Use of a Mobile App by Older People in an Integrated Care Setting

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Chapter 15
Use of a Mobile App by Older People in an Integrated Care Setting

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ABSTRACT

The current study analyzes the information collected and the lessons learned during the first six months of the CONNECARE project in Israel, in order to assess the use of the mobile technology by patients, their motivations and obstacles; as well as their satisfaction. As of the middle of February 2019, 59 patients were recruited and 18 discharged from the project and completed the feedback questionnaires. Based on preliminary data presented in this chapter, as measured against the McGaughey et al. Research Framework, it can be concluded that the usage of the CONNECARE mobile platform can be rated as moderate. The analysis together with insights from the literature, suggest that usage of the CONNECARE app could be improved by introducing additional features that would increase patients' motivation to use the system as well as its full integration into usual healthcare processes.

INTRODUCTION

The use of mobile apps by the elderly is receiving increasing attention and there are an increasing number of apps on the market targeting this populations, particularly in the area of health care. These include apps for monitoring such as *iBP Blood Pressure and Instant Heart Rate: Heart Rate and Pulse Monitor*; provision of medical health care advice such as *My Medical*, *WebMD* and *AskMD*; and medication reminders such as *Pill Reminder Pro*, *Pillboxie*, *MedCoach,* and *MediSafe* (Hurst, 2018; iYogi, 2018). These apps are intended to be used by the patient for self-care at home. Several studies have investigated motivation as well as design issues. Among these, there is a growing conviction and preliminary evidence that mobile apps can support chronic disease management (Quinn et al., 2011; Bexelius et al., 2010; Carrasco et al., 2008; Lester et al., 2010). However, chronic disease management (CDM) apps have not lived up to their potential because relatively few patients are willing to pay for the digital tools. Huckman and Stern maintain that the more likely customers are health care organizations (Huckman & Stern, 2018). Despite this, there have been relatively fewer studies done specifically on the use of mobile apps by complex chronically ill older adults within an organizational based -integrated health care setting as an aid to treatment adherence, self-management and interaction with healthcare professionals. CONNECARE, a project funded by the European Commission's HORIZON 2020 program, is currently being conducted in Ashdod, Israel by Samson Assuta Ashdod Hospital and Maccabi Healthcare Services. The project focuses on digitally enabled integrated care for complex, chronically ill older adults. The digital platform being comprises a mobile app accompanied by a wearable device for the patients that is interfaced with a computerized case management platform operated by the health professionals.

The purpose of this chapter is to analyze the information collected and the lessons learned during the course of the CONNECARE project to date, in order to: assess the use of the mobile technology by the patients in the project in Israel including their motivations and obstacles as well as satisfaction; its effects on patient – healthcare professional interaction; and, the extent to which the use of the mobile technology contributed to patient empowerment and self-management, patient quality of life and care integration. The McGaughey, Zeltman, and McMurtey (2013) research framework was used to guide analysis in this study. It delineates the relationships between motivation, obstacles, ease of use, adoption and actual usage. The objective was to better understand the best use of mobile technology for the elderly in a healthcare setting, address all factors in our research model, and investigate implications related to appropriate technology design for this population.

BACKGROUND

Digitally Enabled Integrated Care

The digital transformation of health care is high on the agenda in all developed countries and is receiving especially high visibility in the European Union with its publication on 25th April 2018 by the European Commission of the Communication on Digital Transformation of Health and Care in the Digital Single Market that identifies three priorities:

- Citizens' secure access to their health data, also across borders;
- Personalized medicine through shared European data infrastructures;
- Citizen empowerment with digital tools for user feedback and person-centered care using digital tools to empower people to look after their health, stimulate prevention and enable feedback and interaction between users and healthcare providers.

Side by side with the movement toward digitalization of healthcare, is the growing conviction regarding the necessity of integrated care to meet the needs of an aging population with an increasing chronic disease burden. While the notion of integrated care was discussed in the late 1990s, a first attempt to define integrated care was offered by Kodner and Spreeuwenberg in 2002 (Kodner & Spreeuwenberg, 2002). Many subsequent definitions were put forth including one proposed by the World Health Organization (WHO Europe, 2016).

The notion of digitally enabled integrated care began to gain significant traction in Europe during the last decade. An indication of its importance has been the willingness of the European Commission to fund projects supporting the development of telehealth and telecare in the 7th European Research Framework (FP7) as well as the AAL (Ambient Assisted Living) Program, jointly funded by the European Commission and member and associated States (including Israel). This emphasis intensified in the European HORIZON 2020 program (2013-2020). On July 30, 2014, the EC published a call for proposals entitled "PHC-25 -2015: Advanced ICT systems and services for integrated care" with a deadline for submission of April 2015. Assuta Medical Centers was invited to be a member of a consortium that successfully submitted the CONNECARE Proposal, which was funded at the end of 2015 and launched in April 2016. Assuta's motivation for joining the project was its ambition for its new hospital being built in Ashdod which was strongly focused on its vision to be a "hospital with a community" and a hub for an integrated care system in the Ashdod area, coordinating the care between the new hospital, community healthcare services and social services.

Israel has been a pioneer in Health IT and its second largest Health Plan, Macccabi Healthcare Services, was one of the first healthcare organizations, internationally, to implement Electronic Medical Records on an organization-wide basis. Israel was an early adopter of telemedicine and was among the earliest to provide its citizens with access to their medical information via web-based patient portals. This was followed by the development and implementation of mobile apps giving both patients and clinicians access to the EMR via smartphone and tablet. Thus, the journey toward digitally supported integrated care in Israel has been part of an ongoing process of digital innovation.

The CONNECARE Project

CONNECARE is a multi-country project funded by the European HORIZON 2020 program to develop and implement a digitally enabled integrated care service. It is being implemented in two areas of Catalonia, Spain (Lleida and Barcelona), in Groningen, Netherlands and in Ashdod, Israel by Assuta Ashdod Hospital and Maccabi Healthcare Services.

Integrated Care for purposes of the CONNECARE project and this chapter is defined according to the definition set out in the report of the HSPA Expert Group on Integrated Care called *BLOCKS: Tools and methodologies to assess integrated care in Europe* (European Commission, 2017a). The definition for "[i]ntegrated care includes initiatives seeking to improve outcomes of care by overcoming issues of fragmentation through linkage or coordination of services of providers along the continuum of care." (European Commission, 2017, p. 2).

The CONNECARE Project is first and foremost an integrated care service based on a patient-centered integrated care model. From an organizational perspective, the integrated care model implemented in Ashdod is a case management model focused on integration and continuity of care between the hospital and primary and secondary healthcare in the community. The CONNECARE project aims to overcome the fragmentation of care by coordinating hospital and community healthcare services using digital technology, specifically mobile technology, for community dwelling, chronically ill patients that have been admitted to the hospital and will be discharged back to the community.

The primary digital tools being used by the patients are a mobile app accompanied by a wearable device (Fitbit watch) that tracks steps and motion, heart rate and sleep quality. The app collects the information from the wearable on a continuous basis, and in addition. includes tasks, reminders, alerts, questions and questionnaires and a chat feature for messaging. The app interacts with a digital case management platform operated by health professionals, in the Israeli program, primarily by nurse case managers and physical therapists. The Israeli project focuses on two groups of patients: complex chronic patients 60+ who are Maccabi members with an unplanned admission to Assuta Ashdod hospital via the Emergency department (Case 1) and Maccabi complex chronic patients 55+ scheduled for major elective surgery in Assuta Ashdod Hospital (Case 2).

The patients scheduled for elective surgery enter the program 3-4 weeks prior to surgery. A hospital- based Care Manager assesses the patient and refers the patient to a pre-surgery habilitation program coordinated by the Assuta Ashdod Physical Therapy Department to strengthen the patient both physically and emotionally prior to surgery, including a supervised and non-supervised physical exercise training program. Patients receive the wearable (a Fitbit watch and the Fitbit app) together with the CONNECARE app, along with instructions and training in their use. The pre-habilitation program is a combination of supervised activity in the physical therapy department, supplemented by nutritional consultation where needed and emotional support; as well as a program of activities and exercises to be performed at home. The patient's activity and adherence to the program at home is monitored by the professional staff with ongoing feedback – both through the chat feature of the app and by phone.

Both groups of patients (post-surgery and those with an unplanned hospitalization) are picked up by the Maccabi Nurse Case managers during their hospital stay and are then followed by them post-discharge for 3 months, using a combination of the app and Fitbit, phone calls and occasional face-to-face visits, either in the Maccabi Integrated Care Unit in the hospital or at the patient's home. The Maccabi Nurse Case managers develop a care plan based on the hospital medical and nursing discharge plans under the guidance of the patient's primary care physician. Post discharge services in the community are arranged

for and coordinated, usually prior to discharge or immediately following discharge. The post discharge plan is translated by the nurse case managers into tasks and entered into the health professional's case management platform. These tasks are automatically transmitted to the patient's app, where he receives notifications of his tasks, reminders, alerts, and questions regarding task performance as well as tracking how he feels and his overall status. The information from the Fitbit as well as everything entered by the patient into the app is transmitted in near real time back to the dashboard so that the case managers can monitor the patient's adherence and progress. In addition to monitoring and ongoing interaction with the health professional, patients are also supported in making appointments and dealing with bureaucratic hurdles in receiving coordinated care in the community.

From a research perspective, recruitment of patients into the project began in July 2018 and will continue until August 2019. The study uses implementation research methodology based on the Standards for Reporting Implementation Studies (StaRI) framework and checklist (Pinnock et al., 2017). A matched control group for both intervention groups will be created using the Maccabi database and compared using propensity scoring. The study measures selected clinical status outcomes as well as healthcare utilization outcomes but focuses predominantly on the evaluation of the implementation and the use of the mobile technology by the patients in the intervention groups.

The digital platform, both the mobile app for patients and the case management platform for clinicians, have been designed and developed using a co-design methodology. The use of the platform by the healthcare professionals has had its ups and downs, but by and large has been successfully implemented with ongoing modifications and refinements to meet their needs.

However, the adoption and actual use of the mobile app and Fitbit watch by the patients in the CONNECARE project has been fraught with challenges, many of which have been addressed in the past by previously published studies. These challenges include: motivation; the unique user characteristics of the older adult; designing the app geared to the special needs of the older users; and, the training/learning process for using the app.

The CONNECARE Mobile Solution

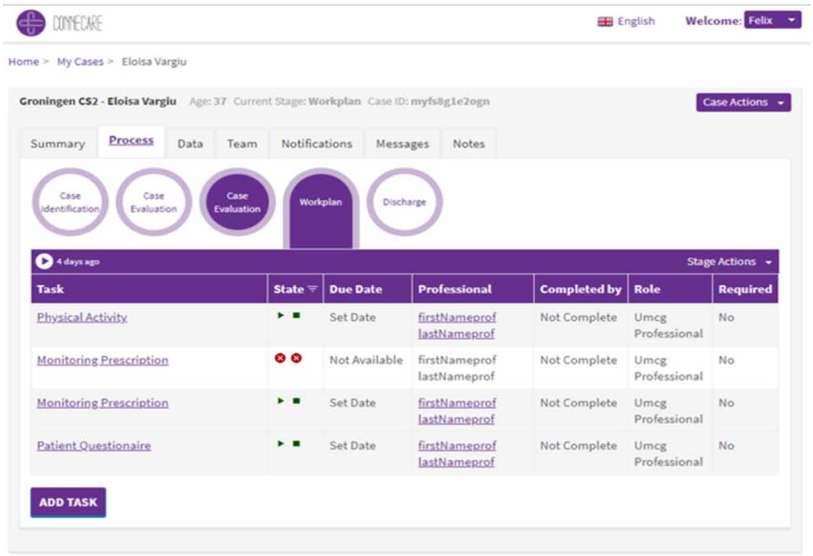
The CONNECARE mobile app for chronic patients is not a stand-alone app, but the patient component of an interactive digital system between the patient and healthcare professionals, and a platform for coordination among health professionals. Because of the interactive nature of the digital platform, the app can only be properly presented and understood within the context of its interaction with the healthcare professional via the CONNECARE case management platform.

In this section, the authors present the app as it transacts with the clinician platform. The screen shots are in English, but the platform used by the clinicians in Israel is in Hebrew and the app for the patients is in English, Hebrew and Russian. The patient can only access the app once he has been registered by the healthcare professional as a patient in the case management platform.

The first steps of the process are the creation of the patient in the clinician dashboard and the medical and functional evaluation of the patient (See Figure 1).

The clinician then creates a care plan, which is translated into tasks for the patient. The healthcare professional defines the task in terms of start and end date, frequency, quantity, and times of day (determines when a reminder will pop up). See Figure 2. The task then appears as a notification in the patient's app. In the following example, the physical therapist has prescribed physical activity, specifi-

Figure 1. Screen from the clinician dashboard - a patient's care plan



cally walking. The patient receives the instruction in the app – he synchronizes his Fitbit with the app and when he sees that the app is active (See Figure 3 and Figure 4), he puts the Fitbit watch on his wrist.

The Fitbit transmits the patient's steps and heart rate to the app, and the patients can monitor their own activity and see their walking trend over time. See Figure 5. The app transmits the information to the clinician platform so that the healthcare professionals can monitor his progress and provide feedback. See Figure 6.

Figure 2. Screen from the clinician dashboard - physical activity task form

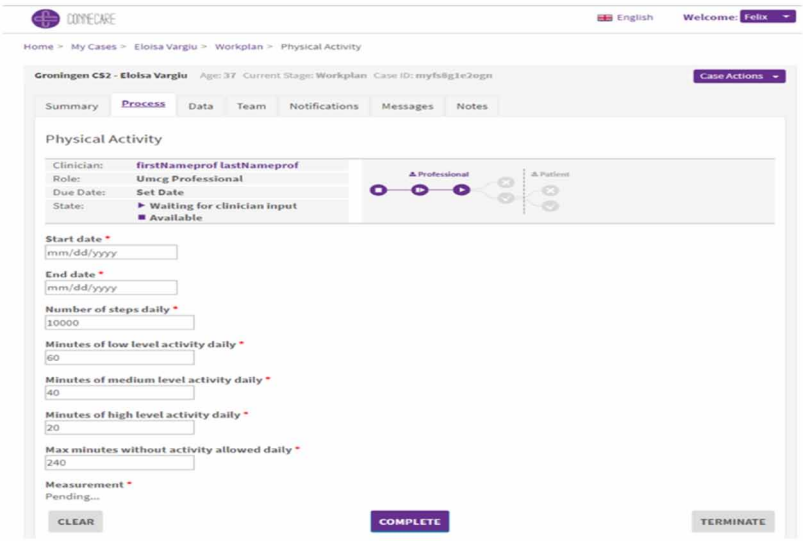


Figure 3. The patient's app - physical activity task pop-up remainder

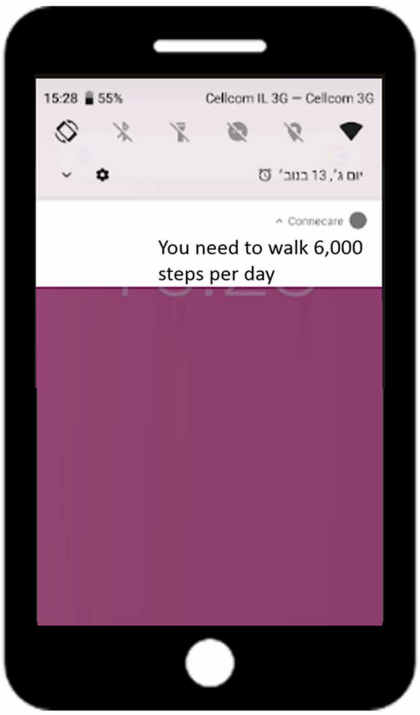


Figure 4. The patient's app - measurements home page

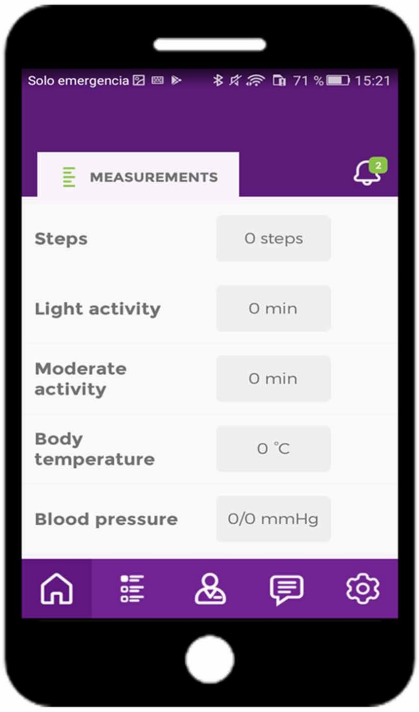


Figure 5. The patient's app - trend of daily steps over time

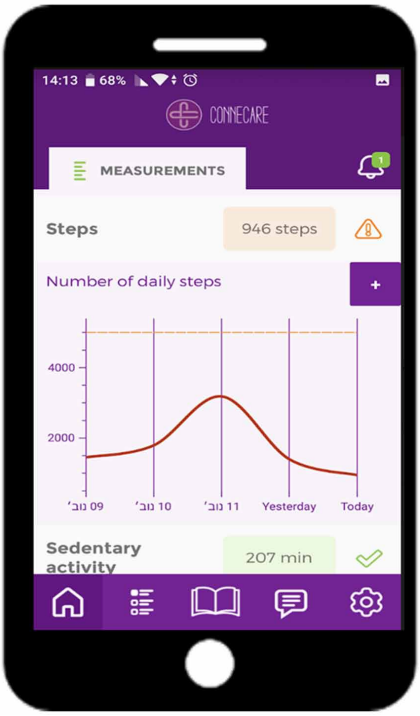
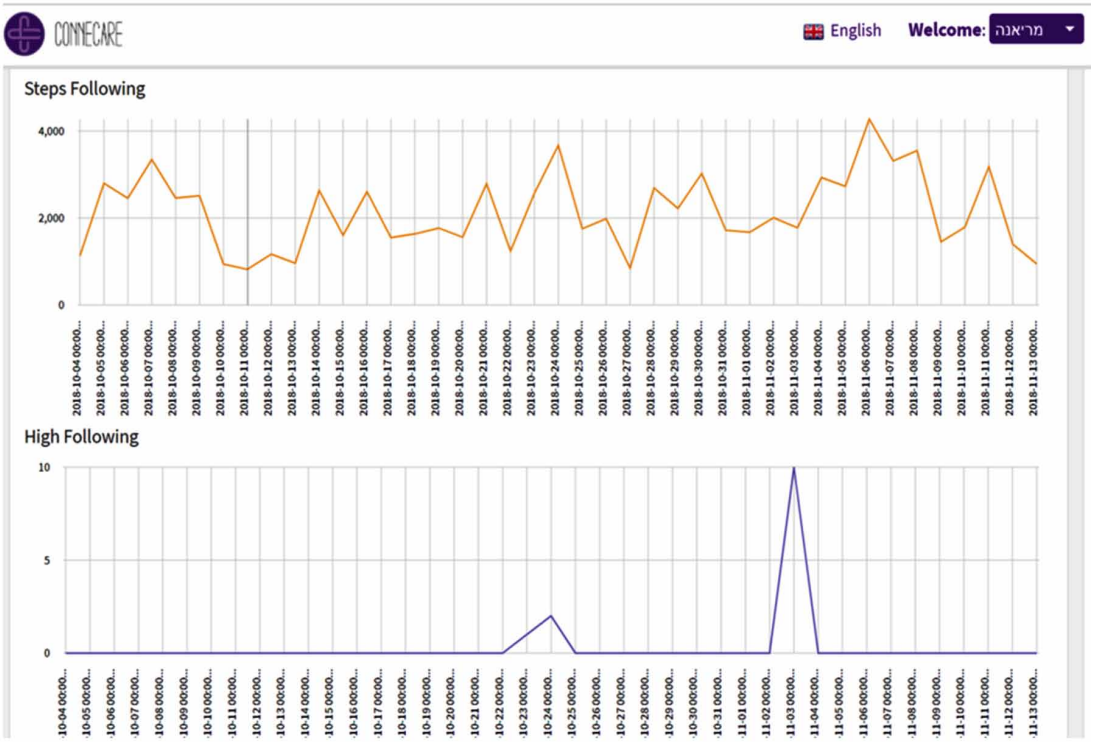


Figure 6. Screen from the clinician dashboard - monitoring the trend of patient's daily steps over time



The clinician can also prescribe additional types of physical activity as part of the care plan, and the patient will get notifications and reminders about these as well, and be asked to report whether he has performed them. See Figure 7. The clinician can also prescribe additional tasks, such as blood pressure monitoring. The patient can use a blood pressure cuff with Bluetooth that transmits to the app. See Figure 8.

The patient can see his current blood pressure levels in the app, and he can also see his blood pressure trends over time. See Figure 9 and Figure 10. The clinician can also monitor the patient's blood pressure on the clinician platform. See Figure 11. Other features include nutrition reminders, medication monitoring, glucose level monitoring and other biometric measures.

One of the most important features of the app is the messaging function that enables asynchronous interaction between the patient and the healthcare professional. In the following example, the nurse case manager sends a message to the patient giving him positive feedback on his walking and asking about his appointment with the orthopedic surgeon. See Figure 12. The patient is notified on the app that he has a message, reads the message and responds with a question relative to the prescription he received from the doctor and takes a picture of the prescription and sends it to the nurse. The nurse receives the prescription and the question in the clinician dashboard and can then respond to the patient. See Figure 13.

Figure 7. The patient's app - notifications of prescribed physical exercise

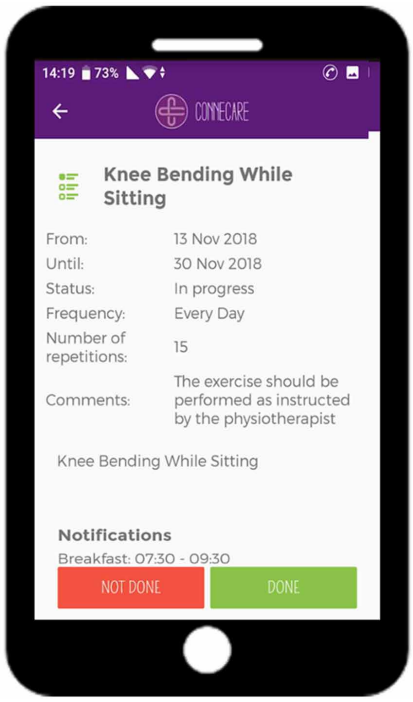


Figure 8. The patient's app - notifications to measure blood pressure

Figure 9. The patient's app - blood pressure values input screen

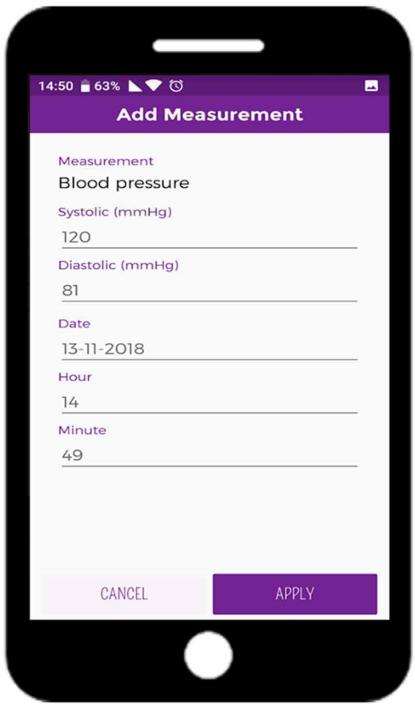


Figure 10. The patient's app - blood pressure trends over time

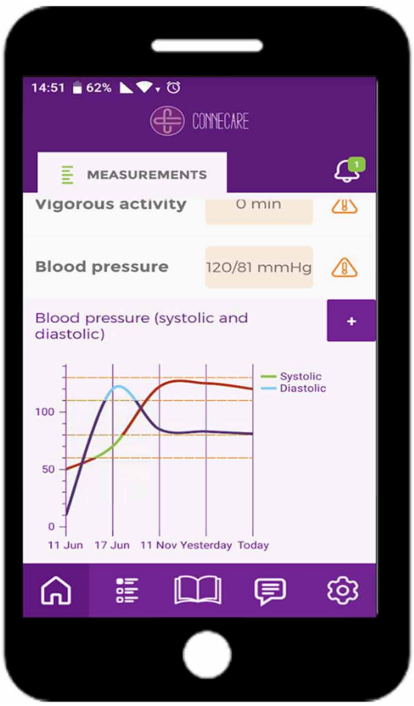


Figure 11. Screen from the clinician dashboard - patient blood pressure trends over time

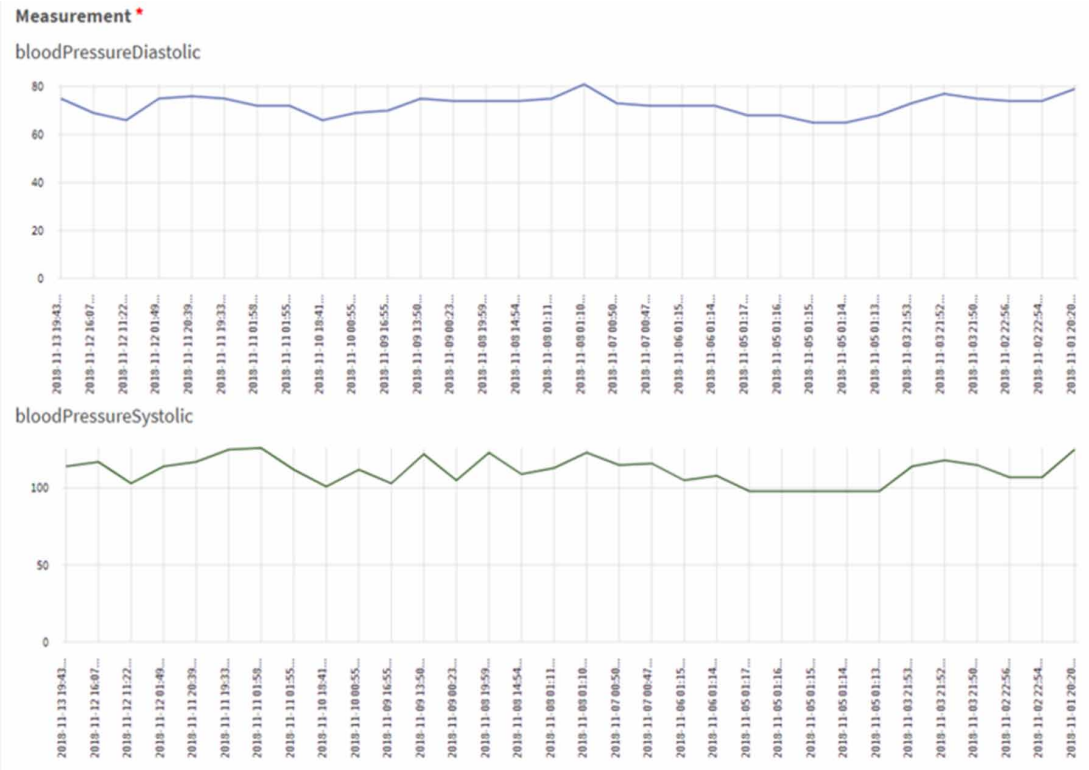


Figure 12. The patient's app - messaging

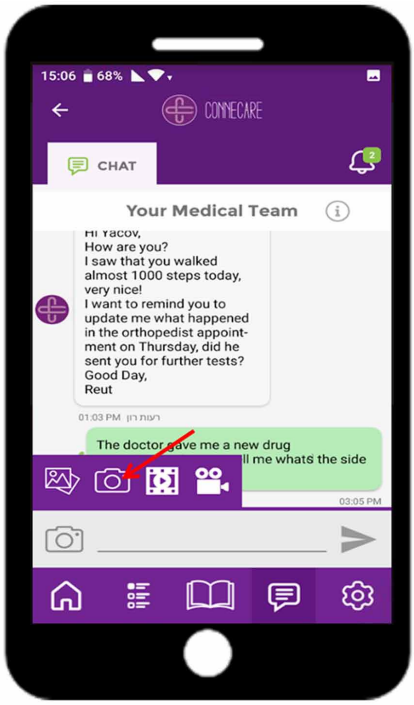
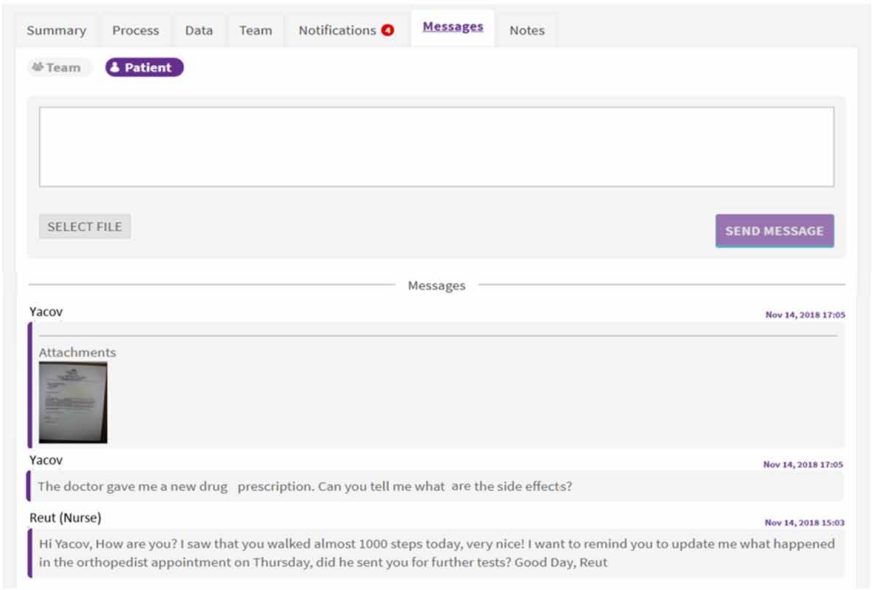


Figure 13. Screen from the clinician dashboard – messaging



MOBILE TECHNOLOGY USE ASSESSMENT FOR CHRONICALLY ILL, OLDER ADULTS

Assessment Framework and Methodology

The research framework proposed by McGaughey, Zeltmann, and McMurtrey (2013) was used in this chapter for assessing the use of the CONNECARE mobile technology by the patients in this project. The sources of information for the assessment were data documented on an ongoing basis by the staff regarding patient usage of the mobile system and its various features. Additionally, patient feedback was collected from those who were discharged from the study using the following instruments: *Satisfaction with the Technology Measures*, *EQ-5D*, *The Person Centered Coordinated Care Experiences Questionnaire (P3CEQ)*, items G1-G4 adapted from the *Nijmegen Continuity Questionnaire (NCQ)*, and *System Usability Scale (SUS)*. This was supplemented by observations by the clinical staff as well as the research staff documented in a structured implementation log and in the minutes of regular staff meetings as well as anecdotal information from both patients and clinical staff. There are additional data regarding health status (before and after) as well as other outcomes that will be measured for comparison with the control group that will be analyzed at the end of the project. The analysis addresses the following major issues:

- Motivation
- Obstacles: human factor (user characteristics), service-related, device-related
- Ease of use
- Training
- Support
- Usage (high, medium, low)

Results

The patient recruitment period for the project in Israel was ongoing at the time of this chapter's development and was expected to cover the time period from July 2018 to August 2019. As of the middle of February 2019, 59 patients had been recruited (28 males and 31 females ranging from ages 58-79 with an average age of 66.8). Most of the patients were married (76%), defined themselves as having middle socioeconomic status (86%), and had university education (58%). Twenty-one patients were recruited prior to major elective surgery and underwent or are currently undergoing the pre-habilitation program with the Fitbit and the app as well as post-discharge follow-up, and 38 have been recruited in the hospital during their inpatient stay after an unplanned admission via the emergency room and received or are receiving post-discharge follow up for three months with the Fitbit and app. 14 patients (24% - 9 from Case 1 and 5 from Case 2) dropped out of the project prior to completing the entire course and 18 patients have been discharged from the project and have completed the feedback questionnaires. Of the 14 patients who dropped out of the project ahead of schedule, eight (57%) were single (divorced or widowed). It should be noted that the feedback results reported here are on the first 18 patients recruited who had to cope with problems with the mobile technology that have since been resolved, so that these results reflect this limitation.

The following sections summarize the overall results. Detailed results can be found in the Appendix.

Usage (n = 59 Patients)

Devices Used

71% of the patients used or are using their smartphone while the remaining 29% are using a tablet. The main reason for tablet use is that the patients owned an old smartphone that cannot support the app. Of the patients using tablets, the majority are using a tablet provided by the project with a SIM card due to difficulties with WIFI in the home. All patients received a Fitbit watch, provided by the project.

Actual Use (n = 45, Excluding Patients Who Left the Study Ahead of Schedule)

82% of the patients measured steps with the Fitbit, with or without the app. 42% of the patients reported performance of tasks other than the walking assigned to them in the care plan via the app. 55% of the patients who were required to monitor their blood pressure used this feature of the app. 32% of the patients used the messaging function

Use by Case (Case 1 -Unplanned Admission; Case 2 – Elective Surgery)

Case 1: 76% counted steps, 41% reported performing assigned tasks, 24% used the messaging.
Case 2: 90% counted steps, 43% reported performing assigned tasks, 44% used the messaging.

Demographic Variables Affecting Usage

Age was not a strong factor in use, although those above 74 years old tended to use both the Fitbit and the app less, with the exception of the oldest patient in the study (age 79) who used all features regularly. Gender was not a strong factor in use, except for the use of the messaging feature, which was used significantly more by female patients. The patient's marital status had a significant impact on their participation in the project and usage. Although the vast majority of patients were married (76%) there is clearly a significantly lower usage pattern for the unmarried patients. This was true even in Fitbit use (93% for married patients compared to 60% for single patients). Education level was not a significant factor influencing usage, although the messaging feature was used less by patients with higher education levels (university degrees). This may be a random finding, and it will be interesting to see whether this finding persists in the final sample. The impact of the patient's socio-economic level on their use of mobile technology was inconclusive as only eight (14%) patients defined themselves as having low or high (not middle) socioeconomic status.

Change in Frequency of Usage over Project Course: As co-design is a major feature of the CONNECARE project, the app is being continuously improved and refined with new features added. The improvement of the app did not affect Fitbit usage which has been relatively high throughout the project. It did, however, affect performance of tasks in the app to some extent. Messaging was not available at the start of the project and there was increased use since the feature became available but not as rapidly as expected.

Satisfaction With the Technology (n=18 Patients Completed and Discharged)

The satisfaction questionnaire contained four question with a scale of 1-10 (1=Low, 10=high, NA= didn't use the technology). The questionnaire was completed separately for the Fitbit watch and the app. The results were significantly higher for the Fitbit watch than the app. The average scores for the Fitbit and app are in Table 1.

Table 1. Satisfaction with the technology average scores for the Fitbit and app (n=18)

Question	Fitbit watch	Connecare App
Overall impression	9	6.77
User friendliness	8.63	7.17
Ability to use	8.81	6.83
Would you recommend this to someone else?	9.54	7.40

System Usability Scale (SUS) (n=17)

The system usability scale questionnaire comprised 10 statements with five possible ratings from strongly disagree (1) to strongly agree (5). The percent of patients who rated each statement 4 or above (agree-strongly agree) for each question was:

- I think that I would like to use this system frequently = 35%
- I found the system unnecessarily complex = 18%
- I thought the system was easy to use = 53%
- I would need the support of a technical person to be able to use this system = 24%
- I found the various functions in this system were well integrated = 59%
- I thought there was too much inconsistency in this system = 12%
- I would imagine that most people would learn to use this system very quickly = 53%
- I found the system very cumbersome to use =12%
- I felt very confident using the system = 41%
- I needed to learn a lot of things before I could get going with this system = 29%

Overall, the proportion of patients who agreed with positive statements about the app were relatively low, but surprisingly, the percent of patients who agreed with the negative statements were even lower.

Patient Comments

Patients added an explanatory comment to their ratings. Some patients felt that the app helped them, was well integrated and felt that most people could learn to use it, but others cited various problems with using the app and cited that they needed repeated training and were helped in its use by their spouse or children. The comments also strongly support the finding that the patients were much more satisfied with the Fitbit than the app and felt that it was more useful for them. The specific comments shed light on some of the obstacles as well as positive aspects of the mobile technology. They also indicate that the context of integrated care service was important. Sample comments included:

Critical Comments

- Some of the data on the Fitbit and the app was in English so I could not understand them
- The watch is simple to use but I got in trouble with the app – synchronizing them is difficult
- Using the app would have been easier if it had been integrated with the Maccabi app which I know and use
- It would help if the app had a reminder to charge the watch
- If the app supported making appointments with my doctor it would have been more efficient for me
- Having to remove the watch to shower is a nuisance
- I only used the watch – I gave up on the app

Positive Comments

- The project is fantastic, provides reminders to drink water, feedback on sleep quality, all of the features
- The app should be accessible to all patients as it is really helpful
- This project helps me organize my day reminding me to take medication, drink water, walk
- The project gave me a sense of safety and security, attention, caring and support
- The app and watch encouraged self-discipline
- I wanted to do more fitness, especially after my last hospitalization, but couldn't bring myself to do it … using the Fitbit really encouraged me to walk more

Rating the Integrated Care Service, Continuity of Care and Perception of Health State (n=18)

While not directly related to the subject of this chapter, which focuses on the use of the mobile technology in the project, it is important to note that most patients felt they were more often than not involved in decisions about their care, received moderate support from the team, always received enough information and felt that they were treated as a "whole person" rather than a disease or condition. Interestingly enough, while they were satisfied with their relationship with the clinical staff, most did not perceive continuity of care among the clinical team. At the end of the three-month post discharge follow-up, they perceived their health state as very good as measured by EQ-5D. In response to the request to rate their health status from 100 (the best health state you can imagine) to 0 (the worst health state you can imagine) the median was 77.5 with highest being 100 and the lowest being 50.

Observations of the Staff as Recorded in the Implementation Log

The implementation log is a record of obstacles encountered from the start of the pilot in July 2018. As there is a strong element of co-design in the project, many of the problems with the mobile technology were addressed and features were added or solutions found. For example, initially there were problems with patients remembering their user name and password, which became an issue as the password would expire if the patients were not using the app on a regular basis. This problem was addressed and resolved. There were also equipment problems. The preferred option was for patients to use their own smartphones but many had old phones that could not support the app. The solution was to provide them with tablets. This led to another issue, which was that, even though they claimed they had WIFI at home, they couldn't remember the password to their WIFI. This was solved by giving them tablets with a SIM card so that they were not dependent on WIFI.

In the early part of the project, patients had to open the app to see notifications and reminders. This was changed so that the patients received pop-ups on their phone or tablet even when the app was closed (just like the pop-ups from text messages and WhatsApp). The staff reported that for many patients, despite the fact that they were trained on Fitbit and app use, and received a simply stated very explicit user manual with lots of pictures of screen shots showing how to use each feature, they forgot or couldn't "get it''.

A recurring phenomenon among many patients was embarrassment at not understanding how to work with the application and / or the Fitbit. Many patients were ashamed to say that they did not understand or did not remember. The staff was very respectful and empathetic, and conducted repeated training sessions both on the telephone and in face-to-face meetings. A number of attempts were made to involve patients' children or other family member to assist in the use of the app at home. This experience was successful in a small number of cases. Either the children did not have the time or patience to help their parents with the app, or the patient did not want the help of his children (mostly because of embarrassment at needing help).

DISCUSSION

The preliminary results on the use of the CONNECARE mobile device, show a clear preference and greater comfort level with the Fitbit watch than the app. This was supported by the structured feedback from the first 18 patients to complete the CONNECARE program and staff observation that seemed to indicate that patients viewed the overall program as supportive, were happy to use the Fitbit, but were not highly motivated to use the app. Not only because it required significantly more effort than the Fitbit, but because they apparently did not perceive enough "added value" to warrant the extra effort.

Motivation

The purpose of the CONNECARE mobile technology was explicitly to improve the health status of the patient, prior to surgery and post-discharge from the hospital. The functions were designed to help improve adherence to the treatment plan, to provide emotional support and a sense of security, and to empower the patient by giving him feedback, both in terms of self-monitoring as well as feedback from the clinicians. In this respect, the CONNECARE mobile platform only met several key needs identified in the literature. Gao and Koronios (2010) identify the key needs of senior citizens in their daily life, as health monitoring needs, personal information needs, social needs, leisure and sale needs, and safety and privacy needs. Older adults are motivated to use mobile technology if they perceive that it contributes to their *Quality of Life* (Qol). Martína, Martinb, and Medranoa (2011) compared Qol components identified by older people, needs found in their review of the research and the AAL (Ambient Assisted Living Program) model, and found a high degree of consistency. Qol components were:

- *Family and other relationships/contact with others* (maintain social contact with mobile phone as communication device);
- *Emotional well-being* (feeling safe and secure, safety, security and privacy, peace of mind);
- *Independence/mobility/autonomy* (freedom of movement, enjoyment, self-actualization);
- *Social/leisure activities/enjoyment* (self-actualization, hobbies, learning and education);
- *Finances/standard of living* (working life);
- *Own health/health of others* (healthier independent life, health and wellness, home care, chores and supply with goods.

In addition to intrinsic life-related motivations, a significant factor in the use of mobile technology by older adults is user satisfaction. Young Seok Lee (2007) found that user satisfaction was affected by three attributes of mobile phones: usefulness, ease of use, and pleasure of use. Another relevant insight from the literature is that for older adults to accept mobile health technology, it must represent a clear benefit to them and fit with their goals, expectations, and lifestyles (Jorunn et al., 2017).

While it is important to distinguish between patient motivation to adhere to medical treatment recommendations and the motivation to use an app as a tool to support adherence to treatment, both raise the question of key motivating factors and factors that impede or deter. Studies on medication adherence have identified the following key deterrents:

- Lack of family/social support;
- Economic factors such as unemployment, poverty, issues of affordability;
- Perceived benefit – asymptomatic patients are less motivated to adhere to a treatment regimen;
- Patient unfriendliness.

While lack of family/ social support was a factor in recruitment of patients to the study, once recruited it did not appear to be a major factor affecting use. Likewise, economic factors were not perceived to be an issue as patients received the mobile technology free of charge. However, perceived benefit and user friendliness were key issues. Lack of doctor- patient relationship (or more broadly – professional-patient relationships) is also cited as an important factor. There was a close and ongoing relationship between health professionals and the patient in CONNECARE. However, while the patient's doctors were supportive, they were not actively involved. An additional factor for lack of adherence to treatment cited in studies on adherence to treatment – not only medication, but other forms of treatment such as physical therapy, is low self- efficacy - the patient's beliefs about their capabilities to produce designated levels of performance required by the treatment regimen (Kagolianni, 2011). While the rationale for using a health related mobile app is to empower the patient and increase the patient's sense of self efficacy, it may be counterbalanced by a sense of anxiety and helplessness in the technical mastery of the use of the app, which then acts to discourage its use.

The CONNECARE app addressed only some of the Qol components listed identified as important to older adults. The CONNECARE app did not address the patients' social needs – in terms of contact with family and friends or leisure activities. It also did not address finances or standard of living. The level of actual usage, as well as the feedback from the first 18 patients recruited, seem to indicate insufficient motivation for using the app. The perception of the staff and the researchers is that because they could use the Fitbit without using the app, they had less motivation to use the app. They could see the number of steps they walked, as well as their heart rate from the Fitbit, and the Fitbit is by far simpler and easier to use, requiring little effort from the patient except to remember to charge it and to take it off before bathing and then put it back on. Another observation of the staff was that CONNECARE patients do not always perceive the benefit as they still have recourse to face-to-face care with their doctor and other health professionals, and communication with their nurse case manager by phone. Thus, the use of the app, even for messaging, was not sufficiently compelling. Patients from Case 2, admitted for major elective surgery, would appear to have exhibited a higher level of adherence to their care plan and the use of both the Fitbit and the app. This may be related to the fact that the benefit was perceived as more

immediate and compelling as part of their preparation for their upcoming surgery. Patients noted that the pre-habilitation program, supported by the app, increased their sense of independence and improved their mobility, giving them greater confidence that they could cope with the challenge of surgery.

Obstacles

Human Factors

User characteristics of older adults is a key factor. Young Sook Lee (2007) found that older adults are generally conservative mobile phone users, who use a few functions of mobile phones and perceive their phone to be difficult to use. Sri Kurniawan noted that older people are passive users of mobile phones, that they experience fear of consequences of using unfamiliar technology, and that most preferred design features that are aids for declining functional abilities (Kurniawan, 2008). Another study showed that older people require more time to complete tasks on mobile devices and describes problems such as the size of the screen to read information, the size of menus and interfaces issues (Lin, Hsieh, & Shiang, 2009). These elements are being experienced in the CONNECARE patient's use of the CONNECARE app. While not true of all patients, many do tend to be passive users, and there has been the challenge of overcoming the fear of using unfamiliar technology. A more common experience of CONNECARE patients has been embarrassment due to their inability to use all of the features resulting in a sense of low self-efficacy. As the co-design of the app is an ongoing process throughout the lifetime of the project, these issues are being addressed with app refinements.

Service Related

The feedback from the 18 patients who have completed the project did not indicate a lack of satisfaction with the service for the devices, although there were times when the app suddenly stopped working and patients needed help getting it back on-line. Some patients had difficulty accessing the WIFI in their homes (particularly those with tablets) but this was perceived more as a user problem than a service problem. Cost was not an issue as the Fitbits and tablets were provided by the project.

Device Related

This was an issue for more than a quarter of the patients who either did not have smartphones or had older smartphones that could not support the app. Providing tablets did not fully resolve the problem until the project started to provide tablets with SIM cards. Even using the Fitbit has its challenges: it requires activation of Bluetooth on the phone or tablet; remembering to charge the Fitbit once a week; and, remembering to remove it before showering and putting it back on after.

Ease of Use

Ease of use is often referred to as usability, that includes characteristics such as: (1) learnability, how easily users can accomplish basic tasks the first time they use the system; (2) efficiency, how fast users can perform a task after they have learned the design; (3) memorability, how easily users can re-establish good use of the system; (4) low error rate; (5) satisfaction, how pleasant users find the system; and (6)

utility, the functionality of the system (Nielsen, 2012). Usability has been a major factor and challenge for the implementation of the CONNECARE app as indicated by the lower satisfaction rating of the app compared with the Fitbit which is perceived as easy to learn and easy to use, error free, and satisfying to use. The usability of the app improved over the course of the project and was reflected in increasing use of additional features beyond counting steps as the project progressed.

Training and Support

Training and Support have been crucial in the CONNECARE project. Training consisted of face-to-face on hands training supplemented by a very detailed users' manual with many visual aids and screen shots of all of the app's screens with arrows and detailed instructions illustrating all of the functions. Nonetheless, repeated training has been necessary frequently and staff reports repeated phone conversations sometimes as long as a half an hour re-explaining and walking the patient through the use of the app and the Fitbit. In addition to the ongoing support of the nurse case managers, technical support has been provided where necessary. This is consistent with Leung et al. (2012) results regarding how older adults learn to use mobile technology. Leung et al. showed that the preference for trial-and-error decreases with age, and while over half of older respondents and participants preferred using the instruction manual, many reported difficulties using it. A useful approach was found to be an example help system, Help Kiosk, designed to support older adults' learning to use mobile devices.

Usage Rating

The McGaughey et al. (2013) model categorized usage as being high, medium or low. In the words of the authors: *"*Use can be low, as in the case when a senior owns a smartphone and uses it only for making calls, or perhaps not at all. High use as we define it, is not just using a lot of minutes for phone calls, it is getting the full benefit of the device's functionality, like taking pictures, sending text messages, using the calendar, alarms, or reminders, etc. Moderate use lies somewhere between the two extremes*"* (p. 190). Based on the preliminary data presented in this chapter on the results of the first 6 months of the CONNECARE pilot, as measured against the McGaughey et al. (2013) research framework, it can be concluded that on average, usage of the CONNECARE mobile platform for patients at this stage in the project can be rated as medium/moderate, with the app having a relatively low usage, both in terms of frequency of use and the number of functions used and the Fitbit having a relatively high usage. The analysis that has been done here together with insights from the literature, suggest that the usage of the CONNECARE app could be improved by introducing additional features that would increase the patients' motivation to use more of the system's functions with greater frequency. This could include additional quality of life components such as a feature that would enable messaging and easy communication with family and friends in addition to communication with the Nurse Case Managers and additional memory aids like appointments and a broader spectrum of reminders (Kurniawan, 2008). Motivation might also be increased if the app could be more flexible with regards to the type of activity it automatically tracks and not be limited to automatic tracking of steps alone (Coughlin et al., 2016). Other aspects that may increase motivation are rewards/positive feedback for the performance of assigned tasks and gamifications (West et al., 2017).

CONCLUSION

An important limitation of the lessons learned is that the CONNECARE mobile technology was developed as part of a research and development project and is constantly being upgraded in response to patient and staff feedback. Thus, at this point in time, the CONNECARE mobile app is not a finished product ready to go to market and will continue to be improved over the next 6 months. Nonetheless, important lessons have been learned that may be applicable in general to the use of mobile technology by older adults in the healthcare setting:

1. In 2019, as opposed to a decade ago, it is increasingly difficult to make generalizations about the needs and skills of "older adults". Most older adults have mobile phones. Many older adults use basic apps. While only 72% of the patients are using their smartphones in this project, this is not because they don't have a smartphone, but because they have a model not capable of supporting the CONNECARE app, which may, in fact, be a limitation of the app. Likewise, as seen from patient comments, responses to the app vary greatly: some patients don't like it and some patients love it.
2. Older adults, in general, still do not use mobile technology with the same ease as people under the age of 40, for whom smartphones are second nature and are rapidly replacing all other IT devices. WhatsApp is rapidly replacing email. Older adults (particularly above the age of 70) are using fewer functionalities than younger people, are using those functionalities that are easy to learn and easy to use, and that provide them with significant added value.
3. The CONNECARE experience so far raises the question as to how much benefit older adults see in health monitoring. The Fitbit watch is a simple, easy to use technology and yet only 82% of the study participants were willing to use it on a regular basis.
4. The fairly overwhelming preference for the Fitbit over the app suggests the most successful mobile technology for older adults (and perhaps the younger population as well) may be wearables, but would prefer wearables that are waterproof and have overcome the limitation of needing to be recharged.
5. Andrew Sixsmith in his chapter on Technology and the Challenge of Aging (2013) makes a point of emphasizing that mobile technologies in healthcare *cannot work in isolation, and should be seen as part of an integrated care solution that enhances the formal and informal networks of care that already exist*. The CONNECARE experience supports this. Many patients were able to overcome the obstacles and use both the Fitbit and the app because it was a part of their relationship with the clinical staff and because the clinical staff urged them to use it and supported them in their use. In assessing the technology and the project using the various questionnaires, patients tended to comment on the project as a whole, not only the mobile technology, confirming that they recognized it was part of a larger program.

It would appear to be a foregone conclusion that smartphones are becoming ubiquitous even among older adults and that they use an increasing number of apps that they perceive as enabling them to do things that are important to them. However, medical and healthcare apps are not among the most used. A recently published AARP research report on a representative sample of 1520 Americans 50+ found that 73% of the 50-69 age group and 55% of the 70+ group owned a smartphone. Yet, only 33% of the 60-69 group and 21% of the 70+ group used apps to manage or receive medical care (Anderson, 2017). There is a consensus in the literature that health and medical care management apps have great potential

and at the same time are facing hurdles in adoption. The area in which research has thus far not been sufficient is in the implementation of healthcare management apps by healthcare organizations such as HMOs, Health Plans, or Regional and National Health systems. All of the Health Plans in Israel have apps that enable their members to access their patient portals on their mobile phones, that enable them to see their medical information and even to perform functions such as renewing prescriptions and making appointments, but the development of organization-wide apps for tracking vital signs and managing care are still in their infancy. This adds an additional dimension of importance to the CONNECARE project, which aims to implement a multi-functional healthcare management app within a hospital and community healthcare organization setting in order to support patient empowerment and integrated care. The lessons learned thus far can be useful in informing healthcare organizations and systems as they move forward acting as a catalyst for further research in this area.

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KEY TERMS AND DEFINITIONS

AAL (Ambient Assisted Living Program): A funding program that works towards creating market-ready products and services for older people, co-financed by the European Commission (through HORIZON 2020) and 17 countries.

Case Management: A collaborative process of assessment, planning and care coordination to meet an individual's comprehensive healthcare needs coordinated by a designated case manager – in the case of CONNECARE in Israel, by nurse case managers.

CONNECARE: Acronym for "Personalised Connected Care for Complex Chronic Patients" the formal name of the project funded by a grant from the European Commission.

Digitally Enabled Integrated Care: Integrated health and social care that coordinate the care for a patient among the various sectors – hospital, primary care, specialist care and social services supported by digital technologies such as electronic medical/health records, case management platforms, patient portals, mobile technology, etc.

Digital Single Market: A policy belonging to the European Single market that covers digital marketing, e-commerce and telecommunications. It is a part of the Digital Agenda for Europe 2020 as defined in the document *A Digital Single Market for Europe* by the European Commission published in May 2015.

Elective Surgery: Surgery that is scheduled in advance because it does not involve a medical emergency.

Electronic Medical Records (EMRs): Digital versions of patient charts in clinician offices, clinics, health plans and hospitals, mostly used for diagnosis and treatment in this chapter. Used interchangeably with electronic health records that contain information from most or all clinicians involved in the patient's care, at least within a given sector such as a community network or a hospital.

HORIZON 2020 Program: The HORIZON 2020 program is the 8th iteration of the European Framework Program for Research and Innovation that is financed and operated by the European Commission and provides grants to proposals responding to published calls from 2014-2020.

Implementation Research: An integrated concept that links research and practice in order to improve the implementation of health policies, programs and practices. It is multidisciplinary and focuses on practical approaches to improve implementation and to enhance equity, efficiency, scale-up, sustainability and ultimately, to improve people's health.

Maccabi Healthcare Services: The second largest Health Fund in Israel covering 25% of the population (more than 2 million people) responsible for covering and providing all of the services in the public basket of services under the Israel National Health Insurance Law.

Maccabi Integrated Care Unit: This unit is operated by Maccabi and physically situated in Samson Assuta Ashdod Hospital. Its purpose is to do joint discharge planning with hospital staff for Maccabi patients and to assure a seamless transition back to the community by coordinating the services required by the patient in the community post discharge.

Samson Assuta Ashdod Hospital: The newest public general hospital to be built in Israel – the first after 40 years – in the city of Ashdod, Israel's fifth largest city. The hospital opened its doors in 2017 and aims to be a hub for integrated care, working cooperatively with Israel's four Health Funds and Social Services.

APPENDIX

Table 2. Demographic variables of 59 patients recruited July 2018 - February 2019

Patient number	Recruitment date	Age	Gender	Marital status	Education level	Socio-economic	Status 02/2019
1001	01/08/2018	61	female	Married	Tertiary	Medium	Released at the end
1002	31/07/2018	70	female	Married	BA	High	Released at the end
1003	01/08/2018	65	male	Married	Tertiary	Medium	Released at the end
1004	06/08/2018	65	female	Married	MA	Medium	Left ahead of schedule
1005	15/08/2018	65	male	Married	BA	Medium	Released at the end
1006	27/08/2018	68	female	Married	BA	Medium	Released at the end
1007	17/09/2018	79	male	Married	Tertiary	Medium	Released at the end
1008	25/09/2018	70	male	Married	High school	Medium	Released at the end
1009	25/09/2018	65	female	Married	BA	Medium	Released at the end
1010	11/10/2018	61	female	Married	High school	Medium	Left ahead of schedule
1011	15/10/2018	74	male	Divorcee	High school	Medium	Left ahead of schedule
1012	16/10/2018	69	male	Married	Tertiary	Medium	Released at the end
1013	17/10/2018	68	male	Married	Tertiary	Medium	Released at the end
1014	23/10/2018	75	female	Married	High school	Medium	Released at the end
1015	23/10/2018	59	female	Divorcee	Tertiary	Low	Left ahead of schedule
1016	13/11/2018	78	male	Married	Tertiary	Low	Released at the end
1017	11/11/2018	68	female	Married	MA	Medium	Released at the end
1018	06/11/2018	64	female	Divorcee	Tertiary	Medium	Left ahead of schedule
1019	07/11/2018	70	male	Married	BA	Medium	Released at the end
1020	23/11/2018	69	male	Married	MA	Medium	Active followup
1021	29/11/2018	71	male	Married	MA	Medium	Active followup
1022	02/12/2018	72	female	Married	MA	Medium	Active followup
1023	03/12/2018	66	male	Widower	High school	Medium	Left ahead of schedule
1024	04/12/2018	71	male	Divorcee	Tertiary	Medium	Active followup
1025	05/12/2018	61	female	Divorcee	Tertiary	Medium	Left ahead of schedule
1026	18/12/2018	69	female	Married	BA	Low	Active followup
1027	16/12/2018	66	female	Married	High school	Medium	Active followup
1028	23/12/2018	69	male	Married	Tertiary	Medium	Active followup
1029	26/12/2018	72	female	Widow	MA	Medium	Active followup
1030	01/01/2019	63	male	Divorcee	Tertiary	Medium	Active followup
1031	01/01/2019	72	female	Married	High school	High	Active followup
1032	08/01/2019	75	female	Divorcee	MA	Low	Left ahead of schedule
1033	15/01/2019	69	male	Married	Tertiary	Medium	Active followup
1034	20/01/2019	71	female	Widow	MA	Medium	Left ahead of schedule

continues on following page

Table 2. Continued

Patient number	Recruitment date	Age	Gender	Marital status	Education level	Socio-economic	Status 02/2019
1035	11/02/2019	71	male	Married	MA	Medium	Active followup
1036	06/02/2019	68	male	Married	Tertiary	Medium	Active followup
1037	06/02/2019	64	female	Married	Tertiary	Medium	Active followup
1038	13/02/2019	71	male	Married	BA	High	Active followup
2001	12/07/2018	60	female	Married	High school	Medium	Released at the end
2002	16/07/2018	71	male	Married	MA	Medium	Released at the end
2003	20/08/2018	78	female	Married	Tertiary	Medium	Left ahead of schedule
2004	13/09/2018	60	female	Married	High school	Medium	Released at the end
2005	25/09/2018	62	male	Married	Tertiary	Medium	Left ahead of schedule
2006	07/10/2018	60	female	Divorcee	Tertiary	Medium	Left ahead of schedule
2007	10/10/2018	60	female	Divorcee	Tertiary	Medium	Released at the end
2008	25/10/2018	66	male	Married	High school	Medium	Left ahead of schedule
2010	20/11/2018	72	female	Married	MD / PHD	Medium	Active followup
2011	22/11/2018	61	male	Married	BA	Medium	Active followup
2012	03/12/2018	69	male	Married	Tertiary	Medium	Active followup
2013	04/12/2018	70	female	Divorcee	High school	Medium	Active followup
2014	12/12/2018	61	male	Married	BA	Medium	Active followup
2015	26/12/2018	68	male	Divorcee	MD / PHD	High	Active followup
2016	31/12/2018	60	female	Married	MD / PHD	Medium	Left ahead of schedule
2017	13/01/2019	62	female	Married	High school	Medium	Active followup
2018	14/01/2019	58	female	Married	Tertiary	Medium	Active followup
2019	28/01/2019	58	female	Married	High school	Medium	Active followup
2020	31/01/2019	62	male	Married	BA	Medium	Active followup
2021	11/02/2019	58	male	Married	Tertiary	Medium	Active followup
2022	11/02/2019	60	female	Married	High school	Medium	Active followup

Table 3. Actual use of mobile technologies (N=59)

Patient number	Equipment	Steps monitoring	Tasks	Blood pressure	Messages
1001	Personal mobile phone	V	partial	V	NR
1002	Personal mobile phone	V	V	V	NR
1003	Tablet	V	X	NR	NR
1004	Personal mobile phone	NR	NR	NR	NR
1005	Tablet	partial	X	NR	NR
1006	Personal mobile phone	X	X	NR	NR
1007	Tablet	V	partial	X	V

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Table 3. Continued

Patient number	Equipment	Steps monitoring	Tasks	Blood pressure	Messages
1008	Personal mobile phone	V	partial	NR	X
1009	Personal mobile phone	partial	X	X	X
1010	Personal mobile phone	NR	NR	NR	NR
1011	Personal mobile phone	X	X	NR	X
1012	Personal mobile phone	V	X	NR	X
1013	Personal mobile phone	V	X	V	X
1014	Personal mobile phone	X	X	NR	X
1015	Personal mobile phone	NR	NR	NR	NR
1016	Tablet	X	X	X	X
1017	Tablet	V	V	V	V
1018	Personal mobile phone	X	X	X	X
1019	Personal mobile phone	V	V	NR	X
1020	Tablet	V	X	V	X
1021	Tablet	partial	X	NR	X
1022	Personal mobile phone	V	V	V	X
1023	Personal mobile phone	NR	NR	NR	NR
1024	Personal mobile phone	X	X	NR	X
1025	Personal mobile phone	partial	X	NR	X
1026	Personal mobile phone	partial	X	partial	X
1027	Personal mobile phone	V	V	V	V
1028	Personal mobile phone	V	V	V	V
1029	Tablet	partial	X	X	X
1030	Tablet	V	partial	V	V
1031	Personal mobile phone	V	X	NR	X
1032	Personal mobile phone	X	X	X	X
1033	Personal mobile phone	V	partial	NR	X
1034	Personal mobile phone	X	X	NR	X
1035	Tablet	V	V	NR	V
1036	Tablet	V	X	NR	X
1037	Tablet	V	V	NR	V
1038	Personal mobile phone	V	V	NR	X
2001	Personal mobile phone	partial	partial	NR	NR
2002	Tablet	V	V	NR	NR
2003	Personal mobile phone	partial	X	NR	NR
2004	Personal mobile phone	V	V	V	V
2005	Personal mobile phone	partial	X	X	X

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Table 3. Continued

Patient number	Equipment	Steps monitoring	Tasks	Blood pressure	Messages
2006	Personal mobile phone	partial	X	X	X
2007	Personal mobile phone	V	V	V	V
2008	Personal mobile phone	X	X	NR	X
2010	Tablet	partial	X	NR	X
2011	Personal mobile phone	V	X	NR	X
2012	Personal mobile phone	partial	X	NR	X
2013	Personal mobile phone	V	partial	X	partial
2014	Personal mobile phone	V	V	NR	X
2015	Tablet	X	X	X	X
2016	Personal mobile phone	partial	X	NR	V
2017	Personal mobile phone	V	V	NR	V
2018	Tablet	V	V	NR	X
2019	Personal mobile phone	V	X	NR	X
2020	Tablet	V	V	NR	V
2021	Personal mobile phone	V	X	NR	V
2022	Personal mobile phone	V	X	NR	V

Table 4. Technology satisfaction questionnaire (N=18)

Patient number	Fitbit watch				Connecare App			
	Overall impression	User friendliness	Ability to use	Would you recommend this to someone else?	Overall impression	User friendliness	Ability to use	Would you recommend this to someone else?
1001	10	10	10	10	NA	NA	NA	NA
1002	10	10	5	9	9	9	5	NA
1003	7	8	6	10	5	7	4	10
1005	9	9	10	8	7	5	8	6
1006	5	3	3	NA	1	NA	NA	NA
1007	10	10	10	10	8	8	8	8
1008	10	10	10	10	NA	NA	NA	NA
1012	5	3	9	NA	6	6	7	NA
1013	10	8	10	10	4	5	2	2
1014	10	8	10	9	3	3	3	3
1017	10	10	10	10	10	10	10	10
1018	NA	NA	NA	NA	NA	NA	NA	NA
1019	10	10	10	NA	NA	NA	NA	NA

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Table 4. Continued

Patient number	Fitbit watch				Connecare App			
	Overall impression	User friendliness	Ability to use	Would you recommend this to someone else?	Overall impression	User friendliness	Ability to use	Would you recommend this to someone else?
1020	10	10	10	10	10	7	7	10
2002	10	10	10	10	7	7	10	7
2004	10	10	10	10	10	10	10	10
2009	NA	NA	NA	NA	NA	NA	NA	NA
2011	8	9	8	8	8	9	8	8
Average	**9.00**	**8.63**	**8.81**	**9.54**	**6.77**	**7.17**	**6.83**	**7.40**

Table 5. System usability scale questionnaire (N=18)

Q1	I think that I would like to use this system frequently
Q2	I found the system unnecessarily complex
Q3	I thought the system was easy to use
Q4	I would need the support of a technical person to be able to use this system
Q5	I found the various functions in this system were well integrated
Q6	I thought there was too much inconsistency in this system
Q7	I would imagine that most people would learn to use this system very quickly
Q8	I found the system very cumbersome to use
Q9	I felt very confident using the system
Q10	I needed to learn a lot of things before I could get going with this system

Table 6. Patient responses

Patient number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1001	2	3	3	3	3	NA	NA	NA	NA	NA
1002	1	2	4	1	3	3	4	2	4	4
1003	5	2	4	5	5	2	5	2	5	4
1005	2	3	3	2	2	3	3	3	3	3
1006	1	5	1	5	1	1	1	5	1	5
1007	5	2	4	4	4	1	4	2	4	2
1008	5	1	5	1	5	1	3	1	3	3
1012	1	2	4	2	4	2	4	2	4	2
1013	1	5	2	2	2	3	2	4	2	4
1014	2	3	3	2	3	3	4	2	3	4

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Table 6. Continued

Patient number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1017	2	2	5	1	4	2	5	1	5	2
1018	3	3	3	5	3	2	2	2	3	3
1019	2	5	3	3	4	4	3	2	3	2
1020	5	2	2	2	4	2	4	2	2	3
2002	3	2	4	2	4	4	2	3	3	1
2004	5	2	5	2	4	2	4	1	5	1
2009	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	4	2	4	2	4	2	4	2	4	2
Average	2.88	2.71	3.47	2.59	3.47	2.31	3.38	2.25	3.38	2.81
% of respondents over 3	35%	18%	53%	24%	59%	12%	53%	12%	41%	29%

Table 7. Person-centered coordinated care experiences questionnaire (N=18)

Q1	F1. Did you discuss what was most important for YOU in managing your own health and wellbeing?
Q2	F2. Were you involved as much as you wanted to be in decisions about your care?
Q3	F3. Were you considered as a 'whole person' rather than just a disease/condition in relation to your care?
Q4	F4. Did your care-team involve your family/friends/carers as much as you wanted?
Q5	F5. Did you have enough support from your care team to help YOU to manage your own health and wellbeing?
Q6	F6. Did you receive useful information at the time you need it to help you manage your health and wellbeing?

Table 8. Responses

Patient #	Q1	Q2	Q3	Q4	Q5	Q6
1001	3	4	4	2	2	4
1002	1	2	4	4	4	4
1003	2	4	1	1	4	4
1005	1	1	1	1	1	1
1006	4	4	4	1	4	4
1007	2	4	4	NA	4	4
1008	4	4	4	4	4	4
1012	1	1	2	1	1	1
1013	4	4	4	4	4	4
1014	4	3	4	3	4	4
1017	4	4	4	4	4	4
1018	4	3	3	1	3	3
1019	1	1	4	4	1	1
1020	2	2	2	NA	4	4

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Table 8. Continued

Patient #	Q1	Q2	Q3	Q4	Q5	Q6
2002	2	2	4	1	2	3
2004	1	2	1	1	2	1
2009	2	4	4	2	4	4
2011	4	4	1	NA	4	4
Average	2.56	2.94	3.06	2.27	3.11	3.22
% of respondents over 3	39%	50%	61%	28%	61%	67%

Table 9. Items G1-G4 adapted from the Nijmegen continuity questionnaire (N=18)

Q1	G1. My care providers transfer information very well to one-another
Q2	G2. My care providers work together very well
Q3	G3. My care providers are very well connected
Q4	G4. My care providers always know what one-another is doing
Q5	G5. I have to wait too long to obtain a service or appointment

Table 10. Responses to items G1-G4 adapted from the Nijmegen continuity questionnaire

Patient number	Q1	Q2	Q3	Q4	Q5
1001	1	1	1	1	4
1002	1	1	1	NA	5
1003	1	1	1	1	2
1005	1	1	NA	3	4
1006	3	1	2	2	3
1007	NA	2	2	NA	NA
1008	NA	NA	1	NA	NA
1012	2	4	NA	4	NA
1013	1	1	1	1	NA
1014	1	1	1	1	4
1017	NA	1	1	1	1
1018	2	2	3	2	1
1019	NA	NA	NA	1	5
1020	2	2	2	2	4
2002	2	3	3	NA	NA
2004	1	2	NA	1	NA
2009	1	1	1	1	1
2011	1	1	1	1	5
Average	1.43	1.56	1.50	1.57	3.25
% of respondents less than 3	72%	78%	67%	67%	22%