

# How we teach children with asthma to use their inhaler: A scoping review protocol

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## Protocol

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# Abstract

## Background

One reason that asthma remains poorly controlled in children is poor inhaler technique. Current guidelines recommend checking inhaler technique at each clinical visit. However, they do not specify how best to train children to mastery of correct inhaler technique. Currently many children are simply shown how to use inhalers (brief Instruction) which results in less than 50% with correct inhaler technique. The aim of this scoping review is to explore published literature on teaching methods used to train children to master correct inhaler technique.

## Methods

This scoping review will follow the Arksey O'Malley scoping review methodology and the 2015 Joanna Briggs Institute guidelines. It will be reported using the Preferred Reporting Items for Systematic Reviews and Meta-analyses Protocols extension for Scoping Reviews. *An initial pilot exercise will be undertaken using the online database MEDLINE before proceeding to a complete search using the databases Embase, Scopus, Web of Science, CINAHL and the Cochrane library. We will include studies published since the year 1956 on teaching the skill of inhaler technique to children.* Due to the iterative nature of a scoping review, the research question or the search terms may alter following a piloting process.

## Discussion

This scoping review will provide a broad overview of currently used educational techniques to improve inhaler technique in children with asthma. This may allow us to make recommendations for primary and secondary care asthma clinics. The analysis will allow us to refine future research in this area by focusing on the most effective techniques and optimising them. This will likely lead to a systematic review of the literature with the potential to design a randomised control trial of educational interventions to teach inhaler technique to children with asthma.

## Background

Asthma remains poorly controlled for many children (1). Regular inhaled corticosteroid (ICS) should provide control for the vast majority of these children (2,3).

Effective delivery of drugs to the lungs relies on patients using their inhalers correctly (4). However, inhaler technique; particularly in children, is generally poor (5,6). This results in failure to deliver an adequate dose of ICS to the airways (7). Failure to deliver ICS to attenuate chronic airways inflammation is associated with poor asthma control, increased asthma attacks and increased risk of death (8,9).

Inhaler technique has not improved over the last four decades despite a major pharmaceutical company investment into easy to use inhaler devices (10). Current guidelines recommend checking inhaler

technique at each clinical visit (11). However it is not known how best to teach children to master the correct technique.

## Aims

The overarching aim of this study is to review published literature on teaching the skill of inhaler technique to children in order to determine effective teaching techniques that can be used in a children's asthma clinic.

The specific objectives are:

1. To identify what different educational methods and approaches have been used to teach the skill of inhaler technique in children.
2. To consider whether these methods need to be tailored according to the age of the child.
3. To describe methods suitable for use in a children's asthma clinic.
4. To determine how the effectiveness of these methods are evaluated?

## Methods (Protocol Design)

For our scoping review we will follow the methodological framework initially set out by Arskey and O'Malley (12); with further enhancements by Levac (13) and Colquhoun (14); which has culminated in an approach to the conduct of scoping reviews laid out in the Joanna Briggs Institute reviewer's manual (15) (see appendix 1).

We will report the findings in accordance with the reporting guidance provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocol – Extension for Scoping Reviews (PRISMA-ScR) checklist (16).

The above process of performing a scoping review will involve the following stages:

1. Define the research question.
2. Identify relevant published literature.
3. Select which studies to analyse.
4. Extract and chart the data collected from these studies.
5. Report and disseminate the results.

### 1. Research question

*'What is known about educational interventions for children with asthma to facilitate the mastery of inhaler technique?'*

However, due to the iterative nature of a scoping review, the research question or the search terms may alter following a piloting process.

## **2. Identifying relevant published literature**

Under the guidance of the Queen's University Belfast medical librarian, the search will include a range of terms and keywords related to the research question. The following search terms will be used:

Asthma or wheeze.

Children or paediatrics or pediatrics.

Inhaler technique or inhaler management or inhaler method.

Educational intervention or training or education.

An initial pilot exercise will be undertaken using the online database Medline before proceeding to a complete search of all available databases. We plan to review 10 publications of varying styles from this initial piloting exercise. The purpose of the pilot is to ensure that we have chosen the most suitable search terms by considering the different concepts that each of these articles could be mapped to.

Once the pilot is complete and consideration of new search terms is made, a full search of MEDLINE will be completed followed by a full search of the subsequent chosen online databases (Embase, Scopus, Web of Science, CINAHL and the Cochrane library). These databases will provide a comprehensive list of the appropriate literature across a range of interdisciplinary fields. A search of the grey literature and discussion with a group of paediatric asthma specialists will also be undertaken to handpick any further highly relevant studies. At this point, we will record the total number of citations yielded by these search terms from each of the databases.

## **3. Selecting studies**

### **Eligibility criteria**

We will include studies published since the year 1956 (when the pressurised metered-dose inhaler (pMDI) was first introduced to clinical practice (17)). In order to consider a full breadth of knowledge in this subject area we will include all publication types for review (including conference abstracts, presentations and scholarly information that has not necessarily been peer reviewed). Studies of children which also involved (but not exclusively) patients above the age of 18 years will also be included.

Publications not in English will be excluded.

### **Screening**

Selection of studies will then be performed in two stages. There will be an initial screening of all publications based on the title with further screening based on the abstract, to ensure they fulfill the

eligibility criteria (P McCrossan). Documents not meeting eligibility criteria will be excluded from full text analysis.

The remaining publications will then be read by two reviewers, from the research team (P McCrossan, O Mallon and D O'Donoghue). These two reviewers will independently analyse the content included in full text articles. If there is any case of uncertainty, the text will be re-evaluated by a third independent reviewer (MD Shields). The final search results will be exported into Endnote™ at which point all duplicates will be detected and eliminated.

A flow diagram in keeping with PRISMA<sup>(18)</sup> (see appendix 2) will be used to report the searches and inclusion/exclusion pathway. Data will be stored and charted using a Microsoft Excel spreadsheet.

### **3. Extracting and charting the data**

This involves a logical and descriptive summary of the results that align to the objectives of the review. A draft charting table (see appendix 3) has been developed to record the characteristics of the included studies and the key information relevant to the review question. This data charting form may be refined following a review of this process with the first 2 or 3 studies; purposively chosen as diverse (in keeping with the iterative nature of the scoping review methodology)(15).

At intervals during the data extraction and charting process, charted data will be compared and discussed to ensure consistency between reviewers and to enable iterative reflection on emerging themes and categories.

During the review process, any amendments to the protocol deemed necessary by the team will be recorded in the master protocol document with the reason for amendment noted on file.

### **4. Reporting results**

The results of this scoping review will produce an outcome that refers to teaching the skill of inhaler technique to children. We will consider the meaning of these findings, as they relate to the overall purpose of the study i.e implications for future research, practice and policy. We will present these results as a 'map' of this data in a logical and diagrammatic form by classifying them under main conceptual categories.

The results of this scoping review will be disseminated through peer reviewed publications and presented at international conferences targeting an audience interested or involved in paediatric asthma.

### **Limitations**

We acknowledge that this study will be limited to those publications in the English language; however, the broad nature of the research question will still allow us to capture a significant proportion of the available literature.

## Discussion

Poor or incorrect inhaler technique remains a major cause of persistent poor asthma control in children. It is relatively common for children prescribed inhalers only to be shown (brief instruction) how to use their inhaler rather than trained to mastery. Effective teaching methods that can be used at a children's asthma clinic that result in more children mastering their inhaler remains an under researched area.

A scoping review of the literature is an important first step in addressing the clinical need to improve inhaler technique for children with asthma. Optimising this fundamental aspect of asthma management will improve patient outcomes.

This scoping review will provide a broad overview of currently used educational techniques, the analysis of which will allow us to refine future research this area by focusing on the most effective techniques and optimising them.

## Declarations

### Availability of data and materials

Not applicable.

### Ethics declarations

Ethical approval has not been sought as this is a secondary study of already published and publicly available literature.

### Consent for publication

Not applicable.

### Competing interests

The authors declare that they have no competing interest.

### Funding

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## Abbreviations

ICS: Inhaled Corticosteroids

pMDI: Pressurised Metered-Dose Inhaler

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## Figures



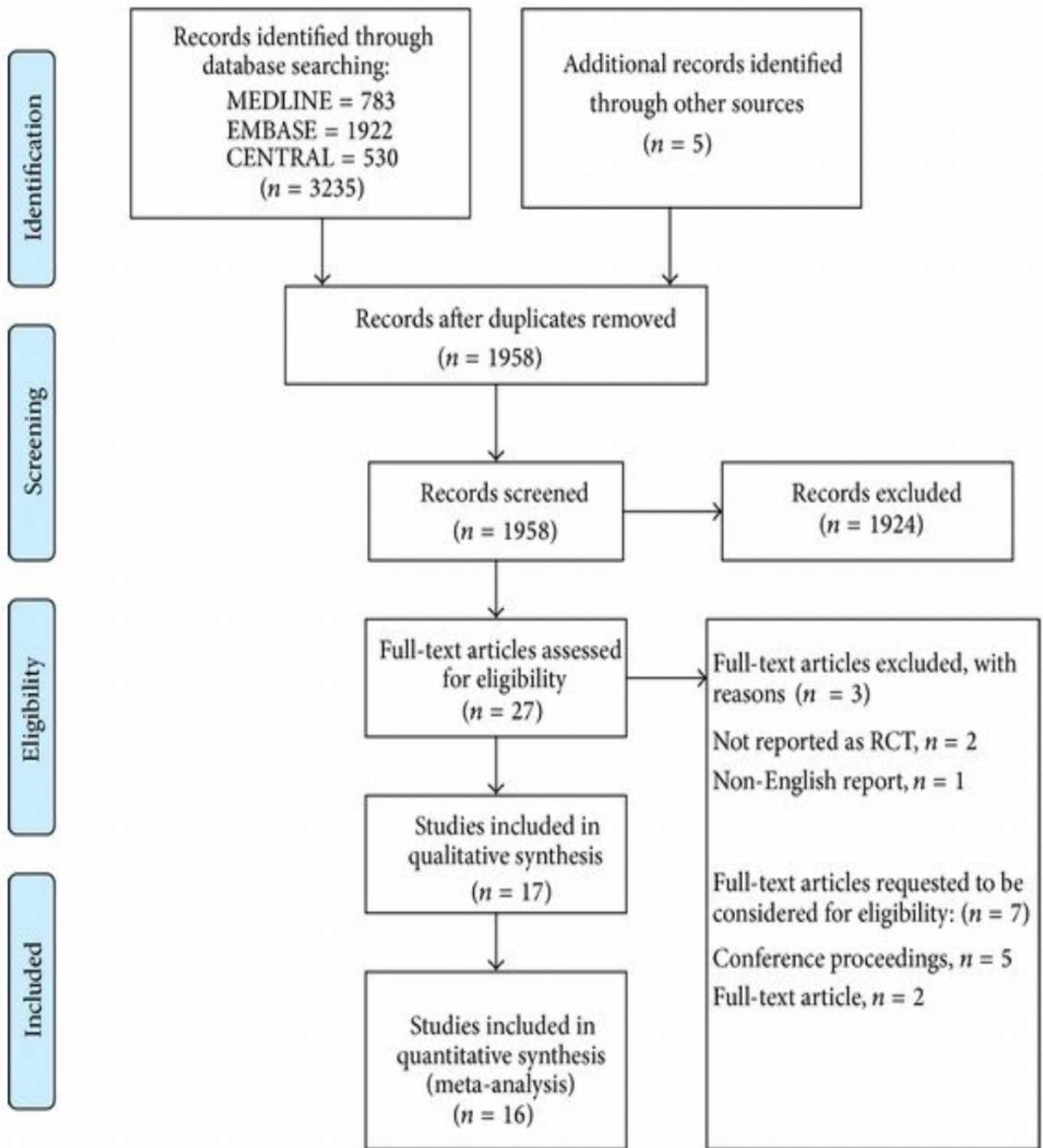


Figure 1

Example of a PRISMA flow diagram (18)