School-based asthma self-management interventions for children and adolescents with asthma

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Background

Asthma is a common chronic respiratory condition worldwide. In the UK, more than a million children are living with asthma, and a high prevalence of childhood asthma has also been reported in other countries, according to the International Study of Asthma and Allergy in Children Study (ISAAC) [1]. Asthma is characterised by airway inflammation and bronchoconstriction, leading to limited airflow. The symptoms of asthma include wheeze, cough, breathlessness, and chest tightness. Asthma is diagnosed clinically, following an assessment of lung function, symptoms and clinical response to medication.

A recent school-based survey assessed current levels of asthma control and school attendance in a sample of 766 children with asthma in London secondary schools [2]. Overall, 20.9% of London school children with asthma self-reported at least one school absence, compared to their peers with optimal asthma control (32.7% vs 10.9%). Other studies have also shown that grade failure is more frequently reported among children with asthma [3].

Self-management involves educating and enabling children to achieve good control of their asthma symptoms to reduce the risk of future exacerbations [4]. In asthma, successful self-management skills include good inhaler technique, optimal treatment adherence, self-monitoring of symptoms, and an ability to respond to asthma symptoms appropriately. Although delivery of an asthma self-management intervention in schools has the potential to reduce the burden of asthma, the effectiveness of such interventions across a variety of outcomes (e.g. healthcare use) is unclear. Similarly, even when interventions are delivered in school settings, several factors, such as variations in study populations, can influence the ways

in which school-based self-management interventions are delivered, and their subsequent overall success.

Aims of the review

The aim of our Cochrane Review was to employ a mixed-methods approach to assess (i), which components of an intervention contribute to the success or failure of the intervention; and (ii), whether school-based self-management interventions are effective in improving outcomes for children with asthma [5]. We sought to use process evaluation studies to address the first aim and outcome evaluations in order to address the second aim. Different synthesis methods were employed with a new technique (Qualitative Comparative Analysis (QCA); see Thomas et al (2014 [6])) used to examine which components of interventions were crucial to successfully run an intervention, and meta-analysis used to examine whether the approach of enhancing children's self-management techniques was effective. We used a logic model to help us to theorise the intervention components that may be important in successful interventions, which was updated to reflect findings uncovered within the review. The original logic model was developed from a synthesis of existing models and with expert input (see Kneale et al 2015 [7] for further information).

Why is the review important?

The school environment offers access to large numbers of children with asthma from all socio-economic backgrounds. The school environment is also commonly associated with the learning of new skills. This review placed a strong emphasis on understanding the different processes that occur during school-based asthma self-management interventions. It was expected that this approach would contribute towards understanding the different mechanisms involved in interventions. Focusing on the delivery of interventions to help

children self-manage their chronic condition is encouraged by advisory groups to UK policy makers, as the integration of health and educational services is important in improving the quality of life for children with chronic conditions.

This review, which is as an 'exemplar' review for its methodological approach, was characterised by three distinct features: (i) it was the first Cochrane review to employ QCA as a synthesis method to disentangle complexity in interventions; (ii) it was distinct in drawing heavily on a logic model, which was subsequently updated on the basis of new findings (see figure 2); (iii) the results were used to inform an ongoing school-based intervention [8].

Main findings from process evaluation

The interventions sought to improve knowledge of asthma and triggers and stressed the importance of regular practitioner review. Thirty-three process evaluation studies (based on the experiences of 14,174 children) were identified, of which twenty-seven provided information for the QCA to identify which intervention components triggered successful implementation. Most of the studies were conducted in North America in socially disadvantaged populations. The QCA results demonstrated the importance of an intervention being theory-driven, along with the importance of factors such as parental involvement and child satisfaction, as well as running the intervention outside of the child's own time, to achieve successful implementation.

Main findings from meta-analyses

Included in the meta-analysis which measured the effect of interventions were 33 Randomised Controlled Trials (RCT) involving 12,623 children. Compared with no intervention, school-based self-management interventions could reduce mean hospitalisations by an average of 0.16 admissions per child over 12 months. They may also

reduce the number of children who visit hospital emergency departments from 7.5% to 5.4% over 12 months, as well as reduce unplanned visits to hospitals or primary care from 26% to 21% at 6 to 9 months. School-based self-management interventions could also reduce the number of days students were restricted in their activity by just under half a day over a two-week period.

Effects of interventions on school absences are uncertain due to variation between the results of the studies; the data on medication use was also insufficient. Quality of life was shown to slightly improve.

A summary of the results from both sets of syntheses is found in figure 1 below.

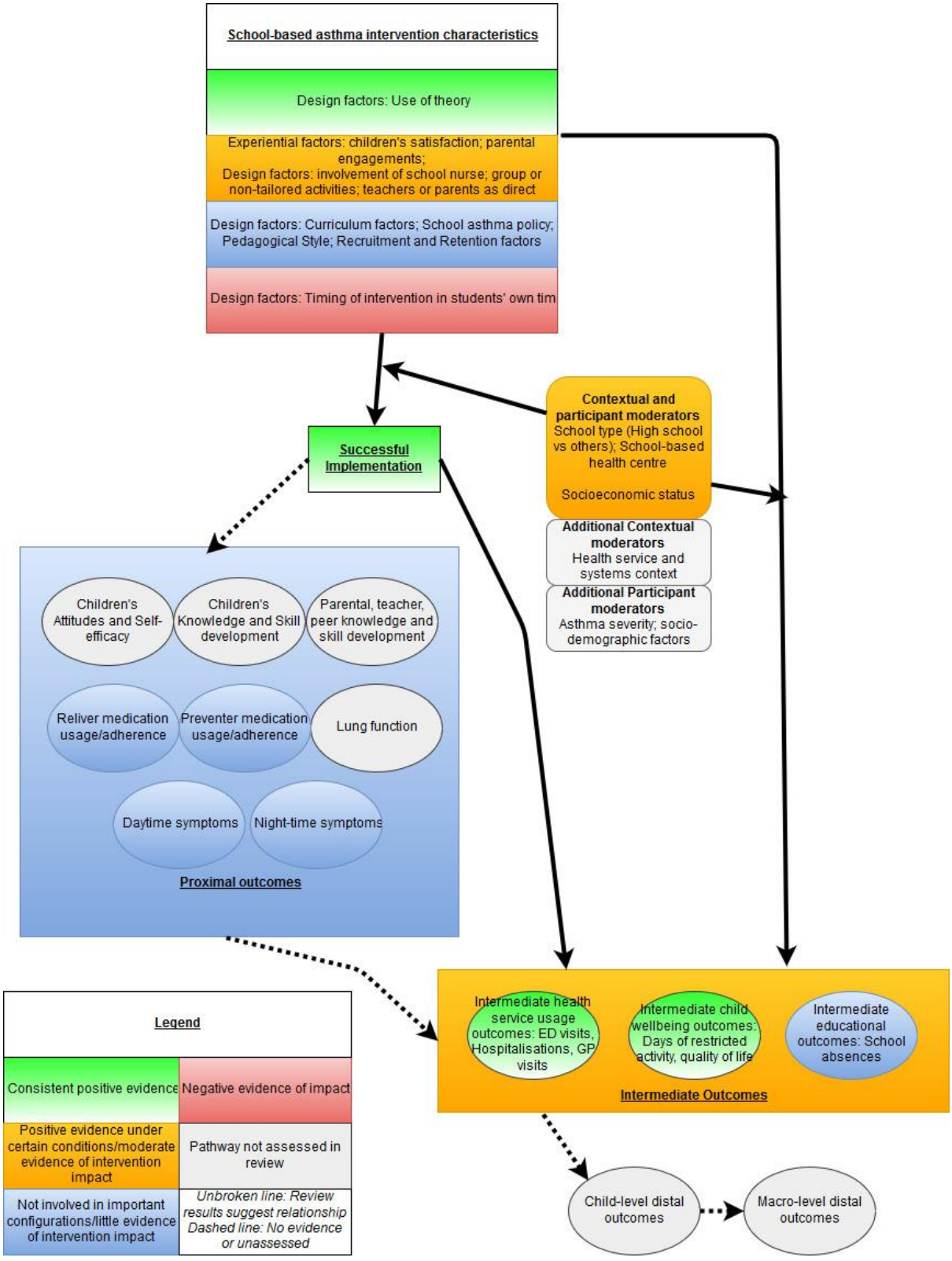

Figure one. Summary of results

Conclusions

The evidence from this review suggests that school-based self-management interventions can help children with asthma through reducing hospital admissions and trips to the emergency department. The findings from the process evaluation also showed that interventions that have a strong theoretical framework could be important in improving children's outcomes, as well as keeping dropout rates low.

References

1. Asher, M.I., et al., *Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys.* The Lancet, 2006. **368**(9537): p. 733-743.
2. Harris, K., et al., *Asthma control in London secondary school children.* Journal of Asthma, 2017: p. 1-8.
3. Fowler, M.G., M.G. Davenport, and R. Garg, *School functioning of US children with asthma.* Pediatrics, 1992. **90**(6): p. 939-944.
4. Kotses, H. and T.L. Creer, *Asthma self-management*, in *Asthma, Health and Society*. 2010, Springer. p. 117-139.
5. Harris, K., et al., *School-based self-management interventions for asthma in children and adolescents: a mixed methods systematic review.* Cochrane Database of Systematic Reviews, 2019(1).
6. Thomas, J., A. O'Mara-Eves, and G. Brunton, *Using qualitative comparative analysis (QCA) in systematic reviews of complex interventions: a worked example.* Systematic reviews, 2014. **3**(1): p. 67.
7. Kneale, D., J. Thomas, and K. Harris, *Developing and Optimising the Use of Logic Models in Systematic Reviews: Exploring Practice and Good Practice in the Use of Programme Theory in Reviews.* PLoS One, 2015. **10**(11): p. e0142187.
8. Harris, K., G. Mosler, and J. Grigg, *Theory-based self-management intervention to improve adolescents' asthma control: a cluster randomised controlled trial protocol.* BMJ open, 2019. **9**(4): p. e025867.