Technology Evaluation for Improving Independence with Activities of Daily Living

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Abstract. We present a pilot case study evaluating the deployment of touch screen tablets in supported living situations to help improve the independence of individuals in their daily lives. Supported individuals who required prompting and reminders for their activities of daily living were provided with tablets in their homes supported by staff members who could set up daily reminders. This paper discusses the needs of supported individuals and staff, the deployment of the technology, and observations of the intended user population. Our focus here is on the observation of adaptation and abandonment factors of the technology by supported individuals and support staff.

Keywords: Activities of daily living · Supported environments
Technology adoption and abandonment

1 Introduction

Seven Hills Community Services provides housing for people with developmental disabilities, autism, and brain injury. Currently, SHCS serves over 500 adults residentially and operates more than 100 homes throughout Massachusetts. These include homes for individuals with significant behavioral health needs as well as individuals on the autism spectrum, individuals with complex medical needs, and individuals with brain injury.

We sought to evaluate an assistive technology that would help these individuals become more independent in various areas of their lives. Our consultations with behavioral specialists and support staff highlighted some areas of concern that could be addressed with the use of technology. Technology concerns included privacy and HIPPA compliance, ease of use of the tablet interface and the staff portal, and the level of training required.

Our needs in searching for an appropriate technology included effectiveness, ease of use, affordability, and the availability of technical support.

To be effective, the solution had to come with the right set of tools to help foster the growth in independence we were seeking. Much of the support given by

staff is in the form of simple reminders, which is something we could automate. "For example, if a person with dementia leaves their home, a reminder message could tell them to lock the front door. This technology can also remind both caregiver and patient of appointments" [1].

Ease of use for both the individual and the staff or caregiver becomes an important determinant of how effective the device will be over time. If the individual feels the device is useful and unobtrusive, they will be more likely to accept and use the device. If staff finds the device cumbersome to interact with or find the learning curve is onerous, they will use the device begrudgingly or not at all. Barriers to adopting new technologies include: "lack of institutional support, lack of financial support, and, most importantly, lack of time to learn new technologies" [2,3]. The biggest obstacle for us was the "time to learn new technologies".

2   Systems, Users, and Context

2.1   Systems

Our pilot study involves the TouchStream Solutions tablet device (Fig. 1 Left). The system provides the following key features for our supported individuals: reminders, task analysis (step-by-step instruction) to support more difficult tasks, automated recording of medical information such as glucose readings and blood pressure readings, scanning of QR codes to indicate accurate completion of specific tasks. The software also has the capability to push surveys to the devices, which we have used to get feedback about the usefulness of the device. Staff configure the system using a portal from a separate computer or tablet, allowing them to monitor compliance, view reporting, receive alerts on missed tasks, set notification thresholds on medical information, and input new tasks, reminders or calendar events remotely (Fig. 1 Right).
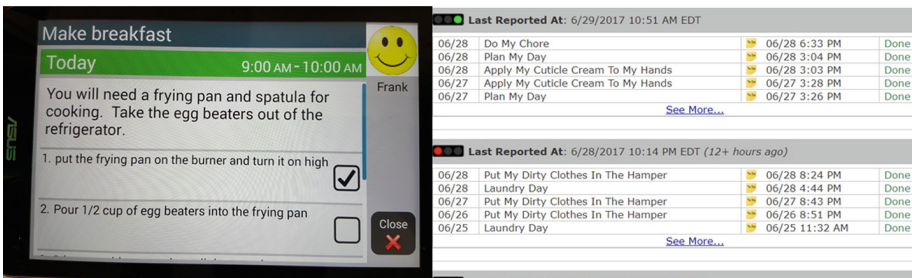

Fig. 1. Left: TouchStream tablet. Right: Staff interface.

The product vendor describes their system as: "a tablet-based monitoring system that helps people live independently and gives their families peace of

mind. The system provides assistance managing medications, chronic health conditions, doctor appointments, and activities of daily living" [4]. The physical device is an Asus 8″ tablet that has been pre-configured so that the assistive software is always presented as the user interface.

2.2 Users

Our users include both supported individuals and support staff. The majority of individuals using the device are over the age of 50, each of whom is challenged with mild to moderate intellectual disabilities. They face various behavioral and cognitive challenges such as anxiety over scheduling and changes to their routines, memory deficits, and deficits in acquiring new skills. The users could interact effectively with the tablet after minimal instruction. The staff charged with setting up the devices have technical skills that range from beginner to intermediate levels, and there was no prior experience using a platform such as TouchStream. Their typical duties are to help all individuals navigate their activities of daily living, medical concerns, and community involvement.

2.3 Context (Environment)

Residences are carefully designed to give each individual the experience of living in their own home. A typical facility would be similar to a single-family home with common areas and private bedrooms. There are always 2–3 support staff members on site. The supported individuals face typical concerns: getting to the dentist on time, remembering to put on sun-screen, drinking enough water every day, or remembering to call family.

3 Pilot Evaluation

Our expectation was that we would utilize the tablets to promote individual independence by having the tablet present reminders and task analysis support, to reduce reliance on staff. Tablets were placed in the common area of the home, as we did not have funding for individual devices to be placed in each of the individuals' rooms. Because the devices were in public areas, and due to HIPPA regulations, we were not able to list personal information, such as specific medication reminders, on a device in public view.

Therefore, reminders included things such as "time to drink more water"; "time for your daily vitamin" or "put on your sunscreen before leaving the house". QR labels were added to some items, such as the sunscreen tube, so that the individual was forced to scan the lotion's QR label at the tablet to record the date and time the individual was contemplating using the lotion.

Our pilot evaluation was conducted in stages. The first stage lasted three months with one device each in three separate homes. We quickly observed that the outcomes we experienced depended on the needs of the individuals in the home balanced with the adoption of the device by staff. One home, using

the device with just one individual, quickly lost interest in the device after the individual reportedly "showed little interest". The second home thought it was useful, reported that the individuals "mostly" paid attention to the device, and felt they could support continuing with the device. The staff in the third home reported that they "needed" to see this trial continue and remarked on how helpful and enjoyable the individuals found the device. The trial in the third home was extended to one year.

After the initial trial, we also decided to pilot the device for one year in an additional home which had been upgraded to a "smart-home" with other available technology. We observed slower adoption with the staff in the smart-home. Although staff in each home was given identical training, and even with the smart-home staff receiving extra support from tablet vendor's tech support team, staff were not timely in reporting concerns or asking questions, which resulted in the under-utilization of the devices. Subsequent discussions indicated that the initial challenges in implementation in the smart-home were a direct result of the staff's comfort level with new technology and not an issue with the individuals, the system, or tech support.

Once we resolved obstacles to effective adoption of the system, we expanded to two devices per home. We also added devices that automatically record medical readings from a glucose meter and blood-pressure cuff. There is a separate study underway to determine if these medical devices will produce fewer errors and omissions than the manual medical reporting system currently in use.

After observing positive outcomes in the first stage of the trial, we added an additional home to the one-year trial. Each participant in this home has his or her own device, in contrast to the other locations where devices were shared among participants. The current stage of the trial consists of eight devices in three homes participating for one year.

3.1 Role of the Staff

The role of the staff was designed and expected to be twofold. First, staff would identify and program in those tasks that they were accustomed to prompting the individuals to complete. Secondly, staff were expected to make sure the devices remained charged and in proper working order. It wasn't until the trials began that it became obvious that the devices were as useful for staff reminders as for individuals. Staff found it useful to be reminded about various compliance issues, for example, recording the water temperature from the faucets once a month.

3.2 Adoption and Abandonment Issues

In some cases, poor adoption by supported individuals was due to poor adoption rates by the staff. Some felt that "they were too busy to ask questions", so if they didn't know how to do something, rather than ask, they just ignored the device.

In other cases, devices were readily adopted by some individuals in a home while others, in that same home, avoided using it. Some just didn't like the

talking tablet, but couldn't articulate exactly why that was, while others perhaps did not receive the reinforcement necessary from staff to make using the device part of their daily routine. One individual had a psychological issue (hearing voices) which was temporarily exacerbated when the device was implemented.

4   Conclusions and Future Direction

One must be certain that the technology is actually helping the user to be more independent and to assure that the user is comfortable with and appreciates the benefits afforded by using the technology. Additionally, staff perception of their role needs to evolve from being there to help individuals to being there to help individuals become more independent. Individuals have unique abilities and situations; larger trials will be needed to generalize the technologys effectiveness for the various populations we support.

We envision that this type of device can have a positive role in helping individuals to become more independent. One way we could have ensured higher acceptance would have been to work more closely with our behavioral specialists in order to design skill acquisition plans around the use of the device. We believe our pilot study demonstrates that these solutions could be scaled to a larger number of our supported individuals without unreasonable burdens of staff time and training. We hope to build a pool of participants that will facilitate longitudinal studies that will benefit the individuals and fill in significant gaps in accessibility research [5,6].

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