Original Article

Effectiveness of Asthma Self-Care Program Through Mobile Line Application (SALA) on Lung Function among Asthma Patients in Angthong Hospital: A Randomized Control Trial

Usa Iamlaor Msc[1,2], Surasak Taneepanichskul MD[3]

[1] College of Public Health Sciences, Chulalongkorn University, Bangkok, Thailand

[2] Advance Practice Nurse Anesthetist, Angthong Hospital, Angthong, Thailand

[3] College of Public Health Sciences, Chulalongkorn University, Bangkok, Thailand

Background: Asthma is a disease that causes a lot of suffering. It becomes a hurdle in everyday life. Asthma self-care program through mobile Line application (SALA) might be a good choice to help resolving this problem.

Objective: To evaluate effectiveness of SALA program among asthma patients.

Materials and Methods: The present study was a randomized controlled trial. The study sample consisted of 62 participants aged between 20 to 60 years with mild to moderate asthma. The study sample were randomly assigned to intervention plus usual care (intervention group, n=31) or usual care (control group, n=31) by computer generated. SALA program was sent to participants once a week for two months through their mobile phone, drug reminder appointment date for four months. The study period was six months. Clinical record form and Questionnaire were adapted to collect the demographic data and lung function via spirometer as FEV_1, FVC, FEV_1/FVC, PEFR, ACS, knowledge, attitude, and self-management. Mini Asthma Quality of Life (QOL) questionnaire was used to collect the data. Intention to treat (ITT), Repeated ANOVA, and General Linear model were statistical technique used to analyze the data.

Results: Data from 60 asthma patients were available for analyses. The baseline characteristics of both groups were not significantly different. There were statistically significant mean differences in between the groups at three and six months. The mean difference in the following variables were FEV_1 13.83 (5.01 to 22.65) FVC, 13.36 (2.62 to 24.09) FEV_1/FVC, 11.65 (4.8 to 18.49), PEFR 9.85 (0.03 to 19.67), ACS 2.45 (0.62 to 4.27), knowledge 2.64 (0.81 to 4.46), and self-management 4.26 (2.00 to 6.52).

Conclusion: SALA improved knowledge, self-management, asthma status, and lung function among asthma patients.

Keywords: Asthma, Self-care program, Mobile line application

Received 10 July 2020 | Revised 21 September 2020 | Accepted 22 September 2020

J Med Assoc Thai 2021;104(2):264-70

Website: http://www.jmatonline.com

Asthma is a chronic inflammatory disease of the airway, physiologically characterized by the variability of excessive air flow and symptoms of coughing, wheezing, shortness of breath, and chest tightness[1-3]. Asthma is a common chronic disease expected to affect up to 339 million people worldwide. It is a major cause of disease burden including both premature death and reduced quality of life (QOL) in people of all ages in all parts of the world. Worldwide, asthma is ranked sixteenth among the major causes of years of living with disabilities and ranked twenty-eighth among the major causes of disease burden[4]. In Thailand, according to the Bureau of Non-Communicable Diseases, it is found that there are 7% of asthmatic patients in Thailand with more than 2,000 deaths per year.

The studies suggest that more than 80% of people with asthma are willing to use mobile technology intervention (MTI) and the quantitative studies suggest that it is an acceptable medium for helping self-management of asthma[5]. Using technology can help patients taking care of themselves and can make patients more easily control their symptoms[6].

At present, the number of LINE users in Thailand

Correspondence to:

Iamlaor U.

Anesthesiology Department, Angthong Hospital, 3, Tesbal 6 Road, Maung District, Angthong 14000, Thailand.

Phone: +66-97-2977271

Email: usa.iamlaor12@gmail.com

How to cite this article:

Iamlaor U, Taneepanichskul S. Effectiveness of Asthma Self-Care Program Through Mobile Line Application (SALA) on Lung Function among Asthma Patients in Angthong Hospital: A Randomized Control Trial. J Med Assoc Thai 2021;104:264-70.

doi.org/10.35755/jmedassocthai.2021.02.11623

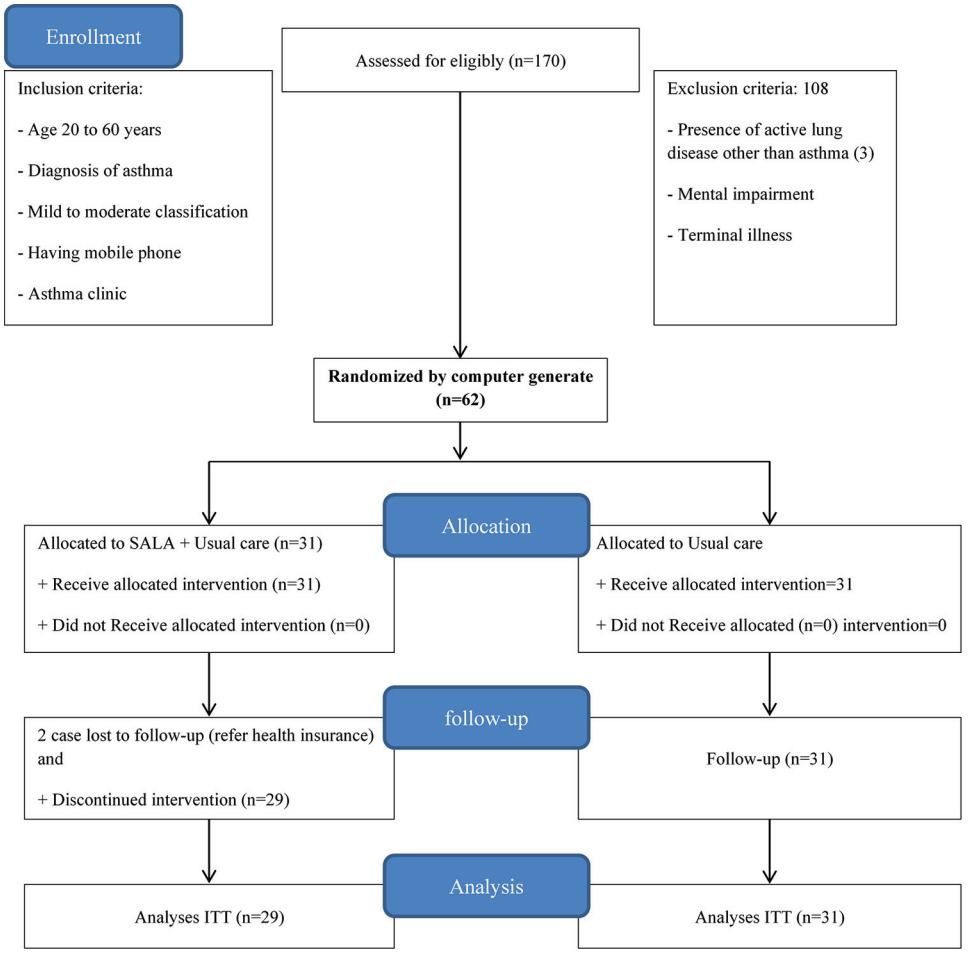

Figure 1. The flow diagram of participants through the study.

have reached 42 million. If compared to the 66 million Thai population, it is 63% of the total population. However, if considering the number of internet users in Thailand at 45 million people, it could be said that Thai people who used the internet, also have LINE accounts[7].

In Thailand, there is no studies about the Line application on self-care management in asthma patients. Therefore, the authors was interested to evaluate the effectiveness of the asthma self-care program through mobile Line application (SALA) on knowledge, attitude, self-care management, lung function, and QOL of the asthma patients at Angthong Hospital.

Materials and Methods

Setting

The present study was performed at Angthong Hospital, the data were collected between August 2019 and February 2020 at out-patients asthma clinic Angthong Hospital.

Procedure and collection of material

Randomization: The study design was a randomized controlled trial. One hundred seventy eligible participants were recruited. A researcher generated the random allocation sequence. The study sample were assigned to intervention plus usual care (intervention group, n=31) or usual care (control group, n=31) by computer generated. Randomization was done using a computer-generated list with hospital number of the patients. In term of the intervention, the SALA were sent to participants once a week by researcher for two months with usual care in intervention group, whereas the control received only usual care (Figure 1).

Primary outcomes: The primary end point were mean differences from baseline for lung function

Table 1. Line delivery format give knowledge about asthma

Week	Subject	Content	Line delivery format
1 and 5	• Knowledge about asthma • Exercise in asthmatic patients	Definitions, causes, symptoms	Still images, video clip
2 and 6	• Things that stimulate asthma • Exercise in asthmatic patients	How to avoid from the stimulus	Still images, video clip
3 and 7	• Food • Exercise in asthmatic patients	How to eat and not to catch	Still images, video clip
4 and 8	• Self-care to prevent asthma • Spray drug use, how to do if asthma attack	Self-care, medication, correct spraying	Still images, video clip

Subject to medication notification would be send a warning line every day before 1 hour of medication from 8 week to 24 weeks. Subject to the notification of the appointment would be send warning line 1 week before the appointment date from 8 week to 24 weeks.

Table 2. Dummy table for patient response

Code	Line	W1			W2			W3			W4			W5			W6			W7			W8			score
		S	R	A	S	R	A	S	R	A	S	R	A	S	R	A	S	R	A	S	R	A	S	R	A	
E1	Y	√	√	3	√	√	3	√	√	3	√	√	2	√	√	3	√	√	2	√	√	3	√	√	3	22
E2	N	√	√	2	√	√	2	√	√	2	√	√	2	√	√	1	√	√	1	√	√	1	√	√	3	14
E3	M	√	√	3	√	√	3	√	√	3	√	√	3	√	√	3	√	√	3	√	√	3	√	√	1	22
E4	Ch	√	√	3	√	√	3	√	√	3	√	√	3	√	√	2	√	√	3	√	√	3	√	√	3	23
....																										
E31																										

S=sent SALA by researcher; R=read SALA by participants; A=answer by participants; W=week

as FEV_1, FVC, FEV_1/FVC, and PEFR, as they were assessed via prebronchodilator spirometry, including forced expiratory volume in one second by both (FEV_1), force vital capacity (FVC), FEV_1/FVC, and peak expiratory flow rate (PEFR).

Secondary outcome: The researchers evaluated the change of mean, knowledge, attitude, self-care management, and ACS Score. Individual domains of the Mini Asthma Quality of Life Question (AQLQ) were reported. Mean difference of Primary outcomes and Secondary outcome were measured.

Intervention: SALA by applying self-regulation theory together with social support and social networks. Consisted of three steps: 1) assessment and preparation, 2) self-management practices, 3) monitoring and evaluation, which were carried out by themselves and line application, using a period of 24 weeks. The activities were conducted according to the program to support self-management as shown in the Table 1.

All intervention participants received a brief training for the use of SALA intervention from researchers before implementation of the SALA. Nurse or clinical officer sent a text message, images, and video clip via Line to the participants in the intervention group. Participants in the intervention group were instructed to respond within 48 hours. The researcher would check the response from the patients by giving a score in the dummy table for patient response (Table 2), including:

1. If the patients read SALA, they responded by typing "Read already". Then the researcher would ask them basic knowledge about Asthma sent by SALA that week. The patients typed, read, and answered the questions from the researcher. If the answers were not correct the researcher told them to read SALA again and answer again. If the answers were correct, the researcher gave a score of 3.
2. If the patients read SALA and responded by sending the "OK" sticker. The researcher would ask questions about the asthma knowledge and then the researcher gave gave them a score of 2.
3. If the patients only read SALA but did not respond the questions or sent sticker, then the researcher gave them a score of 1.
4. If the patients did not read and respond by sending nothing such as typing, or sticker then the researcher gave them a score of 0.

All the communication had to be responded from the patients within 48 hours, otherwise, the researcher would contact them through SALA.

Adverse events

Adverse events (AEs) were defined as adverse change in health that occurred while a patient was taking part in the study. AEs were recorded in the clinical record form.

Inclusion criteria

- Age of patients 20 to 60 years old
- Diagnosis of asthma by health professional and duration of asthma symptom of more than one year
- Mild to moderate classification
- Can assess the internet
- Having mobile phone and use Line application or the family will assist the participant

Exclusion criteria

- Presence of active lung disease other than asthma
- Mental impairment
- Terminal illness

Sample size

The G-power software was used to calculate sample size. The effect size was 0.8, which was based on Cohen's table[8,9]. The power was 0.8 and alpha was 0.05. The sample size was 26 participants per group. Calculated drop out was 10%, the sample size was 31 participants per group. Therefore, 62 participants were included.

Ethical considerations

The present study was registered in the Thai Clinical Trial registration (TCTR20190718004) and was approved by the Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University (No.108.1/2562).

Statistical analysis

Demographic data were reported in means and percentages. Independent t-test was used to compare the mean of age, body mass index (BMI), and year of diagnosis. The data of gender, education, occupation, smoking status, family smoke, hospital visit in one year, and comorbidities were analyzed by chi-square. Intention to treat (ITT) were used to analyze for mean difference at 0-, 3-, and 6-months follow-up of knowledge, attitude, self-management, lung function of FEV_1, FVC, FEV_1/FVC, PEFR, ACS, and QOL for comparisons between the intervention and control group. Between and within the groups were analyzed by repeated ANOVA and General Linear Model. A p-value of less than 0.05 was considered statistically significant. Statistical analysis was performed using IBM SPSS Statistics software, version 22.0 (IBM Corp., Armonk, NY, USA).

Table 3. Baseline Characteristics of the study subjects in the intervention and control group

Variables	Intervention (n=31); n (%)	Control (n=31); n (%)	p-value
Age (years); mean±SD	43.35±9.70	44.45±11.22	0.662(B)
BMI (kg/m^2); mean±SD	24.56±6.76	24.56±6.76	0.397(B)
Length of asthma diagnosis (years); mean±SD	7.10±7.74	9.39±9.12	0.290(B)
Sex			0.767(A)
Male	8 (53.3)	7 (46.7)	
Female	23 (48.9)	24 (51.1)	
Education			0.949(A)
Primary education	7 (46.7)	8 (53.3)	
Secondary education	14 (51.9)	13 (48.1)	
Tertiary/further education	10 (50.0)	10 (50.0)	
Occupation			0.067(A)
Unemployed	4 (44.4)	5 (55.6)	
Employed	21 (55.3)	17 (44.7)	
Other	6 (66.7)	9 (33.3)	
Smoke			0.688(A)
No	26 (83.9)	28 (50.9)	
Yes	5 (16.1)	3 (49.1)	
Family smoken			0.277(A)
No	22 (71.0)	19 (61.3)	
Yes	9 (29.0)	12 (38.7)	
Hospital visit in 1 year			1.000(A)
No	14 (45.2)	14 (45.2)	
Yes	17 (54.8)	17 (54.8)	
Comorbidity			0.409(A)
No	22 (71.0)	20 (64.5)	
Yes	9 (29.0)	11 (35.5)	

BMI=body mass index; SD=standard deviation

Statistical significant at p <0.05, (A) chi-square, (B) t-test

Results

Baseline characteristics of the study subjects

There were no significant differences between the two groups in terms of age, gender, body mass index, education, occupation, smoking, family smoking, hospital visit in the last year, or comorbidity. The characteristics of the study subjects are shown in Table 3.

There were statistically significant differences in lung function such as FEV_1, FVC, FEV_1/FVC, and

Table 4. The outcome of lung function between intervention and control group

Subject	Intervention (n=31); mean (SD)	Control (n=31); mean (SD)	Estimate; difference (95% CI)	p-value
FEV_1 (L)				
Baseline	74.41 (12.04)	70.8 (12.21)		
• Change			3.60 (–2.66 to 9.88)	0.255
3 months	85.55 (17.71)	73.19 (17.71)		
• Change			12.36 (3.61 to 21.10)	0.006*
6 months	89.93 (15.54)	76.09 (18.36)		
• Change			13.83 (5.01 to 22.65)	0.003*
FVC (L)				
Baseline	81.10 (9.26)	77.32 (18.13)		
• Change			3.78 (–3.74 to 11.30)	0.318
3 months	93.06 (13.31)	80.22 (24.01)		
• Change			12.84 (2.71 to 22.97)	0.140
6 months	93.58 (21.28)	80.22 (20.26)		
• Change			13.36 (2.62 to 24.09)	0.016*
FEV_1/FVC (%)[a]				
Baseline	91.72 (14.53)	88.74 (14.48)		
• Change			2.98 (–4.52 to 10.48)	0.429
3 months	92.72 (11.94)	88.19 (12.53)		
• Change			4.53 (–1.80 to 10.86)	0.158
6 months	98.21 (12.99)	86.55 (13.42)		
• Change			11.65* (4.82 to 18.49)	0.001**
PEFR (L/second)				
Baseline	66.86 (21.72)	66.90 (16.22)		
• Change			–0.04 (–9.90 to –9.80)	0.993
3 months	73.00 (21.31)	69.25 (17.90)		
• Change			3.74 (-6.40 to 13.88)	0.463
6 months	76.79 (19.06)	86.93 (18.92)		
• Change			9.85 (0.03 to 19.67)	0.049*

FEV_1=forced expiratory volume in one second; FVC=forced vital capacity; PEFR=peak expiratory flow rate; SD=standard deviation; CI=confidence interval

[a] % FEV_1/FVC is the best data showing the obstruction of the trachea

* Statistical significant at p<0.05, ** p<0.001, Repeated ANOVA, General Linear Model

Table 5. The outcome of knowledge, attitude, self-management, ACS, and QOL

Subject	Intervention (n=31); mean (SD)	Control (n=31); mean (SD)	Estimate; difference (95% CI)	p-value
Knowledge				
Baseline	9.96 (2.5)	10.74 (3.00)		
• Change			–0.77 (–2.20 to 0.65)	0.282
3 months	10.48 (1.95)	10.38 (1.92)		
• Change			–0.096 (–9.08 to 1.10)	
6 months	13.51 (4.50)	10.83 (2.25)		
• Change			2.64 (0.81 to 4.46)	0.005*
Attitude				
Baseline	61.93 (3.28)	61.80 (3.28)		
• Change			0.13 (–1.77 to 2.02)	0.896
3 months	63.51 (3.98)	62.70 (3.96)		
• Change			0.81 (–2.53 to 4.15)	0.361
6 months	64.06 (2.50)	63.80 (5.70)		
• Change			0.26 (–2.04 to –2.56)	0.820
Self-management				
Baseline	40.93 (4.49)	40.61 (4.08)		
• Change			0.32 (–2.26 to 2.89)	0.806
3 months	41.65 (2.40)	41.58 (4.32)		
• Change			0.08 (–1.57 to 1.72)	0.928
6 months	46.05 (1.52)	41.80 (3.67)		
• Change			4.26 (2.00 to 6.52)	<0.001**
ACS				
Baseline	18.89 (4.49)	19.09 (4.08)		
• Change			–0.20 (–2.41 to 2.01)	0.857
3 months	21.00 (2.40)	18.54 (4.32)		
• Change			2.45 (0.62 to 4.27)	0.009
6 months	23.24 (1.52)	18.61 (3.67)		
• Change			4.63 (3.15 to 6.10)	<0.001**
QOL				
Baseline	63.65 (8.79)	61.35 (18.03)		
• Change			2.3 (–5.11 to 9.17)	0.537
3 months	67.03 (12.12)	66.54 (9.82)		
• Change			0.49 (–5.20 to 6.17)	0.865
6 months	69.20 (9.85)	67.29 (14.09)		
• Change			1.92 (–4.40 to 8.24)	0.546

ACS=asthma control score; QOL=quality of life; SD=standard deviation; CI=confidence interval

* Statistical significant at p<0.05, ** p<0.001, Repeated ANOVA

PEFR between the groups (Table 4).

There were statistically significant differences in knowledge, self-management, and Asthma control score (ACS) between the groups. There were no significant mean difference of attitude and overall QOL at 0-, 3-, and 6-months follow-up between the groups (Table 5).

Discussion

The present study was conducted to evaluate the effects of the SALA on lung function. It was found that there was a significant difference in lung function FEV_1 between the intervention and the control group, consistent with those of published studies[10-13] that the mean of forced expiratory volume in one second significantly increased at six months, p<0.05. FEV_1/FVC in the present study was significant different between the two groups similar to the previous

studies[10,13]. PEFR in the present study showed significant difference between the two groups similar to the previous studies[10,12,14]. PEFR significantly increased at 4-, 5-, and 6-months compared to the control group. Knowledge and self-management at 0-, 3-, and 6-months follow-up showed significant differences between the two groups, which was the same as a previous study[10] and it assured that the implementation of the self-management program succeeded in improving the patients' knowledge.

It is implied that the asthma patients in the intervention group gained knowledge about asthma by delivering SALA Program once a week. SALA program has promoted knowledge about asthma, date appointment, and drug reminder. This allows the patients to remember and understanding how to improve their self-care management, which is the basis for learning. Knowledge was applied to change the self-care behavior resulting in better self-care behaviors. Not only behavioral changes but also interaction occured in both physiological and physical environment[15]. Furthermore, this improved the adherence to the asthma self-management[16]. Therefore, when measuring lung function as FEV_1, FVC, FEV_1/FVC, and PEFR, the patients had better lung function, and this increased the mean difference significantly among the intervention than the control group. Moreover, there were significant improved of lung function in the intervention group, whereas no change in lung function in the control group.

ACS improved asthma control similar to[10,12,14] the improvement reported in the Asthma Control Test scores from 18.89 (uncontrolled of asthma status) to 23.24 (partly controlled of asthma status) over the study period between the two groups[14]. The results of the present study implied that providing health education to asthma patients through SALA had given patients knowledge, understanding of asthma, and health practices that affected the asthma control. On the other hand, the control group participants received only the usual care, and there were no changes in asthma control. In addition, when comparing a mean difference in scores of asthma control within the intervention group in the third and sixth month, there were significant mean difference in ACS. It is implied that in the intervention group, the participants were able to manage their symptoms appropriately, thus asthma patients had a better asthma control and changed the asthma status from poor control status to partly control status. However, there was not enough change to have the status changed of control status. This may be because the present study lasted only six months. However, health education through SALA program gave patients knowledge on disease, drug used, and drug reminder as well as some self-management. Therefore, SALA not only improved the knowledge and self-management, but it also improved the asthma control.

The evidence suggests that innovation such as SALA is compatible, accessible, and effective to adult asthma patients in rural central area in Thailand.

The strength of the present study was a randomized controlled trial. The internist, pharmacist, physical therapist, and registered nurse were blinded to decrease bias. As the sample size was relatively small, the generalization of the study findings is limited. Therefore, it is recommended that further studies with a large sample size should be conducted.

Conclusion

SALA improves knowledge, self-management, asthma status, and lung function among asthma patients.

What is already known on this topic?

The use of MTI can support self-management of asthma patients[5,17] and using technology can help patients take care of themselves and can make patients more easily control of their symptoms[6]. However, in Thailand, the Line Application on self-care management in Asthma patients is not available.

What this study adds?

The SALA is an innovation that may offer better self-management of asthma patients than the only usual care, in terms of improving knowledge, self-care management, asthma control, and lung function. SALA does not only help patients become aware about Asthma, it also can improve their self-care management and build good relationship and trust between health care workers and patients. Beyond the study objective, SALA is a digital family medicine innovation.

Acknowledgement

The authors would like to thank all colleagues in the College of Public Health Sciences, Chulalongkorn University. Thank to Dr. Phasit Sillaprasert (MD), internist at the asthma clinic at Anghong Hospital. Finally, the authors were most appreciative for the participation of all the patients in this research.

This research was supported by the Ninetieth Anniversary of Chulalongkorn University (Ratchadaphiseksompot Endowment Fund), Bangkok, Thailand.

Conflicts of interest

The authors declare no conflict of interest.

References

1. Bartholomew LK, Parcel GS, Swank PR, Czyzewski DI. Measuring self-efficacy expectations for the self-management of cystic fibrosis. Chest 1993;103:1524-30.
2. Miller MR, Hankinson J, Brusasco V, Burgos F, Casaburi R, Coates A, et al. Standardisation of spirometry. Eur Respir J 2005;26:319-38.
3. Tran N, Coffman JM, Sumino K, Cabana MD. Patient reminder systems and asthma medication adherence: a systematic review. J Asthma 2014;51:536-43.
4. Boonsawat W. Burden of asthma on public health. In: Chansakulporn S, Chuaychoo B, Poachanukoon O, Kawamatawong T, editors. Textbook of asthma. Bangkok: Thai Asthma Council and Association; 2013. p. 1-6.
5. Fonseca JA, Costa-Pereira A, Delgado L, Fernandes L, Castel-Branco MG. Asthma patients are willing to use mobile and web technologies to support self-management. Allergy 2006;61:389-90.
6. Anhøj J, Møldrup C. Feasibility of collecting diary data from asthma patients through mobile phones and SMS (short message service): response rate analysis and focus group evaluation from a pilot study. J Med Internet Res 2004;6:e42.
7. Tangsiri. Study the LINE TODAY strategy with only 2 years. It is a new Thai newspaper [Internet]. 2018 [cited 2019 Mar 10]. Available from: https://brandinside.asia/line-today-news-for-thai-user/.
8. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. New York: Lawrence Erlbaum Associates; 1988.
9. Worapongsathorn T, Worapongsathorn S. Sample size calculation for research by using the G * power. Thai J Health Promot Environ Health 2018;41:10-21.
10. Liu WT, Huang CD, Wang CH, Lee KY, Lin SM, Kuo HP. A mobile telephone-based interactive self-care system improves asthma control. Eur Respir J 2011;37:310-7.
11. Araújo L, Jacinto T, Moreira A, Castel-Branco MG, Delgado L, Costa-Pereira A, et al. Clinical efficacy of web-based versus standard asthma self-management. J Investig Allergol Clin Immunol 2012;22:28-34.
12. van der Meer V, Bakker MJ, van den Hout WB, Rabe KF, Sterk PJ, Kievit J, et al. Internet-based self-management plus education compared with usual care in asthma: a randomized trial. Ann Intern Med 2009;151:110-20.
13. Rasmussen LM, Phanareth K, Nolte H, Backer V. Internet-based monitoring of asthma: a long-term, randomized clinical study of 300 asthmatic subjects. J Allergy Clin Immunol 2005;115:1137-42.
14. Cook KA, Modena BD, Simon RA. Improvement in Asthma Control Using a Minimally Burdensome and Proactive Smartphone Application. J Allergy Clin Immunol Pract 2016;4:730-7.e1.
15. Tobin DL, Reynolds RVC, Holroyd KA, Creer TL. Self-management and social learning theory. In: Holroyd KA, Creer TL, editors. Self-management of chronic disease: Handbook of Clinical Interventions and Research. Orlando, FL: Academic Press; 1986. p. 29-55.
16. Hung SH, Tseng HC, Tsai WH, Lin HH, Cheng JH, Chang YM. Care for Asthma via Mobile Phone (CAMP). Stud Health Technol Inform 2007;126:137-43.
17. Cleland J, Caldow J, Ryan D. A qualitative study of the attitudes of patients and staff to the use of mobile phone technology for recording and gathering asthma data. J Telemed Telecare 2007;13:85-9.