Children's Hospital of Philadelphia PolicyLab

Effectiveness of Indoor Allergen Reduction in Management of Asthma

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This review evaluates the effectiveness of allergen reduction interventions on asthma outcomes in adults and children. We systematically searched the gray literature and five bibliographic databases, MEDLINE®, Embase®, PubMed®, CINAHL®, and the Cochrane Library, through April 21, 2017. Eligible studies included systematic reviews, meta-analyses, randomized controlled trials (RCTs), and nonrandomized controlled interventional studies. Studies were evaluated for risk of bias using the Cochrane Risk of Bias instrument or the Newcastle-Ottawa scale, and the evidence base was assessed using the methods guidance established by the Evidence-based Practice Center Program. Qualitative comparative analysis was conducted to support the primary analysis. Our literature searches identified 72 publications describing interventions to reduce exposure to indoor allergens and their effects on asthma. This included 60 unique RCTs with data published in 64 articles, as well as 8 non-RCTs. Validated measures of asthma control were infrequently reported across studies, and findings were often inconclusive. Thirty-eight studies evaluated single component interventions. Use of acaricides (dust mite pesticides) was not shown to improve pulmonary function (moderate strength of evidence [SOE]). Air purification devices, used alone, improved quality of life (low SOE) but did not reduce exacerbations or health care utilization (low SOE) or improve pulmonary function (low SOE). Impermeable mattress covers were not associated with improved asthma control (moderate SOE) and did not reduce exacerbations or health care utilization (moderate SOE) or improve quality of life (high SOE). Single intervention studies did not adequately examine carpet removal, high-efficiency particulate air-filtration (HEPA) vacuums, mold removal, pet removal, and pest control. Thirty studies assessed multicomponent interventions, but wide differences among study interventions (and combinations of interventions) precluded meta-analysis. When examined as a component within a broader set of interventions, use of air purification reduced school absenteeism (low SOE) but did not improve asthma control (low SOE), reduce exacerbations (high SOE), or improve quality of life (high SOE). HEPA vacuums, when included in a multicomponent approach, reduced exacerbations and improved quality of life (moderate SOE) for children. Mattress covers used within multicomponent interventions reduced school absenteeism and missed activities (low SOE) but had no effect on emergency department visits (low SOE), hospitalizations (high SOE), or quality of life (moderate SOE). Pest control strategies incorporated into multicomponent interventions reduced exacerbations (moderate SOE), improved quality of life (low SOE), and reduced school absenteeism (low SOE) but did not reduce emergency department visits (moderate SOE), hospitalizations (high SOE), or worker absenteeism (low SOE). Other multicomponent interventions included carpet, mold, and pet removal, but the evidence for these strategies was inconclusive. Single intervention studies were not associated with improvement in clinical asthma outcomes, with most strategies showing inconclusive results or no effect. Multicomponent intervention studies demonstrated improvement in various outcomes, but no specific combination of interventions was identified as more effective than others. High or moderate strength evidence suggests that multicomponent interventions that include HEPA vacuums or pest control may be effective in reducing exacerbations and improving quality of life. For many primary outcomes for both single and multicomponent interventions, the evidence is inconclusive because of a lack of studies. Further research is needed examining well-defined (standardized) indoor allergen reduction interventions in comparative studies, with sufficient population size of well-characterized patients to detect clinically meaningful differences in validated and relevant asthma outcomes.

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