Salud Móvil

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Outline

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II. Scope of Work
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Background – Diabetes

• 240,000 adult Diabetes cases in Honduras
• 7.1% of the population
• Most Diabetic hospital visits are for diabetic wounds
• Left untreated these wounds can cause amputation
• Patients fear hospital visits, fear of amputation
• Hospitals are sometimes hours away, w/ long lines
Background – Cell phones

• Cell phones prevalent

• 96 Cellular devices for every 100 people in Honduras
Scope of Work

• Problem Statement: Design/implement a system, based on cell phone technology, with which a care giver can periodically transmit key diabetes test and wound data to a medical center for evaluation and receive health management consultations

• Costumer:
  • Larry and Angie Overholt
  • Medical staff and patients

• Needs Assessment:
  • Limited Hospital care
  • Negative feelings toward Hospitals
Scope of Work – Goals

• Improve Diabetic Wound patients access to medical care
  • Bypassing negative attitudes toward Hospital
  • More time efficient treatment

• Enable medical professionals to deliver best possible care/advise
  • Accurately measure wounds
  • Track patient data over time to view trends or patterns
Deliverables

• Wound measuring software
• Installation Guide
• Software manual
• Instructions on how to send picture
• Informational Brochure
Calculating Area Manual
Reading File Manual
Health Promoter Manual
# Project Schedule

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>PLAN START</th>
<th>PLAN DURATION</th>
<th>ACTUAL START</th>
<th>ACTUAL DURATION</th>
<th>PERCENT COMPLETE</th>
<th>MONTH-WEEK</th>
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<tbody>
<tr>
<td>Language</td>
<td>2-Feb</td>
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<td>5-Feb</td>
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<tr>
<td>Image Processing</td>
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<td>12-Feb</td>
<td>65</td>
<td>90%</td>
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<td>Text/Pic Message and Filing</td>
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<td>36</td>
<td>17-Feb</td>
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<tr>
<td>System Design</td>
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<td>17-Feb</td>
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<td>Design Interface</td>
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<td>31-Mar</td>
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<tr>
<td>System Integration</td>
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<td>3-Apr</td>
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<td>Testing (local)</td>
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<td>Testing (Honduras)</td>
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<tr>
<td>Instruction Manual</td>
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<tr>
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Research

- Google Gmail API
  - Unsuccessful
- Twilio
  - Insufficient resources
- The simpler route
  - One phone to another
  - Connecting to computer
Software Design

• Python
  • Free
  • Expandable, Modules

• Tkinter
  • Default Graphical User Interface (GUI) library
  • Create GUI by using pre-built buttons and canvas

• MatPlotLib
  • Allows MATLAB-like data plotting

• Py2exe
  • Creates an executable version of a Python script
Image Processing

• The user outlines the wound using the mouse
• The area inside of the outline is calculated into a number of pixels
• The number of pixels for each cm is calculated using the two calibration points
• This calibration factor is used to convert number of pixels to $cm^2$
Drawing GUI

Nombre del Paciente
Dud

Ubicación de la Herida
Brazo Izquierdo
Brazo Derecho
Pierna Izquierda
Pierna Derecha
Torso
Otro

Hemoglobina A1C (mg/dL)
14

Glucosa en la Sangre (mg/dL)
70

Área de la Herida (cm²)

Foto cargada, ahora optar por Calibre o Esquema

Guardar
Cargar Imagen  Calibrar  Contorno  Calcular Área
Drawing GUI
### Nombre del Paciente
Ted

### Ubicación de la Herida
- Brazo Izquierdo
- Brazo Derecho
- Pierna Izquierda
- Pierna Derecha
- Torso
- Otro

<table>
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<tr>
<th>Hemoglobina A1C (mg/dL)</th>
<th>14</th>
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<tr>
<td>Glucosa en la Sangre (mg/dL)</td>
<td>70</td>
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<tr>
<td>Area de la Herida (cm^2)</td>
<td>1.1551</td>
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</table>

[Salvar]
[Cargar Imagen] [Calibrar] [Contorno] [Calcular Area]
Reading GUI
Reading GUI

SaludMovil Lectura App

- Nombre del Paciente: Ted
- Ubicacion de la Herida: Pierna Derecha

Graphs:
- Area de la Herida
- Hemoglobina A1C
- Glucosa

Dates:
- May 10, 2015 to Jul 19, 2015
Pre-Trip Testing

- Drew various shapes on grid paper
- Took picture of shape
- Input that picture into the software
- Record 10 samples of area per picture
- Calculate % Error and % Standard Deviation
In-Country Plan

<table>
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<tr>
<th>Monday</th>
<th>11-May</th>
<th>Meet with citizens, teach MMS</th>
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<tbody>
<tr>
<td>Tuesday</td>
<td>12-May</td>
<td>Meet with citizens, teach MMS and Salud Movil system</td>
</tr>
<tr>
<td>Wednesday</td>
<td>13-May</td>
<td>Meet with hospital, teach Salud Movil system</td>
</tr>
<tr>
<td>Thursday</td>
<td>14-May</td>
<td>Meet with hospital, teach Salud Movil system</td>
</tr>
<tr>
<td>Friday</td>
<td>15-May</td>
<td>Trial with Salud Movil system</td>
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<tr>
<td>Saturday</td>
<td>16-May</td>
<td>Brainstorming, documentation</td>
</tr>
<tr>
<td>Sunday</td>
<td>17-May</td>
<td></td>
</tr>
<tr>
<td>Monday</td>
<td>18-May</td>
<td>Revisit citizens</td>
</tr>
<tr>
<td>Tuesday</td>
<td>19-May</td>
<td>Revisit hospital</td>
</tr>
<tr>
<td>Wednesday</td>
<td>20-May</td>
<td>Testing of system</td>
</tr>
<tr>
<td>Thursday</td>
<td>21-May</td>
<td>Any finishing tasks</td>
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In-Country Implementation

• May 11
  • Team learned cell phones are not MMS supported unless equipped with internet
  • Team bought phone with Patti for hospital (included internet)
  • Tested phone for compatibility with Salud Móvil
  • Changes made to code to include filing and easier to read

• May 12
  • Team looked further into need of MMS and internet together
    • Unsuccessful results
  • Spanish version of GUI created
In-Country Implementation

• May 12 (continued)
  • Next steps discussed with Angie
    • Health promoters send pictures
    • Train Patti and health promoters

• May 13
  • Went to mall to compare Tigo and Claro phone companies
    • Prices
    • Plans
    • Best phone for health promoters
  • Software was put onto USB
    • Plan to take to hospital
    • Included installer for Windows
In-Country Implementation

• May 14
  • Presented Salud Movil system to hospital
    • Ebesly, IT guy, understood system
    • Gave hospital software and installer
    • Gave hospital Android phone
  • Began constructing manual for hospital and health promoters

• May 15
  • Changed file type of programs
    • Can run software without installing Python
    • Easier to use
In-Country Implementation

• May 18
  • Finished manual for hospital
    • Approved by Mariant
  • Finished manual for health promoters

• May 19
  • Presented Salud Movil system to health promoters
    • Siete de Mayo
    • Gave them cell phone
  • Picture of wound was taken by Edyth and Patti
    • Photos were sent
    • 2 photos of same wound (Patti’s phone and phone we bought)
In-Country Implementation

• May 19 (continued)
  • Went to hospital
    • Installed new software (not needing Python)
    • Photos had not been received
    • Ebely was able to use program with no issues

• May 20
  • Sent email to Ebely to see if messages were received
  • More pictures were taken with a health promoter and sent to hospital
  • Messages were received
    • Ebely used program with photos received and data/information were filed
In-Country Implementation

- May 21
  - New manual for health promoters
    - Health promoters had little experience with a cell phone
    - Expanded to make it easy for someone who has never used a cell phone
In-Country Adjustments

• More time spent on building system
  • Needed to buy phones
  • Investigate multimedia message requirements

• MMS supported phones were not common
  • Only health promoters would have phones

• Health promoters had little to no experience using a cell phone
  • Manual had to be greater in detail
In-Country Adjustments

• Less time needed to teach
  • System to be used by “Health Promoters” rather than diabetics themselves
  • Only trained one individual at Hospital
    • IT personal
    • Funding for Healthcare professional pending with grant

• Sending a message back to the Health Promoter was deemed no longer necessary
  • Lack of need for position at the hospital
    • If this project becomes scaled up, we may bring this back
In-Country Testing

• Heath Promoter is able to take picture with reference ruler in same frame
• Health Promoter is able to send picture in message to helpdesk
• Helpdesk receives picture of wound with diabetic’s name
• Helpdesk correctly uses wound calculator
• Helpdesk stores information and picture in diabetic’s file
• Helpdesk can access data and trend of data of diabetic
Challenges

• Limited Health Professional support
  • Unsure of grant money
  • Inability to pay doctor

• Standard “dumb” phones not capable of picture messaging

• Health Promoters had limited understanding of cell phone use
Cost Analysis

• R&D Costs - $0
• In Country Implementation (L21.89 = $1)
• Two Phones, service plan, wound rulers
• Future costs to be paid for by possible Grant
  • More phones
  • Payment for Doctors or Nurses

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (Lempira)</th>
<th>Cost ($)</th>
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<tr>
<td>EYO 207 LOL</td>
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<td>18.23</td>
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<tr>
<td>4 GB SD card</td>
<td>149.01</td>
<td>6.81</td>
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<tr>
<td>Tigo service</td>
<td>200.00</td>
<td>9.14</td>
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<tr>
<td>Dash JR</td>
<td>1000.00</td>
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<td>250 Wound Rulers</td>
<td>744.70</td>
<td>34.02</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>2492.71</strong></td>
<td><strong>113.87</strong></td>
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Sustainability and Ownership

• As system grows, help desk could create a full time job

• Users will continue to use SaludMovil because:
  • Inexpensive, only cost is text and picture messages
  • Time efficient, much easier than travelling to a hospital
Conclusions

• Successful implementation of project
• There is a need for this project in Honduras
  • We met with a lady who just had her leg amputated not too long before we got to Honduras
Recommendations/ Next Steps

Recommendations
• Upgrade health promoter phone to Android smart phone
  • Android interface is more user-friendly
  • Easier to teach

Next Steps
• Get healthcare support
• Expand system to other villages
Acknowledgements

• Roger Dzwonczyk
• Mariantionieta Soto Gutierrez
• Jodi McDaniel
• Angie and Larry Overholt
References


• http://data.worldbank.org/indicator/IT.CEL.SETS.P2

• http://populationpyramid.net/honduras/
Questions?