GRAVEL Seed Grant Proposal

Gaming Technology to Increase Pediatric Patient Compliance with Asthma Medications

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Introduction

Asthma is a chronic respiratory disease. Asthma's primary manifestations include coughing, wheezing, and shortness of breath. Unfortunately, asthma's incidence and prevalence in pediatric children (2 to 18 year old) is increasing higher than 70%.[1] Alarmingly, the management of asthma in pediatric patients is inadequate. Although the American Academy of Allergy Asthma & Immunology (AAAAI) prepared specific guidelines in 1999 for pediatric patients,[2] and are agreed upon in the health-care professional community, these guidelines are not regularly incorporated into management of the chronic disease. Medication compliance, the ability of the patient to receive the right medication at the right time consistently, is extremely low in pediatric asthma patients. One estimate of asthma medication compliance is less than 50%. These reasons include a lack of social support, forgetfulness, parent and child concerns about medication safety, and social stigma.

The cost of pediatric asthma to society is substantial. The literature documents worse patient outcomes resulting from noncompliance of therapy. The number of parents' missed days of work is positively correlated with a pediatric patient's poor compliance with asthma medication. Asthma is one of the primary reasons for missed days of school and work in the United States.[3] The number of hospitalizations due to pediatric asthma has increased by 1.4% annually between 1980 and 1999.[4] Pediatric asthma patients incur an average annual cost of $1129 to the health-care system as opposed to $468 in pediatric patients without asthma.[5] Prevention of even a small fraction of these crises would increase the patient's quality of life and realize a substantial increased cost savings to the parent and provider. Clearly, there is a need for better management of asthma in the pediatric patient population.

The pharmacy profession is constantly searching for methods to improve medication compliance. Specifically, pediatric drug therapy compliance remains a frequent challenge for those in the pharmacy arena. Thus, the researchers believe gaming technology can aid in the realization of patient compliance by changing behaviors and assuaging the patient's fear of the asthma medication regimen. The research will target a population of pediatric patients with asthma who play videogames (4 to 8 years old), since there is evidence to suggest that creating habits of compliance in earlier development will be retained later into adolescence. The project will utilize a novel method to assist us with the younger pediatric patients: inventing a simple computer game. The necessary information for understanding asthma can be coded into an entertaining format for the

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[1] Mannino DM, Homa DM, Akinbami LJ, Moorman JE, Gwynn C, Redd SC. Surveillance for asthma--United States, 1980-1999. MMWR Surveill Summ. 2002 Mar 29;51(1):1-13.

[2] Resources: Pediatric Asthma: Promoting Best Practices. (1999). Retrieved January 12, 2005, from the American Academy of Allergy Asthma & Immunology (AAAAI) Web site: http://www.aaaai.org/members/resources/initiatives/pediatricasthmaguidelines/default.stm.

[3] Asthma Prevalence, Health Care Use and Mortality. NCHS. 2002.

[4] Akinbami LJ, Schoendorf KC. Trends in childhood asthma: prevalence, health care utilization, and mortality. Pediatrics. 2002 Aug;110(2 Pt 1):315-22.

[5] Lozano P, Sullivan SD, Smith DH, Weiss KB. The economic burden of asthma in US children: estimates from the National Medical Expenditure Survey. J Allergy Clin Immunol. 1999 Nov;104(5):957-63.

pediatric population. This format will prove to be an effective vehicle in increasing compliance for the child in conjunction with parent education by creating a positive association with asthma medication.

The Game Project

There is extensive data regarding deficiencies in pediatric asthma medication compliance. Although the literature continues to indicate that novel methods are necessary for communication with noncompliant patients, experimentation and data are deficient in this area. If this project is successfully executed, the task would be a significant contribution to literature and practice in the health care arena.

Additional research in education and psychology is necessary to ascertain the best method for delivery to pediatric patients; however a graphical interface similar to what "The Learning Company" uses in products like Reader Rabbit is the primary choice. The researchers will consult with individuals at GRAVEL to develop the proper game.

Incorporation of an innovative and fun approach to patient education is aligned with a holistic approach to pediatric patient education. The project will improve compliance to drug therapy, provide more understanding of the chronic disease of asthma, incur a better quality of life, demonstrate monetary savings for the parent or other provider, and stimulate more professional recognition for the pharmacy profession.

Approximate Timeline

Spring 2005
- Complete literature evaluation
- Design and develop asthma program

Summer 2005
- Receive IRB approval for the pediatric humans-subject project
- Administer pretest to focus group of asthmatic, pediatric patients with inclusion of a think-aloud procedure (for child and guardian)

Fall 2005
- Manage final test of asthmatic, pediatric population
- Perform statistical analyses of results necessary for explanation of results of the gaming technology in pediatric patient education of asthma

Spring 2006
- Write paper and submit to the Journal of the American Pharmacists Association (JAPhA)

Action Plan

With receipt of the grant, the researchers will meet with individuals at GRAVEL to discuss the different methods necessary to implement the game.

Also, a complete literature evaluation will be conducted to assure proper procedure of gaming technology in the pediatric patient population. Upon review and determination of the best type of game to encode, the IRB application will be submitted for approval before actual programming begins. With IRB consent, advertising and hiring of a graphical assistant will ensue. After complete design of the asthma game for the population, the researchers will seek a small group of pediatric patients for the focus group and pretest of the game. With feedback and revisions, the project will advance to test a larger sample of asthmatic pediatric patients. Finally, a post-test survey and evaluation will determine the effectiveness of the game on patient outcomes.

Constant consultation and updates with necessary individuals at GRAVEL will continue throughout the program, which will be completed no later than July 2005.

Testing

The researchers will ensure valid and reliable results by pretesting the game of asthma patient education on a small group of asthmatic, pediatric patients. A qualitative think-aloud procedure will discover program difficulties and faults in information comprehension and acceptance. The feedback will assist with revision of the final project. The final sample will be tested from the asthmatic, pediatric patient population at the Fairview University Medical Center (FUMC) or family members of those who appear at the College of Pharmacy, Pharmaceutical Care Clinics. A post-test survey and evaluation will determine the effectiveness of the game on patient outcomes. We intend to demonstrate that the computer game has a positive relationship with improvement of pediatric patient outcomes with increased compliance to medications for management of asthma.

Project Impact and Implications

1. **A Novel Way to Achieve Positive Gain in Effectiveness of Medication Compliance in Pediatric Patients:**

Those in the pharmacy profession must identify a manner to improve pediatric patient compliance in management of the chronic disease of asthma. The GRAVEL grant will provide funds necessary to explore one innovative method to improve patient medication compliance and positive asthma health outcomes.

2. **Professional Development**:

Current health professional shortages and costs are driving innovation into other areas of information delivery. While this impetus is based on cost-effectiveness and accessibility, the researchers would like to target the increasing trend in patients taking active control of their health and welfare. Gaming technology is an important tool in general education, and one that will prove to be similarly as critical to patient education in the pediatric population. The principal investigators would like to explore different methods to deliver

information to patients and consumers she and he will work with. Not only will this project enhance pharmacy (if not all health professions) recognition, but it will also aid in understanding and illustration of a way to communicate with patients/consumers for better education of a chronic disease.

3. **Future Development Possibilities**:

With successful delivery of asthmatic pediatric patient education, the researchers plan to distribute information to others interested in health care delivery methods for the younger population. Also, the project will act as a prototype for future gaming technology focused at education of patient understanding of other chronic diseases.

Budget

We are requesting $2500 to develop the project. Both researchers have some computer technology and statistical programs in the Social and Administrative Pharmacy Graduate Program, but funding is necessary for a graduate assistant in graphical design ($14/hour), literature review copies (0.08/page), and patient recruitment ($10 each).

Biographies of the Investigators

Christine E. Bartels, Pharm.D. is a Ph.D. graduate candidate in the Department of Pharmaceutical Care and Health Systems in the College of Pharmacy. She graduated with a Doctor of Pharmacy from the University of Minnesota in 2002, and is currently a registered pharmacist. She is a research assistant for Dr. Barbara F. Brandt, Assistant Vice President for Education at the University Academic Health Center. With various education course experiences in the College of Education, her research interests focus on patient and student education to increase learning for the improvement of the American health care system.

Richard H. Pham, Pharm.D. is a Ph.D. graduate student in the Department of Pharmaceutical Care and Health Systems and a M.S. graduate student in Health Informatics. He received his Pharm.D. from Midwestern University and is currently a registered pharmacist. His research interests are in optimizing information interpretation and representation for medical professionals and patients. He has some programming experience in C++ and would like to develop innovative technological solutions for pharmacy in the future.

Peter C. Morley, Ph. D. is a Professor of Pharmacy in the Peters Institute of Pharmaceutical Care of the College of Pharmacy. Professor Morley is educated as an anthropologist and has wide experiences in patient medication-taking behavior and compliance. His current research interests are in pharmacist understanding of patients and their behaviors and in the process of pharmaceutical care. Professor Morley is specifically interested in this project for investigating novel methods of influencing and changing patient behaviors.