



A Systematic Review of Randomized Controlled Trials of Nurse-Led Educational Interventions for Adults with Asthma

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Abstract

Asthma is a serious chronic respiratory disease and one of the major causes of morbidity and mortality worldwide. Although the prevalence of asthma varies internationally, it is estimated that approximately 300 million people of all ages suffer from asthma worldwide. Asthma is a burden on governments, health-care systems, families, and patients, which is constantly increasing. Therefore, many proposed guidelines for asthma management emphasize the significance of educational program for patients in order to improve patient knowledge and the management of the disease, ultimately resulting in better health-care outcomes. One model of care that plays a significant role in patient asthma education is the nurse-led clinic. This study was carried out to determine the effectiveness of nurse-led educational intervention versus “usual care” for adults with asthma, before and after discharge from hospital and in terms of quality of life, lung function, self-management, and self-efficacy. The method used for this review derives from the methodology for systematic literature reviews adopted by the Joanna Briggs Institute. The reviewed studies showed no significant difference between nurse-led educational intervention groups and usual care groups in relation to the quality of life, which improved over time for both groups. However, the nurse-led educational group showed significantly better self-management and self-efficacy than the control group. All the reviewed studies support educational interventions by asthma nurses or respiratory nursing specialists as a means of improving clinical outcomes for adults with asthma in a hospital setting.

Key words: Nurse-led interventions, educational interventions, adults with asthma, randomised controlled trials, systematic review, usual medical care.

INTRODUCTION

Asthma is a prevalent chronic respiratory disease and one of the major causes of morbidity and mortality worldwide (Cruz, 2007). According to a recent estimate, approximately 235 to 300 million people currently suffer from asthma (Global Initiative for Asthma, 2014). Although it is the most common chronic disease during childhood, it also causes considerable disability in adults across the world (Bener et al., 1996). Interestingly, asthma is more prevalent in developed countries such as the United Kingdom, New Zealand, Australia, and Ireland

(Masoli et al., 2004). Although the prevalence of asthma is found to be generally low in the Middle East, high rates have been recorded in the Kingdom of Saudi Arabia (KSA), Kuwait, and Lebanon (Global Initiative for Asthma, 2014). In Saudi Arabia in particular, patients who suffer from asthma account for 24% of the population (Al-Ghazawy, 2013), and local reports suggest that its prevalence is increasing (Al-Ghamdi et al., 2008). This phenomenon could be attributed to the level of education among the population and is supported by the study of

Al-Jahdali et al. (2008), which revealed a significant correlation between asthma and educational level. This study also found that only 5% of patients' ($N = 1,060$) asthma conditions were well controlled, 31% were not well controlled, and 64% were very poorly controlled.

Asthma management guidelines emphasize the significance of patient educational programs as well as the need for regular medical reviews (National Asthma Education and Prevention Program, 2007; Scottish Intercollegiate Guidelines Network, 2012; Al-Moamary et al., 2012; Garrett et al., 1994). However, patient educational programs that aim to improve patient knowledge of this disease and its management can be designed and delivered in various formats, including written, verbal, visual, and audio. These programs can also take different forms, such as interactive or independent and structured or unstructured (Wilson et al., 2012; Sudrea et al., 1999; Lahdensuo et al., 1996; Gibson et al., 2002). The amount of information contained in an educational program—varies; however, programs containing only written material or short, unstructured verbal interactions between asthma or respiratory nurses and patients are considered to be minimal educational programs. In contrast, a maximum program is a structured one, and the relevant information is delivered using both interactive and non-interactive instructional modes (Al-Moamary et al., 2012). These measures are congruent with the guidelines proposed in Saudi Arabia, particularly by the Saudi Initiative for Asthma (SINA), which stresses that all patients should receive structured education, including the provision of a written asthma action plan (guidance for patients and their families for the purpose of patient self-management). Such education should also cover a review of the techniques used with different types of inhalers, especially in cases where patients are using multiple devices (Wilson-Barnett and Beech, 1994).

The usual medical care in this review refers to the standard asthma care provided by physicians and nurses and other health services inline with the hospital policies and procedures. This means that participants in the control groups of the studies reviewed received only usual asthma medical care, which may have included several forms of interventions such as a diagnostic assessment and pharmacological interventions and limited educational interventions. Moreover, the descriptions of usual care in this review did not include interventions, education, self-monitoring, or regular medical reviews by asthma or respiratory nurse specialists. Nurses are increasingly adopting an educational approach to healthcare with enhanced competence, which enriches job satisfaction (Royal College of Nursing 2010).

One model of care that plays a significant role in patient asthma education is the nurse-led clinic that is staffed by nurse specialists with advanced knowledge

and skills (Wagner, 2000). It is noteworthy that the nurse-led clinic model is not only an established model for asthma but it is also used for other chronic diseases, such as chronic obstructive pulmonary disease (COPD), diabetes, and musculoskeletal disorders (Wong and Chung, 2006). These clinics were mainly developed to provide patients and physicians with timely access to high quality primary care and safe health-care services, which result in improved patient outcomes and an increased satisfaction of both nurses and patients and ultimately a reduction in costs (Wooler, 2001; Armstrong et al., 2002; Cockcroft et al., 1987; Levy et al., 2000). Therefore, the purpose of this paper is twofold: 1) to determine the effectiveness of nurse-led educational interventions in adults with asthma in a hospital setting as measured during hospitalization and after discharge during follow-up in an outpatient setting, and 2) to compare the effectiveness of these educational interventions with usual medical care.

METHODOLOGY

Types of Studies

Only randomized controlled trials (RCTs) were included in this review. These RCTs assessed the effectiveness of nurse-led educational interventions with adult patients with asthma.

Types of Participants and Interventions

Adults, both men and woman above the age of 16 years, with asthma that has been diagnosed by a physician in different clinical setting such as inpatient and outpatient clinic were included in the studies reviewed as participants. The educational interventions provided by primary or asthma nurses targeted at individual adults have been utilized for the purposes of this study. These interventions, which occur before and after discharge, may take place in an emergency facility, inpatient unit, outpatient clinic, or in the community. Interventions may include information, counselling, the use of home peak flow or signs and symptom monitoring, a written asthma action plan, or a combination of the methods mentioned.

Types of Outcome Measures

The types of outcomes measured are outlined as primary and as secondary ones. The primary outcome is quality of life, whereas the secondary outcomes include lung function (forced expiratory volume in 1 second [FEV1]), self-management, and self-efficacy. Self-management, which is also known as a written asthma action plan,

includes peak expiratory flow (PEF), use of short acting medication, long acting medication, and monitoring asthma sign and symptom.

Search Strategy for the Identification of Studies

The Cochrane Collaboration and the Joanna Briggs Institute were searched to ensure that a systematic review of this subject had not already been undertaken or was in progress. In an attempt to broaden and diversify the information collected, this review aimed to identify and locate published literature in the English language from 1980 to January 2015. A two-step search strategy was used in this review:

1. An initial limited search of MEDLINE and CINAHL was conducted to identify keywords used in titles and abstracts. Keywords used in the initial search included patient education, asthma, nurse-led intervention, inpatient, and outpatient clinic.
2. An extensive search using all identified keywords associated with a list of synonyms was then undertaken across electronic databases, including CINAHL, MEDLINE, Cochrane, PubMed, and AMED, all from 1980 to January 2015.

Study Selection

Studies were included in the current review according to the following criteria:

- Randomized controlled trials (RCTs)
- Educational interventions provided by nurses, regardless of their specialty
- Usual medical care as a control group
- Adult asthmatic patients of both genders, aged 16 and above
- Primary and secondary outcomes measured by reliable and valid measurement tools, either for a specific outcome or multiple outcomes

All qualitative studies and other quantitative studies such as experimental studies, quasi-experimental studies, and surveys were excluded. Two reviewers independently reviewed and evaluated all studies identified by the search strategies, based on title and abstract eligibility criteria. Any study that did not meet the inclusion criteria were excluded (Table 1).

Assessment of Methodological Quality

The methodological quality of the retrieved studies was assessed independently by the research team members prior to inclusion in the review using the Joanna Briggs Institute's Critical Appraisal Instrument (JBI MASTARI)

(Joanna Briggs Institute, 2014) for the randomized and pseudo-randomized controlled trials. This tool comprised ten questions with four elemental answer choices (Yes, No, Unclear, and Not Applicable). Most of the included studies were well designed and were scored with a low risk of bias on most of the items (Table 2).

Data Extraction

All studies that met the inclusion criteria were retrieved using the JBI-Data extraction tool, which is helpful in collecting and managing relevant data, as well as decreasing the risk of error. Data from the included studies were independently extracted and entered into a modified JBI-Data extraction form. Data regarding the number of participants, interventions and outcomes were also extracted.

Data Synthesis

Among the included studies there were different types of educational interventions, disease severity and outcome measurement tools, which all show that there was clinical diversity (clinical heterogeneity). Based on this heterogeneity, the meta-analysis was not possible for some of the included studies; therefore, the findings were presented as a narrative review.

RESULTS

The literature search yielded 389 studies, which were imported into Endnote X6. Of these, 385 studies were identified across all accessed databases and four studies were identified by hand searching from the reference lists of the retrieved studies. After the removal of 240 duplicate studies, the titles and abstracts of the remaining 149 studies were examined. This led to the exclusion of 135 studies as they did not cover the subject of nurse-led educational interventions. The full texts of fourteen studies were assessed based on the eligibility criteria for this review, and as a result, six of these studies were excluded. One reason for excluding these studies was the fact that the patients had previously recorded diagnoses of chronic obstructive pulmonary disease (COPD). Another study included adults and children as participants, and the results could not be separated. The eight remaining studies met the inclusion criteria and appropriately addressed the review topic. The numerical data from this process are illustrated in the flowchart below (Figure 1). The methodological qualities of the retrieved studies were reviewed by the research team.

Table 1: Characteristics of Excluded Studies

Study	Year	Reason for exclusion
George, M. R. et al.	1999	A cohort study- not a randomized controlled trial. Also the design did not cover “nurse-led versus usual medical care”
Griffiths, C. et al.	2004	Participants’ age ranged from 4-60 years (unable to separate adults)
Willems, D. C. M. et al.	2007	The participants age group was 7 and older (unable to separate adults)
Rootmensen, G. N. et al.	2008	Nurse-led care are not part of intervention group
Vargas, P. A. et al.	2010	Participants included were children and their parents
van der Meer, V. et al.	2010	The target population of this study were chronic obstructive pulmonary disease(COPD) and asthma patients

Table 2: Study design quality of included studies based on JBI critical appraisal tool for RCTs

JBI critical Appraisal Checklist for RCT/Pseudo-randomised Trial	INCLUDED STUDIES								
	Levy, M. L., et al. 2000	Morice, A. H. and Wrench 2001	H. C. Palen, J., et al 2001	van der Pilotto, L. S., et al. 2004	Nathan, J. A., et al. 2006	Smith, J. R., et al. 2005	Huang, T., et al. 2009	Bobb, C., et al. 2010	
1 Was the assignment to treatment groups truly random?	Y	Y	Y	Y	Y	Y	Y	Y	
2 Were participants blinded to treatment allocation?	Y	U	U	U	U	Y	U	U	
3 Was allocation to treatment groups concealed from the allocator?	Y	Y	Y	Y	Y	Y	Y	Y	
4 Were the outcomes of people who withdrew described and included in the analysis?	U	U	U	U	U	U	U	U	
5 Were those assessing the outcomes blind to the treatment allocation	Y	Y	Y	Y	Y	Y	Y	U	
6 Were control and treatment groups comparable at entry?	Y	Y	Y	Y	Y	Y	Y	Y	
7 Were groups treated identically other than for the named interventions?	Y	Y	Y	Y	Y	Y	Y	Y	
8 Were outcomes measured in the same way for all groups?	Y	Y	Y	Y	Y	Y	Y	Y	
9 Were outcomes measured in a reliable way?	Y	Y	Y	Y	Y	Y	Y	Y	
10 Was appropriate statistical analysis used?	Y	Y	Y	Y	Y	Y	Y	Y	
Total	9	8	8	8	8	9	8	7	

Note: Y= Yes, U= Unclear, N= No

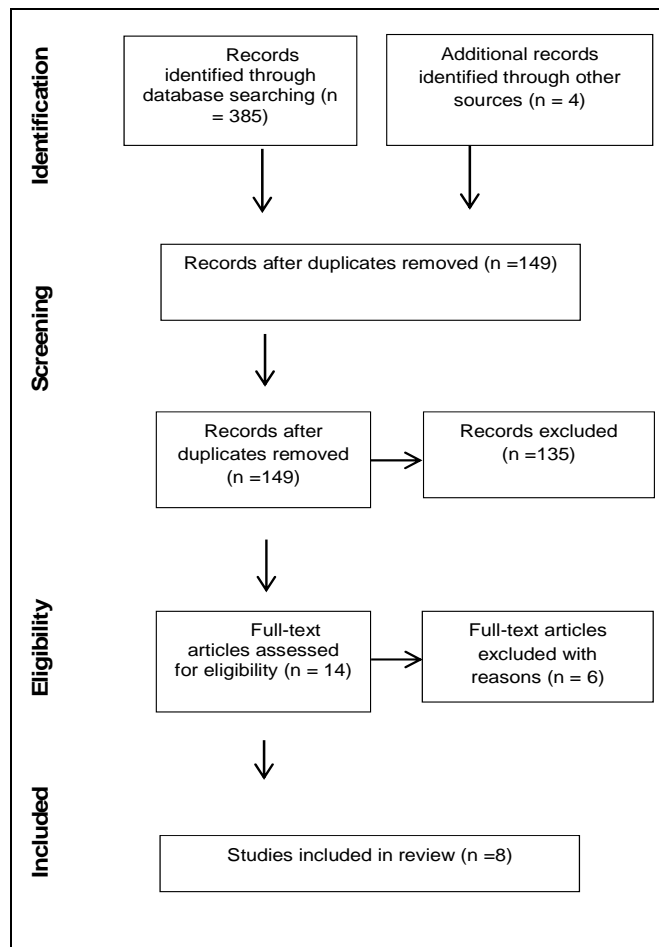


Figure 1: Study Selection Process

Characteristics of the Studies Reviewed

All included studies were examined to assess the effectiveness of educational interventions delivered by nurses for diverse asthma cases, as illustrated in table 3. Across all the studies, there were 1297 participants, who differed in terms of age and sex. The age of the participants in six studies was 18 years and older (van der Palen et al., 2001; Pilotto et al., 2004; Smith et al., 2005; Huang et al., 2009; Bobb et al., 2010; Morice and Wrench, 2001). The remaining two studies involved participants above 16 years of age (Nathan et al., 2006; Smith et al., 2005). The research questions of the reviewed studies were diverse. Levy et al. (2000) investigated the effectiveness of patient education provided by hospital-based specialized asthma nurses who used guided self-management plans that aimed to improve patient recognition and self-treatment of asthma. Van der Palen et al. (2001) also evaluated the efficacy of self-management training that included self-treatment and was provided by a specialized asthma nurse. In

addition, the study conducted by Morice and Wrench (2001) examined whether asthma nurse-led intervention when admitting patient to the hospital could increase knowledge and improve self-management as well as whether this measure would impact the number of emergency home visits by general doctor and hospital re-admissions. Smith et al. (2005) compared the effectiveness of nurse-led psychoeducational intervention for adult with severe asthma with the effectiveness of a usual care (control). Nathan et al. (2006) evaluated whether the follow-up of recently discharged patients after an acute asthma episode could be sufficiently provided by asthma nurse rather than a physician. The study conducted by Huang et al. (2009) compare the effectiveness of three different interventions (usual care, education alone, and education plus peak flow monitoring). Bobb et al. (2010) studied an intervention with usual care patients by nurses trained in asthma educator program. Finally, Pilotto et al.(2004) evaluated the ability to improve the quality of life (QOL) of adults

Table 3: The study sample and their characteristics

Study	Country	Design	Participants	Intervention	Duration & Setting	Comparator	Outcome
Levy, M. L. et al. (2000)	United Kingdom	RCT	n = 211 adults, 18 years and above who visited the hospital twice over 13 months	Nurse-led ED	13 months; Emergency Departments	Usual medical care	Self-management of asthma exacerbations Quality of life Home peak flow Symptoms diaries
Morice, A. H. & C. Wrench (2001)	United Kingdom	RCT	n = 80 patients (53 women) aged 18–72 years (mean 36.1 years)	Nurse-led ED	18 months; Medical Units	Usual medical care	Knowledge of inhalers Self-management plans Peak flow monitoring Recognition of worsening symptoms and appropriate emergency action
Van der Palen, J. et al. (2001)	The Netherlands	RCT	n = 245 adults	Asthma nurse specialist; educational sessions (ED)	12 months; hospital	Usual care	Self-management Self-efficacy
Pilotto, L. S. et al. (2004)	Australia	RCT	n= 80 patients 18 years and older	Nurse-led ED	6–9 months; hospital	Usual medical care	Quality of life (SGRQ) Lung function (FEV1) Asthma-related health service
Nathan, J. A. et al. (2006)	United Kingdom	RCT	n= 155 patients aged 16 years of age who were admitted to hospital	Nurse-led ED	3years Hospital (inpatient and outpatient)	Respiratory doctor	Compare the number of acute exacerbations within 6 months of hospital discharge between the two groups
Smith, J. R. et al. (2005)	United Kingdom	RCT	n= 92 adults 18 years and older	Nurse-led ED (respiratory nurse specialist)	6 months; hospital, home	Usual medical care	Asthma symptom control Asthma specific quality of life
Huang, T. et al. (2009)	Taiwan	RCT	n= 148 adults patients, 18 years and older	Nurses	6 months hospital	Usual care	Asthma self-care competence (knowledge and skills) Self-efficacy Peak expiratory flow rate (PEFR), forced expiratory Volume of the first second (FEV1)
Bobb, C., et al. (2010)	USA	RCT	n= 214 adults between 18 and 65 years	Nurse-led ED	13 month Outpatient clinic	Usual care	Asthma Control Questionnaire (ACQ) Lung function Self-efficacy

with asthma of nurse-led care compared with the usual medical care.

Primary outcome: Quality of life

Four studies (Levy et al., 2000, Pilotto et al., 2004, Smith et al., 2005, Nathan, 2006) had different forms of quality of life scores as outcomes. Specifically, the study conducted by Smith et al. (2005) used the Living with Asthma Questionnaire (LWAQ), which was originally developed by Hyland in 1991. Their findings show no differences in health outcomes between the intervention and control groups at intervals of 6 and 12 months. This finding is further supported by two other studies, Pilotto et al. (2004) and Nathan (2006) which used different measures for QOL, such as the St. George's Respiratory Questionnaire (SGRQ). Pilotto et al. (2004) found no significant difference in the average change in QOL between intervention group attending nurse-led asthma clinics and those attending control practices using the SGRQ. In addition, there were no differences in the mean QOL life domains, namely activity, impact, and symptoms. However, using the same measure as in the above two studies, Levy et al. (2000) (N = 211) found that the QOL scores improved significantly in both groups, particularly in the control group. These varied findings could be attributed to differences in sample size, duration of the study, and context.

Secondary outcomes: Lung function

Lung function was assessed either by clinical forced expiratory volume in one second (FEV1) (Pilotto et al., 2004, Huang et al., 2009) or peak expiratory flow (PEF) (Nathan et al., 2006, Levy et al., 2000). For assessing the effectiveness of asthma clinic intervention on lung function, Pilotto et al. (2004) used the FEV1 test and found no statistically or clinically significant improvement in the percentage of predicted FEV1, which included pre- and post-bronchodilators. The conducted study by Huang et al. (2009) investigated the effectiveness of three interventions: usual care, education alone, and education plus peak flow monitoring (PFM). A statistical significant difference was found in the scores of the education alone and the usual care groups, in pre-bronchodilation FEV1 and post-bronchodilation FEV1. For the assessment of lung function using PEF, the maximal peak flow measurement was compared by Nathan et al. (2006) at the first hospital follow-up with the six-month measurement. These findings indicated that there was a difference in the mean score, with 2.53% for the usual care group and 3.92% for the intervention group. Regardless of this dissimilarity, this study showed no significant difference in peak flow scores between the two

groups ($p = 0.122$). Contrasting findings were revealed by the study of Levy et al. (2000) which found that the intervention group had significantly higher peak expiratory flow scores at six months from the baseline. These diverse results may be attributed to the large sample size (N = 213) in this study.

Self-management (behavior) and action plan

Three studies presented data regarding self-management. Levy et al. (2000) revealed the significant impact of nurse-led intervention on self-management behavior. These findings illustrated the use of inhaled corticosteroids for severe asthma attacks in 51% of the patients in the intervention group, whereas only 21% of severe attacks were similarly managed in the control group. The use of rescue medication was also compared between the groups. The results indicated improved usage in the intervention group, with 89% of severe attacks treated, compared with 76% for the control group. A similar finding was also found in terms of patient adherence to written asthma action plans in the study conducted by Morice and Wrench (2001). There was a significant difference found between the intervention group (86%) and the control group (17%) in relation to the number of patients requesting to have written asthma action plans. This study also reported a substantial dissimilarity in the knowledge of peak flow rates, with 74% reported for the control group and 97% for the intervention group.

Asthma self-care competence as investigated by Huang et al. (2009) includes knowledge and skills related to asthma self-care. Huang et al. (2009) used the knowledge and skills subscales, and the findings continue to emphasize the effectiveness of educational intervention (education alone) compared with usual care in regards to asthma self-care competence. The study results indicated that the skill scores for the two education groups (educational alone and education plus PFM) were slightly higher than the scores for the control group. Moreover, Huang's study measured asthma self-care behavior on the Asthma Self-Care Behavior Scale, which indicated a significant statistical difference in self-care behavior between the control and intervention groups, with the mean score higher in the intervention group at six months.

Asthma self-efficacy

Three of the reviewed studies measured asthma self-efficacy. Van der Palen et al. (2001) reported a significant improvement in asthma-specific self-efficacy expectancies in both the intervention and control groups. Their study also found a positive improvement in

generalized self-efficacy in the intervention group. This finding is further supported by a subsequent study by Huang et al., (2009) which indicated that the mean total self-efficacy scores for the educational group at the 6-month follow-up were significantly higher than the scores for the usual care group ($p < 0.001$). A more recent study conducted by Bobb et al. (2010) indicated an equally significant improvement in both groups over a period of 13 months. The measurements in the two previous studies were taken after a six-month period.

DISCUSSION AND CONCLUSION

This systematic review aims to evaluate studies in the literature that address various nurse-led educational interventions provided for adults with asthma in hospital settings and at home care. Out of 389 studies, 8 RCTs were included in this systematic review. These RCTs compared usual medical care with various forms of education interventions delivered by specialized nurses to adults with asthma, including self-management, asthma action plans, and in some cases, the use of PEF measurements (self-efficacy). These studies found that such interventions can lead to improvements in health-care outcomes.

Specifically, the findings of the reviewed studies suggest that patients who received nurse educational interventions obtained sufficient knowledge to effectively manage their asthma in the hospital setting as well as following discharge. This improvement in self-management can contribute significantly to reducing asthma morbidity and thereby result in a reduction in symptoms, an improvement in lung function, fewer consultations with health-care professionals, and a reduction in cost (Levy et al., 2000). The studies found a significant improvement in self-management behavior in the intervention group compared with the usual care group (Huang et al., 2009; Bobb et al., 2010; Morice and Wrench, 2001).

Lung function was assessed in the reviewed studies using FEV1 and PEF measures (Levy et al., 2000, Pilotto et al., 2004, Nathan 2006, Huang et al., 2009). Most of the findings of these studies indicate no statistically significant improvement in the percentage predicted for FEV1 and no significant difference in the change of peak flow between the two groups. However, Huang et al. (2009) found that patients' FEV1 scores in the education alone and usual care groups differed significantly. For asthma self-efficacy, Van der Palen et al. (2001) and Huang et al. (2009) reported that a marked improvement in self-efficacy was found in the intervention group only, whereas Bobb et al. (2010) showed a significant improvement for both groups, equally.

The reviewed studies revealed a general improvement in QOL for patients from baseline over time;

however, no statistically significant difference was found between the nurse-led groups and the usual care groups (Levy et al., 2000, Pilotto et al., 2004, Smith et al., 2005). Although a single study indicated a mean improvement in the QOL score in the nurse-led group compared with the usual medical care group, there were no significant differences between these two groups (Smith et al., 2005). These findings confirm that nurse-led educational interventions and consultations are as efficient as interventions led by doctors. Therefore, providing support for asthma nurse specialists who independently advise and support patients and their families during hospitalization and after discharge through follow-up visits can improve the QOL of patients (Smith et al., 2005). The benefits are not limited to patients as asthma nurse specialists can offer advice and support to other health-care professionals in order to improve the quality of care and health-care outcomes for their patients.

The quality of the evidence

In this review, the research strategy was to identify and include studies that only used RCTs. These studies, which were based on the JBI quality appraisal instrument, provided high to moderate quality evidence in the analysis of educational interventions provided by nurse specialists.

Implications for advanced nursing practice

The results of this systematic review are illuminating. They emphasize the importance of the role of nurses as expert practitioners in leading care for adults with asthma through the provision of continuous support, education, and advice to patients and their families. In this capacity, nurse specialists can draw on and incorporate the evolving knowledge and research evidence in asthma care to improve their practice and the health-care outcomes for patients.

Implications for future research

The reviewed studies were conducted in a variety of countries, including the United Kingdom, Australia, Netherlands, the United States, and Taiwan. As the research team members of the current study come from Saudi Arabia, there was a deliberate search for studies that evaluated and explored the effectiveness of nurses in improving the QOL and other clinical outcomes for adults with asthma in Saudi Arabia. Unfortunately, the search demonstrated a lack of adequate research in Saudi Arabia. Therefore, future research is

recommended to address this gap in order to improve the quality of care, not only for adults with asthma but also for pediatric and adolescent patients. Further research incorporating RCTs with duration of over one year are recommended to be conducted in Saudi Arabia and other countries with similarities in health care organization as well as in cultural characteristics.

Strengths and limitations

This review has both strengths and limitations. One of the study's strength is that it explicitly and accurately stated the eligibility criteria for the included studies as well as performed a comprehensive search across academic databases to identify eligible studies. Another strength is that it limited the search to only RCTs studies that are highly ranked in the hierarchy of evidence. Using the JBI-MASARI critical appraisal tool to evaluate the studies significantly reduced any potential bias. The topic addressed by the review can also be considered a strength as it significantly contributes to the improvement of the population's health-care quality and well-being. On the other hand, this review has two main limiting features. One was the potential absence of valuable studies that could not be gleaned by the search due to the enormous number of studies related to this research topic. The other major weakness was the inability to use a meta-analysis approach for synthesizing the results due to the heterogeneity of the included studies, which led to the findings being presented as a narrative summary.

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