Nutrition and Aging
Resource Center

Connecting Seniors to Care:
Implementing Amazon Alexa Technology into the Homes of Meals on Wheels (MOW) Clients

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Background and Purpose

A. Goal:

The Interfaith Ministries for Greater Houston (IMGH) Connecting Seniors to Care project explored the ways that a virtual assistant device (Amazon Echo Show 8) with Alexa can support the social determinants of health together with Meals on Wheels (MOW) deliveries to improve health outcomes, reduce isolation, and provide innovations to support the principles of Aging in Place of older adults.

B. Objectives:

1) Conduct an IRB approved medical study measuring physical and mental conditions through multiple interventions including meal delivery and technology implementation.

2) Pilot a program that promotes Mental, Physical, and Spiritual well-being along with Caregiver coordination in the homes of MOW Clients with an installed virtual assistant device (Amazon Echo Show 8 with Alexa) utilizing a custom developed Amazon Alexa skill (application).

3) Study the feasibility of technology utilization and acceptance by older adults receiving MOW service.

C. Overview of Project:

The Connecting Seniors to Care project was a multiyear feasibility study with research performed on two cohorts totaling 110 clients. Cohort 1 study involved 52 clients in an 18-week, 3 phase study with 3 interventions (Meals, virtual assistant device, and expanded technology interaction) that was conducted in partnership with Jessica Lee, M.D. from the University of Texas Health Science Center. Cohort 2 study involved 58 current MOW clients in a 12-week, 2 phase study with 2 interventions (Virtual assistant device and custom developed IMGH MOW Well-Being Menu). The target population were MOW qualifying clients in the Greater Houston area.

D. Project Results:

- Demographics of the project's participants were of the average age of 73 years, 74% female, 66% African American, 16% White, 5% Hispanic, and 13% Unknown/Other.
- In this project there was a 65% retention rate (34 of 52 clients completed) for cohort 1 and 72% (42 of 58 clients completed) in cohort 2.
- In cohort 1, a Montreal Cognitive Assessment (MOCA) was completed at each of the 4 visits and results implied that meals and Amazon Echo Show 8 with Alexa may improve cognitive function. Additionally, Activities of Daily Living (ADL) and Independent Activities of Daily Living (iADL) measures were conducted and significant improvement was found in the ADL (Cochran's $Q = 31.783$, $p < .001$) but not in the iADL (Cochran's $Q = 5.455$, $p = .141$).

Background and Purpose Continued

- In cohort 2 a Technology Acceptance Measurement (TAM) was conducted at 2 timepoints and showed an overall positive shift in acceptance of the Amazon Echo Show 8 with Alexa and this result was similar in cohort 1.
- The majority of project participant's responses were positive towards using the Amazon Echo Show 8 with Alexa. The top 5 uses based on data provided by Amazon for cohort 2 being: Music, Asking Alexa a question, Weather, Pleasantry (humorous interaction or remark with Alexa) and Asking the time; in addition, there was the utilization of reminders, including medication reminders, which clients expressed as highly beneficial for their well-being when they were interviewed. (Wulf)[1]
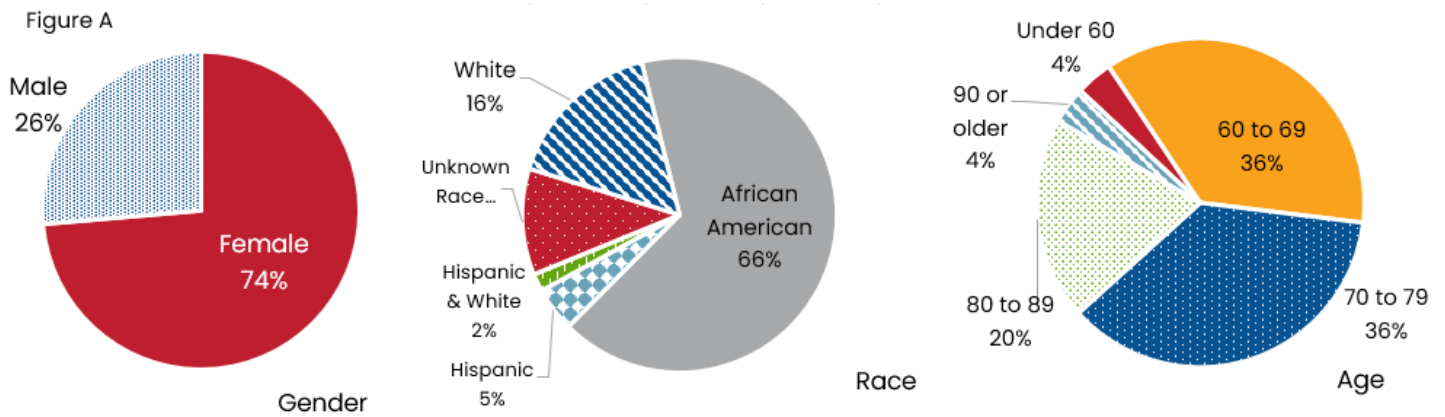
Figure A. Demographics of the 110 clients participating in the study
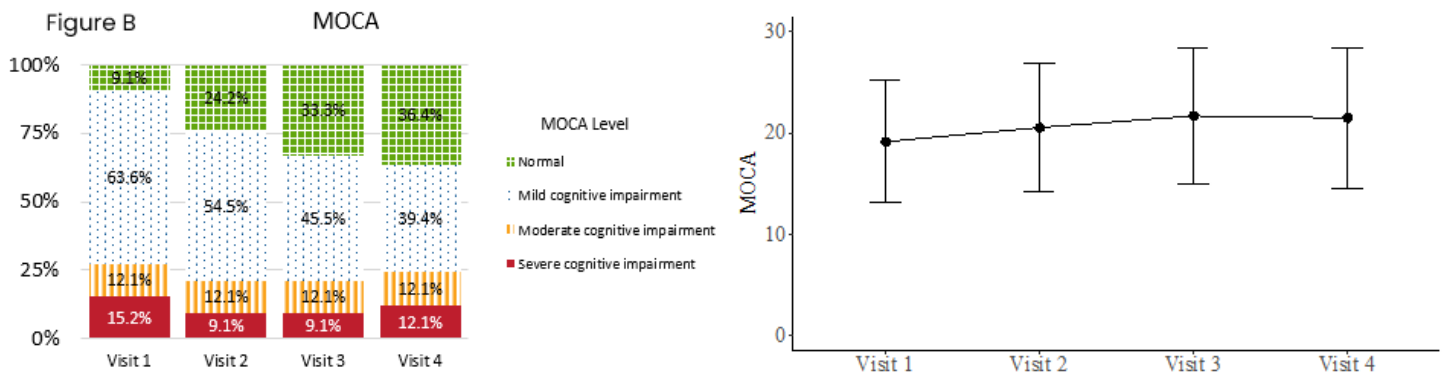
Figure B. In cohort 1 cognitive function was measured by Montreal Cognitive Assessment (MOCA) with higher scores indicating better cognitive function. Like depression, the study found that older age was moderately and significantly related to worse cognition (r = -.409, p = .005), so age was controlled for in the repeated measures ANCOVA. The results showed an increasing trend over time with an improvement from visit 1 (M = 19.15, SD = 6.04) to visit 4 (M = 21.48, SD = 6.94) with moderate-large effect size (Cohen's d = .66).

Background and Purpose Continued
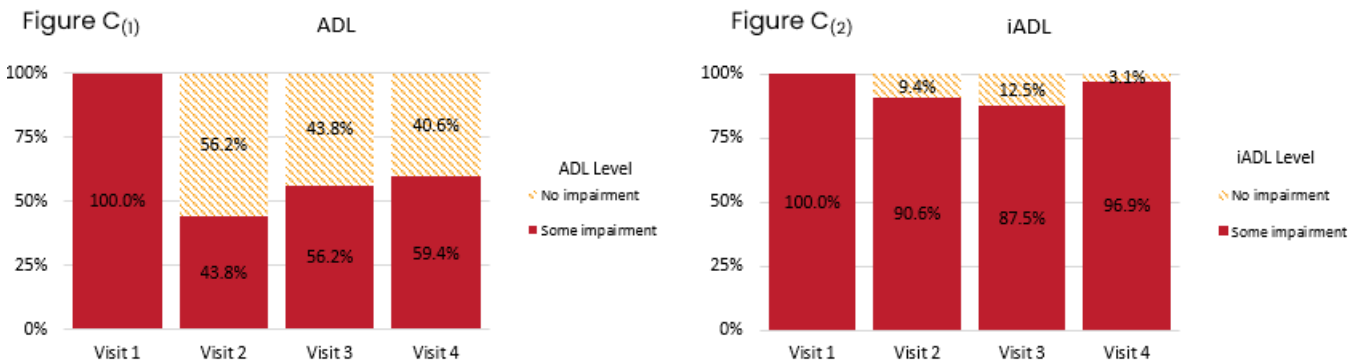
Figure $C_{1,2}$. In cohort 1 Activities of Daily Living (ADL) and Independent Activities of Daily Living (iADL) measures were conducted at 4 visits and significant improvement was found in the ADL (Cochran's Q = 31.783, p < .001) but not in the iADL (Cochran's Q = 5.455, p = .141). All participants reported some degrees of impairments for ADL at visit 1. Then, a majority of participants reported no impairment (ADL=0) at visits 2-4 (56.2%, 43.8%, and 40.6%). Of note, visit 1 assessment was completed by the IMGH MOW assessment team via phone and Visits 2 to 4 were completed in-person by the study team.
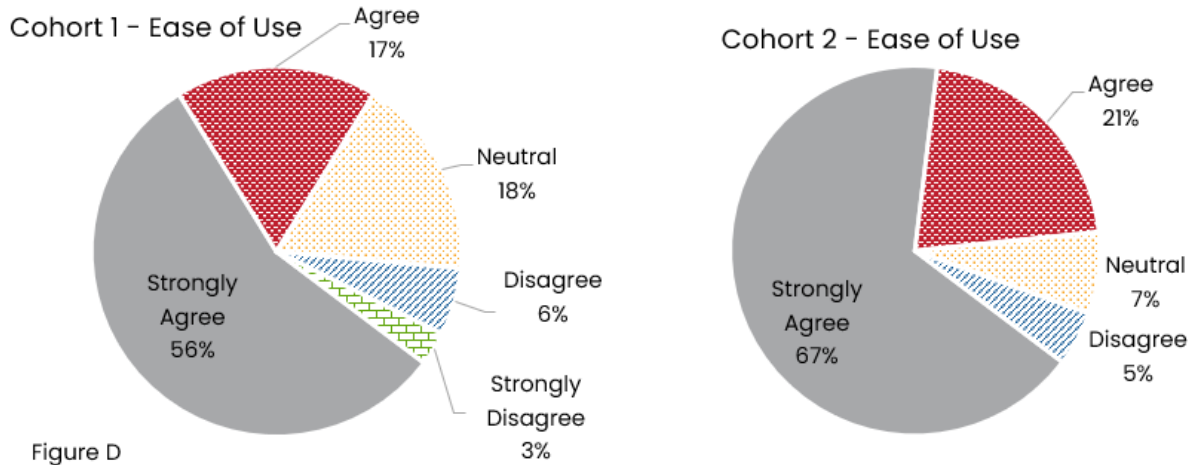
Figure D. In this study a Technology Acceptance Measurement was used at 2 time points and this figure represents the 2nd and final measurement. Despite some technical issues, both cohorts showed an overall positive measure in ease of use of the Amazon Echo Show 8 with Alexa device. Established research demonstrates that, though elderly people are more reluctant to utilize technologies such as voice assistants, "...interviews, focus groups and encounters with a system prototype that actively engaged the prospective users in the system design, helped to lower this acceptability barrier" (Yaghoubzadeh)[2]
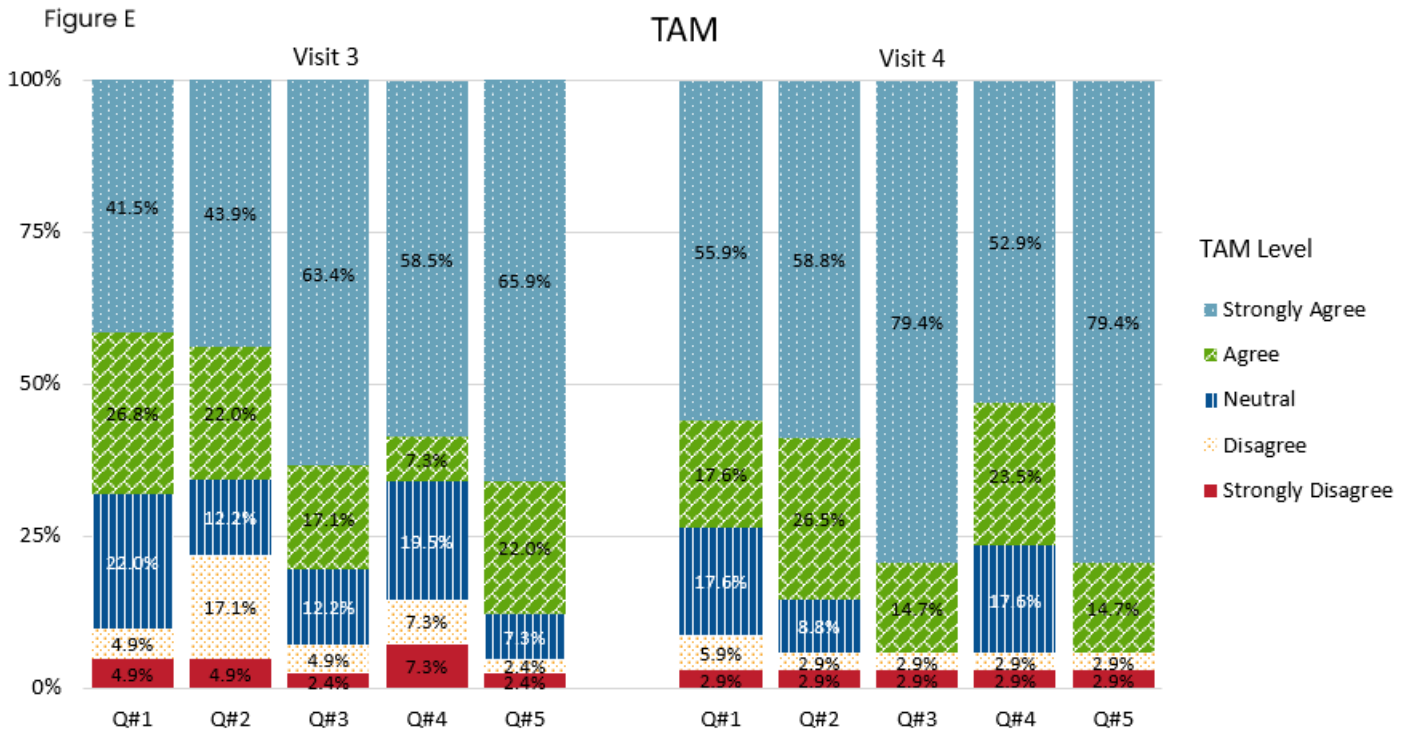
Q#1: I find the Alexa Echo Show to be easy to use.
Q#2: I find it easy to get the Alexa Echo Show to do what I want it to do.
Q#3: Given that I have access to the Alexa Echo Show, I intend to use it.
Q#4: I could use the Alexa Echo Show if I had no one around to tell me what to do as I go.
Q#5: I find using the Alexa Echo Show to be enjoyable.

Figure E. In cohort 1 a Technology Acceptance Measurement (TAM) was conducted at visit 3 and 4. Most participants agreed/strongly agreed that it was easy to use (Q1: 68.3%), it was easy to have Alexa do what they wanted it to do (Q2: 65.9%), they intended to use it (Q3: 80.5%), it was self-efficacious (Q4: 65.8%), and using it was enjoyable (Q5: 87.9%) at visit 3. When comparing these items at visit 4 to visit 3, the results indicate a significant improvement in the satisfaction in Question 2 "I find it easy to get the Alexa Echo Show to do what I want it to do" (MH = 50.00, p = .008). Six participants who disagreed with this item at visit 3 selected "neutral" to "strongly agree" at visit 4. There was also a significant improvement on Question 3 "I intend to use Alexa Echo" (MH = 34.00, p = .046). Seven participants selected "Strongly disagree" to "neutral" at visit 3 whereas only two participants selected "Strongly disagree"/ "Disagree" at visit 4.

Background and Purpose Continued
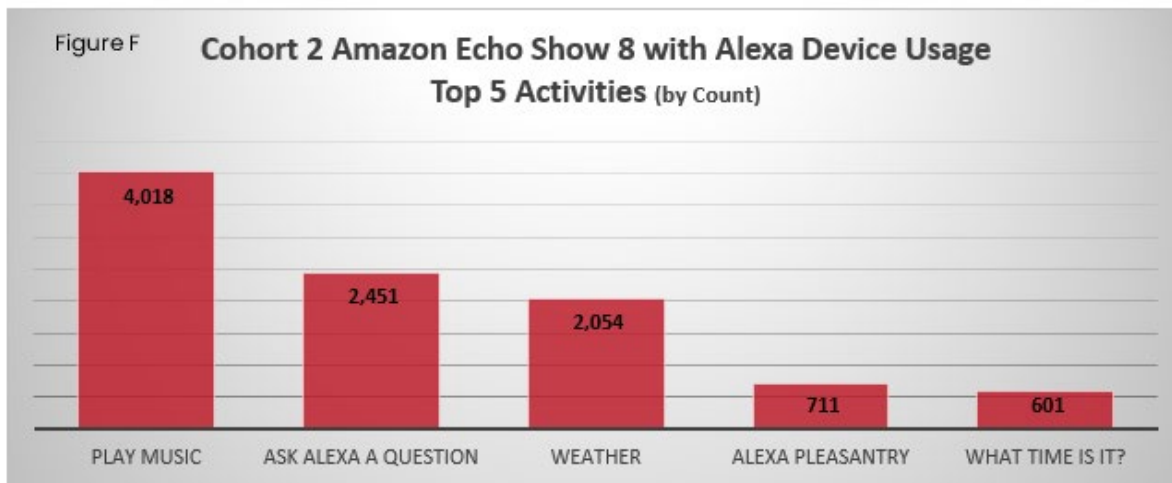
Figure F. This chart was provided by Amazon based on cohort 2 utilization of the Amazon Echo Show 8 devices on the Amazon Alexa Smart Properties platform for the 12 weeks of the study. This represents the total overall Amazon Echo Show 8 device utilization by all cohort 2 clients. These results have correlation to published research that "the use of Virtual Assistants might contribute to enjoyable leisure time experiences, via entertainment features like music, videos, and jokes" (Schlomann)[3] and numerous studies on the use of digital assistants demonstrate themes of entertainment in which "opinions regarding IPAs {Intelligent Personal Assistant} were overwhelmingly positive." (Smith)[4]
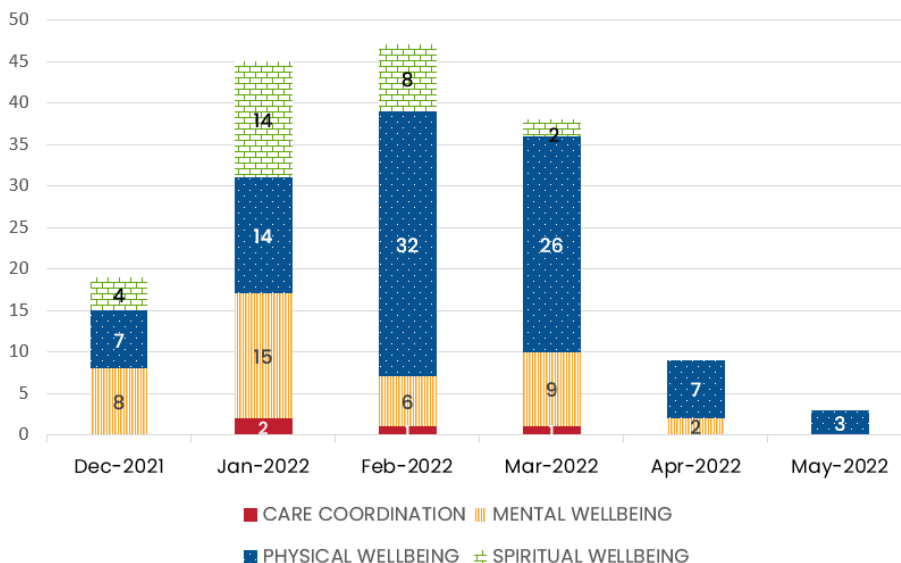
Figure G. In cohort 2 the study introduced a custom developed Amazon Alexa skill known as the IMGH MOW Well-Being Menu for 6 weeks and results show it was utilized 161 times for activities in the 4 categories. Cohort 2 participation started at different time points based on recruitment with January 2022 (n=16) and February 2022 (n=11) having the greatest number of users.

Partners and Project Staff

A. Partners:

- **University of Texas Health Science Center:** provided co-principal investigator to conduct medical study, acquire IRB approval and facilitate client visits with study team members for cohort 1.
- **Amazon:** technology partner for the Alexa Smart Properties platform and Amazon Echo Show 8 with Alexa devices.
- **T-Mobile:** provided connectivity solution for cohort 1 to connect Amazon Echo Show 8 devices to the internet, including:
    - **Mobile Edge:** provided wireless hotspot devices and management utilizing the Pintrac Mobile Device Manager (MDM) platform.
- **OnGuardian:** provided product development resources and skill building to create the IMGH MOW Well-Being Menu with their caregiver connection platform along with technical assistance for the Amazon Alexa Smart Properties.
- **DataDiggers, LLC:** provided statistical analysis for cohort 1 data collected by the study team.

B. Project Staff Roles:

a. List number of FTEs
   - (3) FTEs

b. List staff title and general responsibilities
   - **Director, Meals on Wheels Healthcare Innovation:** Oversight of entire project including develop and monitor contracts, direct employees, volunteers and contractors, communicate with National Resource Center on Nutrition and Aging (NRCNA) and Administration for Community Living (ACL) monthly as required, coordinate study activities, and collaborate with product development resources.
   - **Project Manager, Healthcare Analytics:** Responsible for managing, analyzing, and presenting conclusions about large sets of data, coordinate activities between team members and project partners for the Connecting Seniors to Care project.
   - **2 part-time contract staff members:** Provided technical and soft skills for installation, follow-up, and end of study of the Amazon Echo Show 8 device along with client training and troubleshooting as needed.

c. Organizational chart for Connecting Seniors to Care project:

Leslie Kian, MBA/HCM

Director, MOW Healthcare Innovation

Jason Hassenbusch, MBA, DBA

Project Manager, Healthcare Analytics

Chelsea Akanna & Veronica Hernandez

Part-time Installation and Technical Support

Funding and Sustainability

A. Initial Funding:
- ACL Nutrition Innovations 3-year Grant 2019-2022.
- In-Kind Match including: Albert Schweitzer Fellows, donated Amazon Echo Show 8 devices, private/non-governmental funding for contract services and other project expenses, IMGH funded all the personnel costs for initial client assessments (MOW Client Services team) and MOW administration (Data/Billing team).

B. Continued Funding:
- IMGH continues to pursue private gifts to support this project.
- IMGH is seeking other grants available from foundations, government assisted technology funds, hospitals, assisted living centers, Area Agencies on Aging funds, and insurers. Meetings are taking place with organizations in the Texas Medical Center to discuss the interest and feasibility of using the Amazon Echo Show 8 devices as a tool to better connect the hospital with its chronically ill patients that may include exploring funding prospects from insurers.
- Pursuing an opportunity to replicate the project in Waco and Tarrant County, Texas with support from Meals on Wheels America.
- Investigating an opportunity for clients and their family to purchase the Amazon Echo Show 8 device and IMGH MOW Well-Being Menu.
- The project is funded, as needed, with IMGH general fundraising for expanded MOW services.

C. Sustainability:
- Based on proven feasibility and benefit of the Amazon Echo Show 8 device with Alexa in the homes of MOW clients, IMGH envisions a marketable and viable product that can be upgraded and customized for a variety of special needs and projects. Working with OnGuardian as an Amazon Alexa for Senior Living partner, this relationship provides opportunity to strengthen the features with increased benefits to the clients. Ongoing demonstrations of the Amazon Echo Show 8 device with Alexa and IMGH MOW Well-Being Menu have garnered significant interest from many organizations. A short-term goal is to obtain grants to support acquisition and distribution of additional Amazon Echo Show 8 devices and allow opportunity for further development of the content and skills to meet a variety of needs.
- Methods of future branding are being pursued though IMovation (IMovation is the innovation think-tank for IMGH) and to refer to the Amazon Echo Show 8 device with Alexa running the IMGH MOW Well-Being Menu as "IMmy". Coined after Interfaith Ministries (IM), this supports the opportunity to have "IMmy" as a product which clients can enjoy as a friend and assistant.

Funding and Sustainability Continued

- This project has established a strong potential for future growth of the device features and offerings in various senior situations combining the values of alerts, a communications device between caregivers and their loved ones, spiritual support for healing, exercises for seniors and games and puzzles to keep seniors engaged and their minds active. There are already interested parties that expressed their desire to use it to address the Social Determinants of Health with their clients/patients.
- IMGH is seeking to partner with other senior service providers to demonstrate how the Amazon Echo Show 8 device with Alexa and IMGH MOW Well-Being Menu can be an integral part of caregiving and communications for seniors.
- Exploring collaborations with other senior services through the United Way of Greater Houston 2-1-1 clearinghouse[5], where seniors could be referred by "IMmy" to social services by asking "IMmy" directly for help. Ultimately the goal is for the device to connect the senior to other agencies ready to serve and support their needs. This fosters commitment to constantly curate and update the system to make the best connections possible.

Recruitment

A. Participants

a. List Requirements

- Cohort 1 (n=52)
    - 60 years old or greater
    - Medically Stable
    - MOW applicant
- Cohort 2 (n=58)
    - Qualified MOW client
    - Have current wireless internet in their residence
        - With known Wi-Fi name and password

b. What recruitment methods were used?

Successful:

- IMGH has a large MOW client base (5,000+ current clients) which provided a large pool of potential study participants.
- Cohort 1
    - Using the MOW client assessors at the time of the initial assessment to offer participation in the study and possible benefits. With this approach there were 201 Clients referred by the assessors to the study team, 52 enrolled in study (26%), 112 declined after speaking with the study team (56%), and 37 were determined ineligible (18%).
- Cohort 2
    - Utilizing MOW delivery drivers for client recruitment was successful with 114 clients referred and of those, 55 qualified and enrolled (48%).
    - MOW drivers are trusted by seniors and have unique access to their homes. A driver was able to introduce the idea of participating in this study and potential benefits. The drivers were incentivized for a successful referral that enrolled in the study with a $25 gift card per client enrolled.

Not successful:

- Cohort 1 had a barrier to recruitment due to the study design using new clients that would have to wait until the 1st study visit was completed in their home with the medical team before the delivery of meals. Coordinating schedules could take up to a few weeks.
- Cold calling clients for cohort 2 was not a successful as a method for recruitment. When 135 clients were called, 6 accepted and only 3 were qualified and enrolled (2%).

Recruitment Continued

B. Volunteers or Students

    a. **List Requirements**

- Pass a background check
- Valid driver's license due to installing devices in homes

    b. **What recruitment methods were used? What was successful or not successful?**

Successful:

- IMGH volunteer resources and local network of volunteer-based organizations were utilized.
- Referrals by college advisor which lead to students (University of North Texas) with Amazon Alexa skills to support development.
- Albert Schweitzer Fellowship Foundation provided (6) graduate students serving in a fellowship program, including (2) students per 1 year commitment who were 4th year medical and social work graduate students.
- Serve Houston Ambassadors (national service participants) provided (2) undergraduate students to participate for 6-month terms.

Not successful:

- Based on the volunteer pool, some issues evolved related to the skillset and abilities of the volunteers to match the needs of the project.
- Scheduling of part-time students who had additional commitments of school and work was challenging to maintain a consistent process and progress.

C. Marketing Tips

Successful:

- IMGH MOW Assessors offered participation of this project to MOW applicants in cohort 1 and in cohort 2. Flyers (Appendix B) were distributed by MOW drivers advertising participation in the study.
- Communicated with multiple local volunteer programs to attract students and volunteers.

Not successful:

- In cohort 1 the recruitment of participants was by the IMGH MOW assessor who was not incentivized to recruit participants. In cohort 2, recruitment was initially done via cold calls to current IMGH MOW clients which was difficult due to feedback that there was a fear of scams and telemarketers causing clients to not answer their phones.

Tools

A. Technology

- **Amazon Echo Show 8 (AES8) with Alexa:** This device is designed around Amazon's virtual assistant Alexa. It has an 8" HD screen with stereo sound and built-in webcam and Bluetooth connectivity. AES8 is sized at 7.9"x 5.4"x 3.9" and weighing 36.6oz. It has a friendly user interface that is voice and touch enabled. AES8 requires a standard 110-volt connection for power and a wireless internet connection.[6]
- **Cellular data hotspot along with mobile device management application or existing client wireless internet access:** A wireless internet connection is required for AES8 to function. For clients who do not have wireless internet access (Wi-Fi) in their home this study used a T-Mobile Franklin T9 mobile hotspot which offered the ability to have the device status monitored with the Pintrac (MDM) platform in cohort 1. Based on the teams experience, an unlimited data plan is recommended for the cellular hotspot to ensure utilization of all functions.
- **Amazon Alexa Smart Properties:** Utilized to provide device fleet management of the AES8 device at scale. This simplifies deploying and managing AES8 devices in one console and leveraged Alexa Artificial Intelligence (AI) to improve how a community is managed[7].
- **Microsoft Teams:** Allowed for communication between many different involved parties including internal and external stakeholders. This was also used as a cloud-based document repository that could be accessed by the external study team. Additionally, this tool was used for internal video conferencing as all members of the organization are provided access on their computers.
- **Patient Care Intervention Center (PCIC) Unified Care Continuum Platform (UCCP) and Community Data eXchange Platform (CDX):** Used to track and document cohort 1 data collection, assessments, and comparative analytics of the study population to Greater Houston area.
- **Accessible Solutions ServTracker:** Platform used by IMGH MOW for client tracking and billing, including this study.
- **SPSS Statistical Analysis Software:** In collaboration with DataDigger, LLC. this application was used to analyze the cohort 1 assessment data (4 Visits with 9 assessments per visit) and create results for future peer-reviewed publications.
- **Zoom Meetings:** Utilized for video communications with external team members.

B. Resources

- Personal Protective Equipment (PPE) for client home visits following COVID-19 protocols
- Thermal Laminator for creation of physical document of instruction provided to the clients
- Cohort 1 used medical equipment for client assessments at visit with medical practitioner
- Meal deliveries by IMGH MOW

Project Timeline

2019

Fall 2019

- Received ACL Innovations in Nutrition Grant
- Created a project advisory council and received guidance from council members

Winter 2019

- Recruited Co-Principal Investigator (Dr. Jessica Lee, MD) and project team lead

2020

Spring 2020
- Project director hired to take lead on project
- Co-principal investigator assigned/contracted with University of Texas Health Science Center
- Research and demonstrations initiated for a comparative analytics and data collection tool to be used in cohort 1 medical study
- 2 Albert Schweitzer Fellows were onboarded to support project
- Organization acceptance and approval of study designed for project
- IRB proposal drafted with adjustments made for COVID protocols
- Solicitation of multiple mobile hotspot internet providers based on requirements

Summer 2020
- IRB proposal submitted
- Student volunteer developers created demonstration of Alexa Skills
- Contract executed with student developers to create Alexa skill
- Approval for final configuration and setup of Cohort 1 Amazon Echo Show 8 devices

Fall 2020
- IRB proposal approved
  - Recruitment initiated for new clients by IMGH MOW assessment team
- Alexa skills developed and implemented into production for cohort 1

Winter 2020
- T-Mobile was selected as provider for wireless internet using mobile hotspots
- Revised Cohort 1 recruitment criteria, received revised IRB approval, and reinitiated study recruitment
- Patient Care Intervention Center (PCIC) contracted for data collection tool and comparative analytics
- Cohort 2 study design was revised to pilot the IMGH MOW Well-Being Menu

Project Timeline Continued

2021

Spring 2021

- OnGuardian partnership established for IMGH MOW Well-Being Menu development
- IMGH MOW Well-Being Menu designed
- Amazon partnership initiated for Alexa Smart Properties platform
- Cohort 2 recruitment initiated
  - Leverage existing clients with in-home wireless internet connection
  - Initiate IMGH MOW driver incentives for client referrals
- Engaged (2) Albert Schweitzer Fellows to install, train, and support Amazon Echo Show 8 devices; including research and content development tasks for IMGH MOW Well-Being Menu, replacing previously assigned fellows

Summer 2021

- Engaged (2) part-time Serve Houston Ambassadors (national service participants) to install, train, and support Amazon Echo Show 8 devices in clients' homes

Winter 2021

- Engaged MOW volunteer to assist with project administration and study support
- Hired part-time temporary employee for client installations and support

2022

Spring 2022

- Engaged temporary staffing agency to assist with installations, client orientation, and support
- Hired full-time employee to replace volunteer for project administration and study support
- Published "Reimagining cross-sector collaborations post-pandemic to optimize care for vulnerable homebound older adult populations" in Journal of the American Geriatrics Society[8]
- Engaged (2) Albert Schweitzer Fellows to install, train, and support Amazon Echo Show 8 devices, replacing previously assigned fellows
- Solicited multiple biostatisticians for Cohort 1 data and initiated contract with DataDigger, LLC

Summer 2022

- End of study reached for all clients and cohorts closed
  - Cohort 1 data collection completed, analyzed, and results produced by biostatistician
  - Cohort 2 data collected from the IMGH MOW Well-Being Menu usage
- Final reports completed, project documentation reported to all stakeholders

Frequently Asked Questions

Q: What is needed to install the Amazon Echo Show 8 device in the client's home?

A: The Amazon Echo Show 8 device requires:

    i. Wireless internet connection (Wi-Fi) in the home to connect. If the client does currently have in-home Wi-Fi, a mobile hotspot can be used *(the team experienced the mobile hotspot will need an "unlimited" data plan)* or there are options for low-cost internet providers *(See Appendix F - Alexa Show 8 data requirements from Wireless internet and in-home Data Plan options Review).*

    ii. Safe household power outlet.

    iii. Place to set device on (Table, mantel, etc.) in viewing distance of client.

    iv. Amazon Log-in is required. In Cohort 1, individual log-in accounts were created for each client. In the Cohort 2, Amazon Alexa Smart Properties was utilized which allowed for centralized device management and provided a single log-in account for all devices on the platform.

Q: How does the client interact with the Amazon Echo Show 8 device?

A: The advantage of the Amazon Echo Show 8 device with Alexa is its display and supports both audio and touchscreen input for Amazon's AI assistant service. This is beneficial with the senior population as most smart speaker designs are audio-only and driven by speech recognition, whereas the Echo Show's touchscreen makes the device more of a general-purpose computing device with abilities to show visual in addition to audio. This device provided the ability to show specific videos through the IMGH MOW Well-Being Menu in addition to audio.

Q: How is client privacy addressed with the Amazon Echo Show 8 device and in this project?

A: The Amazon Echo Show 8 device is equipped with physical buttons to turn off the microphone and camera and clients were provided laminated instructions (Appendix G) related to this. Additionally, the study used the Amazon Alexa Smart Properties, Alexa for Senior Living platform for centralized management of the device and this platform is HIPPA compliant. If needed, the client can ask "Alexa, what are my privacy settings?" to find out more.[9]

Q: What can the Amazon Echo Show 8 device do and how does it benefit the client?

A: The Amazon Echo Show 8 device is a very robust tool for seniors especially when they are in their homes (supporting the concept of Aging in Place). With this device they can ask the Weather, Time, questions, listen to music, and set reminders for medication or events[3]. This study found that the playing of music was the most used function, followed by asking questions. There is also the opportunity to pair their phone to the device via Bluetooth and use a specific video conferencing application to interact with family and others.

Q: What training and support did you provide with the Amazon Echo Show 8 device?

A: An advantage of the Amazon Echo Show 8 device is the AI ability and ease of interaction. At the initial installation of the Alexa Show Echo 8 device, there was an in-person walk-through of some device functionality along with printed instructions (Appendix G). At the 6-week follow-up, a Technology Assessment Measurement was conducted and the study team was available to answer additional client questions about using the device. Additionally, a support phone number was provided to the clients.

Frequently Asked Questions Continued

This support number was a central phone in the office and if unable to answer, the messages were checked on all business days and the study team responded. In cohort 2 the devices were managed centrally, allowing the team to see if devices were active or if they lost connectivity. If they lost connectivity, the team would reach out to the client to support and resolve any issues.

Q: How did you manage the Amazon Echo Show 8 device in the homes of the clients?

A: In cohort 2, the Amazon Echo Show 8 devices were managed from a central location via the Amazon Alexa Smart Properties and specifically Alexa for Senior Living platform. This platform allowed for all devices to have identical content and eliminated the need for individual email and amazon accounts with each device. This platform also allowed for the settings to be minimized on the client's device including Wi-Fi settings.

Q: What is the IMGH MOW Well-Being Menu and which features were most used?

A: In this study a custom-built skill (application) was developed and implemented in the second phase of cohort 2 which is known as the IMGH MOW Well-Being Menu and contains content in the following categories: Mental Well-Being, Physical Well-Being, Spiritual Well-Being, Caregiver Well-Being. The Caregiver Well-Being option was in collaboration with OnGuardian. This skill had minimal functionality with limited/static content for feasibility purposes; containing about 10 videos and 5 brain games. Study results show the exercise videos were used most and there is benefit in expanded content for future replication.

Q: Can the Amazon Echo Show 8 device call 911 emergency services?

A: No, the Amazon Echo Show 8 device is not permitted to make 911 emergency service calls. The device does have the ability to be paired to a mobile phone via Bluetooth and this does allow the use of calls through the phone's address book. With a mobile phone paired, Alexa can call and text a predesignated emergency contact when asked "Alexa, call for help."[10] In this study, Bluetooth or pairing of mobile phones was not enabled.

Q: What is the cost of the Amazon Echo Show 8 device?

A: In this study the Amazon Echo Show 8 (2nd Gen, 2021 release) was used which has an 8" display. As of August 2022 this device is $129.99 on the Amazon website and there is opportunity for reduced cost during Amazon sales (e.g., Prime Days) and other ways Amazon supports non-profits.[6] There are larger and smaller versions of the device and correlated pricing. Infrastructure and support costs for the device would vary by location, scale, and of level of field-based support.

Q: How was the Amazon Echo Show 8 device accepted by the clients?

A: The study results show that the Amazon Echo Show 8 device was accepted and appreciated widely by the clients in the study. With the limited timeline the most used features were playing music, asking for the time or weather, and asking general questions. 70% of the clients completed the study and the majority expressed positive responses to utilization of the Amazon Echo Show 8 device as seen through the Technology Acceptance Measurement.

Advice for Replication

1. **Offer multiple languages to clients where regionally appropriate.**
   - This study was limited to English for the primary language of the clients due to the scope of study documentation, installation, and follow-up. There is opportunity to offer Spanish, Arabic, and French languages for replication as the Amazon Echo Show 8 device will support interaction with these languages.[11]

2. **Determine all possible options for internet connectivity in the homes of clients.**
   - In a recent survey of IMGH MOW Clients, there were 737 responses to the question of "Do you have working internet service in your home" and 52.2% responded "Yes." With this, there are also possible issues with the clients knowing their Wi-Fi password. Wi-Fi is the best choice for connectivity as the study found limitations with cellular based hotspot devices (cellular signal, data bandwidth, device power). See Appendix F for additional information on Federal sponsored programs with discounts to seniors.

3. **Determine methods and resources to provide on-going support for the clients.**
   - In this study, the Amazon Echo Show 8 devices were placed in over 100 homes of clients in the Greater Houston Area. Due to the large radius of locations, consideration is needed as to the resources and time involved with visiting client's homes for set-up of the device, training, and on-going support. A central phone number was created to offer support and the study team found that when clients had issues with the device, it could not always be solved over the phone and thus an in-home visit was needed. This was more prevalent with issues related to Wi-Fi connectivity.

4. **With constant change and progression of technology, it is recommended to review current product and technology availability from Amazon and partner directly with Amazon for input on current and future development of the Alexa Smart Properties.**
   - If incorporating the use of video conferencing with Amazon Echo Show 8 device, it is recommended to offer a pedestal stand for the device so the angle of the screen and camera can be adjusted. Additional review of current offerings from Amazon for the hardware/device can provide benefits including cost effective larger screen size and other features incorporated in the device. Amazon is innovating its offering of services routinely and available new Alexa services (e.g., Alexa Together) should be considered versus creation of localized features or content. This study used the Alexa for Seniors Living platform and this is a new platform that is evolving and has opportunity for expanded features and greater support from Amazon by partnering directly with them.

5. **Consider Alexa connectivity to other devices for greatest benefit to clients.**
   - For replication, feedback indicated the desire for additional features to the Amazon Echo Show 8 device that would benefit clients. In this study the team did not pair the client's mobile phone (if applicable) to the device via Bluetooth and this feature would have been beneficial for clients to be able to make phone calls using only voice to dial from their phone's address book. Additionally, the study showed there would be value in smart plugs for lights, wearable devices, and other home automation like video doorbell which would support Aging in Place scenarios.

Appendix List

A. **Recruitment - STUDY TEAM - Call Script**. Script that was used by the IMGH study team to call referred clients to the study to schedule initial visit with FAQs.

B. **Recruitment – DRIVERS - Client Handout**. Document used by the MOW drivers to explain program to clients.

C. **Recruitment – DRIVERS – Recruitment Script**. Script that was used to inform MOW drivers of the study and aid in their client's recruitment along with FAQ.

D. **Recruitment – DRIVERS - Template for recording referred clients**. Template used by the drivers to identify clients interested in the study which was then submitted to the study team for enrollment.

E. **Installation – STUDY TEAM - Client Study Agreement**. Study agreement for client to sign for enrollment into the study.

F. **Amazon Echo Show 8 data requirements and in-home Data Plan options Review**. Document outlining the internet connectivity and data needs of the Amazon Echo Show 8 device along with current options for in-home internet/Wi-Fi for seniors.

G. **Installation – CLIENT - Alexa virtual assistant guide.** This guide was laminated and provided to the client to assist in use of the device.

H. **Installation – STUDY TEAM – Detailed device installation Guide.** This document was used by the study team to install the Amazon Echo Show 8 device in the homes of clients along with activating the device in the Alexa for Senior Living platform.

I. **Installation - STUDY TEAM - Alexa Commands to use.** Detailed document of available features using Alexa, including Basic Commands and Questions to Ask Alexa.

J. **Phase 2 - STUDY TEAM - Call Script.** Script used by the study team when calling the client for their 6-week interview.

K. **Phase 2 - STUDY TEAM - Technology Acceptance Measure.** 5 Question measurement used at 6 weeks and End of Study with the clients to evaluate their acceptance of the technology.

L. **End of Study - STUDY TEAM – Process.** Process for the final visit to the client to end the study along with an exit interview.

M. **End of Study - STUDY TEAM - How to Reset Alexa to Factory Defaults Cohort 2.** Process on how to reset the Amazon Echo Show 8 device to factory defaults and remove from the Alexa for Senior Living platform.

N. **End of Study - STUDY TEAM - Questions Sheet.** 5 Questions that were asked of the clients at their final visit to provide them opportunity for additional feedback.

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