Benefits of community engagement in health informatics application/system development: Development of a mHealth Decision Support Tool for School Food Allergy Emergency Preparedness

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Significance
Food allergy is a chronic health condition and the leading cause of anaphylaxis (a severe potentially life-threatening allergic reaction) in children.1 Food allergy prevalence is rising among school-aged children; approximately 1-2 children in each classroom live with food allergy.2 Anaphylactic incidents often occur in community settings such as schools.3 Caregiver recognition of anaphylactic symptoms and immediate treatment with an epinephrine auto-injector is critical for child survival. However, many schools do not have an on-site nurse and students have frequent caregiver transitions (e.g., field trips, aftercare) which are challenges in school emergency health response.4 See Table 1 below for more challenges.

Therefore, a need exists for health crisis support systems to aid caregivers in acting in the critical minutes before first responders arrive. Furthermore, given the dynamic school environment with frequent transitions in childcare (e.g., multiple child caregivers throughout the day such as bus drivers, substitutes, field trip chaperones and aftercare), a student-centric system design could aid in addressing gaps in caregiver health information exchange.

Community Partners
- Archdiocese of Milwaukee Office for Schools
- Marquette University Ubicomp Computer Lab
- Aquinas Academy (see picture right)
- Padre Pio School Clinic

Objective
Using a community-centered design approach, create a mobile caregiver health education and decision support system for school teachers and staff who care for students with food allergy.

Table 1. School Food Allergy Challenges

<table>
<thead>
<tr>
<th>Problems:</th>
<th>Examples:</th>
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<tr>
<td>Incomplete health information</td>
<td>Gaps in health provider prescribed food allergy emergency action plans at school</td>
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<tr>
<td>No method for caregivers to access to student action plans &amp; epinephrine at aftercare</td>
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<tr>
<td>Training</td>
<td>Fewer and fewer school nurses to coordinate staff training</td>
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<td>No online training available</td>
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<tr>
<td>Food Everywhere</td>
<td>Class Parties, art projects, lunchroom, snacks</td>
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<tr>
<td>Multiple Caregivers</td>
<td>Teachers, nurse, lunchroom staff, bus drivers, field trip chaperones, camp</td>
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<tr>
<td>Common Allergens</td>
<td>Peanuts/tree nuts, fish, shellfish, milk, egg, soy, wheat</td>
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</tbody>
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Methods
- Presentation of community engaged research on school management of food allergies to computer science (T1) researchers
- Trans-disciplinary prototype design: The Archdiocese of Milwaukee Office for Schools, Marquette University’s Computer Laboratory, and the Medical College of Wisconsin (MCW) collaborated in designing a caregiver decision support system for mobile handheld devices to be used by school teachers and staff in the school setting.
- Active engagement of school nurses, administrators, and teachers in the work flow design process.
- An evidence-based medicine approach was used to design the decision tree for the decision support “arm” of the application (see screen shots Figures 1 & 3 below)

Results
- A 3 “armed” system prototype was developed for mobile devices including iPad, iPhone, or Android device. (see figures 1-4 of screen shots above)
- Student health (allergy) information arm-data entry
- Action plan arm-easily accessible list of interactive student electronic food allergy action plans (eEAPs) with scrollable search screen
- Educational arm-videos

In the system’s design, eEAPs are entered by school healthcare providers and securely viewed by teachers/staff on mobile devices. (see figure 5 below)

Future
Early assessment of usability and system accuracy is scheduled for Fall 2013, when school teachers and staff at Aquinas Academy, a K-8th grade school, will interact with the system using case scenarios developed in collaboration with an allergist from the Medical College of Wisconsin.

In the future, we envision using this mHealth care plan model for school management of other chronic health conditions such as asthma.

Conclusion
Community engagement can be an important component to health informatics research. This mHealth solution aims to improve school caregiver food allergy-induced anaphylaxis emergency preparedness in a dynamic school environment, where frequent care transitions pose risks to caregiver health information exchange and health emergency response.

Acknowledgement
We thank Mitath Uddin for his hard work and initial contributions to the development of the application.

References

Figure 1. Start Screen showing 3 arms

Figure 2. Student List

Figure 2. Action plan symptom screen

Figure 3. Student List

Figure 4. Educational video screen

Figure 5. System Design

Picture above: Our Community Partner Aquinas Academy K3-8th Grade School

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