliver is unknown.

Specific and Quantifiable Data—A smaller number of participants emphasized that obtaining useful data would be critical in successfully implementing a device. The data collected must be concrete, "to the point," and related to specific outcomes (e.g., pain level, number of bowel movements). In addition, as one participant pointed out, the data should, whenever possible, help the clinician detect an adverse event before it happens:

> We need to pick up constipation before it gets to obstipation, confusion before it gets to frank delirium, and problems urinating before urinary retention. …

Pre-Assessment of the Patient—A few participants stressed the importance of determining an older patient's ability to use the device prior to recommending its use. Participants suggested that this might take the form of assessing patients' mental status, technological literacy, and risk for theft.

Potential Benefits of Device Use

Some participants cited several putative benefits that telemedicine devices might provide when caring for older patients with CNCP. Possible benefits included eliminating the burden of traveling to the doctor and prescribing analgesic medications more confidently.

A few participants also cited putative benefits with broader implications. One participant explained that improved CNCP management could lead to reduced visits to the emergency room, thereby helping to reduce the overall costs of health care. In addition, some participants theorized that a device could also play an educational and social role for homebound elderly patients with CNCP:

> If people aren't afraid of the technology and they could use it, I think that opens up a lot of opportunities to improve health … and make friends, especially for people who are shut-ins.

Discussion

This investigation contributes to our understanding of the potential role that telemedicine technologies could play in the management of older adults with CNCP. To our knowledge, this is the first study to explore geriatric primary care providers' perspectives about these

technologies when caring for older adults with CNCP. Reflecting the growing role of telemedicine in geriatric care [25], participants in this study reported awareness of its use. The majority of participants, however, reported that their use of telemedicine (as the investigators defined it) was quite limited. Those participants with more intimate experience with telemedicine reported use specifically within the research setting. Of note, no participants reported use of telemedicine in geriatric CNCP management. This finding reinforces our hypothesis that telemedicine for this use is, indeed, new and unexplored territory.

Interestingly, participants' lack of experience using telemedicine in CNCP management did not correlate with their willingness to try it. Almost all participants stated that they would be very willing to try a telemedicine device, such as a smartphone or tablet, when treating their older patients with CNCP. This positive attitude would likely prove helpful in eventual device implementation because having an open mind when using a modality as new and often unfamiliar as a smartphone "app" would certainly facilitate the process of adapting to it.

With regard to clinical data that would be captured by a telemedicine device, participants were most interested in capturing data about patients' pain levels and medication side effects (e.g., gait function and mobility, bowel function, mental status changes). They were also interested, however, in capturing other geriatric-relevant data, such as activities of daily living, mobility, and number of hours that a patient slept. Similarly, when discussing additional putative benefits of the device, participants expressed a particular interest in a social media component, whereby homebound adults could use the device to connect with family and friends. This interest builds on an emerging body of research, some of which has been conducted in Japan, whereby telemedicine devices that facilitate face-to-face communication (through video media, for example) have been shown to improve cognitive function among older adult users, resulting in more "pleasant," home care experiences as well as increased ADL independence [29,30].

Even if the device captured all of the information they wanted, however, providers were quick to state that they would only use it if certain barriers could be overcome. One commonly identified barrier was the perceived inability or unwillingness of their older patients to use the device because of physical, financial, or educational (e.g., lack of familiarity with the technology) limitations. To overcome these barriers, participants suggested a "user-friendly design" that would address the specific needs of older adults [31]. Other suggested approaches for facilitating patient use included matching patients to appropriate telemedicine modalities according to a yet-to-be-developed screening tool, or instead targeting tech-savvy "baby-boomers." Interestingly, these opinions differ from the literature, where it has been suggested that older adults are quite interested in trying telemedicine tools to help them in the management of their pain disorder(s) [32]. Nonetheless, these barriers and suggested solutions are worth noting for future device trials.

Although endorsed, the issues of cost, reimbursement, liability, and loss of physician-patient contact were relatively less concerning barriers for participants. This also differs from other

telemedicine research, where these issues have been shown or suggested to be significant challenges to device implementation [4,25].

In contrast, the most important barrier cited by participants involved a concern about workday efficiency. Participants were most concerned about the possibility of information overload, where they would receive more data than they could practically act on. This concern corresponds with the telemedicine literature, where the concepts of data volume and how it is managed have been shown to be some of the most important and complex challenges to address with respect to device implementation [25,33]. Given the repeated endorsement of this concern in the telemedicine literature [25,33] as well as in this study, device developers should focus on determining the most practical (and useful) methods of data presentation so that providers are not overwhelmed but rather able to act on these data in an efficient manner.

Several limitations of this study warrant consideration. The first is word choice and terminology: the term “mHealth” or “eHealth,” which specifically refers to digital mobile health technologies such as smartphones and tablets, would have been more precise than our choice of the phrase “novel telemedicine technologies.” Exposed to the latter phrase, participants may have provided responses based on health-related technologies that the investigators were not seeking to examine in this study. Additionally, group dynamics and the participants’ established work relationships may not have allowed us to accurately capture the full extent of participants’ views. Finally, the sample was small, non-random, and limited to providers at two urban academically affiliated primary care practices located in the same state (New York). Our findings may therefore not generalize to other settings, such as non-academic clinical practices or other states where state laws and provider accessibility patterns may be different.

Despite these limitations, this study contributes to the literature by demonstrating that there is an unexplored and potentially feasible role for the use of novel telemedicine technologies in geriatric pain management. First, the results suggest that these technologies would find a welcome reception among primary care providers delivering care to older adults with CNCP. Second, design efforts should focus most on data presentation, as participants considered potential “information overload” to be the most important barrier to device implementation. Finally, our results suggest that a geriatric CNCP device would be most helpful if designed with the specific needs of geriatric populations in mind (e.g., older adult-friendly design, tracking activities of daily living, social media component).

Ultimately, we hope that the results from this study can help to inform the development of devices that are feasible and as effective as possible for use in geriatric pain management. If proven to be cost- and time-efficient for clinicians, as well as able to improve patient outcomes, novel telemedicine technologies could help to significantly improve the management of CNCP among older adults.

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Table 1

Study participant characteristics

Characteristic	N = 25
Mean age in years (range)	44 (31–63)
Female (%)	16 (64)
Caucasian (%)	11 (44)
Physician (%)	23 (92)
Mean years of clinical experience (range)*	10 (0–31)
Mean percent of patients estimated to have chronic non-cancer pain in each provider's panel (range)	42 (5–90)

* Participants were asked to report number of years of clinical experience following fellowship training. Five participants were geriatric medicine fellows at the time of the study.

Table 2

Clinical data deemed important to capture by telemedicine devices

Specific data	Degree of Endorsement by Participants
Pain level	High
Gait function and mobility	Medium
Bowel function	Medium
Mental status changes	Medium
Activities of daily living	Medium
Quality of life	Low
Vital signs	Low
Appetite and food intake	Low
Hours slept	Low

Table 3

Barriers and facilitators to telemedicine device implementation

Affected Component of Telemedicine Model	Identified Barriers	Identified Facilitators
Device	• Information Overload • Liability • High cost • Risk for theft • Reimbursement issues	• Pre-analysis of data • User-friendly design • Specific and quantifiable data
Patient/Caregiver	• Unable to use device	• Pre-assessment of patient • Growing population of tech-savvy older adults
Physician	• Unwilling to use device • Loss of contact with physicians	• Proof of utility