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Smartphone applications for seizure care and management in children and adolescents with epilepsy: Feasibility and acceptability assessment among caregivers in China

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ABSTRACT

Objective: to determine the feasibility as well as the attitudes among caregivers of children and adolescents with epilepsy in China towards the use of smart phone applications (apps) for the management of seizures.

Methods: The caregivers of children and adolescents with epilepsy, ages ranging from 0 to 15 years, were enrolled in the study from the Epilepsy Prevention and Cure Center of West China Hospital within the time period from June 2015 to December 2015. A 10-item questionnaire gauging the attitudes towards using apps for seizure management was administered to the 390 caregivers. Additionally, data on the demographic and clinic characteristics of the children and adolescents with epilepsy for each caregiver were also collected.

Results: The results indicated that approximately 99.2% of caregivers own a mobile phone, of which, 97.9% of these mobile phones were smart phones. Despite only 3.1% (12/390) of caregivers currently having an app regarding the management of a chronic illness, 70.2%(274/390) reported that they would use a free seizure management app. The results of the current study indicated that the likelihood of using such a free app increased if the participant was a male as opposed to a female ($P = 0.03$) and among caregivers with a higher education level, a higher annual household income as well as stable job ($P < 0.001$, $P < 0.001$, $P = 0.02$). No statistically significant difference was found in the likelihood of using such a free app among caregivers living in rural as opposed to urban areas ($P = 0.3$).

Conclusions: The results of this study imply a favorable attitude towards the use of apps for epilepsy and seizure management among caregivers. The use of such apps in China thus represents a promising strategy among caregivers for seizure management.

1. Introduction

Epilepsy is a common neurologic disorder affecting approximately 65 million people worldwide, with a higher incidence rate found in developing countries as compared to developed ones (Beghi et al., 2005; Kwan et al., 2011; Kotsopoulos et al., 2002). Previous studies suggest that the incidence of epilepsy among children and adolescents is almost two times greater than the incidence observed for the adult population (Kotsopoulos et al., 2002). Living with uncontrolled seizures has a negative impact on the quality of life of children and adolescents as well as their caregivers and imposes a substantial burden on society through the considerable use of health care resources (Sander and Shorvon, 1987; Strzelczyk et al., 2008). Management of childhood and adolescent epilepsy must be holistic, giving due consideration to the needs of the individual and the expectations of both the patient and their family (Zuberi and Symonds, 2015).

Mobile phone applications (apps) have been demonstrated by recent research to have the potential to improve the treatment and management of chronic disease (Hilliard et al., 2014; Arnhold et al., 2014; Garabedian et al., 2015). Currently, developed countries, including Australia and the United States (US), have utilized seizure management apps to help effectively manage people with epilepsy (Pandher and Bhullar, 2014; Le et al., 2011; Fisher et al., 2012; Fisher et al., 2015). Mobile health services in China are only now beginning to emerge. Our previous research regarding the feasibility and

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acceptability of using such apps for seizure management among adults with epilepsy suggested a favorable attitude towards their use among patients who were young, had a higher level of education, had stable employment, and lived in an urban environment (Liu et al., 2015). While seizure and epilepsy management among children and adolescents patients is primarily the responsibility of their caregivers. In addition, as far as we know, there was yet a lack of an assessment of caregivers' attitudes towards the use of epilepsy apps. So, the objective of this study was to determine the feasibility as well as the attitudes among caregivers of children and adolescents with epilepsy towards the use of smart phone apps for the management of seizures.

2. Methods

2.1. Subjects and content of questionnaire

The caregivers of children and adolescents with epilepsy, ages ranging from 0 to 15 years, were enrolled in the study from the Epilepsy Prevention and Cure Center of West China Hospital. This cross-sectional study required the caregivers to complete a questionnaire. This study was approved by the Research Ethics Committee of the Medical School of Sichuan University. Either the patients or their caregivers provided their informed consent prior to their enrollment.

The questionnaire being used is a proprietary tool that has not been previously validated in other studies and is comprised of three main parts. Part I was designed to gather socio-demographic data of the caregivers, including age, gender, residence, educational background, occupation, and income as well as the main demographic and clinical features of the children and adolescents with epilepsy, including age, gender, seizure type, age of onset of epilepsy, seizure frequency, and number of AEDs. Rural or urban location was self-identified according to answers of participants about the current residence by questionnaire.

Part II surveyed the current approach used by caregivers in order to obtain general information regarding epilepsy and the contents of smart phone applications of primary interest to them. The results of previous studies indicate that the contents of primary interest included general epilepsy information; first aid and safety; medication information; seizure diary; and on-line epilepsy consultation (Pandher and Bhullar, 2014; Liu et al., 2015).

The aim of part III was to gauge the attitudes of caregivers toward the use of smart phone applications for the management of epilepsy in children and adolescents; which was done through the use of a 10-item questionnaire. These items utilized a 5-point Likert-type scale answering scheme, with 5 being 'strongly agree', 3 being 'neutral', and 1 being 'strongly disagree'.

3. Statistical analysis

The data processing and analyses were carried out using SPSS for Windows (version 17.0). Descriptive statistics were used to summarize all of the outcome variables. Qualitative data were summarized as proportions. A Pearson chi-square test was used in order to test the between-group differences for categorical variables. The survey items of primary interest to the caregivers were chosen and the socio-demographic characteristics of those who had a favorable attitude towards the use of epilepsy apps were also analyzed. A "p" value < 0.05 was considered to be statistically significant.

Table 1
Socio-demographic characteristics of survey caregivers.

Variable	No.	%
Age (years)		
24–39	253	64.8
40–47	137	35.2
Gender		
Male	180	46.2
Female	210	53.8
Resident location		
Urban	162	41.6
Rural	228	58.4
Education		
≤Junior high studies	106	27.2
Senior high studies	149	38.2
≥University studies	135	34.6
Occupation		
No work	147	37.6
Stable work	243	62.4
AHI(RMB)		
<40,000	140	35.8
40,000–60,000	144	36.9
>60,000	106	27.3

AHI: Annual household income.

Table 2
Demographic and clinical characteristics of children and adolescents with epilepsy.

Variable	No.	%
Age (years)		
0–11	208	53.3
12–15	182	46.7
Gender		
Male	214	54.8
Female	176	45.2
Primary seizure type		
SPS	11	2.8
CPS	84	21.5
SGTC	24	6.2
GTCS	222	56.9
TAS	49	12.6
Number of AEDs		
≤One AED	230	59.0
≥Two AEDs	160	41.0
Seizure frequency		
≤Once a year	149	38.2
≥Twice a year	241	61.8

Primary seizure type was defined the most common seizure types of one patient; SPS, simple partial seizure; CPS, complex partial seizure; SGTC, secondarily generalized tonic-clonic seizure; GTCS, generalized tonic-clonic seizure; TAS, typical absence seizure; AED, Antiepileptic drug.

4. Results

4.1. The demographics of caregivers and the clinical characteristics of patients

A total of 390 caregivers (180 men and 210 women) agreed to participate in the survey from June 2015 to December 2015. The mean age was determined to be 36.6 ± 4.6 years, with ages ranging from 24 to 47 years. The demographic details of the caregivers are given in Table 1.

The onset of epilepsy in patients ranged from year 0–15 years of age, with a calculated mean of 6.6 ± 4.2 years. The mean length of time that patients had experienced seizures was approximately 3.9 years. The clinical details of the children and adolescents with epilepsy are given in Table 2.