

Research Article

Self-management in Asthma Patients: A Systematic Review

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Abstract.

Self-management is very important in treating asthma patients. Various self-management support interventions have been developed to facilitate adequate self-management of asthma. This review aims to identify, describe and assess the evidence regarding self-management intervention programs and their effects on self-management outcomes among asthmatic patients. Four databases, Google Scholar, Europe PMC, Science Direct, and PubMed, were searched using a systematic strategy using keywords: Asthma, Chronic disease, eHealth, smartphone, self-management, educational programs, and quality of life. The study eligibility criteria was a Randomized Control Trial study, published between 2016 and 2021, with language restrictions published in English only. The JBI (Joanna Brings Institute) tool was used to evaluate study quality. 422 studies were screened, and 11 studies that met the criteria were extracted. The review identified two intervention group methods to improve self-management among asthma patients, including digital-based self-management and non-digital-based self-management. Most research shows that self-management programs improve and maintain quality of life so that people with asthma can live normal lives without obstacles in carrying out daily activities. The self-management program for asthma patients provides the ability to manage the disease so that it can improve the quality of life.

Keywords: asthma, self-management program, quality of life, mHealth

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1. Introduction

Asthma is one of the non-communicable diseases that is a global problem today. Asthma can attack children and adults with high morbidity rates and can cause mortality in severe cases. According to the World Health Organization (WHO), currently, there are 300 million people with asthma worldwide (1) This number could be greater than predicted due to undiagnosed asthma cases, worsening air quality, and changes in lifestyle in the community. If a person has a predisposition or has had asthma, exposure to precipitating factors can lead to an asthma attack. (2)

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Although there is no cure for asthma completely, effective self-management strategies can help patients to control their disease and prevent worsening symptoms. (3) This industrial era 4.0 needs special management in dealing with the incidence of asthma. The m-health system is one method that is quite interesting to reduce the incidence and recurrence of asthma. M-health is defined as the use of information and communication technology to support the health sector and matters related to health, including health education (4).

Due to poor implementation of asthma self-management programs and underutilization by patients, innovative patient self-management methods are needed. Providing effective self-management education can help sufferers to control, and prevent symptoms that can lead to decreased health and interfere with their daily lives. The importance of this management is so that the patient can live a normal life by minimizing the recurrence of asthma, and can control asthma. Relapse of asthma is caused by anxiety and stress disorders experienced by sufferers. In addition to providing self-management, there is also education for asthmatics by providing knowledge regarding the dangers of asthma, how to control asthma relapse and how to treat it (5)(3).

Self-management of asthma is a behavior that is carried out independently by sufferers to manage and control asthma symptoms to prevent exacerbations. The main goal of asthma management is to improve and maintain the quality of life so that people with asthma can live a normal life without obstacles in carrying out daily activities. If you have been diagnosed with asthma and have been given asthma prevention and reduction therapy, it is important to take some preventive measures every day, even if you are not experiencing asthma symptoms. Because asthma cannot be treated and its symptoms cannot always be avoided. Therefore, there needs to be an effort that can be done to control asthma (4)(5).

The management program intervention is also a self-management intervention that can be carried out by patients in managing their disease to improve their health status. So this systematic review aims to determine the understanding of the forms of interventions that support self-management programs in asthma patients.

2. Material and method

This is a systematic review by synthesizing narratives of the main findings on interventional self-management programs in patients with asthma. This review is based on PRISMA's guidelines for writing systematic review reports (Moher et al., 2009). The process used to carry out a systematic review is that the reviewer looks for several research

journal articles published through an electronic database. The electronic databases used include PubMed, Science Direct, Europe PMC, and Google Scholar. The inclusion criteria in this study (a) were written in English in the last 6 years (2016-2022), (b) used a quantitative study design with a randomized control trial (RCT) (c) patients diagnosed with asthma, participants were excluded if they had heart disease, tuberculosis, and psychiatric disorders. (d) examine interventions that support self-management in asthma patients. Keywords: Asthma, Chronic disease, eHealth, smartphone, self-management and quality of life. All included studies were assessed for methodological quality using the JBI (Joanna Brings Institute) instrument. (JBI, 2014). The articles obtained in the search process were then selected based on the inclusion and exclusion criteria shown in table 1.

TABLE 1: Inclusion and exclusion criteria with PICOS.

Criteria	Inclusion	Exclusion
Population	Asthma	Not Asthma
Intervention	There is an intervention	No intervention
Comparisons	There is a comparison	No Comparison
Outcome	Interventions that support self-management in asthma patients	Not relevant to supportive interventions in Asthma patients
Study Type	Randomized Control Trial	mixed method, a quasi-experimental design, clinical trial or randomized controlled trial, Systematic or literature reviews, qualitative research
Publication Type	Peer-reviewed original studies Non-peer-reviewed	Peer-reviewed original studies Non-peer-reviewed
Publication Years	2015 - 2022	Pre 2015
Language	English	Not English

3. Result

Of the 11 selected articles identifying two group intervention methods to improve self-management among Asthma patients:

3.1. Digital-based self-management

Digital interventions are increasingly recognized as an enabling approach to achieving the goals of supporting chronic diseases, such as asthma. An intervention strategy that has proven effective in improving the care patients receive is reminding patients to ask

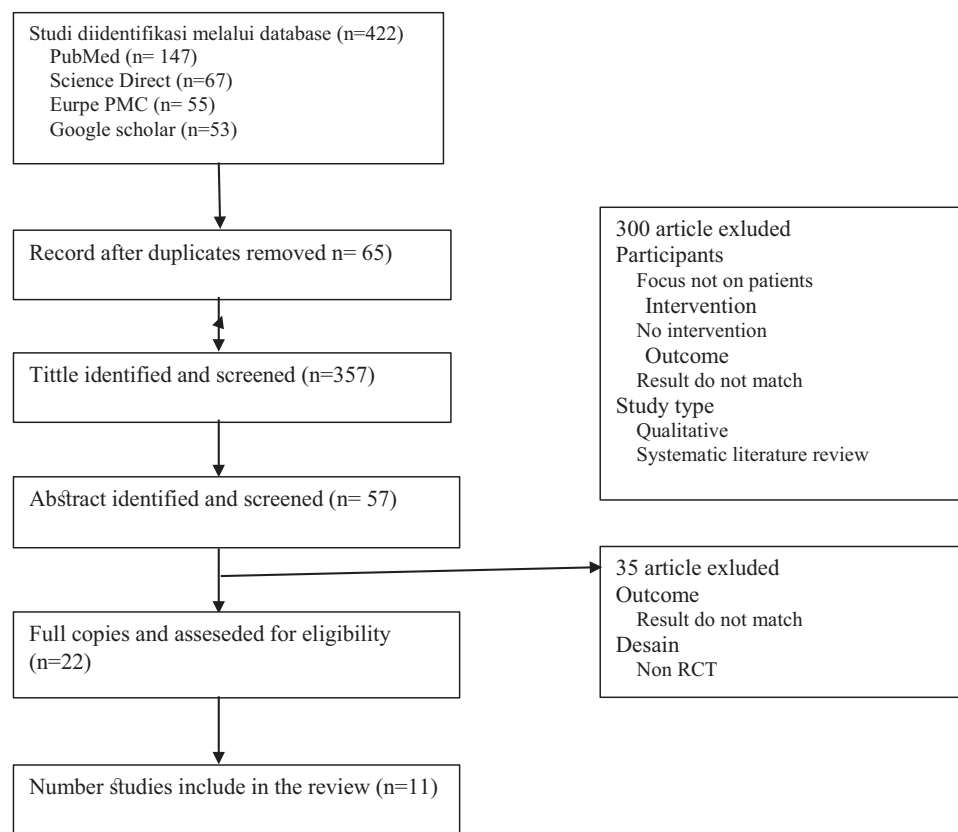


Figure 1: PRISMA diagram adapted from Moher et al. (2009).

providers specific questions that lead to changes in care in the form of SMS and web-based reminders (6)(7)(15). Regular home visits added to the typical form of patient portal tools can help patients to improve their asthma control (8). The theoretical foundation of the expert intervention is supported by a conceptual review which suggests that observing and participating in online sharing of personal experiences about health and illness can be beneficial in self-management (13), mobile health (mHealth) is a viable and acceptable method to support adherence in young patients, as mHealth can target various aspects of non-adherence behavior and has the potential to empower patients with different tools (14).

3.2. Non-digital-based self-management

Self-management using the Self-Management Behaviors in Older Adults (SAMBA) design adheres to the teaching-to-goal concept, focusing only on topics agreed upon by the patient and asthma care coaches (ACCs) that require attention and reinforcement. ACC and patient work together, in English or Spanish, to set goals and priorities, and ACC uses back-teaching techniques to ensure understanding. ACC reinforces targeted

TABLE 2

No	Author /Year	Study Design	Sample	Intervention			Control	Outcome	Result
				Duration of self Management	Mode	Provider			
1.	Benjamin L. Mitchell, John Carter, Amy Mitchell, 2019 (6)	RCT	577	6-12 weeks SMS reminder	Group and individual	Nurse	Usual Care	spirometry as a second important indicator of asthma care	Based on the results of the study at a three-month follow-up, 35 of the 79 patients allocated to the intervention had completed the action plan compared with five of the 59 patients allocated to usual care (P<0.0001).
2	Andrew C. Pool, et al, 2017 (7)	RCT	408	12 months Online reminder for asthma control	Group and individual	Nurse	Usual care	Asthma Control Test (ACT).	Based on the results After 12 months, 323 participants completed follow-up measures (79.2%). Participants in the IC reported a greater mean improvement in the ACT score than participants in the CC (2.3 vs. 1.2; p = 0.02) and 9 of 11 individual asthma control survey items showed non-significant improvements favoring the IC. No differences were observed in medication adherence, several asthma controller medications, ns, or health care utilization.
3.	AJ Apter, 2019 (8)	RCT	301	27 Weeks Portal training and home visits	Group and individual	Nurse	Usual care	Asthma Control Test (ACT).	Based on the results Of 170 (56%) patients used the portal independently. Rates of portal activity did not differ between randomized groups. Asthma control and asthma-related quality of life improved in both groups over one year. Differences in improvements over time were greater for the home visit group for all outcomes but reached conventional levels of statistical significance only for yearly hospitalization rate (-0.53, 95% CI= -1.08 to -0.024). Poor neighborhoods and living conditions plus limited internet access were barriers for patients to complete the protocol and for community health workers to make home visits.
4.	Alex D. Federman, 2019 (9)	RCT	391	3,6,12 months Supporting Asthma Self-Management Behaviors in Older Adults (SAMBA)	Group and individual	Nurse	Usual care	Asthma Control Test, Asthma Mini Quality of Life Questionnaire, Medication Adherence Rating Scale, metered dose inhaler technique, and emergency department visits for asthma care	Based on the results Of the 391 patients who received treatment, 58 (15.1%) were men, and the mean (SD) age was 67.8 (7.4) years. After accounting for baseline scores, scores on the asthma control test were better in the intervention groups vs the control group (difference-indifferences at 3 months, 1.2; 95% CI, 0.2-2.2; P = .02; 6 months, 1.0; 95% CI, 0.0-2.1; P = .049; 12 months, 0.6; 95% CI, -0.5 to 1.8; P = .28; and overall, $\chi^2 = 13.4$, with 4 degrees of freedom; P = .01). Emergency department visits were lower at 12 months for the intervention groups vs the control group (16 [6.2%] vs 17 [12.7%]; P = .03; adjusted odds ratio, 0.8; 95% CI, 0.6-0.99; P = .03). Statistically significant improvements were observed for the intervention vs control patients in quality of life (overall effect: $\chi^2 = 10.5$, with 4 degrees of freedom; P = .01), medication adherence (overall effect: $\chi^2 = 9.5$, with 4 degrees of freedom; P = .049), and inhaler technique (metered-dose inhaler technique, correctly completed steps at 12 months, median [range]: 75% [0%-100%] vs 58% [0%-100%]). No significant differences in outcomes were observed between patients receiving the intervention in the home vs practice setting.

learning by referring patients as needed to low literacy asthma education booklets (9).

TABLE 1

No	Author /Year	Study Design	Sample	Intervention			Control	Outcome	Result
5.	Elif Isik, PhD, RN, et al, 2020 (10)	RCT	73	6 – 12 months Asthma management program	Group and individual	Nurse	Usual Care	1. Pediatric Asthma Quality of Life Questionnaire (PAQLQ(S)) 2. the Asthma Control Questionnaire (ACQ)	Based on the results of the study the treatment group had statistically significant differences in reported symptoms ($p < .001$), asthma control with the use of a peak flow meter ($p < .001$), and daily activities ($p < .001$) at 6 weeks. and 12 weeks.
6.	Claudia Steurer-Stey, 2015 (11)	RCT	61	3 months Asthma education with Zurich Resource Model (ZRM)	Group and individual	Nurse	Usual care	Self-efficacy scale Patient-reported self-regulation	Based on the research result As control patients ($n=30$) were younger, mostly male, and had better asthma control compared with the intervention group ($n=30$), we adjusted the analyses for these imbalances. Both groups showed excellent adherence to self-monitoring over three months [27 patients (90.0%) in intervention and 25 patients (83.3%) in the control group, adjusted odds ratio: 1.28 (0.24–6.78), $P=0.78$]. Patients in the ZRM group tended to adjust their medication more often [median 36% days with action (IQR 11–62%)] than control patients [9% (0–43), $P=0.18$]. In both groups, actions were raby with the action plan [median 20% of actions appropriate (IQR 0–37) in intervention and 11% (IQR 0–56) in control group, $P=0.92$]. After three months, self-efficacy was significantly better with ZRM (adjusted difference on self-efficacy scale 2.31, 95% CI 0.31–4.31, $P=0.02$
7.	Sharon D. Horner, PhD, RN, FAAN, et al 2016 (12)	RCT	190	12 months Health education	Group and individual	Nurse	Usual care	Background Factors Family Asthma Management Health Outcomes Asthma Control	Based on research result In other words, hospitalizations decreased from baseline to Time 4, $F(1, 266) = 15.65, P < .0001$. Children who attended an asthma class, $F(1, 509) = 3.68, P < .10$, and in the asthma day camp, $F(1,509) = 2.30, P = .13$, were less likely to have hospitalizations compared to those in the attention control group. After controlling for group status, asthma severity decreased significantly over time, $F(1, 266) = 43.05, P < .0001$. A group effect was found for asthma class, $F(1,510) = 8.28, P = .004$. Initial results indicated that parents in the asthma day camp group had significant improvement in their asthma management, $F(1,249) = 5.09, P = .025$
8.	Nikki Newhouse, 2016 (13)	RCT	148	2 months Interventions using experiential internet to support self-management	Group and individual	Nurse	Usual Care	The Partners in Health Self-Efficacy Scale (CDESES) E-Health Impact Questionnaire (eHIQ),	Based on the research result Recruitment tar was get exceeded. 148 participawerandomized (73 intervention groups). Age range 19–84 years; 59% female. 121 of 148 (84%; 62 intervention group) followed up. The median number of logins was 2 (IQR 2–3, range 1–48). Minimal differences of change from baseline between groups; both showed improvement in health state or management of their condition with no significant differences between arms. No adverse events.

School-based asthma interventions are often carried out by researchers who do not work in the school environment where the program is implemented. Implementing a school nurse-led asthma intervention program outside of a hospital setting will increase

TABLE 1

No	Author /Year	Study Design	Sample	Intervention			Control	Outcome	Result
9.	Carolina M. X. Olivera et al, 2016 (4)	RCT	59	4 months Module usage	Group and individual	Pharmacist	Usual care	Knowledge about asthma Inhaler handling Evaluating medication adherence Quality of life	Based on research results the intervention group obtained an increase in asthma knowledge scores of 58.3– 79.5% (P < 0.001). In this group, there was also an increase in the number of individuals who practiced physical exercise (36–43%), the number of correct replies regarding the use of inhalers, the percentage of adherent patients, and quality of life scores for all domains. We concluded that this asthma self-management model effectively improved asthma patients' quality of life.
10.	Richelle C. Kosse, et al 2018 (14)	RCT	234	6 months Interactive mobile Health	Group and individual		Usual care	Medication adherence report scale Asthma control Quality of life	Based on the research result In total, 234 adolescents (147 in the control group and 87 in the intervention group) completed the study; the mean age was 15.1 ± 1.9 years, and 52.6% were females. Adherence rates of patients with low baseline adherence (MARS scores ≤19; n = 76) increased by 1.42 points in the intervention group (n = 26). Adherence rates of patients in the control group (n = 50) decreased by 0.70 points. Thus there was a positive effect of the intervention on medication adherence (MARS +2.12, p = 0.04). This effect was stronger (MARS +2.52, p = 0.02) in poor adherent adolescents with uncontrolled asthma (n = 74). No effect of the intervention was observed on asthma control or quality of life.
11.	Ben Ainsworth et al, 2019 (15)	RCT	88	12 months 'My Breathing Matters' (MBM) is a digital asthma self-management intervention designed using theory, evidence, and person-based approaches to provide tailored support for both pharmacological and nonpharmacological management of asthma symptoms.	Group and individual	Nurse	Usual care	(Asthma Quality of Life Questionnaire (AQLQ)	Based on the research result and primary outcomes: 88 patients were recruited (target 80). At the 3-month follow-up, two patients withdrew and six did not complete outcome measures. At 12 months, two withdrew and four did not complete outcome measures. 36/44 patients in the intervention group engaged with MBM (median of 4 logins, range 0–25, IQR 8). Consistent trends were observed in improvements in asthma-related patient-reported outcome measures.

opportunities to learn about the condition and develop self-management skills (10). The asthma education intervention showed that more education sessions (larger doses) and the use of more interactive learning strategies resulted in greater improvements in asthma management and reductions in acute care visits (12).

4. Discussion

Adherence to self-management in asthma, and doing the right things at the right time reduces morbidity and even mortality (16). Patients in both groups showed better adherence to self-monitoring with PEF and symptoms than is usually reported (17). One potential reason is that a team trained and experienced in evidence-based asthma education educates all patients. It is likely that this education increased the patient's inner motivation to be in control in both groups and encouraged the patient to be more obedient. Self-efficacy and self-regulation Self-regulation broadly denotes the process by which people bring their thoughts, feelings, and behaviors in line with goals (18). Self-efficacy, an individual's perception of his or her ability to act and in health terms the patient's beliefs about the ability to perform certain health behaviors, is an important ingredient in the self-management process (19).

Adherence to self-monitoring indicated that patients from both groups recorded their PEF and symptom monitoring almost daily. Both groups showed high adherence to self-monitoring for three months (90.0%) in the intervention and 25 patients (83.3%) in the control group, $P = 0.65$]. Patients with the intervention did not show significantly better adherence to self-monitoring [unadjusted odds ratio 1.80 (95% CI 0.39-8.32, $P = 0.45$), and adjusted odds ratio 1.28 (0.24-6.78), $P = 0.78$]. Patients with ZRM training adjusted their treatment more frequently than patients in the control group, but the difference was not statistically significant ($P = 0.20$) (11).

Self-management is a complex process, especially among children, which requires professional contribution and guidance. School nurses can provide important learning steps and continuity of care for schoolchildren. The findings of this study indicate that elementary school children are quite capable of taking responsibility for managing their asthma and school nurses are very important in the process of increasing children's awareness, knowledge, and skills to manage asthma (10,20) Orem's self-care theory maintained that children's awareness of symptoms asthma and self-skills to manage asthma for normal daily life is improved. Findings suggest that Orem's self-care theory supports educational programs for school children to learn and adapt skills for asthma self-management (10).

Compared with older adults receiving usual care, those randomized to the SAMBA asthma self-management support intervention had better asthma control and quality of life, improved adherence to medication and MDI techniques, and fewer asthma-related emergency department visits. These results suggest that the identification of barriers

to asthma self-management with targeted support is an effective method for improving appropriate asthma self-care, control, and quality of life among older adults (9).

The mHealth App-based self-management can help lower costs by facilitating care delivery and connecting patients to healthcare providers. In general, the results of this study indicate that the number of visits, admissions, and hospitalizations of economic outcomes increased in some studies and did not increase in others. Other economic outcomes, such as days off from work or school and health care costs, did not increase in any of the studies(21). In their systematic review showed that no smartphone app had insignificant improvement in outcomes such as hospitalizations and emergency department visits. With many of the features provided by the mHealth app (such as recording patient-entered data and providing educational information and reminders) to patients and their relatively good accessibility, it can be expected that they have more effectiveness than other IT-based interventions (such as text messages, phone calls, email, and Web sites) that have limited features or low accessibility. Therefore, to improve self-management in asthma patients, it is recommended to do the following to increase the acceptance of this type of intervention: use new self-care models, including smartphone applications for better asthma control, and improve patients' quality of life, as well as use applications that provide many functions for the patient (1).

The mobile health intervention (mHealth) appears to be a feasible and acceptable method to support adherence in young patients, as mHealth can target various aspects of non-adherence behavior and has the potential to empower patients with different tools. Moreover, almost all adolescents have smartphones (22) (23) and adolescents with asthma also suggested the use of smartphone applications (applications) to support their disease management. Many mHealth interventions to improve adherence have been developed. But most are ineffective, not aimed at youth, or target only one aspect of non-compliant behavior, such as reminders to prevent forgetting (24). Almost all of the evaluated asthma applications have the function of recording patient data and use more than one function. The multifunctional mHealth application has good potential to improve asthma control and quality of life in afflicted patients. However, the effects of these interventions on outcomes related to health care costs and medication adherence were inconsistent (14,15).

5. Conclusion

Self-management programs for asthma patients can provide patients with skills in managing their disease so that they can take appropriate action when a worsening of their

condition occurs. Self-management programs also increase the confidence in patients to be able to manage their chronic diseases, through continuous self-management programs will affect increasing lung capacity, physical capacity, and quality of life. Subsequent research is to determine the impact or effect of self-management programs to look at the overall and integrated self-management program on the patient's ability to carry out long-term self-management programs after discharge from the hospital and to measure the factors that hinder the implementation of an effective self-management program.

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