Daily Asthma Care Device

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ABSTRACT
The purpose of this study is to enhance the feasibility of daily peak-flow monitoring of asthmatic children by proposing a daily asthma care diary. This diary is designed to daily record asthma symptoms and to take care of asthmatic children's condition. The proposed asthma diary consists of two parts functioning collaboratively: the peak-flow meter and the data collection station. The peak flow meter contains the features of educational toys encouraging asthma children to actively use it in their house. The data collection station electronically gathers the asthma peak-flow data acquired by the peak-flow meter, in contrast to caregiver’s daily written diary, and provides the data to caregivers in order to efficiently recognize asthmatic children's condition. The study was undertaken to investigate the methods of recording asthmatic children's daily symptoms and to perform asthma research focusing on a prototype of the daily asthma care diary for asthmatic children.

Author Keywords
Asthma diary, asthma children, peak expiratory flow, home-monitoring

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Asthma is the most common chronic disease of childhood. Especially the daily management of asthma disease is a major source of expense to manage asthmatic children in parent defrayment. In these days, highly effective medical therapy for asthma disease has been developed and provided online by asthma doctor. However, asthmatic children still need to do self-management for their disease and manage their symptoms. Furthermore, their parents should have knowledge about asthma and their children's symptoms. Otherwise, the parents are not able to control even manage their asthmatic children. The asthma symptoms are usually happened daily to their children so that the caregivers should recognize asthmatic children' symptoms to prevent emergency. Asthma disease should be managed daily by the caregivers.

For these reasons, we propose a daily asthma care device. An electronically recorded peak flow measurement is suggested with asthma diary on a co-related way. We researched that asthmatic children and caregivers have considerable difficulty initiating peak flow and maintaining their asthma diary. More importantly, recent paper asthma diary has difficulties to maintain daily. We call the device an asthma peak flow diary. The asthma peak flow diary will help caregivers learn asthma children's triggers, track asthma children's medicines, and check when asthma children are getting better or worse. We strongly suggest that the peak flow diary is a powerful tool to caregivers could use to manage daily asthma at home.

RECENT RESEARCHES
Asthma self-management
Therapeutic failure is related to inadequate using of medication based on incorrect information or misunderstanding [1-3]. Improved education and monitoring of asthmatic children with asthma have been suggested to control in highly effective ways. To Prevent failure of caring asthmatic children, parents basically should recognize and learn from their children so that they are able to defend their children in emergency. More importantly, asthmatic children should learn their asthma symptoms daily for educational purposes.

Caregivers have used asthma paper diaries [4]. Asthma Action Plans (Figure.1), a paper-based asthma diary, let the caregiver cognize what medicine their asthmatic children should take. Asthma Action Plan provides a four-zone plan that tells caregivers what to do when asthmatic children are fine, have a mild episode, have a moderate episode or need emergency care. Categorized Zones are based on the peak flow scores or the signs scores that are recorded on the asthma diary. The authors do not recommend three-zone action plans because they treat someone who is slightly sick
the same as someone who needs to visit a hospital in an emergency.

SAMPLE DIARY:

In recent years, investigators have described the use of real-time telemedicine tools to supplement outpatient monitoring [5-14]. This technology has been effective for and accepted by children even in low socioeconomic groups. According to recent study results, 62% of adults have personal computers [15, 16] and 50% of families have Internet access [17]. As more families gain Internet access, telemedicine is a cost-effective method to monitor asthmatic children and help avoid unscheduled clinic visits, to schedule asthma medicine for the asthmatic children, and to share asthma information with other people online. Mainly, web-based asthma diary system allows for daily monitoring, it helps patients manage their asthmatic children. Besides, Web-based store-and-forward systems have an advantage over the paper diary based monitoring that has been reported so that parents may utilize web-based asthma diary easily.

Home tele-health for the control of asthma in children is likely to become increasingly sophisticated but useful. Researchers in previous studies used real-time video-conferencing, non-Internet-based communication (such as telephone), or store-and-forward text data to manage the symptoms of patients [5, 7]. The researchers believe that this study is the first that integrates store-and-forward video technology with Internet-based management of children with asthma in the home.

In another study, authors found that a Web-based system (figure2) was used to monitor the adherence of children to asthma management at home over an extended period by frequent direct observation of the use of peak-flow devices [5, 11, 12, 14]. Given the importance of correct observation technique to the effectiveness of asthma therapy and the propensity of children to practice inadequate technique, this system provides a valuable mean of ensuring compliance with outpatient treatment.

The Proposed Research Approach

Asthmatic children and caregivers have considerable difficulties in initiating and maintaining peak flow recordings. Data obtained by manually recording symptoms and the use of medicine in paper diaries may overestimate actual use. Web-based diaries also have obstacles to the daily share of asthma information with asthmatic children so that the aim of education is excluded. The purpose of our study is to manage daily asthma symptoms and conditions with a daily asthma care device so that caretakers can gather asthmatic children's important situations and symptoms. Children also can learn their symptoms by using this device as asthma toy (daily used-peak flow meter device).

Previous Study

1. Asthma Diary
   Paper based diary

Caregivers with asthma child usually use printed paper based diary to record the child’s daily condition. Usually they use a spiral notebook or design their own diary on your computer. Print out a sheet for every day. There are some template tables people often use.
EDRROR, -Hyland and coworkers have reported successful use of hand held computers as electronic diary cards in asthma [18]. This device greatly simplifies data handling, and they record the time at which each entry was made. However, the use of a conventional type of computer may present problems for some patients. Pen based devices provide an alternative that may be easier for many patients to use. Some researchers evaluated 22 people and most of them preferred the electronic diary.

Electronic diary

2. Peak Flow Meter

Existed products

The appearance of the existed peak flow meter is not attractive to children. According to interviews, children dislike using this device because they feel isolated by using this kind of medical device in front of other children. Besides some children would cheat on the test so that they could get better records which allows them to play outside.

Introduction of Design

The proposed asthma diary consists of two parts functioning collaboratively: the peak-flow meter and the data collection station. The peak flow meter contains the features of educational toys encouraging asthma children to actively use it in their house. The data collection station electronically gathers the asthma peak-flow data acquired by the peak-flow meter, in contrast to caregiver’s daily written diary, and provides the data to caregivers in order to efficiently recognize asthmatic children's condition.

The toy peak flow meter is a small, hand-held device that children blow into. It has the function of measuring child’s maximum speed of expiration, or peak expiratory flow rate (PEFR or PEF). Children could hold it with one hand and blow into it. Then the toy could remember the record including of the time of entry. After the child blows into the device, the little flower would raise to a level of height according to the measurement. The higher the measurement is, the higher the flower will rise. This feature aims at encouraging children to take measurement. The growing flower as an interesting feature could encourage the children to measure themselves in time. The child could carry this toy with them. At the end of the day, caregivers could connect this toy peak flow meter to the data collection station. Then the record of the whole day
would be read and transferred. It would be saved as electronic diary. The diary could also be printed out and compared within the whole week. Comparison would let the caregivers know better about the changes of the child’s condition.

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**Conclusion**

This study presented the design of diary to record daily asthma symptoms and to take care of asthmatic children’s condition. With the collaborative function of two parts—the peak-flow meter and the data collection station—this design could accomplish the goal of enhancing the feasibility of daily peak-flow monitoring of asthmatic children. With the add-on educational feature, the peak flow meter encourages asthmatic children to actively use it and record their measurement in time. The data collection station gathers the asthma peak-flow data automatically from the connected peak-flow meter. The study investigated the methods of recording asthmatic children’s daily symptoms and to perform asthma research focusing on a prototype of the daily asthma care diary for asthmatic children. The design of this diary aims at creating a happy healthy environment for asthma children.

For the future steps, the design of educational toy peak flow meter could be further developed. Research and test would be taken aiming at encouraging asthmatic children to engage further and manage and monitor themselves’ asthma condition.

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