Development of a Home Use Medication Organizer to Improve Patient Adherence to Medication Regimens

Karen H. Frith, PhD, RN, NEA-BC, CNE
Norene Chancelor, MS, RN
Funding

• Research reported in this presentation was supported by the National Institute Of Nursing Research of the National Institutes of Health under Award Number R43NR017544. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

• Investigators:
  – David Chancellor, PI. Green Apple Technologies
  – Karen Frith, Co-PI, UAH
  – Norene Chancellor, Clinical Coordinator, Green Apple Technologies
Disclosures

• I have no conflicts of interest to disclose related to this presentation.
Objectives

• Describe usability testing as a method to improve the design of medication organizers

• Summarize the strengths and weaknesses of a user-centered design process
Definitions

• **Usability**
  – How effectively, efficiently and satisfactorily a user can interact with a user interface.

• **Usability evaluation or assessment**
  – A variety of techniques for measuring usability.

• **User-Centered Design (UCD)**
  – An approach to designing a product or service (e.g. user interface design), in which the end user is placed in the center of the process.
Usability Testing

• A range of test and evaluation methods such as automated evaluations, inspection evaluations, operational evaluations, and human performance testing.

• Users perform a variety of tasks with a prototype while observers note what each user does and says and performance data are recorded.
Why Usability Testing

- User experience
- Improve health outcomes
- Safety
- Reliability
Problem – Medication Non-adherence

• Over 50% of individuals who are prescribed a medication not taking them as prescribed.
• The cost of medication non-adherence = $100 billion each year
• People with non-adherence are 5 times more likely to be readmitted to the hospital or die
At Risk Populations

• People with
  – Complex medication regimes for single problems
  – Multiple chronic illnesses
  – Cognitive decline
  – Mental illness
Solutions
Solutions for Older Adults

• Simple to use
• Help independent living
• Reduce strain on health partner
Our Solution

• Every Medication Every Time E.M.E.T.
  – Medication organizer with digital camera
  – Alerts to patient and care partner
  – Assistance from a medication adherence specialist
Our Vision for Smart Device

EMET Device Generates an Alert

Care Partner Resolves Alert within 48 Hours?

Yes

End

No

Medication Adherence Specialist Contacts Patient

- Explores Barriers to Adherence
- Explains Reasons Medication is Prescribed
- Explains Side Effects of Medication
- Explains Importance of Adherence

- Health Care Provider
- Pharmacy
- Care Partner
- Insurance Company

Provides Education

Facilitates Communication with

Provides Resources

- Patient Assistance Program
- Mental Health Hotlines
- Local Food Banks
- Community Assistance
- Disease-Specific Assistance
User-Centered Design
Methods

• Descriptive study to evaluate the medication following usability testing guidelines
  – Convenience sampling with a group of 45 older adults from Osher Lifelong Learning Institute
  – Two user meetings
  – Participants were given scenarios so they could interact with devices and alert system as though they were using them at home.
  – Participants completed the SUS after using the device.
Using Prototypes

(photo permission obtained from participants)
Results

• Participants
  – 78% white
  – 16% African American
  – 4% Asian American
  – 2% were Hispanic

• Of the initial 45 participants, 37 completed the entire usability study.
Results

– The first user meeting showed the usability scores from the SUS to be in the low 70%
  • Changes were made based on user input
    – Size
    – Bins – size, shape, pill release
    – More flexibility in reports from software

– Results from the second user meeting showed an improve usability score of 86% for the device and alert system
  • See video
Discussion

– More development will be needed to make the device ready for field testing.

– The aim of future studies will be to place devices with individuals who have a history of non-adherence to improve their chronic illness—hypertension and type ii diabetes.
Alert Software

Sept. 12, 2016
Janet Henderson
ID: 1234567

AM Status
✓ All medications appear taken as placed

Noon Status
+ Check for possible medication addition

Evening Status
quate: Meds have been removed.

Bedtime Status
× Meds were not taken on time.

Patient Name
Test Patient

Test Patient
Oct 2018

Monthly Report

Calendar Color Legend
Medications Taken On Time
Medications Not Taken On Time
Tanner Medications Taken Normal
More Medications Taken Than Normal

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>28</td>
<td>29</td>
<td>30</td>
<td>31</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>
I missed taking my blood pressure medicine and had a stroke.

It is a good reminder about the end results with missed med. Good idea to incorporate some with the device.
Conclusions

– Usability testing is a necessary part of emerging technology

– Researchers conduct usability studies in the early part of health information technology design
References


