Protocol:
Education Support Services for Improving School Engagement and Academic Performance of Children and Adolescents with a Chronic Health Condition: A Systematic Review
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BACKGROUND

Description of the condition

Chronic health conditions in children and adolescents can have profound impacts on education as well as health and well-being. While there are many different definitions of what constitutes a chronic health condition or chronic disease, the World Health Organization (WHO) described chronic diseases as being of "long duration and generally slow progression" (WHO, 2013). O’Halloran 2004 provided a more detailed definition and suggested that chronic diseases may have a duration that has lasted, or is expected to last, at least six months; have a pattern of recurrence or deterioration; have a poor prognosis and produce consequences or sequelae that impact on the individual’s quality of life. The Centers for Disease Control and Prevention (CDC) defined chronic diseases as "noncommunicable illnesses that are prolonged in duration, do not resolve spontaneously, and are rarely cured completely" (CDC, 2009). Chronic diseases are the leading cause of death globally (Yach, 2004). Although chronic health conditions have been more commonly linked to developed countries, chronic health conditions also impact people from developing countries, with death rates from chronic diseases exceeding those of communicable diseases in some low-income countries including India and Pakistan (WHO, 2005). Research that focuses specifically on children and adolescents with chronic health conditions in developing countries is limited; however, there is evidence to suggest that chronic conditions such as obesity and type 2 diabetes are experienced globally (WHO, 2005).

Children and adolescents now experience higher levels of chronic health conditions than in the past (Canter, 2012; Newacheck, 1992; Van Cleave, 2010), with increasing rates noted in both developed and developing countries (Michaud, 2007). In part, this reflects technological and medical advances that result in children now living longer with complex health conditions. It also reflects increases in the incidence of certain conditions such as chronic inflammatory bowel disease, allergy, type 1 and 2 diabetes, together with increasing diagnosis of developmental and mental disorders in children (e.g., autism) and adolescents (e.g. eating disorders, depression and anxiety) (Sawyer, 2007). A wide range of different chronic conditions affect children and adolescents, including conditions of congenital onset (e.g. cystic fibrosis), acquired illnesses (e.g., asthma, cancer), mental and developmental disorders, and disabilities (e.g., cerebral palsy).

Due to the variety of both different chronic conditions and definitions, it is not easy to gain clear figures for the prevalence of chronic health conditions in children and adolescents. One systematic review by van der Lee (2007) reviewed 32 studies that reported prevalence rates of chronic health conditions in children and adolescents and reported prevalence estimates of chronic health conditions between 0.22% and 44%; the majority of these studies were from the US, one was from a middle-income country (i.e., 7.8% of children aged zero to seven years in Jordan had a chronic disease or disability), and none were from low-income countries. Further, not all chronic conditions have poor sequelae. Sequelae appear to be
related to the severity of the chronic health condition, and the impact on cognitive and functional capacities. Of people with a chronic health condition, an estimated 5% are affected by severe conditions characterised by limitations to daily activities and frequent bother (Newacheck, 1992). In one large New Zealand study of over 9000 high-school students (most of whom were aged 13 to 17 years), 18% reported having a chronic health condition (Denny, 2014). As many as 28% of students with a chronic health condition reported that their condition negatively impacted their daily activities and 8% noted difficulties in socialising due to their chronic health condition (Denny, 2014), thus emphasising the importance of considering the impact of chronic health conditions on daily life and functioning in addition to the prevalence of these conditions.

The impact of chronic health conditions on children's quality of life is described more specifically by Martinez 2009 who suggested that besides the physiological consequences of chronic health conditions, chronic health conditions for children carry secondary psychological and educational consequences. Existing research identifies a wide range of impacts of chronic health conditions for children and young people including effects on school absenteeism, school engagement, school functioning, academic and social-emotional development, and well-being.

For example, rates of school absenteeism appear to be higher for children and adolescents with chronic health conditions compared with non-ill peers. Daraganova (2013) found that 18% of students (aged six to seven years) with a medical condition/disability lasting for at least six months had missed school for three or more days. In comparison, 14% of healthy peers had missed school for three or more days. The same author found that 41% of children aged six to seven years with a medical condition were absent from school for one or two days compared with 33% of healthy peers. McDougall (2004) found that children with a chronic illness were absent from school for a mean of 16 days as compared with three days for their healthy peers.

Further, it should be kept in mind that some, but not all, children and adolescents with a chronic health condition miss school due to their illness. Both the presence and the severity of chronic health conditions appear related to the extent of school absenteeism. For instance, Moonie 2006 found that children and adolescents with asthma missed a mean of 9.2 days of school per year compared with children and adolescents without asthma who missed 7.9 days of school per year. However, when severity of asthma was considered, pupils with severe persistent asthma were away from school more frequently (11.6 days) than pupils with moderate persistent asthma (10.3 days), mild persistent asthma (11.3 days), mild intermittent asthma (8.5 days) and without asthma (7.9 days). While these differences for asthma appear to be small, Shaw 2008 noted that some chronic conditions take a profound toll on school attendance. For example, "children being treated for chronic childhood leukemia miss an average of 40 school days during the first stages of treatment and have inconsistent attendance for 3 years that follow" (Shaw, 2008, p. 74).
School attendance, which is generally higher for primary school children compared with secondary school students (Hancock, 2013), is important for academic and social skill development. When children and adolescents are absent from school due to a chronic health condition, school engagement can be affected, as can the achievement of important educational milestones and the acquisition of knowledge and skills. Chronic health conditions and severity are also associated with academic performance. For instance, Cadman (1987) showed that the odds of not doing well at school for children and adolescents with a chronic health condition alone were not significant (odds ratio 1.3), but were significant for students with a chronic health condition and a disability (odds ratio 4.7).

Some chronic health conditions such as cerebral palsy may have an associated cognitive impairment that can directly affect school functioning. However, children and adolescents with chronic health conditions that are not associated with a cognitive impairment can still experience difficulties at school due to school absenteeism, adjustment and emotional problems, and the impact of the chronic health condition and its treatment on the individual such as fatigue (Madan-Swain, 2008). Subsequently, children with a chronic health condition are at greater risk of a range of negative school-related outcomes such as poorer academic achievement and lower motivation to do well at school (Forrest, 2011). Similar to school absenteeism, the degree of these associations may vary across chronic health conditions and according to severity of these conditions. For example, asthma is a common chronic health condition, affecting approximately 12% of children and adolescents aged zero to 14 years in Australia (Australian Bureau of Statistics, 2006). It is also the most common reason for hospitalisation in this age group (Australian Institute of Health and Welfare, 2005). While children and adolescents with asthma report lower school functioning (e.g., experience greater difficulty in concentrating, forgetting things, keeping up with school work, missing school) than healthy peers (Varni, 2007), it has been found that the odds of graduating from high school or being employed were similar for students with asthma compared with their healthy counterparts (Maslow, 2011). By contrast, students with a non-asthmatic chronic health condition (e.g., cancer) were less likely to graduate or be employed compared with healthy peers or students with asthma (Maslow, 2011). Compared with asthma, cancer is far less common. The incidence of childhood cancer in the U.S. was 14.3 per 100,000 children in 2007, while over 175,000 new cases of childhood cancers were reported worldwide in 2008 (American Cancer Society, 2011). Cancer is a serious chronic disease, contributing to 16% of deaths in children and adolescents aged one to 14 years (Australian Institute of Health and Welfare, 2005). Children and adolescents with cancer report poorer school functioning and lower health-related quality of life compared with their healthy peers (Varni, 2007). Children and adolescents with cancer may miss school because of acute treatment or because of complications of the cancer and its treatment (or both) (Prevatt, 2000). A number of studies reported that children and adolescents with cancer encountered higher rates of school absenteeism compared with healthy students or students with other chronic conditions (refer to Vance, 2002 for a review on this topic).
Education support services for children and adolescents with chronic health conditions who miss school due to their illness aim to prevent them from becoming disengaged from school, education and learning. Disengagement from school is associated with poorer academic achievement, social emotional functioning and career choices (Abbott-Chapman, 2013; Bond, 2007; Hancock, 2013). Education support services provide academic support with the goal that students are able to perform either as well as their non-ill counterparts or to their fullest potential.

Importantly, all children and adolescents have a right to education, including children and adolescents who require hospitalisation due to a chronic illness (Ratnapalan, 2009). Access to education is a fundamental human right for children and adolescents that is enshrined in international law. According to international law, countries have obligations of making available primary education that is compulsory and free to all, secondary education that is generally available and accessible to all, and access to educational programmes on the basis of non-discrimination and equality of educational opportunity (Hodgson, 2012). As such, governments around the world, most often through their ministries or departments of education, invest significant amounts in education support services for children and adolescents with chronic health conditions, especially in children's hospitals. Delivering education support to children and adolescents with a chronic health condition is, therefore, considered an important step in terms of equity and in assisting school-aged students with chronic health conditions to reach their academic potential and to become successful and engaged learners. However, there is very limited evidence on the effectiveness of educational support interventions in improving school engagement and educational outcomes for children and adolescents with chronic health conditions and a scarcity of research evidence outlining best practice models. Moreover, much of the evidence relates to a particular diagnostic illness category with few studies investigating the common impacts of chronic health conditions and effectiveness of education support interventions more generally. Such a non-categorical approach is useful in public policy decision-making in which interventions may be provided universally with the expectation that they will be tailored at the local level to suit specific needs or conditions.

Chronic health conditions in children and adolescents are generally managed throughout the healthcare system, including primary care (e.g., general practice), community-based specialist services (e.g., community health centres, private paediatricians) and hospitals. However, educational support programmes for children and adolescents with chronic health conditions may be provided within either the healthcare or education systems. As such, this review will investigate the effectiveness of educational interventions across the healthcare and education systems at a global scale.

**Description of the Intervention**

This review will include educational support interventions delivered to children and adolescents with a chronic health condition who may miss school due to illness, some of
whom may or may not have been hospitalised due to their chronic illness. As such, educational support interventions may be provided in settings external to regular school environments (e.g., children’s hospitals, community settings or in the home). We will include educational interventions that target one or more of the four sites of hospital, home, community setting or school in this review. This approach is consistent with Daraganova (2013), who stated that, “to improve school attendance, interventions should be implemented at different levels (i.e., individual, family and community) and targeted toward specific subgroups in the population” (p. 75). Educational support may be delivered by hospital-based school teachers, community-based school teachers or by teachers from a student’s regular school. Educational support aims to assist children and adolescents who are unable to attend their regular school because of illness to meet their educational needs and goals despite absence from school, with efforts often focusing on facilitating a smooth re-entry to school (Kaffenberger, 2006; Madan-Swain, 2008). Education support may include one-to-one or group tuition and is often highly personalised.

**How the Intervention Might Work**

Figure 1 provides a logic model depicting how we hypothesise education support interventions for children and adolescents might work. The logic model includes the inputs, modifiable factors that the interventions may target, and the logical/theorised intermediary and primary outcomes that are aimed to be affected by the intervention.

Educational support interventions for children and adolescents with chronic health conditions may be delivered in the hospital, school, home or community setting, and may target the child, family, school or hospital staff (e.g., multidisciplinary teams). They may be provided by a child’s parent(s) or carer(s), the child's regular school (sometimes referred to as the 'home school'), the regional/district school authority, the hospital (in the case of long periods of inpatient stays or frequent outpatient visits), private provider organisations or community-based organisations. This approach is consistent with a socio-ecological model that acknowledges the complex interplay between the systems in which children and adolescents are immersed, and the influence of these systems on their development. This review will focus on education support interventions that at minimum have direct involvement with the child (i.e., the sphere of service delivery is at least at the level of the child). These interventions could take the form of one or more of the following formats in either one-to-one or group sessions: face-to-face interaction, online interactions, synchronised or asynchronised, or virtual classroom interactions. These features of the intervention are captured as inputs in the logic model, information about which we will gather in this review to help inform our investigation of the nature of educational support interventions.
Educational support interventions delivered to children and adolescents with a chronic health condition aim to target some of the known modifiable predictors of engagement and academic achievement. These modifiable factors are identified in the logic model as attitudes to school, school connectedness and anxiety, each of which will be described below in the context of how we propose educational support interventions might work.

Research has shown that students' attitudes to school, including motivation and approach to learning, are important predictors of school engagement, including 'drop-out', and academic achievement (Froiland, 2014; Hillman, 2010; Li-Grining, 2010).

Educational support interventions for children and adolescents with chronic health conditions aim to build a sense of connectedness to school staff and peers. This is because "research has shown that students who feel more accepted, included and involved in their school are more likely to be engaged in classroom learning, in extracurricular activities, in interpersonal relationships, and in the wider school community" (Robinson, 2014, p. 14). School connectedness refers to the quality and number of connections students have with 'place' (the school) and 'people' (teachers, other school staff and peers) (Bond, 2007; Maslow, 2012; Robinson, 2014). Improving school connectedness is important as research has linked feelings of belonging and connectedness to a range of school outcomes including aspects of school engagement and achievement (see review by Osterman, 2000). Maslow (2012) found that, for students with chronic health conditions, school connectedness was an
important predictor of academic achievement (i.e., college graduation). Furthermore, social support (e.g., having close friends) has been identified as an important factor that assists young people to manage the effects of their chronic illness on school functioning (Lightfoot, 1999; Shiu, 2004). A student’s connectedness to school and their peers has also been linked to later mental health and academic outcomes (Bond, 2007; Pittman, 2007).

Children and adolescents with certain chronic health conditions (e.g., chronic fatigue syndrome, epilepsy and asthma) are known to experience heightened levels of anxiety (Pinquart, 2011). Many children and adolescents with a chronic health condition, their parents and their teachers are also concerned about the effects of having a chronic health condition on school work, on keeping connected to peers and peer relationships, and school attendance (Shiu, 2004; Yates, 2010). High levels of intense stress and anxiety, if not managed well, can affect functioning and impede learning, with the risk of negatively affecting school functioning and academic performance. Educational support interventions may aim to alleviate some of the psychological stress and anxiety associated with the effects of the chronic health condition thereby reducing the ‘impairment’ of the condition and assist in building adaptive functioning (Power, 2006). Furthermore, educational support delivered to children and adolescents with chronic health conditions aims to provide students with ongoing learning opportunities, despite not being able to attend their regular school because of illness. This continuity in learning promotes and supports students to keep up-to-date with their school work or learning goals so that academic performance and progress is not negatively impacted due to school absenteeism. Reducing anxiety through receipt of educational support may, therefore, lead to improved mental health and better academic functioning given that mental health problems and school functioning are clearly related (DeSocio, 2004). However, we also acknowledge that anxiety can of itself be a type of mental illness and research has indicated that anxiety disorders are related to lower levels of educational participation (DeSocio, 2004; Woodward, 2001).

Modifying attitudes to school, school connectedness and anxiety through educational support is, therefore, hypothesised to lead to improved mental health, better quality of life and may facilitate a smoother transition to school (i.e., adjusting to school life after having been absent from school due to a chronic health condition). We identify these as intermediary outcomes as they can of themselves have a direct relationship with school engagement and academic achievement.

Underpinning this logic model is the context in which the intervention is delivered that can influence not only the intervention itself, but also the modifiable factors, intermediary outcomes and primary outcomes. These contextual factors may include severity of illness and degree of cognitive impairment and physical disability associated with the chronic health condition, as well as if the condition is a mental health or physical health condition. They may include potential features of the population such as age/grade level. We have also selected features from the PROGRESS (Place of residence, Race/ethnicity/culture/language, Occupation, Gender/sex, Religion, Education, Socioeconomic status, and Social capital;
O’Neill, 2014) framework, to collect information so to, where possible, perform subgroup analysis including gender, place of residence, parental occupation, parental education and socioeconomic status.

**Why it is Important to do This Review**

The purpose of this review is to examine and describe the current state of the evidence about the effectiveness of education support services for children and adolescents with a chronic health condition. To date, there appears to be little research detailing the types and effectiveness of models of educational support services for children and adolescents with chronic health conditions. From scoping searches, the evidence appears limited to qualitative studies, expert opinions, case studies and literature reviews. The quality of this literature has not been reported. Much of the evidence is limited to specific conditions (e.g., Prevatt (2000) reviewed school reintegration programmes for children with cancer). One exception is a literature review conducted by Canter (2012), which explored the effectiveness of school reintegration interventions for children with chronic health conditions. Canter found that these interventions were more effective in increasing knowledge about the child’s illness than changing attitudes about chronic health conditions. Moderate improvements in reports of self worth of the ill/injured child were also noted after interventions in four studies included in the Canter review.

The approach used in Canter (2012) differs from the current systematic review in a number of ways. Canter examined school re-entry programmes for ill or injured children, whereas our review will not focus on injured children unless their injury is associated with, or results in, a chronic health condition. Canter examined interventions specific to an injured/ill child’s return to school, whereas our review will adopt a broader examination of educational support interventions provided to children and adolescents with a chronic health condition while in hospital, at home or at school re-entry. Finally, Canter examined school reintegration programmes and their effect on the outcomes of changing knowledge about, and attitudes towards, chronic illnesses primarily among the ill-student’s teachers and peers. Our review will examine the impact of educational support services on school engagement and academic attainment outcomes as experienced by students with chronic health conditions who have received educational support services. To our knowledge, there are no systematic reviews on this topic.

In conducting our review, we are motivated by a desire to build the knowledge base about effective models of education support for children and adolescents with a chronic health condition. Information derived from this review can inform current and future research, practice and policy decisions and is expected to be of interest to those who fund or deliver (or both) educational support programmes to children and adolescents with chronic health conditions. Findings from this review may inform future improved models of educational support interventions. Improving models of educational support not only has potential for enhancing students’ educational trajectories, but also has clinical relevance, as it is well
acknowledged that education influences health and well-being (Cohen, 2013). Given the interplay between education and health, it is imperative that education features in the holistic provision of care of a child or adolescent with a chronic health condition. This review is also expected to provide an initial examination of the evidence on this topic, which in addition to highlighting research gaps and future research opportunities, will also provide an opportunity to capture developments over time in future updates of the review.

**OBJECTIVES OF THE REVIEW**

To describe the nature of educational support interventions for children and adolescents with a chronic health condition, and to examine the effectiveness of these educational support interventions on school engagement and academic achievement.

**METHODS**

**Criteria for Considering Studies for this Review**

*Types of Studies*

We will include randomised controlled trials (RCTs) in our review as they are well understood to be the ideal method for evaluating the efficacy and effectiveness of healthcare interventions (National Forum on Early Childhood, 2007; O'Connor, 2011). Importantly, RCTs are considered less vulnerable to bias compared with other study designs (Lewis, 2004); however, there are sometimes ethical and feasibility issues that limit the utility of RCTs (Roland, 1998). It is unlikely that RCTs will be the sole research study design used to evaluate the effectiveness of educational support interventions for children and adolescents with chronic health conditions. As such, we will also include non-randomised studies, which are studies that use non-random methods to allocate people to treatment arms (Reeves, 2011). It is possible that we will encounter non-randomised trials, as it is often not desirable or ethical (or both) to randomise participants systematically into different conditions in school and hospital settings. We will consider controlled before-and-after studies for inclusion in our review. Controlled before-and-after studies incorporate a control group with similar characteristics to the intervention group; however, the group allocation is based on a non-random method. In addition, the intervention and control groups are assessed before and after the intervention. Finally, our review will include studies using an interrupted time series (ITS) design. This study design involves measuring outcomes in people on multiple occasions before the intervention to identify underlying trends and on multiple occasions after the intervention. The observations collected after the intervention provide information as to whether the observed trend noted post intervention is different to that of the underlying trend. ITS may or may not have a control group.

We expect to find other study designs in our search (e.g., cross-sectional studies); however, due to the potential high risk of bias associated with these studies and the questionable
reliability of evidence produced from such studies, we will not include them in our review. However, we will record the different types of studies that we find and exclude from our review so that we can comment on the current state of evidence in this field.

We understand that both RCTs and non-randomised studies may be susceptible to bias, and as such, we will examine and report risk of bias for all included studies. For studies involving a control group, we will accept studies where group allocation was conducted at the cluster level.

We will also include qualitative studies if they were conducted within the context of an included quantitative intervention study. We will report on qualitative data if the qualitative information is about the effectiveness of the intervention or factors influencing intervention effectiveness (e.g., enablers or inhibitors). Qualitative information on factors that may influence intervention effectiveness has the potential to provide information about why an intervention may have been effective or ineffective, which we believe would be of interest to readers. We will exclude standalone qualitative studies from our review.

**Types of Participants**

Participants will include children and adolescents aged four to 18 years who have a chronic illness or chronic health condition as defined in Description of the condition. We also note that in the US the term 'special healthcare needs' is often used either instead of, or to refer to, people with chronic health conditions. While not widely used outside of the US, we will include studies on children and adolescents with special healthcare needs on the condition that the population in the study is described as having a 'chronic' health condition. We justify this as the definition of special healthcare needs is broader than that of chronic illness. Children with special healthcare needs are "those who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally" (McPherson, 1998, p. 138). In this definition, the presence of a chronic health condition is considered together with the degree of support required to aide healthy functioning. As such, children and adolescents with a chronic health condition, disability, mental disorder (or a combination of these) could be captured under the broad umbrella term of special healthcare needs should they meet the service usage criteria of the special healthcare needs definition. In some circumstances, people may be captured under the definition of special healthcare needs when they have not yet experienced a chronic health condition, as the definition includes those who are at risk of developing a chronic illness due to biological and environmental risks. We will not include people at risk of developing a chronic health condition in our review.

The review will include studies with children and adolescents who have any chronic health condition regardless of severity. It is understood that not all children and adolescents with a chronic health condition experience negative educational outcomes due to school absenteeism caused by their illness. However, children and adolescents with more severe
chronic health conditions miss substantial amounts of school because of their illness (Moonie, 2006; Newacheck, 1992), and for these pupils, school functioning may be impacted. Therefore, we will collect information about severity of condition and number of days of school absenteeism so that we can perform a subgroup analysis to examine the potential impact of severity of disease on learning and developmental outcomes. We will include studies of children and adolescents with a chronic health condition who have been hospitalised or who have had regular specialist medical intervention. We will also include studies of children and adolescents with a chronic health condition who are not necessarily hospitalised but who may be absent from school due to their illness. This is because there are certain conditions (e.g., chronic fatigue syndrome) that may not be severe enough to require hospitalisation or intense medical attention but have associated functional impairments that may lead to school absences and may place pupils at risk of school disengagement, poor quality of life and poor educational outcomes.

We will not place any restrictions on studies and participants in our review by gender, developed or developing country status, or socioeconomic status.

Types of Interventions

This review will examine education support interventions wherever they are delivered throughout the child’s journey from hospital to home to school. It will also include education support interventions provided to children and adolescents with a chronic health condition who are not hospitalised but who may miss school due to the health condition. Interventions may vary according to two constructs: where the intervention is delivered, and the principal provider or co-ordinator of support. Generally, interventions are delivered in one or more of the following four sites: home, hospital, regular school or community, and may target the child, family, school, hospital, community or a combination of these. Similarly, interventions may be delivered or co-ordinated principally by the parents/carers, hospital, regular school or community-based organisation. These are depicted in the logic model (see Figure 1).

We will include multi-component interventions only if they have a direct education intervention component to the child or adolescent. For example, we will exclude a support intervention that makes changes to the physical environment of a school to better accommodate the needs of a child or adolescent with a chronic health condition and that runs information sessions for parents/carers or students (or both), but does not include a direct education intervention component to the child or adolescent with a chronic health condition.

Where possible, interventions may be compared with people receiving no treatment (i.e., people who do not receive education support over and above that received by a child without a chronic illness). It may be possible that a new intervention is compared with an existing intervention; in this case, we will seek advice from a statistician about how best to analyse data from such non-inferiority and equivalence designed studies.
Types of Outcome Measures

This review will involve studies reporting on school engagement or academic achievement, or both. They may also report on a series of secondary outcomes including quality of life, transition to school, mental health and adverse outcomes. We will consider short-term and long-term outcomes for inclusion in the review (i.e. we will not place a restriction based on timing of outcomes). These can be seen as key outcomes in the logic model (Figure 1).

School Engagement

School engagement can be defined as "the extent to which students identify with and value schooling outcomes, and participate in academic and non-academic school activities" (Willms, 2003, p. 8). School engagement is multi-faceted involving behavioural engagement, emotional engagement and cognitive engagement (Fredricks, 2004). Behavioural engagement relates to participation (e.g., school attendance, school drop-out) and is typically measured via teacher ratings and student self report (Fredricks, 2004). Emotional engagement encapsulates a student’s affective reaction to school and represents the bonds and ties one has to school. Self-report is commonly used to measure emotional engagement (Fredricks, 2004). Cognitive engagement includes the investment one places in learning and also includes "perceptions and beliefs related to self, school, teachers, and other students" (Jimerson, 2003, p. 7). Cognitive engagement is often measured via observational techniques or self-report (or both) (Fredricks, 2004). We will include studies with outcomes that fit with all or part of this definition of school engagement in this review.

The reasons to include school engagement as a primary outcome of this review are two-fold. First, research suggests that young people with chronic health conditions are at risk of school disengagement and poor academic achievement (Cadman, 1987; Forrest, 2011). Second, school engagement plays an important role in influencing educational outcomes including academic achievement and persistence at school (Fredricks, 2004), and further protects against school dropout (Fredricks, 2004). School engagement, has also been associated with positive adult educational and occupational outcomes including post-compulsory school education qualifications, as well as occupation status in adulthood (Abbott-Chapman, 2013).

Academic Achievement

There is a noted association between academic achievement and poor school functioning in children and adolescents with chronic health conditions (Taras, 2005). Academic achievement is usually measured in the form of students' school test grades/scores, year level progression/repetition, high-school graduation/completion or highest level of education attained by students.

Academic achievement is considered an important outcome in the current study given that higher academic attainment has been associated with better health outcomes and healthy lifestyles (Feinstein, 2008). Furthermore, research has shown that "when poor achievement
is coupled with poor engagement (measured by truancy from school) the risk of ill health in
adulthood multiplies by 4.5” (Feinstein, 2008, p. 12). Therefore, improving the academic
achievement and school engagement of students with a chronic health condition may have a
carryover effect of improving health. In addition, higher educational attainment in
adolescence is associated with higher levels of educational attainment and higher occupation
status in adulthood (Abbott-Chapman, 2013), which illustrates the long-term impact of
school achievement on subsequent educational and occupational attainment in later life.

Quality of Life

Quality of life has been defined by the WHO as an "individual's perceptions of their position
in life in the context of the culture and value systems in which they live and in relation to
their goals, expectations, standards and concerns. It is a broad ranging concept affected in a
complex way by the person's physical health, psychological state, level of independence,
social relationships, personal beliefs and their relationship to salient features of their
environment” (WHO, 1997, p. 1)

It is often reported that people with a chronic health condition may experience impaired
quality of life. This is evidenced by research that shows that children and adolescents with
certain chronic health conditions (e.g., diabetes, asthma, cerebral palsy) report poorer
health-related quality of life than their non-ill counterparts (Varni, 2007). Children with
chronic health conditions also tend to report lower school functioning (an indicator of
health-related quality of life) compared with healthy peers (Varni, 2007). It is for these
reasons that we will include quality of life as a secondary outcome in this systematic review.

Quality of life is a multi-dimensional construct including aspects relating to physical health,
psychosocial health, emotional functioning, social functioning and school functioning. As
such, for studies that meet the inclusion criteria and include quality of life as an outcome
measure, we will closely examine and report on the indicators that the study used to measure
this construct. Some existing quality of life measures that we may expect to encounter in
studies include EQ-5D-Y, Health Utilities Index (HUI II/III), Australian Quality of Life
Instrument (AQoL), 16-D, 17-D, Quality of Wellbeing scale, Child Health Utility 9D (CHU
9D) and PedsQL.

Transition to School/School Re-entry

Some school students miss substantial amounts of school due to a chronic health condition.
When children and adolescents are absent from school for long periods, the transition back
to school can be difficult (Kaffenberger, 2006). Educational support interventions delivered
to children and adolescents who have been hospitalised because of a chronic health
condition therefore "enhances the student's learning potential while ill, and facilitates a
smoother return to school” (Ratnapalan, 2009, p. 433). It has been said that "model school
reentry programs target school attendance as a primary goal to reintegrate the child into the
academic programming and to symbolize a return to normalcy” (Shaw, 2008, p. 76).
Therefore, we will include school re-entry, which involves a student’s return to school following school absence or hospitalisation due to a chronic health condition, as a secondary outcome of educational support services for children and adolescents with a chronic health condition. We will examine the success by which school children and adolescents with chronic health conditions transition from home or hospital to school by assessing information relating to school attendance and school absenteeism when returning to school. We will also examine other indicators of students' adjustment to school (e.g., relationships with peers) following the transition back to school after being absent from school or hospitalised.

**Mental Health**

The WHO describes mental health as "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community" (WHO, 2014).

In our logic model (see Figure 1), we have included mental health as an important secondary outcome for our review. This is because chronic illness experienced by children and adolescents is associated with greater psychological stress and reduced sense of well-being for the child, their siblings and parents/carers (Stuber, 1996). Quach (2014) found that children with a chronic illness experienced poorer psychosocial functioning compared with children without a chronic health condition. In one meta-analysis of 87 studies, children and adolescents with chronic physical disorders were also found to report higher rates of psychological adjustment problems including internalising and externalising problems as compared with controls (Lavigne, 1992). These studies suggest that having a chronic health condition can negatively impact mental health. In addition, mental health issues can inhibit academic attainment (Fletcher, 2008), and school problems and emotional distress can be experienced concurrently for some students (Roeser, 1998). Therefore, educational support provided to children and adolescents with a chronic health condition has potential to alleviate some of the stress and anxiety associated with chronic illness, and in doing so improve their mental health status. Improvements to mental health may in turn enhance learning, school engagement and educational attainment in the longer term.

We will focus on capturing the mental health outcomes as they relate to the emotional well-being of children and adolescents with chronic health conditions (e.g., depression, anxiety, self esteem). Valid and reliable mental health measures used with children or adolescents that we might expect to encounter include, but are not limited to, Kessler Psychological Distress Scale, Mental Health Inventory, Strengths and Difficulties Questionnaire, Beck Depression Inventory, Depression Anxiety Stress Scale and Child Behaviour Checklist.

**Adverse Outcomes**

We will report on any adverse outcomes (or harms) of the intervention. For instance, while poor school engagement may be associated with increased stress and anxiety, the reverse
may also be true, namely that chronically ill children and adolescents who receive educational support may experience poorer mental health (e.g., increased anxiety and reduced coping) due to the expectation of participation in educational support programmes.

**Search Methods for Identification of Studies**

This review covers topics relating to education, psychology, and health, which necessitates a thorough multi-disciplinary search. We will not limit our search to specific languages or publication status. Two review authors (MT and TB) will conduct the searches with guidance from a librarian from the Royal Children's Hospital (Melbourne).

**Electronic Searches**

We will search the following electronic databases, which span the health/medical, social sciences and education disciplines:

- Cochrane Public Health Group public health register
- Cochrane Central Register of Controlled Trials (CENTRAL)
- MEDLINE (Ovid)
- EMBASE (Ovid)
- CINAHL (EBSCO)
- PsycINFO (EBSCO)
- ERIC (Education Resources Information Center)
- Applied Social Sciences Index and Abstracts: ASSIA (ProQuest)
- PubMed (from 2014)

We developed a preliminary search strategy in MEDLINE in consultation with a librarian at the Royal Children's Hospital (Melbourne, Australia) and the Cochrane Public Health Group Trials Search Co-ordinator (see Appendix 1). The search strategy involved using Boolean operators to combine search terms (both text words and controlled vocabulary) relating to the population (i.e., hospitalized children/adolescents or children/adolescents with a chronic illness) and the intervention (i.e., educational support). As part of our search of the population, we will also include specific chronic illness disease search terms based on their relative prevalence and known impact of causing significant absence from schooling and education (e.g., cancer, cystic fibrosis, eating disorders, and scoliosis).

While our population of interest is children and adolescents with chronic health conditions, we have decided to also include hospitalized children/adolescents in the electronic search strategy and will manually review titles and abstracts for the selection of studies that are based on children/adolescents with a chronic health condition. We have chosen to do so as there is little consistency in the use of either the term or definition of chronic illness or chronic health conditions. For example, as some chronic health conditions (but not all) are also associated with a disability or mental illness, published potentially relevant studies that refer to disability or mental health problems would be missed if we were to use solely chronic
illness search terms in our electronic search strategy. This is also true for studies on chronic illness that are classified as special healthcare needs or described by a specific illness type. Thus, we believe our approach will better capture potentially relevant studies on chronic health conditions regardless of whether they are described in terms of disability, mental illness or special healthcare needs. Furthermore, we will include in our electronic search the link to hospital as a proxy for severity of chronic illness.

In addition, we will manually search the results of our initial search for studies that meet our study design inclusion criteria instead of using search terms reflecting study designs. We will closely replicate this search strategy in each of the electronic databases.

**Searching Other Resources**

We will handsearch the top five journals from our list of eligible studies for the 12 months prior to our electronic search date. We will also search the bibliographies of included studies and existing reviews to identify additional published and unpublished studies via trial registries and sources of theses and conference abstracts. These will include:

- ClinicalTrials.gov ([www.clinicaltrials.gov/](http://www.clinicaltrials.gov/))
- WHO International Clinical Trials Registry platform ([www.apps.who.int/trialsearch/](http://www.apps.who.int/trialsearch/))
- Australian New Zealand Clinical Trials Registry ([www.anzctr.org.au/](http://www.anzctr.org.au/))
- OpenGrey ([www.greynet.org/opengreyrepository.html](http://www.greynet.org/opengreyrepository.html))
- National Technical Information Service ([www.ntis.gov](http://www.ntis.gov))
- OpenSIGLE; ProQuest Dissertation and Theses database

We will also contact organisations and individual experts in the field (including members of the advisory group) via email and request that they identify potentially relevant studies that may have been published or studies that may be ongoing.

**Data Collection and Analysis**

**Selection of Studies**

We will import search results (including titles and abstracts) into the reference management software Endnote X7. We will initially remove duplicate records from Endnote. Two review authors will independently screen the remaining citations in Endnote and assess them for inclusion. The review authors will independently use a checklist outlining the inclusion criteria to assess the eligibility of each study for inclusion in this review.
To be considered for inclusion in the review, the study must meet the following criteria:

- **participants**: must include children or adolescents (aged four to 18 years) with a chronic health condition. We will also include studies involving children or adolescents with special healthcare needs providing the study reports findings with a reference to chronic illness;
- **intervention**: must include educational support;
- **outcomes**: must report the primary outcomes (e.g., school engagement or academic performance) or secondary outcomes (e.g., quality of life, transition to school/school re-entry, mental health or adverse outcomes);
- **type of study**: must be an RCT, non-RCT, controlled before-and-after study or ITS.

We will retrieve the full texts of potentially relevant studies identified through the screening process or studies where the eligibility is unclear. Two review authors (MT and TB) will independently review each study and record details about final inclusion/exclusion decisions, including reasons supporting each decision in the 'Characteristics of included studies' table. We will detail information about the excluded studies in the 'Characteristics of excluded studies' table.

If there is a discrepancy between the two review authors about a decision to include/exclude a particular study, the two review authors will discuss the matter to try to resolve the disagreement. In the event that consensus is not achieved, a third review author (SS) will arbitrate. If required, we will contact study authors and request further information about the study to clarify this process.

**Data Extraction and Management**

We will retrieve the full texts of studies that meet the inclusion criteria. Two review authors (MT and TB) will independently extract study characteristic data, risk of bias data and outcome data from the full texts of included studies using a data extraction form, before entering the information into Review Manager 5 (RevMan, 2012). We will develop the data extraction form based on the Cochrane Public Health Group Methods Manual (Cochrane Public Health Group, 2011), and we will include a risk of bias assessment. We will pilot the data extraction form to assess the consistency of the data extracted by two review authors.

The data extraction form will collect information about study context, including information about the study methods, participants, details of the intervention, outcomes explored and analyses used. As part of this process, we will collect socio-demographic information about the sample in the included studies (where available) based on the PROGRESS framework (i.e., gender, place of residence, parental occupation, parental education, and socio-economic status) so as to examine the outcomes from an equity perspective. We will report this information, along with information about the risk of bias of each study, in the 'Characteristics of included studies' table. We will also include information about study
outcomes and potential moderators/confounders (e.g., illness type, child age: see Crump 2013) of the study outcomes in the data extraction form. We will record information about outcomes in the 'Characteristics of included studies' table and the 'Summary of findings' table.

Where available, we will extract the key characteristics of included studies including:

- **descriptive information:**
  - author;
  - year of publication;
  - year of study;

- **study methods:**
  - research question(s);
  - research aim(s);
  - study design (including information about the timing of assessments);
  - consent rate;

- **participants:**
  - demographics, using the PROGRESS checklist;
  - age/year level;
  - chronic illness type;
  - severity of chronic illness;
  - physical disability or cognitive disability, or both;
  - mental health condition or physical health condition, or both;
  - number of school days missed because of chronic illness;

- **location:**
  - country;

- **details/nature of intervention:**
  - name of intervention;
  - description of intervention, including who delivered the intervention, what was delivered, where it was delivered and to whom it was delivered, as well as information pertaining to the multi-component nature of the intervention;
  - theoretical foundation of intervention;
  - setting (site of delivery) of intervention (e.g., home, hospital, regular school or community-based);
  - principal provider or co-ordinator of intervention (e.g., home, hospital, regular school or community-based);
  - target of intervention (e.g., child, family, school, hospital, community);
  - staffing (e.g., roles and numbers);
  - pedagogy (e.g., personalised, individual or group);
  - technology;
  - duration and intensity of intervention;
  - format of intervention;
  - cost of intervention;
• outcomes:
  o primary outcomes (e.g., school engagement, academic performance) and measures used to assess outcome;
  o secondary outcomes (e.g., quality of life, transition to school/school re-entry, mental health, adverse outcomes) and measures used to assess outcome;
  o potential confounders/moderators (e.g., health/well-being, illness severity, chronic illness type);

• analysis:
  o how the data were analysed;

• other:
  o risk of bias information;
  o source(s) of research funding;
  o potential conflicts of interest;
  o implications for replication;
  o qualitative information on effectiveness.

If disagreements in data extraction arise between review authors, the two review authors involved will discuss the discrepancy with reference to the original full-text paper to try to reach consensus. If required, we may also confer with a third review author (SS). We will contact authors of included studies if additional information is required (e.g., if data are missing or if raw data are required).

In the event that we find multiple publications reporting on the same study, in the first instance we will use the most recently published source as our primary reference. If information from the study is missing from this primary reference, we will also refer to earlier publications.

**Assessment of Risk of Bias in Included Studies**

We will assess the risk of bias of included RCTs and non-RCTs (involving a separate control group) using the 'Effective Practice and the Organisation of Care' 'Risk of bias' tool. This tool assesses selection bias (i.e., random sequence generation and allocation concealment), performance bias (i.e., blinding of participants and personnel), detection bias (i.e., blinding of outcome assessment), attrition bias (i.e., incomplete outcome data), reporting bias (i.e., selective reporting), potential contaminations and other sources of bias. We will assess risk of bias in ITS studies using the 'Effective Practice and the Organisation of Care' 'Risk of bias' tool for ITS study designs.

Two review authors will independently undertake the risk of bias assessments. We will resolve disagreements between the review authors risk of bias judgements through discussion; however, if unresolved, we may consult a third review author. If information
required to assess the risk of bias is missing in the text, we will contact authors of included studies to request this additional information.

We will record risk of bias judgements (e.g., 'low risk', 'high risk' and 'unclear risk'), along with evidence to support these judgements under the 'Risk of bias' section in the 'Characteristics of included studies' table. We will base decisions on risk of material bias (i.e., "bias of sufficient magnitude to have a notable impact on the results or conclusions of the trial" (Higgins, 2011a: Section 8.5.3)). We will follow the criteria for judging risk of bias in our included studies as detailed in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins, 2011a), as a basis for judging bias across the seven domains. We will summarise overall risk of bias for each included study by study outcome.

**Measures of Treatment Effect**

It is likely that categorical, continuous and ordinal data will be used to measure outcomes in the included studies. Therefore, we aim to provide an account of the extent to which these outcomes change in the included studies of our review.

Data summary statistics for studies reporting continuous outcomes will include mean scores and standard deviations. We will report pre-intervention and post-intervention mean scores (and standard deviations) on the continuous outcome measures for both intervention and control groups where available. We will also record the total number of participants who were measured in each study condition. We will report the mean difference between intervention and control groups to ascertain the degree to which the intervention group change differs from the control group change. We will report standard deviations and 95% confidence intervals. It is likely that studies will use different scales to measure the continuous outcomes explored in this review. In this circumstance, we will report standardised mean differences with 95% confidence intervals. Statistical methods for reporting ordinal data (e.g., measurement scales) will be consistent with methods used to report continuous data.

For studies reporting dichotomous data, we will present proportions based on the number of participants in each outcome category for the intervention and control groups. Therefore, we will collect information about the number of events and the total number in each group for this purpose. We will use risk ratios with 95% confidence intervals to express the treatment effects for the dichotomous outcomes in the intervention and control groups. We will assess intervention effects by calculating the risk difference (i.e., absolute risk difference) between control and intervention groups on the dichotomous outcome measures.

Once we have selected studies, we will confirm the analytic approach with a statistician based on the included studies. However, it is anticipated that it is unlikely that we will retrieve a sufficient number of comparable studies to conduct a meta-analysis. If this is confirmed, we will present the results from individual studies in table form. If a meta-analysis is appropriate, we will conduct a meta-analysis for each study design separately.
Finally, and as previously mentioned, we will include qualitative studies in our review if they were conducted within the context of an included quantitative intervention study. We will report on qualitative data if the information is about the effectiveness of the intervention or factors influencing intervention effectiveness (e.g., enablers and inhibitors). Qualitative information on factors that may influence intervention effectiveness has the potential to provide information about why an intervention may have been either effective or not effective, which we believe would be of interest to readers. We will report on the qualitative data/findings in a descriptive and summative manner. We will not do a primary analysis of qualitative data or synthesis of qualitative data across studies.

**Unit of Analysis Issues**

*Clustered Trials*

We will include studies where group allocation has been conducted at the cluster level (e.g. hospital, school) and thus the group should be the unit of analysis. It is possible that for cluster RCTs and cluster non-RCTs, authors may have undertaken analysis at the individual level while not accounting for the effects of group clustering. In these circumstances, we will make adjustments for the effect of clustering by reducing the effective sample sizes of included trials (by calculating the sample size divided by the design effect) using the methods outlined in Higgins (2011b) (Section 16.3.4). We will divide the sample size of both the overall sample and the sample size of those in the events category by the design effect. Where an intraclass correlation coefficient (ICC) is not available from the trial for the purpose of calculating the design effect, we will use ICC estimates from external sources (from similar studies).

We will conduct a sensitivity analysis to examine the impact of trials that did not originally adjust for the effects of clustering on the meta-analysis results.

*Multiple Treatment Groups*

It is possible that trials may compare multiple interventions. In these circumstances, we will combine the intervention groups (which meet the eligibility criteria and if appropriately similar) to form one group, while we will combine the other groups to form the comparison group.

If trials include multiple intervention groups that are substantially different, and each intervention meets the eligibility criteria, we may choose to conduct pair-wise comparisons. In these analyses, we will half the comparison group in each pair-wise comparison to ensure that participants are not included in the analysis twice.

*Multi-component Interventions*

We will accept multi-component interventions if they have a direct education intervention component to the child or adolescent with a chronic health condition. We will capture
information about the different components of the intervention when collecting information about the nature of interventions. Where information about the multi-component nature of the intervention is available, we will develop an index of the degree to which the intervention has components that work across the different ecological levels and test for differences in outcomes according to this index using a subgroup analysis.

**Non-inferiority Studies**

It may be possible that a new intervention is compared with an existing intervention; in these cases, we will seek advice from a statistician about how best to analyse data from such non-inferiority and equivalence designed studies.

**Dealing with Missing Data**

Missing data can be related to publication bias and reporting bias. We will extract and record missing data and retention data using the procedures described in Data extraction and management. We will report information about biases in the 'Risk of bias' section in the 'Characteristics of studies' table.

In addition, we will employ the following strategies to deal with different types of missing data in our review.

- Where there is missing information on methods of the included studies, we will contact authors of trials to obtain information on the methods used or to clarify the methods when this is unclear in the paper.
- We will contact authors by email in the first instance, using contact details provided in the publication. We will contact authors of original papers to obtain missing data required for the analysis, including missing outcome data. We will also contact study authors to ascertain the reasons for this missing data.
- Whenever possible, we plan to conduct our analyses using an intention-to-treat methodology, which involves using all participants who were initially randomised in the trial in the analyses. In the analyses, the group treatment that participants were initially allocated to (e.g. intervention group versus control group) will be analysed accordingly, regardless of the subsequent treatment received or irrespective of whether participants were lost at follow-up.
- Where summary data are missing, we will calculate these data using existing information as provided in the paper (e.g. using confidence intervals, standard errors, t values, p values, F values). Where we cannot calculate standard deviations and standard deviations of the change due to missing data of supplementary statistics, we will impute the standard deviations and standard deviations of change statistics from other existing studies in this review or from studies from a different review.
**Assessment of Heterogeneity**

We will examine study heterogeneity by comparing the study characteristics of trials that meet the inclusion criteria. Included in this assessment will be an examination of similarities and differences in study design, participants, interventions and outcome measures across the studies. For a meta-analysis to be undertaken, there will need to be an adequate number of studies with study characteristics deemed sufficiently similar. In the event that a meta-analysis is appropriate, we will construct and visually inspect a forest plot (using a random-effects model), and will examine the $I^2$ statistic (using the threshold of 75% or greater to indicate considerable heterogeneity) along with the chi-square test for heterogeneity (using $P$ value $\leq 0.1$ to indicate considerable heterogeneity), to determine the statistical heterogeneity. If we determine that there is a high level of unexplained heterogeneity, we will present a table of the results of individual studies and provide a narrative overview of the results in lieu of pooling the studies in a meta-analysis, and will interpret the results with caution given the substantial heterogeneity noted across studies.

**Assessment of Reporting Biases**

We will extract information on potential reporting biases as described in Data extraction and management. Likely types of reporting biases on this topic are: publication bias, outcome reporting bias, citation bias and time lag bias.

In the event that we include only a small number of studies (10 or fewer) in the review, we will describe reporting biases in the 'Risk of bias' tables.

If the number of studies included in the review exceeds 10, we will produce a funnel plot (plotting the effect estimates of individual studies against a measure of study precision, e.g., the standard error of the intervention effect) in Review Manager 5 (RevMan, 2012), and will initially examine potential reporting bias via this funnel plot.

We will undertake a visual inspection of the funnel plot for asymmetry. Asymmetrical funnel plots may signal potential reporting (publication) bias. However, it has been argued that a visual inspection of funnel plots may be subjective (Sterne, 2011). Therefore, where we suspect that there is potential reporting bias in the studies reporting on the same outcome, we will consult with a statistician regarding the most appropriate test for funnel plot asymmetry based on the options proposed in Sterne (2011) (Table 10.4.b), and in light of the visual inspection of the funnel plot.

**Data Synthesis**

Should we have a sufficient number of comparable studies (based on study characteristics and study design) that report on the same outcomes, we plan to provide an overall estimate of treatment effect by undertaking a meta-analysis using a random-effects model, given that we expect that the studies will be naturally heterogeneous.
We will examine the pooled estimate of treatment effects for RCTs using meta-analyses. Likewise, we will examine the treatment effects for non-RCTs separate to that of RCTs. We will examine treatment effects for non-RCTs, controlled before-and-after study and ITS designs separately. We will also provide summaries and treatment effects by outcome for dichotomous and continuous measures separately. We will generate summary statistics and the meta-analysis in Review Manager 5 (RevMan, 2012), and compliment these by a narrative review of the results.

The meta-analysis for dichotomous outcomes will provide a pooled treatment effect using a random-effects model proposed by DerSimonian (1986) (also refer to Deeks, 2011). This will be calculated in Review Manager 5 using the Mantel-Haenszel method (RevMan, 2012). For the meta-analysis involving continuous outcomes, we will use the inverse variance random-effects method to summarise the mean differences or standardised mean differences.

If there is substantial study or statistical (or both) heterogeneity, it will not be appropriate to create a pooled estimate using a meta-analysis. In this instance, we will present the results from individual studies in table form.

We will use a 'Summary of findings' table to synthesise the findings for each primary outcome. For each outcome, this table will detail the number of participants, number of included studies and intervention effects. In addition, the table will include an evaluation of the quality of the collective evidence examined for each separate outcome as assessed using the GRADE system, whereby the body of evidence is rated based on four levels of quality from 'High' quality to 'Very Low' quality as described in the Cochrane Handbook for Systematic Reviews of Interventions (Schünemann, 2011). The GRADE approach will involve assessing the study limitations including methodological quality (within-study risk of bias), directness of evidence, heterogeneity, consistency of results, precision of results and risk of publication bias (Schünemann, 2011).

Subgroup Analysis and Investigation of Heterogeneity

Poor school outcomes and poor sequelae appear related to severity of chronic health conditions, especially in relation to co-morbid cognitive and physical disability. Likewise, severity of chronic conditions is positively associated with number of days absent from school (Newacheck, 1992). Therefore, we will conduct a subgroup analysis to examine the impact of educational support for children and adolescents according to severity of chronic health conditions. Where information about severity of chronic health conditions (e.g., number of days absent from school) is available from studies, we will dichotomise participants with chronic health conditions into two subgroups: severe conditions and non-severe conditions, and will investigate whether the effectiveness of educational support interventions differs according to severity of chronic health condition.

We also acknowledge that the nature of certain chronic health conditions (their treatments or both conditions and treatments) may directly impact academic achievement due to
cognitive impairment/disability. To address this, we plan to categorise the conditions according to the degree of cognitive impairment (i.e., no cognitive impairment, minor cognitive impairment and major cognitive impairment) in instances where information of the condition is known. We will then conduct a subgroup analysis to compare results from participants in each of the groups of varying cognitive impairment. We will also categorise and undertake a similar subgroup analysis for different levels or degrees of physical disability.

Because we may include studies examining children and adolescents with mental health conditions, and we are also interested in examining the impact of educational support interventions on students’ mental health as a secondary outcome, we will conduct a subgroup analysis that compares the results of interventions for children and adolescents with chronic mental health conditions with those who have chronic physical conditions. Conducting this subgroup analysis is of particular relevance when examining the impact of educational support interventions on mental health outcomes.

Given that it is well established that school absenteeism increases with age, we plan to conduct a subgroup analysis to examine whether the results of our review differ according to age/grade level. We will do this by comparing the results for younger students (e.g., junior primary school-aged students [preparatory to grade three; approximately aged five to eight years] and senior primary school-aged students [grade four to six; approximately aged nine to 11 years]) and older students (e.g., middle years secondary school [grade seven to nine; approximately aged 12 to 14 years] and senior secondary [grade 10 to 12; approximately aged 15 to 18 years]), separately.

As described earlier, we will conduct a subgroup analysis on studies according to the degree to which interventions work across the child’s socio-ecological spheres of influence (e.g. child, family/parent, school, hospital and community). We will code interventions on a scale of 1 to 5 according to the number of proximal and distal levels/spheres that the intervention directly operates within. We will then test our hypothesis that the more educational support interventions are delivered across the multiple socio-ecological levels, the more effective the educational support is likely to be.

We may also conduct subgroup analyses to examine the outcomes of the intervention for differing levels of disadvantage, by exploring factors relating to equity, using the PROGRESS framework. We may explore potential differential effects of the intervention according to gender, place of residence, parental occupation, parental education, and socio-economic status if the included studies provide information on these factors.

Providing that there are sufficient numbers of studies detailing adequate information relating to the subgroups of interest, we will conduct the subgroup analyses using Review Manager 5 using meta-analyses within subgroups (RevMan, 2012). We will examine differences in effects between subgroups by identifying non-overlapping confidence
intervals. We will also implement significance tests for subgroup differences using a random-effects model using Review Manager 5 (RevMan, 2012).

**Sensitivity Analysis**

It is anticipated that we will conduct a sensitivity analysis to examine whether the results of the meta-analysis differ if we exclude studies at high risk of bias. We will also conduct a sensitivity analysis on clustered trials that did not provide an estimate of ICC (in which we had to choose appropriate ICCs from alternative sources). We may consider further sensitivity analysis based on the information provided in the included studies.

**REFERENCES**


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Royal Children’s Hospital Education Institute, Australia

Salary support for MT and TB to conduct the review

Royal Children’s Hospital and University of Melbourne, Australia

Salary support for SS to assist in the review

**DECLARATIONS OF INTEREST**

None known
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**ROLES AND RESPONSIBILITIES**

MT led the draft of this review protocol. She will also be responsible for undertaking the searches, selecting studies based on the inclusion and exclusion criteria, extracting the data from studies and entering this information into Review Manager 5 (RevMan, 2012). She will assist in carrying out and interpreting the analysis. MT will lead the writing of the final review.
TB assisted in writing this protocol. He will also perform the searches and will select studies based on the inclusion criteria. TB will extract data and enter data into Review Manager 5 (RevMan, 2012). He will also carry out and interpret the analysis. TB will help write the final review and will be responsible for maintaining the review.

SS edited the protocol. SS will assist in resolving disagreements between review authors. She will also contribute to the interpretation of the analysis and will be involved in writing the final review.

SR edited the protocol. She will also assist in interpreting the analysis and drafting the final review.

ACKNOWLEDGEMENTS

This review is co-registered with the Campbell Education Group and will be co-published on The Campbell Library. We thank The Cochrane Public Health Group and the Campbell Education Group for their assistance and ongoing support in developing the review. We thank our advisory group members for their valuable feedback and contribution to this protocol. We also wish to acknowledge and thank Poh Chua from the Royal Children’s Hospital (Parkville, Australia) library for her assistance in developing the initial search strategy.
### APPENDIX A. MEDLINE SEARCH STRATEGY

<table>
<thead>
<tr>
<th>Number</th>
<th>Search String</th>
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<tbody>
<tr>
<td>1</td>
<td>(Inpatients/ or Hospitalization/ or &quot;chronic disease&quot;/ or exp <em>Neoplasms/ or exp <em>Cystic Fibrosis/ or exp <em>Eating Disorders/ or exp &quot;Scoliosis&quot;) and (child</em> or adolescent</em> or teen</em> or &quot;young person&quot; or &quot;young people&quot; or &quot;youth&quot; or boy* or girl* or pediatric or paediatric or childhood or pupil<em>1 or schoolchild</em> or schoolpupil*).ti,ab</td>
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<tr>
<td>2</td>
<td>(Inpatients/ or Hospitalization/ or &quot;chronic disease&quot;/ or exp *Neoplasms/ or exp *Cystic Fibrosis/ or exp *Eating Disorders/ or exp &quot;Scoliosis&quot;) and (exp Adolescent/ or exp Child/)</td>
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<td>3</td>
<td>((hospital* or admissions or admitted or chronic condition* or chronic health* or chronic disease* or chronic* disorder* or chronic ill* or life-long disease* or life-long disorder* or long-term disease* or long-term disorder* or long-term ill* or special health care need* or cancer* or &quot;cystic fibrosis&quot; or &quot;eating disorder*&quot; or scoliosis) adj3 (child* or adolescent* or teen* or &quot;young person&quot; or &quot;young people&quot; or &quot;youth&quot; or boy* or girl* or pediatric or paediatric or childhood or pupil<em>1 or schoolchild</em> or schoolpupil*).ti,ab</td>
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<td>4</td>
<td>(hospital* or admissions or admitted or chronic condition* or chronic health* or chronic disease* or chronic* disorder* or chronic ill* or life-long disease* or life-long disorder* or long-term disease* or long-term disorder* or long-term ill* or special health care need* or cancer* or &quot;cystic fibrosis&quot; or &quot;eating disorder*&quot; or scoliosis).ti,ab and (exp child/ or exp Adolescent/)</td>
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<tr>
<td>5</td>
<td>Adolescent, Hospitalized/ or Child, Hospitalized/ or Hospitals, Pediatric/</td>
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<td>6</td>
<td>or/1-5</td>
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<tr>
<td>7</td>
<td>(Remedial Teaching/ or Schools/) and (achievement/ or absenteeism/)</td>
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<tr>
<td>8</td>
<td>(Remedial Teaching/ or Schools/) and (achiev* or attain* or engag* or participate* or participation or absent* or absence or recent* or reent* or reintegr* or transition to school or mental health or quality of life).ti,ab</td>
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<tr>
<td>9</td>
<td>((School* or academic or education* or curricular* or maths or numeracy or literacy or &quot;key stage&quot; or ELA or &quot;english language arts&quot;) adj3 (achiev* or attain* or engag* or participate* or participation or absent* or absence or re-ent* or reent* or reintegr*).ti,ab</td>
</tr>
<tr>
<td>10</td>
<td>((School* or academic or education* or curricular* or maths or numeracy or literacy or &quot;key stage&quot; or ELA or &quot;english language arts&quot; or teacher<em>1 or schoolteacher</em>) adj4 (performance or functioning).ti,ab</td>
</tr>
<tr>
<td>11</td>
<td>((School* or academic or education* or curricular* or maths or numeracy or literacy or &quot;key stage&quot; or ELA or &quot;english language arts&quot;) adj3 (support* or service*).ti,ab</td>
</tr>
<tr>
<td>12</td>
<td>((School* or academic or curricular* or maths or numeracy or literacy or &quot;key stage&quot;) adj4 intervention).ti,ab</td>
</tr>
<tr>
<td>13</td>
<td>or/7-12</td>
</tr>
<tr>
<td>14</td>
<td>6 and 13</td>
</tr>
<tr>
<td>15</td>
<td>Adolescent, Hospitalized/ed or Child, Hospitalized/ed or inpatients/ed or hospitalization/ed</td>
</tr>
<tr>
<td>16</td>
<td>14 or 15</td>
</tr>
</tbody>
</table>