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***Scoping review*: Strategies of providing care for children with chronic health conditions in low- and middle-income countries**

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ABSTRACT

Objectives: To identify and review strategies of providing care for children living with chronic health conditions in low- and middle-income countries.

Methods: We searched MEDLINE and Cochrane EPOC databases for papers evaluating strategies of providing care for children with chronic health conditions in low- or middle-income countries. Data were systematically extracted using a standardised data charting form, and analysed according to Arksey and O'Malley's 'descriptive analytical method' for scoping reviews.

Results: Our search identified 71 papers addressing 8 chronic conditions; two chronic communicable diseases (HIV, TB) accounted for the majority of papers (n=37, 52%). Nine (13%) papers reported use of a package of care provision strategies (mostly related to HIV and/or TB in sub-Saharan Africa). Most papers addressed a narrow aspect of clinical care provision, such as patient education (n=23) or task-shifting (n=15). Few papers addressed strategies for providing care at the community (n=10, 15%) or policy (n=6, 9%) level. Low-income countries were under-represented (n=24, 34%), almost exclusively involving HIV interventions in sub-Saharan Africa (n=21). Strategies and summary findings are described and components of future models of care proposed.

Conclusions: Strategies that have been effective in reducing child mortality globally are unlikely to adequately address the needs of children with chronic health conditions in low and middle-income settings. Current evidence mostly relates to disease-specific, narrow strategies and more research is required to develop and evaluate integrated models of care which may be effective in improving outcomes for these children.

Keywords: chronic disease; delivery of health care; child; adolescent; review

INTRODUCTION

Chronic health conditions contribute substantially to global child morbidity estimates, accounting for one-third of disability adjusted life years (DALYs) lost for children <15 years(1). Common conditions include: growth and nutritional issues; consequences of birth complications and prematurity; HIV/AIDS; congenital heart disease; mental health and behavioural disorders; asthma, tuberculosis, and other chronic lung diseases; epilepsy and developmental disabilities. By definition, "chronic health conditions" feature: long disease duration (typically defined as >3 months); significant functional impairment, and; particular health service needs(2, 3).

Historically, chronic conditions of childhood have been neglected by global child health strategies which have targeted the biggest killers, and promoted care models that provide primary care for acute infectious disease and malnutrition (e.g. IMCI). The NCD movement introduced a shift away from acute communicable disease, with the formation of the NCD Alliance in 2009-2010 by the International Diabetes Federation (IDF), the Union for International Cancer Control (UICC), the World Heart Federation (WHF), and in the International Union Against TB and Lung Disease (The Union). Although the NCD movement has traditionally focused on the prevention of common adult chronic diseases, work by the Alliance's child-focused working group (and later NCD Child) has ensured that the interests of children and young people are increasingly heard – including recognition that childhood is not only a time for *exposure* to disease risk factors but also a time that many children to *experience* chronic illness(4-8). As appreciation of the impact of chronic conditions of childhood continues to grow, it is clear that better models of care are needed to serve these children and their families(9-11).

This study reviews the literature on strategies of providing care for children with chronic health conditions in low- and middle-income countries, identifying gaps and opportunities for developing improved models of care.

METHODS

This scoping review involved a systematic search, selection, data extraction, analysis and reporting methods based on the Arksey and O'Malley framework for scoping studies(12, 13). In contrast to traditional systematic reviews, which seek definitive answers to a narrow research questions, scoping reviews seek to map the existing literature on a particular topic and identify opportunities for future policy, practice, or research attention(12, 13). As such, the scoping review method requires balancing feasibility with breadth and comprehensiveness(12, 13).

Data sources

We searched the major biomedical (Medline) and healthcare delivery (Cochrane Effective Practice and Organisation of Care) databases on 8 March 2016. We included studies in low- or middle-income countries

(World Bank July 2016) that evaluated strategies of providing care for children (aged 0-18 years) with a common chronic health condition (Appendix 1). We focussed on 13 conditions: HIV/AIDS, tuberculosis, asthma, congenital and rheumatic heart disease, epilepsy, cerebral palsy, spina bifida, depression, anxiety, diabetes, congenital hypothyroidism, leukaemia/lymphoma. These conditions were selected based on their contribution to global burden of disease(1) and to represent a variety of chronic health conditions (i.e. congenital, acquired, preventable, non-preventable, communicable, non-communicable, physical, mental, developmental, curable, and non-curable). We defined "care provision strategies" as interventions or practices that directly provide care for the health benefit of the child – including clinical care and supportive care delivered in health care organisations and in the community. We restricted results to English-language, 1996-2015, believing this would include the most relevant strategies to inform a contemporary model of care.

We excluded studies involving predominantly adult populations if they did not report child-specific outcomes; studies solely evaluating directly observed treatment for tuberculosis (DOTS), prevention of mother-to-child-transmission of HIV (PMTCT), or treatment guidelines, as they have been reviewed elsewhere(14-18); and studies addressing condition-specific medical or surgical therapies if there was no direct relevance to the broader system of care. Other search strategies included searching key websites, review of reference lists, and contacting individuals through professional networks.

Two investigators (HG, MT) independently screened all titles and abstracts using pre-determined inclusion and exclusion criteria, then reviewed full-text articles for inclusion, with disagreement settled by consensus.

Data extraction and synthesis

Data were systematically extracted from studies using a standardised data charting form, including information on: population; methods; outcomes; intervention; and key findings. We adopted Arksey and O'Malley's 'descriptive analytical method' for data analysis and reporting, comprising: numerical summary of included studies; and narrative synthesis to describe key findings(12, 13). Quality was assessed using a standardised tool (EPHPP)(19).

We adopted the WHO Innovative Care for Chronic Conditions (ICCC) framework(2) as the analytical framework to guide analysis and reporting of results (Figure 1). The ICCC framework was developed following a WHO review of healthcare models, and is based on the well-known Chronic Care Model (CCM)(20, 21). It is a multi-level framework that emphasises the interaction between patients (and families), health care organisations and the community within the broader policy context(2). We report strategies based on the ICCC domain in which they are predominantly located (health care organisation, the community, or policy-level).

RESULTS

Database searches returned 421 unique results; 60 additional papers were identified from other sources. Screening of title and abstract identified 162 papers for full-text review. 91 papers were excluded after review for not including children (n=41), no intervention of interest (n=25), no outcome of interest (n=11), high-income country (n=10), or inappropriate methodology (n=4).

Seventy-one papers were included in our final analysis (Figure 2)(Table 1,2). Papers were from 34 countries, most commonly South Africa (n=9), Kenya (n=6), Uganda (n=6), and Malawi (n=6). Most papers were published after 2005 (n=59, 84%), and a minority involved a low-income country (n=24, 34%)(Figure 3).

Papers reported on 8 chronic health conditions; half concerned HIV/AIDS or tuberculosis (n=37, 52%). No studies were identified for anxiety, congenital hypothyroidism, spina bifida, or congenital or rheumatic heart disease. Almost all the studies investigating HIV/AIDS and tuberculosis were conducted in sub-Saharan Africa (37/39) and almost all the studies from sub-Saharan Africa investigated HIV/AIDS (37/40).

Types of Strategies

According to ICCC domains (Figure 1), 9 papers (13%) described strategies that significantly covered elements from multiple domains. These 'multifaceted' strategies (Table 3) will be described in more detail, followed by summary descriptions of other strategies according to their primary ICCC focus.

Multifaceted strategies

The Municipal Asthma Management Program in Brazil was a community-based program implemented by pharmacists and health workers for children with moderate to severe asthma(22). Results included good population coverage (70% of target population) and lower health service utilisation among children exposed to the program. The authors identified regular re-education by community-based health workers, and accessible location of pharmacies, as critical to success.

Six papers from South Africa(23-25), Lesotho(26), Uganda(27), and Kenya(28) evaluated multifaceted community-based HIV/AIDS treatment programs (for adults and children) that were integrated into primary care services. These programs utilised nurses to test and treat HIV and lay workers to provide education, care and support. Two similar programs in Lesotho(29), and Peru(30) involved children with multi-drug resistant tuberculosis (MDR-TB). Some programs included additional elements: 'family-centred care'(27, 28); community education(27, 28); integrated HIV/TB services(23, 27); extensive community involvement(23, 27); psychosocial support(28); and community worker incentives(24, 25). These papers reported improved and earlier enrolment (especially for women and children), less loss to follow up, and good clinical outcomes. They also identified the need to concurrently improve medication supply, laboratory services and information systems; address human resource constraints; support community volunteers; and develop a supportive policy environment.

Health Care Organization

Two-thirds of papers (n=46, 65%) focussed on strategies at the level of the health service organisation. Twenty-six papers focussed on strategies to *support self-management and prevention*, through education (n=23) or self-monitoring (n=3). Educational strategies involved asthma (n=10)(31-40), diabetes (n=5) (41-45), cerebral palsy (n=3)(46-48), HIV (n=3)(49-51), epilepsy (n=2)(39, 52), and leukaemia (n=1)(53). Studies employed a variety of educational methods (e.g. material, duration, frequency, audience), and reported some common findings (Table 4).

Three papers addressed enhanced self-monitoring. Increased glucose monitoring for children with diabetes in Bosnia/Herzegovina(54) and Brazil(55) improved glycaemic control. In Indonesia, a written health diary (including medication and appointment reminders) for children with leukaemia was associated in better event-free survival - but only for children with educated parents(56).

Five papers involved the *promotion of continuity and coordination*. Text or phone call appointment reminders for families of children at-risk for HIV in Cameroon increased attendance rates(57). Automatically generated text messages (HITSystem) for health workers and mothers of infants at risk for HIV in Kenya increased retention in care, treatment initiation and decreased lag-times between testing and follow-up(58). A discharge planning program (including education, resource provision, home visits and telephone calls) for paediatric oncology patients in Turkey reduced some physical care needs(59). Home visits for testing of HIV contacts had greater uptake than facility-based testing in Uganda(60). Routine inpatient HIV testing increased HIV detection over client-initiated community-based testing in Malawi(61).

One paper focussed on *information systems*. Computer-generated reminders for clinicians treating children with HIV in Kenya improved adherence to protocols(62) (and a similar web-based algorithm was used for the HITSystem infant HIV project targeting laboratory workers, health care provider, and mothers(58)). One paper involved *encouraging quality in health care organisations through leadership*. Professional mentoring of clinicians treating children with HIV improved clinician adherence to guidelines in Botswana(63).

Three papers related to the *organisation and equipping of health care teams*. In Brazil, use of treatment protocols in a dedicated paediatric oncology unit improved event-free survival for children with leukaemia(64). In Uganda and Sri Lanka, community health worker use of a cerebral palsy algorithm provided early detection for children with disabilities, and compared well to expert assessment(65). In South Africa, implementation of the HIV component of IMCI was challenging, with frequent misclassification(66).

Task-shifting refers to the delegation of tasks to less specialized health workers. While it may fit into the *organisation and equipping of health care teams* in health care organisations, it can also be fully community-based. For clarity we report relevant papers together. Thirteen papers involving task-shifting as their primary focus and it was a key component of most of the multifaceted strategies.

Task-shifting was used extensively in the scale up of HIV services in sub-Saharan Africa, both to expand the role of nurses(23, 26-30, 67-72) and to mobilise community members as lay workers(23, 27, 28, 73-76).

These studies consistently reported increased enrolment, improved adherence, high quality of service, and good clinical outcomes for children. Use of community-based workers was reported as key to preventing loss to follow up, and community members living with HIV and TB played a particularly valuable role(27, 69, 74).

Task-shifting has also been successful in reducing the treatment gap and morbidity from epilepsy in China (community doctors treating children with epilepsy)(77, 78), increasing access to care for adults and children with epilepsy and asthma in Cameroon (nurse-led community clinics)(79, 80), and improving depression scores among AIDS orphans in China (lay worker-led group counselling)(81).

Across these papers there is evidence that task-shifting works best with standardised guidelines, adequate access to medicines and investigations, good training and ongoing supervision, accessible referral pathways, supportive community leaders, appropriate levels of responsibility and remuneration, and enabling policy environments. Failure to address these issues can result in challenges to health worker retention, and neglect of existing responsibilities.

Community

Of the few truly community-based strategies (n=10, 14%), almost all involved HIV projects in sub-Saharan Africa with predominantly adult populations. Two papers involved a community program for HIV and TB in Malawi that covered multiple aspects of the ICCC 'Community' domain (*leadership and support*, *mobilize and coordinate resources*, *complementary services*), reporting increased case detection, adherence and treatment success(75, 76). This involved identifying and legitimising existing community involvement in HIV/TB (e.g. religious leaders organising material support); mobilising community members to participate in health activities (e.g. lay volunteers doing counselling and assisting nurses deliver community-based care); and community provision of complementary services (e.g. vocational training for AIDS-orphans). The authors describe communities as an 'unexploited resource' but warn against making the community the 'dumping ground' for relegation of activities that should be the responsibility of public services or other partners. Other projects involving the mobilisation of lay workers have been discussed under 'task-shifting'(23, 27, 28, 73, 74, 79-81).

Two papers reported on initiatives to *raise awareness and reduce stigma*, involving teacher-supported peer-education in Yemeni(82) and Tanzanian(83) schools. The Tanzanian project also involved youth friendly health services; condom promotion and distribution; and annual youth health weeks(83). Results showed improved sexual health knowledge and attitudes but no impact on HIV or STI prevalence or pregnancy rates. The authors suggested that integration within community-wide risk-reduction programs may help translate knowledge and attitudinal changes into beneficial behaviours and health outcomes.

Three papers focussed on the *provision of complementary services in the community*, involving provision of school assistance and/or economic incentives to children with or at-risk of HIV in Kenya(84), Zimbabwe(85) and Uganda(86). Material help alone was not associated with changes in attitudes or behaviour

(even with a community support person)(84, 85). However, as part of a holistic program for AIDS orphans, monetary incentives coupled with financial and career classes were associated with modest improvements in HIV attitudes, educational aspiration, and monetary savings(86).

Policy Environment

Six (8.5%) papers addressed policy-level strategies involving integration of HIV services with immunisation in Tanzania(87-90) and with maternal-child health and reproductive health services in Ghana, Kenya, Zambia, and South Africa(91, 92). These papers identified benefits to patients (e.g. convenience, time-saving, access to care), health workers/service (e.g. enhanced roles, access to certain populations), and health systems (e.g. clustering of services); and risks that were underestimated (e.g. reduced guideline adherence/effectiveness, increased costs, limitations of syndromic diagnoses, privacy compromise, training challenges, stigma). Authors highlighted the danger of driving integrative policy changes top-down, and emphasized the need to position integration within the context of strengthening primary health care systems (as additional activities can overwhelm primary care providers). Integration was also central to the multifaceted HIV programs in South Africa(23-25), Lesotho(26), Uganda(27), Kenya(28), and community-based HIV projects involving lay health workers(66, 71, 73-76).

Other aspects of the 'Policy' domain were not a focus of included studies, however *supportive legislative frameworks* and *allocation of human resources* were important for enabling effective task-shifting(23, 26-30, 67-81).

DISCUSSION

Our review into strategies of providing care for children with chronic health conditions in low-resource settings identifies some promising approaches, and areas for future research. The WHO ICCC framework, while useful as a conceptual framework, appears to lack utility to those involved in the care of children globally. It was not referenced by any of the included papers, and evidence for it comes almost exclusively from high-income countries and adult populations(93).

Evidence regarding particular strategies of care for children with chronic conditions mostly relates to patient education and other activities of health care organisations. Evidence on comprehensive care models is limited; mostly involving HIV projects (and it would useful to test how relevant these models are for other chronic conditions). We are aware of other comprehensive care models that are operational for TB(94-96), HIV(97), and chronic health conditions(98), but have not been evaluated. We draw attention to the "person-centred, rights-based" CLAN model in particular, as it is has been applied for a variety of chronic health conditions in various contexts globally(98) and fits well with the recommendations from this review. CLAN activities hinge on support groups that consist of children (and their families) who are living with a particular chronic health condition, and involve improving access to quality medical care, supporting education and advocacy, and mobilising family and community support(98). Evaluation of comprehensive

care models such as these would contribute greatly to the development and implementation of better systems for care for children with chronic health conditions.

The evidence on strategies for providing care for children with chronic health conditions identifies several components that may contribute to more effective models of care. These areas share common themes with primary health care, participatory community development, disability, child development, and NCD discourse. They are not exhaustive, but we offer them as a guide for future practice and research seeking to improve care provision for children with chronic health conditions.

Children and their families should be at the centre; they are the main care-providers and legitimate 'experts', who experience the consequences of living with a chronic condition every day. Our review identifies some experiences using family-centred care models in HIV(27, 28), consistent with previous reviews(99), but evidence relating to other chronic conditions is lacking. Apart from patient education, there is little evidence about how to promote self-management. Potential areas may include patient-controlled health records(56, 100), patient inclusion in automated protocol reminders(58), and support from others living with a chronic condition(43-45, 98).

Community involvement is essential, as the community is where the majority of care is provided. Emphasized by primary health care advocates for decades(101), community-based care is now recognised as essential to combating HIV and TB(102-105), and could be relevant for other chronic health conditions(106). Our review identified many projects that involved community members(23, 27, 28, 73-76) and health workers(23, 26-30, 67-72) in HIV or TB care, as well as the use of community pharmacists and nurses in asthma and epilepsy(22, 79, 80)[65]. However, there is little evidence about the role of the community more broadly in providing complementary resources or support(82-86). The role of communities in chronic care provision will vary in different contexts, and it cannot replace the public service or other partners. However, it is almost certainly under-realised at present.

Education is necessary at multiple levels. For patients and families, self-management education is critical. While the best approach is likely to be context-specific, our findings (Table 4) are consistent with other reviews(107) in supporting practical, child-centred, task-based education delivered by skilled educators and reinforced in during follow-up(31-53). For clinicians in low- and middle-income countries, training, guidelines and resources on chronic conditions of childhood is extremely limited (with the exception of HIV and TB). For communities, there is evidence that stigma and other barriers to HIV and TB care can be tackled by targeting vulnerable adolescent populations(75, 76, 82, 83), but the role of community education in other contexts is poorly defined.

Psychosocial and developmental support is important, recognising the broad individual and social impact of chronic health conditions across the lifespan and resultant health inequity(108, 109). Current evidence is sparse but growing, and includes strategies of early developmental support(48, 49, 51) and community-based counselling(81) – but more research is clearly needed. Broader community-based social and economic support were important in a number of projects(23, 27, 28, 73-76, 81, 84-86), reflecting the im-

portance of basic supports for families affected by chronic health conditions.

Basic health system structures are critical. These comprise essential medications and supplies; standardised guidelines; referral pathways; trained staff; education and supervision structures; and health information systems. Many of these things may be lacking in low-resource settings and have previously been identified as barriers to implementing the ICCC framework(11, 93). However, our review identifies a number of projects that have successfully included systems improvements(22-30, 64, 75, 76) suggesting there is a role for tackling structural barriers alongside other interventions.

Policy-level support is important. While this review provides little with regard to how supportive policies can be achieved, there are unpublished reports of successful family-led community advocacy, particularly regarding access to medication(98). Integration of services may be important, and remains high on the agenda for HIV and TB control(110). However, consideration of the risks and benefits of integration is essential (some services may be better delivered using a vertical approach), and integration should be part of a comprehensive primary health care approach(90-92).

Our review highlights the need for renewed attention towards the care of children and young people with chronic conditions in low-resource settings. Current health care systems are failing those with chronic conditions, especially children(11), and alternative models of care are needed.

Limitations

HIV programs are disproportionately represented in our review, and some findings will not be generalizable. Our search strategy was broad, in keeping with scoping review methodology, aiming to capture the full breadth of research on providing care for children with chronic health conditions. However, this may have excluded operational reports that have not been the subject of research evaluation, and papers describing systems-level strategies that related directly to provision of care but did not report child health outcomes or were reported outside the biomedical literature. Our review did not include condition-specific medical or surgical interventions or technical expertise, instead focussing on strategies relating to more generalizable aspects of care provision. Our review focussed on the provision of care for children with chronic health conditions, and therefore excluded broader aspects of health strategy that did not directly relate to the provision of care. We particularly recognise the importance of advocacy activities by civil society and academia(4-8), and the role that international organisations can provide in supporting local programs (e.g. for congenital heart disease(111, 112), diabetes(113), and oncology(114), and other conditions(98)).

CONCLUSIONS

Care of children with chronic health conditions is a growing global health priority. Care models that have been effective in reducing child mortality are not sufficient for children with chronic health conditions; innovative new models are needed. This review reveals knowledge gaps regarding the provision of care for

children with chronic health conditions in low-resource countries but also highlights promising approaches that can inform future development models of care for these children for children. Common themes included: holding children and their families at the centre; involving the broader community; providing education to patients, families, and the community; supporting psychosocial and socio-economic development; and promoting stronger healthcare structures and supportive policies. We urge researchers, funders, and policy makers to make children with chronic health conditions a higher priority.

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Figure 1. Innovative Care for Chronic Conditions (ICCC) Framework, used with permission (WHO 2002)[2]

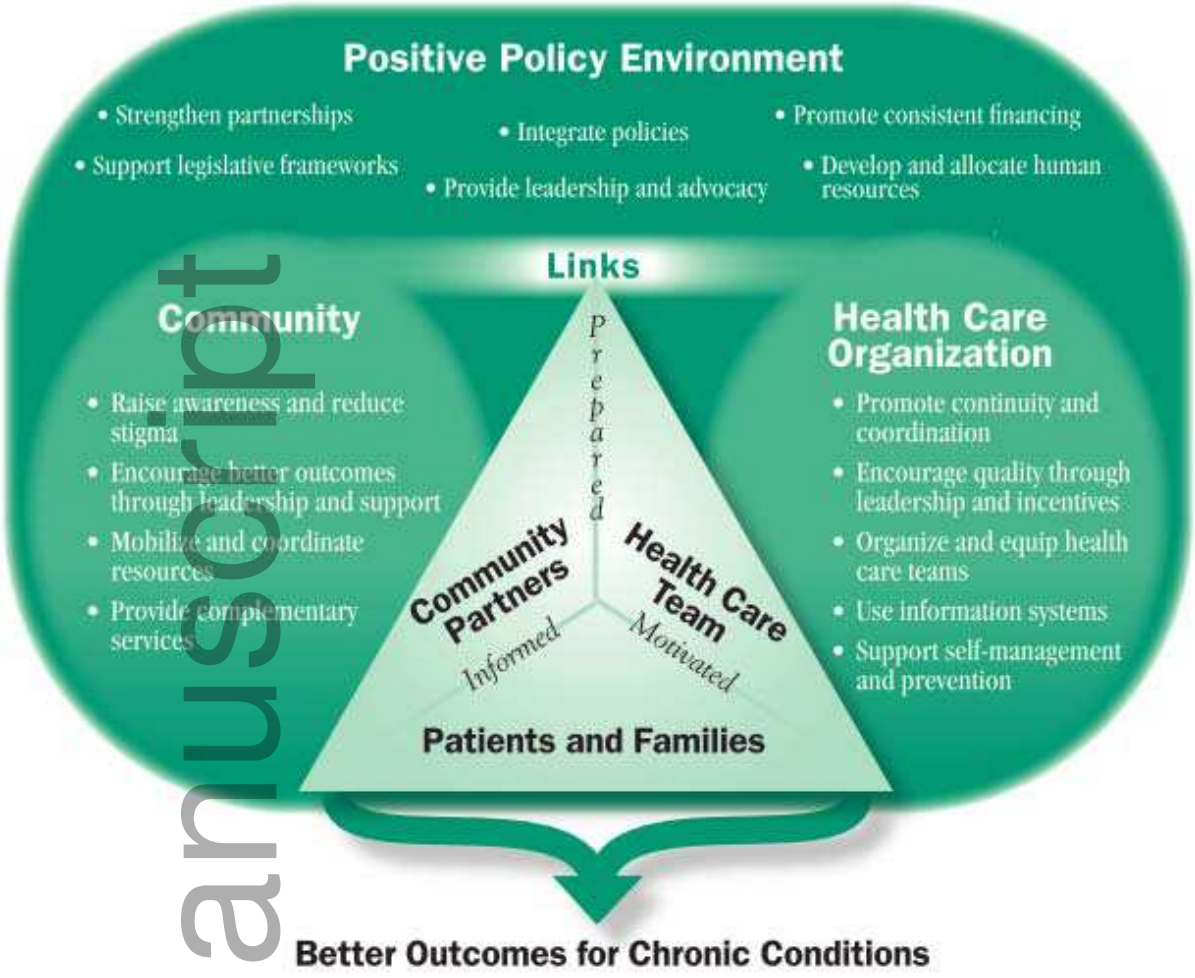
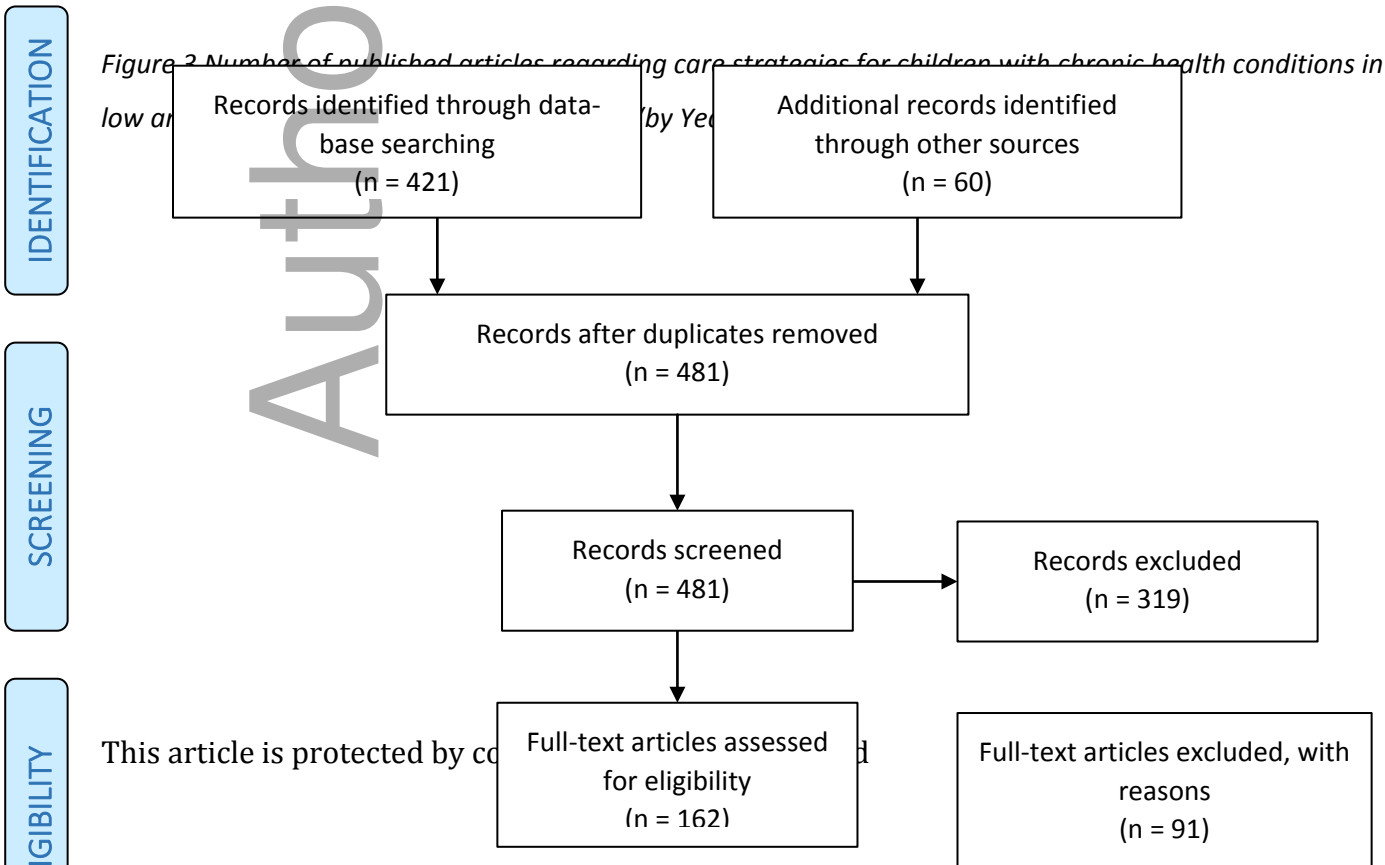


Figure 2 PRISMA 2009 Flow Diagram of literature search

Figure 3 Number of published articles regarding care strategies for children with chronic health conditions in low ar by Ye



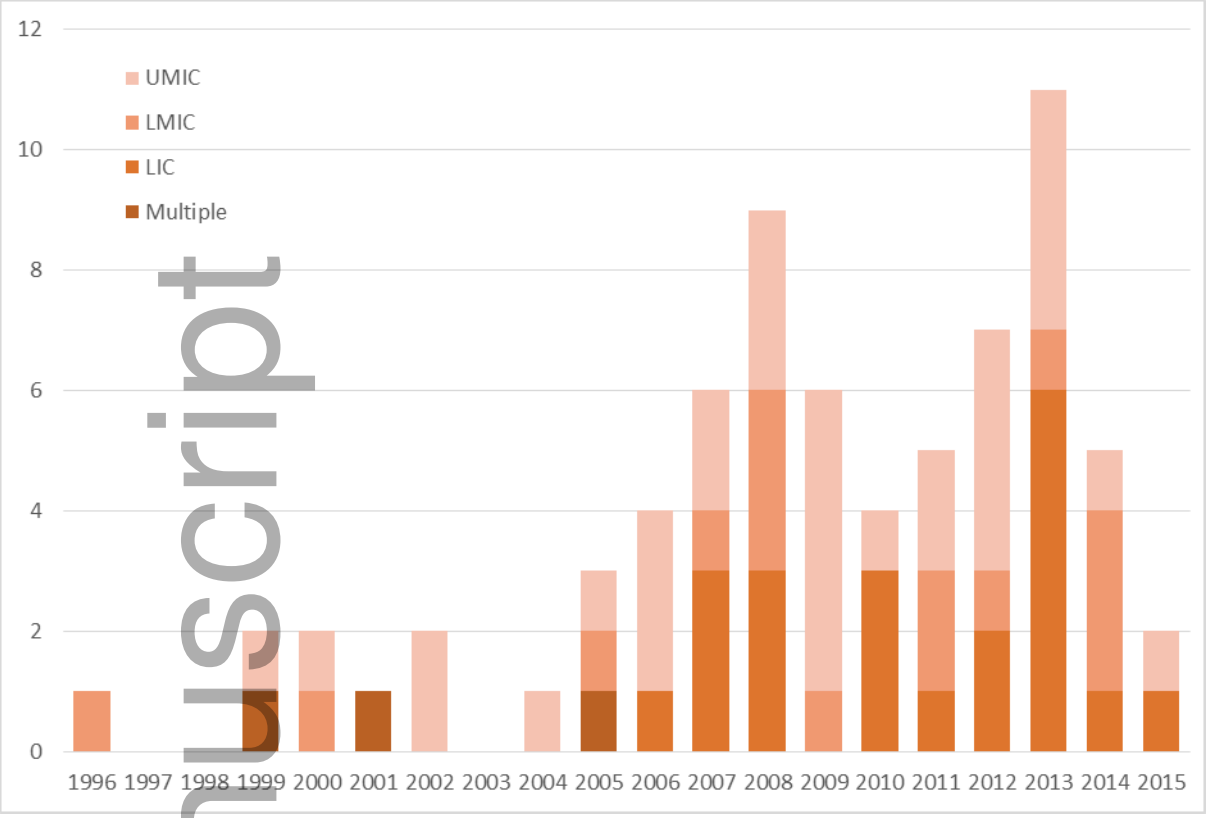


Table 1 Characteristics of included studies on strategies to improve the quality of care for children with chronic health conditions in low and middle-income countries 1996-2015

Characteristic	**Number of articles (%)**
World Bank Income Category	
- Low (LIC)	21 (29.6%)
- Low-middle (LMIC)	15 (21.1%)
- Upper-middle (UMIC)	32 (45.1%)
- Multiple	3 (4.2%)
World Bank Region	
- East Asia	8 (11.3%)
- Europe & Central Asia	6 (8.5%)
- Latin America & Caribbean	9 (12.7%)
- Middle East & North Africa	4 (5.6%)
- South Asia (SA)	4 (5.6%)
- Sub-Saharan Africa (SSA)	36 (54.9%)
- SA / SSA (multiple)	1 (1.4%)
Chronic condition	

- HIV/AIDS	29 (40.8%)
- Asthma	11 (15.5%)
- Diabetes	7 (9.9%)
- Epilepsy	4 (5.6%)
- Leukaemia	4 (5.6%)
- Cerebral palsy	4 (5.6%)
- Tuberculosis	2 (2.8%)
- Depression	1 (1.4%)
- Multiple	9 (12.7%)
- HIV/AIDS & Tuberculosis	8
- Epilepsy, Asthma & Diabetes	1
ICCC Domains (Fig. 1)	
Multiple domains	**9 (12.7%)**
Health service organisation	**46 (64.8%)**
- self-management	26 (36.6%)
- continuity / coordination	5 (7.0%)
- information systems	1 (1.4%)
- leadership / incentives	1 (1.4%)
- organise & equip teams	13 (18.3%)
- task-shifting, facility-based	10
Community	**10 (14.1%)**
- 'multifaceted'	2 (2.8%)
- mobilise / coordinate	3 (4.2%)
- task-shifting, community-based	3
- raise awareness / reduce stigma	2 (2.8%)
- complementary services	3 (4.2%)
- leadership & support	0
Policy	**6 (8.5%)**
- integrate policies	6 (8.5%)
- supportive legislation	0
- human resources	0
- strengthen partnerships	0

- leadership / advocacy	0
- consistent financing	0
Study design	
- Randomized trial	28 (39.4%)
- Non-randomized trial	1 (1.4%)
- Before-after study	21 (29.6%)
- Cohort study	5 (7.0%)
- Cross-sectional study	2 (2.8%)
- Non-comparative evaluation	12 (16.9%)
- Case study (health system)	2 (2.8%)

Table 2 Summary of 64 included studies addressing strategies to improve the care of children with chronic health conditions (1996-2015)

Author	Country	Cond.	Type	Intervention	Study population	Outcome measures / Results	Study Quality
Multifaceted Strategies							
Andrade et al. (2010)(22)	Brazil	Asth	Coh	Municipal asthma program	582 children with asthma (age 4-14y)	Lower health service use due to asthma (**HR 0.12, 0.07-0.21**). Comment on factors for program success.	M
Bedelu et al. (2007)(23)	South Africa	HIV	Eval	Community-based HIV program	1,025 adults and children with HIV	Lower loss to follow-up in community clinics vs hospital (2% vs 19%). High coverage (95%), earlier enrolment, better CD4 progression, similar mortality. Factors for program success.	W
Cohen et al. (2009)(26)	Lesotho	HIV, TB	Eval	Community-based HIV program	13,243 people with HIV (5% children)	Increased enrolment, fewer sick on enrolment (11.9% vs 22.2%). Good retention (89% 12m, 87.5% 24m). Comment on systems changes.	W
Drobac et al. (2006)(30)	Peru	TB	Eval	Community-based TB program	38 children with MDRTB	High cure (95%), low loss to follow-up (3%) and mortality (3%). Moderate side effects (42%). Comment on factors for program success.	W
Luyirika et al. (2013)(27)	Uganda	HIV, TB	BA	Family-centre HIV program	Children and families at community HIV clinic	Increased child enrolment (43-fold), near-universal cotrimoxazole coverage. Qualitative data on best practices and enabling factors.	W
Satti et al. (2012)(29)	Lesotho	TB	Eval	Community-based TB program	19 children with MDRTB (age 2y-14y)	High cure (88%), low loss to follow-up (0%) and mortality (12%). High side effects (95%). Comment on factors for program success.	W

Uwimana et al. (2012)(24)	South Africa	HIV, TB	RCT	Community-based HIV/TB program	3,584 households in 6 villages	Greater service provision (TB/HIV testing)(**72% vs 48%, p<0.05**). Similar treatment support activities. Higher proportion of children (**12 vs 6%, p=0.000**).	M
Uwimana et al. (2013)(25)	South Africa	HIV, TB	RCT	Community-based HIV/TB program	3,584 households in 6 villages	Higher uptake of HIV testing (**79% vs 55%, p<0.001**). Higher quality TB, HIV, STI care (**p<0.05**). Lower quality IMCI and social welfare care (**p<0.05**).	M
Van Winghem et al. (2008)(28)	Kenya	HIV	Eval	Family-centre HIV program	648 children with HIV (age <15y, median 4.9y)	High 12m survival (95.3%, 93.2-96.7%). Comment on program components and acceptance.	W
Health Care Organisation-based Strategies							
Agrawal et al. (2005)(33)	India	Asth	RCT	Asthma action plan, education	60 children with asthma (age 5-12y)	Fewer exacerbations (**0.5 vs 1.0, p=0.02**), school absences (**1.5 vs 2.5, p=0.015**), night waking (**1.7 vs 3.2, p=0.001**), symptom score (**21.9 vs 33.7, p<0.001**).	S
Al-sheyab et al. (2012)(34)	Jordan	Asth	RCT	Peer education in school	261 youth with asthma (Yr 8-10) at 4 schools	Higher QoL (**5.4 vs 4.1, p=0.02**), self-management knowledge (**7.1 vs 5.5, p=0.03**), self-efficacy to resist smoking (**11.5 vs 6.9, p=0.03**).	S
Altay et al. (2013)(31)	Turkey	Asth	RCT	Education for child	80 youth with asthma (age 12-19y, 72% male)	Increased self-administration of medication (**p<0.001**), improved self-care behaviour (no change in controls).	M
Arora et al. (2014)(46)	India	CP	BA	Educational film for parents	Parents of 53 children with CP (age 6-72m)	Higher knowledge (**p<0.001**).	W
Bigna et al.	Camer-	HIV	RCT	Phone/text	242 HIV-exposed	Higher attendance for text+call (**OR 7.5, 2.9–19.0**), call-only (**OR 5.5, 2.3–**	S

(2014)(57)	oon			reminder	children (mean age 3y)	**13.1**), text-only (**OR 2.9, 1.3–6.3**) vs control. Text only was most cost-effective.	
Boivin et al. (2013)(49)	Uganda	HIV	RCT	Education for caregivers	120 children with HIV (age 16m-5y)	Higher receptive language (**p=0.004**), expressive language (**p=0.001**), overall cognition (**p=0.006**). Data on associations, and carer coping.	S
Bukara-Radujkovic et al. (2011)(54)	Bosnia & Herzegovina	DM	RCT	Continuous monitoring	80 children with DM (age 5-18y)	Improved HbA1c, but no difference between groups. No difference in hypoglycaemia. Fewer hyperglycaemia in intervention group (**p<0.03**).	M
Caliskan Yilmaz et al. (2010)(59)	Turkey	Leuk	NRT	Discharge plan, education	49 children with cancer (mean age 9.7y)	Lower physical care needs (**p=0.000**), including mucositis, fever, catheter problems, nausea and vomiting. Fewer admissions, unplanned admissions.	M
Cano-Garcinuno et al. (2007)(35)	Cuba, *Spain, Uruguay*	Asth	RCT	Education for child +/- caregiver	245 children with asthma (age 9-13y)	Child: fewer exacerbations (**–1.61, –2.87 to –0.34**), admissions (**–0.28, –0.51 to –0.05**). Child-caregiver: fewer exacerbations (**–1.60, –2.88 to –0.31**), admissions (**–0.25, –0.49 to –0.02**). Caregiver: no difference. No impact QoL.	M
Cevik Guner et al. (2015)(32)	Turkey	Asth	RCT	Education for child	108 youth with asthma (age 10-18y)	Better post-intervention self-efficacy score (**p<0.001**), symptom control (**p<0.005**), increased medication use (**p<0.05**), less school absence (80 -> 15%).	M
Clark et al. (2005)(36)	China	Asth	RCT	Education for child	639 children with asthma in 21 schools (age 7-11y)	Fewer symptomatic days (p=0.13), home triggers (**p=0.009**), school absences (**p=0.02**); higher school performance (**p=0.04**). Similar hospitalisation (aOR 1.43, p=0.36), emergency visits (aOR 1.0), parental asthma management, QoL.	S
Finocchario et al. (2014) (58)	Kenya	HIV	BA	Web-based coordination	843 mother-infant pairs (maternal HIV)	Very high uptake (98%). Increased infant retention in care (**p<0.001**), proportion of infants starting treatment (**p<0.05**). Decreased lag-time test and	S

						action.	
Grossi et al. (2009)(55)	Brazil	DM	RCT	Education for child + care-giver	21 children with DM (mean age 10.5y)	Reduced HbA1C in less-intensive scheme (**p=0.021**); no difference in more-intensive scheme (p.0.79).	S
Hashemi et al. (2011)(53)	Iran	Leuk	RCT	Education for parents	60 parents of children (age 7-10y)	Higher QoL (**227 vs 181, p<0.001**) in all domains (no change in control group).	M
Horwood et al. (2009)(66)	South Africa	HIV	CS	Integrated IMCI-HIV guidelines	1,357 children (age 6m-5y) seen by 77 nurses	Expert-use of algorithm: sensitivity 90.8% (81.9-96.2), specificity 75.3% (72.5-77.9), PPV 22.0% (17.6-27.1), NPV 99.1% (98.1-99.6). Health workers classified HIV-risk in 33.8% of children; discordant with expert-use.	W
Howard et al. (2004)(64)	Brazil	Leuk	Coh	Protocol, social support	375 children with leukaemia (median age 5.4y)	Higher 5-year event-free survival (**63% vs 32%, p<0.001**). Hazards ratio 2.4 (1.5-3.8) per- vs post-intervention.	M
Ibinda et al. (2014)(52)	Kenya	Epil	RCT	Education for child + care-giver	738 children and adults with epilepsy (mean age 19y)	Increased adherence but no difference intervention and control (plasma drug detectable: 81.0% vs 74.4%, p=0.28). Similar decrease in seizure frequency (80.2% vs 74.8%, p=0.12). Higher knowledge and belief scores.	M
Ibrahim et al. (1996)(37)	Egypt	Asth	BA	Education for child + care-giver	54 children with asthma (age 8-18y)	Higher child knowledge (**p<0.05**), self-efficacy (**25.9% to 61.1%, p<0.05**). Higher parent knowledge (**p<0.05**), self-efficacy (**35.2 to 72.2, p<0.05**). Higher appropriate use of medication (**p<0.05**), fewer emergency visits.	W
Karande et al. (2008)(47)	India	CP	BA	Education for caregiver	26 parents of children with newly diagnosed CP	Increased parental knowledge and belief scores (**p<0.05**).	M
Lightfoot et al. (2007)(50)	Uganda	HIV	RCT	Education for youth	110 youth with HIV (age 14-21y)	Higher reported condom use (**p<0.01**). Higher reported decrease in sexual partners (**p<0.05**).	M

Likitmaskul et al. (2002)(42)	Thailand	DM	BA	Education for child + care-giver, dis-charge plan	24 children with DM (mean age 7y)	Shorter length of first admission (**17.6 vs 36 days, p=0.03**). Higher hypo-glycaemic seizures (n=2 vs n=0). Lower long-term readmission rate and HbA1C (**9.2% vs 11.5%, p=0.03**). Similar growth trends.	M
Lugada et al. (2010)(60)	Uganda	HIV	RCT	Home-based testing	7,184 HIV-exposed children and adults	Higher uptake of testing (**55.8% vs 10.9%; aOR 10.41, 7.89-13.73**). Com-ment on predictors of acceptance.	M
McConachie et al. (2000)(48)	Bangla-desh	CP	RCT	Parental rehab training (dis-tance, facility, none)	85 children with CP (age 1.5-5y)	Urban: improved knowledge and maternal adaptation in facility group (none for development, or behaviour scores). Rural: improved maternal adaptation for both distance and control (none for development, behav-iour, knowledge).	S
Perez et al. (1999)(38)	Vene-zuela	Asth	RCT	Education for child + care-giver	29 children with asthma (age 6-14y) and parents	Higher child knowledge and behaviour (**p<0.05**, multiple domains), lower morbidity index (p=0.05). Higher parental knowledge and management (**p<0.05**). Younger children benefited more (p=0.09).	M
Potterton et al. (2009)(51)	South Af-rica	HIV	RCT	Training on child devel-opment	102 children with HIV (mean age 18m)	Greater developmental gains in mental (**p=0.01**) and psychomotor (**p=0.02**) tests, but still low for age.	S
Preidis et al. (2013)(61)	Malawi	HIV	Coh	Provider-initiated test-ing protocol	742 children with HIV attending clinic	Younger enrolment (**p<0.001**) at more severe disease stage (**p<0.0125**). Similar retention and adjusted mortality. Comment on predictors of early mortality.	W
Santiprabhob et al. (2008)(44)	Thailand	DM	BA	Education camp	60 people with DM (age 10-46y, mean 16y)	Lower HbA1C at 3-months (**8.2% vs 9.0%, p<0.001**) but not 6-months (9.2% vs 9.0%, p=0.2). Higher knowledge (**31 vs 26, p<0.001**). Qualitative data.	W
Santiprabhob et	Thailand	DM	BA	Education	27 youth with DM	No change in HbA1C (p=0.806), life satisfaction (p=0.655), worry (p=0.109),	W

al. (2012)(43)				camp	(mean age 15.5y)	or QoL (p=0.711). Improved knowledge at 12-months (**33.0 vs 29.1, p<0.001**).	
Semiz et al. (2000)(45)	Turkey	DM	BA	Education camp	57 children with DM (age 8-20y)	Higher knowledge scores sustained at 6 months (**76.9 vs 53.5, p<0.05**). Similar HbA1C (9.6 vs 10.3, p>0.05). Trend towards more ideal weight.	W
Servilha et al. (2014)(41)	Brazil	DM	RCT	Photo-based food education	54 adolescents with DM (mean age 13.9y)	Photo-based carbohydrate counting education took longer than conventional (14 vs 11 mins). Greater improvement in photo-based group (**p0.03**).	S
Sitaresmi et al. (2013)(56)	Indonesia	Leuk	RCT	Medication diary	109 children with leuk. (mean age 5.8y)	Lower event-free survival at 3-years if high maternal education level (**62% vs 29%, p=0.04**), but not if low maternal education level (26% vs 18%, p=0.86).	S
Tieffenberg et al. (2000)(39)	Argentina	Epil, Asth, DM	RCT	Education for child + caregiver	355 children with asthma or epilepsy (age 6-15y)	Higher knowledge and fear gains (**probability of gain 0.62**), control over health (**p<0.05**). Fewer health 'crises' (**p<0.05**). Fewer doctor (asthma) (**p=0.048**) and emergency (epilepsy) (**p=0.046**) visits. Lower school absenteeism (**p<0.05**).	M
Were et al. (2013)(62)	Kenya	HIV	RCT	Computer-reminder	1,611 HIV-exposed children (mean age 7y)	Higher completion of overdue tasks (**68% vs 18%, p=0.001**), lower delay (**77 vs 104 days, p=0.001**).	S
Wirz et al. (2005)(65)	Sri Lanka, Uganda	CP	Eval	Implement screening tool	1,349 children (age <3y) with 'maternal concern'	Expert-health worker agreement was 82% (Uganda), 76% (Sri Lanka), lower if <2-year-old. Qualitative data on acceptability.	W
Workneh et al. (2013)(63)	Botswana	HIV	BA	Clinical mentoring	374 children from 4 clinics (age <15y)	Variable results between sites, mostly with improvement in adherence (pill count), disclosure, viral load, CD4, correct lab monitoring, correct drug dosing.	W

Zivkovic et al. (2008)(40)	Serbia	Asth	RCT	Education for child + care-giver	302 children with asthma (age 5-18y)	Greater improvement in adolescent and parent knowledge (**p<0.05**), compliance (**90% vs 70%, p<0.05**), fears (**p<0.05**).	M
Task-shifting interventions							
Ahmed et al. (2015)(67)	Malawi	HIV	BA	CHW training, integrate services	7658 HIV-exposed children (age 18m-15y)	Increased rate of enrolment, decreased median age of enrolment (**2.5 vs 5.2 years, p<0.001**). Qualitative comment on quality and retention.	W
Bekker et al. (2006)(73)	South Africa	HIV	Eval	Lay worker training and support	>1,100 people with HIV (age 1-64y, mean 32y)	Increased children and women enrolled (69 vs 1), lay counsellor number (28 vs 6) and efficiency (33 vs 13 clients each). Low loss to follow-up (2.9%), high retention (up to 92%), high viral suppression (**p<0.001**).	W
Bolton-Moore et al. (2007)(68)	Zambia	HIV	Coh	Train and support providers	4,975 children with HIV (median age 65m)	High late/no return for follow-up. Mortality 6.6 per 100 child-years (5.7-7.5). Comment on risk factors for mortality, and general clinical outcomes.	W
Kaufman et al. (2013)(81)	China	Depr, Anx	BA	Lay worker-led counselling	39 AIDS-orphaned children with Depression	Improved anxiety scores (**23.9 vs 29.9, p<0.01**) but no change in depression scores (12.7 vs 13.9).	M
Kengne et al. (2008) (79)	Cameroon	Epil	BA	Nurse-led management	224 people with epilepsy (age 5-72y, median 23y)	Improved seizure control (p<0.024), increased enrolment. Two-year mortality 2.7%.	W
Kengne et al. (2008)(80)	Cameroon	Asth	BA	Nurse-led management	87 people with asthma (age 4-92y, median 51y)	Improved symptom control (p<0.041).	W
McCollum et al.	Malawi	HIV	BA	Lay worker-led	6,318 children in	Increased children offered testing (**45.2% vs 19.9%, p<0.001**), lower time	M

(2010)(69)				testing	hospital	to test (**1.76 vs 2.44 days, p<0.001**), younger age tested (**17.4 vs 26.7 months, p<0.001**). No difference in test acceptance (97.8% vs 99.2%).	
Monyatsi et al. (2012)(70)	Botswana	HIV	CS	Nurse-led management	100 clinicians, children with HIV (age 1-16y)	No difference in correct documentation (96.0% vs 94.9%) between nurse prescriber and physician.	W
Mukherjee et al. (2007)(74)	Haiti	HIV, TB	Eval	CHW-led care	155 CHWs at 2 health facilities	Increased utilisation (1050 vs 50 visits per day). Qualitative data on health worker perceptions, role, and function.	W
Patel et al. (2013)(71)	DRC	HIV, TB	Eval	Nurse-led HIV/TB care	31 children starting TB treatment (age 3-18y)	HIV: 53% 'timely treatment', 78.3% adherence, positive median change in CD4. TB: 93.6% adherence, 87.1% success, CFR 6.5% (0.8-21.4). Side effects 54.6%.	W
Van Griensven et al. (2008)(72)	Rwanda	HIV	Eval	Nurse-led management	315 children with HIV (age 0.7-14.9y)	Alive and well 84%, mortality 2.6%, loss to follow-up 3.8%, poor adherence 5%, drug toxicity & change 8.3%. Comment on retention, accessibility, acceptability.	W
Wang et al. (2006)(78)	China	Epil	BA	Train primary care providers	2,455 people with epilepsy (10.9% <15y)	Good adherence 95% (pill count), loss to follow-up 23%. 66% of patients improved control of seizures by 50% or greater.	M
Wang et al. (2008)(77)	China	Epil	BA	Train primary care providers	Census of 55,616 people (age >2y)	Reduced treatment gap (49.8% vs 62.6%).	M
Community-based Strategies							
Al-Iryani et al. (2011)(82)	Yemen	HIV	BA	Peer education in school	2,510 youth (age 15-17y) at 27 schools	Higher knowledge (68% vs 43.3%), life skills (**p<0.01**). Lower stigma (empathy, non-discrimination, treatment, helping, human rights)(**p<0.001**).	M
Doyle et al. (2010)(83)	Tanzania	HIV	RCT	Peer education in school	13,814 children (Grade 5-7), 20 rural	No difference in risk of HIV (male aPR 0.91, 0.50–1.65; female aPR 1.07, 0.68–1.67), pregnancy or attitudes. Higher knowledge. Minimal effect on	M

					communities	sexual behaviour, except higher female condom use (aPR 1.34, 1.07–1.69).	
Hallfors et al. (2011)(85)	Zimbabwe	HIV	RCT	Material support and visits	329 AIDS-orphaned girls in Gr 6 at 25 schools	Higher educational aspiration (**p<0.01**), gender equity (**p<0.01**), sex attitudes (multiple measures). No change in abstinence rate or school absence.	S
Hallfors et al. (2012)(84)	Kenya	HIV	RCT	Material support and visits	105 AIDS-orphaned children (age 11-14y)	No effects at 2 year (school absenteeism, pregnancy, educational aspiration, gender equity, sex attitudes). Qualitative data on program.	S
Ssewamala et al. (2008)(86)	Uganda	HIV	RCT	Economic incentive	96 youth AIDS-orphans (mean age 13.8y)	Higher HIV-prevention attitudes scores (**p<0.05**), educational plans (**p<0.05**). Experimental cohort mean annual saving US$318.60 (including 2:1 matching).	W
Zachariah et al. (2006)(76)	Malawi	HIV, TB	BA	Community involvement	52,510 people (mean age 33)	Est. case detection 37%. High cotrimoxazole compliance (93-94%). Majority (12/14) of sites run by lay counsellors, conducting 41% of testing. Qualitative data on coverage, acceptance, program implementation.	W
Zachariah et al. (2007)(75)	Malawi	HIV, TB	BA	Community involvement	52,510 people (mean age 33)	Higher proportion alive and on ART (**95.6% vs 76.0%, p<0.001**), lower mortality (**3.5% vs 15.5%, p<0.001**), loss to follow-up (**0.1% vs 5.2%, p<0.001**).	W
Policy-level Strategies							
Goodson et al. (2013)(90)	Tanzania	HIV	BA	Integrate testing and immunisation	308 HIV-exposed infants at clinic for immunisation	Vaccine service provision stable or higher. Qualitative data on acceptability, experience, perspectives of mothers and providers.	M
Lush et al. (1999)(91)	Ghana, Kenya, Zambia, South Africa	HIV	CS	Integrate HIV/AIDS care and MCH	na	Qualitative synthesis of national experience of integration. Contrast South African integration within strong primary health care focus to Ghana/Kenya/Zambia integration adding new activities to fragile system.	W

Lush et al. (2001)(92)	Ghana, Kenya, Zambia, South Africa	HIV	CS	Integrate HIV/AIDS care and MCH	na	Qualitative data on impact of top-down decision-making, disadvantages of integration, relationship to primary health care, and syndromal approach to care.	W
McCollum et al. (2012)(87)	Malawi	HIV	CS	Integrate testing and immunisation	1757 mother-infant pairs (immunisation visit vs usual paediatric clinic)	Higher testing uptake (84.2% vs 11.4%, **p<0.001**) and return for follow-up (78.6% vs 25.0%, **p<0.001**), earlier detection (**p<0.001**), greater exposure risk and treatment need (**p<0.001**) with routine testing/counselling at immunisation visit compared to usual clinic care.	S
Rollins et al. (2009)(88)	South Africa	HIV	Eval	Integrate testing and immunisation	584 mother-infant pairs at clinic for immunisation	High level of testing acceptance (90%) and return for results (56.8%).	M
Tejiokem et al. (2011)(89)	Cameroon	HIV	Eval	Integrate testing and immunisation	1587 mother-infant pairs at clinic for immunisation	High level of testing acceptance (89.7%) and return for results (83.9%).	M

Notes: EPHPP study quality rating, weak (W), moderate (M), strong (S).

Abbreviations: Anx – anxiety; aOR – adjusted odds ratio; aPR – adjusted prevalence ratio; Asth – asthma; BA – before-after study; CHW – community health worker; Coh – cohort study; CP – cerebral palsy; CS – cross-sectional study; Depr – depression; DM – diabetes mellitus; DRC – Democratic Republic of Congo; Epil – epilepsy; Eval – non-comparative evaluation; HIV – human immunodeficiency virus; Leuk – leukaemia; MDRTB – multi-drug resistant tuberculosis; NRT – non-randomised trial; QoL – quality of life; RCT – randomized control trial; TB – tuberculosis.

Table 3 Summary of 'multifaceted' strategies to improve the health of children with chronic health conditions, identified from systematic literature search 1996-2015.

Study details	Location	Description of Care Strategy
Andrade et al., 2010(22)	Brazil	**Municipal Asthma Management Program.** Involving: community-based pharmacist and health worker led care with paediatrician support; free medication (exclusively provided by community pharmacists); written action plan; comprehensive self-management education (discussion of printed educational brochures; interactive learning sessions on asthma, the benefits of regular medication use, self-management of exacerbations, and the importance of avoiding triggers); reinforced education and adherence monitoring at every presentation for medication; supportive local health department policies.
Cohen et al., 2009(26)	Lesotho	**Community-based HIV program.** Decentralised model of care with hospital supporting 14 rural health centres; task-shifting to enable primary care nurses to initiate and supervise HIV care (including testing, counselling, prescribing); integration within primary care package, PMTCT, and TB services; nurse training and ongoing supervision; established referral pathways; recruitment and training of lay worker for counselling, testing, and support to nurse; community-based health worker for contact tracing, education, health promotion, and referral; supportive health department policies (especially regarding nurse-prescribers).
Bedelu et al., 2007(23) - See also(115)	South Africa	**Lusikiski community-based model of HIV/AIDS care.** Decentralised model of care involving: nurse-led HIV testing, treatment, and prevention activities; physician mobile clinics, supervision and ongoing training for nurses; new role for lay counsellors to lead adherence activities, support groups, and testing; improved drug supply with enhanced role for pharmacists and pharmacy assistants; integration with TB and primary care; improved clinic infrastructure; community support groups, committees and advocacy, adherence committee and representation on the health facility committee.
Van Wingham et al., 2008(28)	Kenya	**Family-centred HIV program.** Involving: HIV diagnosis, prevention, prophylaxis, and treatment services; child friendly environment and educational resources (e.g. fairy tale book); family group consultations, with attention to health literacy; group meetings and 'family fun days' with multiple families; adherence support (e.g. adherence tick boxes) and tracing; psychological therapy (including support groups for children and teens, caregivers); promotion of involvement of people living with HIV.
Luyirika et al., 2013(27)	Uganda	**Family-centred HIV model 'Mildmay'.** Involving: HIV diagnosis, prevention, prophylaxis, and treatment services; integration with TB and maternal health services (including PMTCT, family planning, and cervical cancer screening); paediatric outpatient and inpatient services (including rehabilitation for severe acute malnutrition); commodity distribution for families enrolled in care (e.g. insecticide treated nets, safe water

		supplies); specialist services (including dental, ophthalmology, and mental health); home-based follow-up and counselling support from community-based volunteers and community nurses.
Satti et al., 2012(29)	Lesotho	**Community-based TB program.** Involving: trained, paid community health workers to give twice daily treatment in community and monitor for adverse effects; community team to follow-up patients, support households (including food supplementation and income-generation), assist with school access, and provide counselling; enhanced capacity and supervision from tertiary health facility (including training, guideline implementation, and training). Also treated HIV/AIDS in these patients. Implemented on the background of: good drug supply; standardised treatment protocols; established referral pathways; supportive health authorities.
Drobac et al., 2006(30)	Peru	**Community-based TB program.** Involving: community health workers to give twice daily treatment in community and monitor for adverse effects; community team to provide nutritional and economic support (not described in detail); enhanced capacity and supervision from tertiary health facility (including training, guideline implementation, and training). Also treated HIV/AIDS in these patients. Implemented on the background of: standardised treatment protocols; established referral pathways; supportive health authorities.
Uwimana et al., 2012(24), 2013(25)	South Africa	**Community care worker (CCW) HIV/AIDS and TB program.** Involving: creation of a single CCW cadre (from multiple existing diverse community workers); harmonisation of scope of practice and stipend of CCWs; improved supervision for CCWs; integrating TB/HIV/PMTCT care; create referral pathways; CCW training. CCWs led the management of HIV and TB in the community, including screening, testing, adherence support, tracing contacts and defaulters, community education, as well as continuing IMCI services.

Abbreviations: CCW – community care worker; HIV/AIDS – human immunodeficiency virus, acquired immunodeficiency syndrome; IMCI – integrated management of childhood illness; PMTCT – prevention of mother to child transmission; TB – tuberculosis.

Table 4 Common findings of 23 studies evaluating educational interventions for chronic health conditions of childhood

Theme	Findings
Outcomes	Education may improve child/carer knowledge, self-efficacy, symptom control, absenteeism, developmental outcomes, and service utilisation. Mixed findings on whether education may improve quality of life or adherence.
Educational methods	Interventions that incorporate educational techniques such as role-play, problem solving, and modelling may be more effective than interventions that rely on didactic teaching or rote learning.
Educators / Facilitators	Multi-disciplinary education may be more effective than single-clinician education. Peer-education may be effective with trained educators as facilitators. The involvement of trained educators may increase the effectiveness of interventions.
Intended participants	Interventions involving parents only may have less effect on child health outcomes than education involving children. Group versus individualised education may be equally effective.
Frequency	Interventions that are conducted over multiple sessions, or on an ongoing basis, may be more effective than once-off sessions.
Material	Audiovisual, written, and online material may all have a role in education.

Web-Appendix 1. MEDLINE search query

The MEDLINE search involved the following:

1. developing countries/
2. (developing countr$ or third world or underdeveloped countr$ or under developed countr$).mp.
3. exp africa/
4. exp caribbean region/ or exp central america/ or latin america/ or mexico/ or exp south america/
5. exp europe, eastern/ or exp transcaucasia/

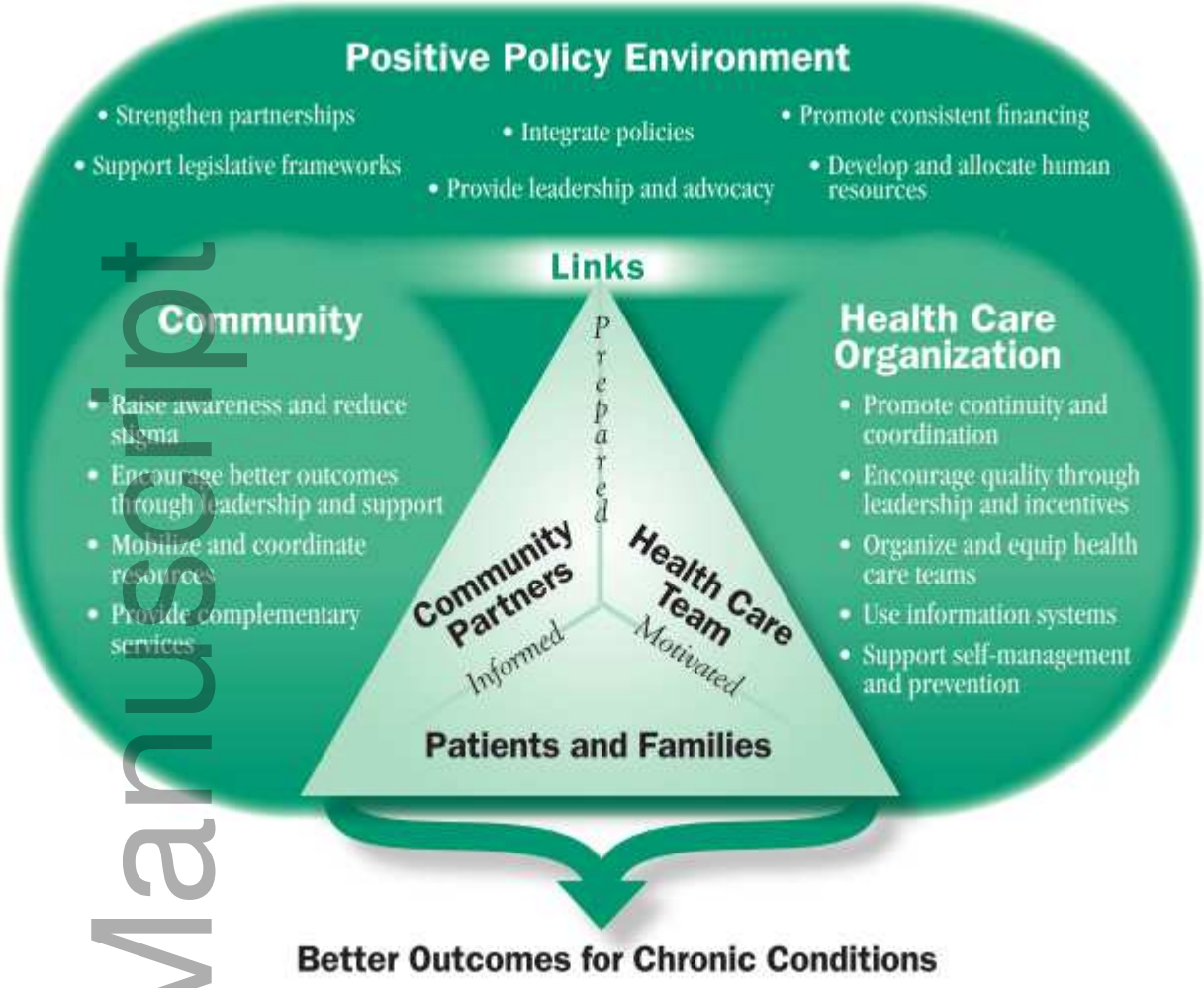
6. exp atlantic islands/ or exp indian ocean islands/ or exp pacific islands/
7. New Guinea/
8. asia/ or exp asia, central/ or asia, southeastern/ or borneo/ or cambodia/ or east timor/ or indonesia/ or laos/ or malaysia/ or mekong valley/ or myanmar/ or philippines/ or thailand/ or vietnam/ or asia, western/ or bangladesh/ or bhutan/ or india/ or middle east/ or afghanistan/ or iran/ or iraq/ or jordan/ or lebanon/ or oman/ or saudi arabia/ or syria/ or turkey/ or yemen/ or nepal/ or pakistan/ or sri lanka/ or far east/ or china/ or tibet/ or exp korea/ or mongolia/
9. (Afghanistan or Albania or Algeria or Angola or Antigua or Argentina or Armenia or Azerbaijan or Bangladesh or Barbados or Barbuda or Belarus or Belize or Bhutan or Bolivia or Bosnia or Botswana or Brazil or Bulgaria or Burkina Faso or Burundi or Cambodia or Cameroon or Central African Republic or Chad or Chile or Colombia or Comoros or Congo or Costa Rica or Croatia or Cuba or Czech* or Congo or Djibouti or Dominica or Dominican or East Timor or Ecuador or Egypt or El Salvador or Equatorial Guinea or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gambia or Ghana or Grenada or Guatemala or Guinea-Bissau or Guyana or Haiti or Honduras or Hungary or India or Indonesia or Iran or Iraq or Ivory Coast or Jamaica or Jordan or Kazakhstan or Kenya or Kiribati or Kyrgyzstan or Laos or Latvia or Lebanon or Lesotho or Liberia or Libya or Lithuania or Madagascar or Malawi or Malaysia or Maldives or Mali or Marshall Islands or Mauritania or Mauritius or Mexico or Micronesia or Moldova or Mongolia or Montenegro or Morocco or Mozambique or Myanmar or Namibia or Nepal or New Guinea or Nicaragua or Niger or Nigeria or Korea or Oman or Pakistan or Palau or Panama or Papua New Guinea or Paraguay or Benin or China or Peru or Philippines or Poland or Cape Verde or Georgia or Kosovo or Macedonia or Yemen or Romania or Russia or Rwanda or Saint Kitts or Saint Vincent or Saint Lucia or Sao Tome Principe or Saudi Arabia or Senegal or Serbia or Seychelles or Sierra Leone or Slovak* or South Africa or Solomon Islands or Somalia or Sri Lanka or Sri-Lanka or Sudan or Suriname or Swaziland or Syria or Tajikistan or Tanzania or Thailand or Togo or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Uganda or Ukraine or Uruguay or Uzbekistan or Vanuatu or Venezuela or Vietnam or Samoa or Zambia or Zimbabwe).af.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. *Asthma/ or exp *Tuberculosis/ or Bronchiectasis/ or Cerebral Palsy/ or exp *Spinal Dysraphism/ or *Chronic Disease/ or exp *Epilepsy/ or exp *HIV Infections/ or Heart Defects, Congenital/ or *Rheumatic Heart Disease/ or exp *Neoplasms/ or exp *Mental Disorders/ or *Congenital Hypothyroidism/ or (*diabetes mellitus/ or exp *diabetes mellitus, type 1/)
12. *Patient Education as Topic/ or exp *Self Care/ or *Reminder Systems/ or (*audit/ and *feedback/) or *patient education/ or *promotion of self-management/ or exp *Inservice Training/ or *provider education/ or *facilitated relay of clinical data/ or *shared care/ or *task-shifting/ or *financial incentives/ or *financial regulation/ or (*medical records/ or *health re-

cords, personal/ or *medical record linkage/ or *medical records, problem-oriented/ or exp *medical records systems, computerized/) or (*case management/ or *patient-centered care/ or exp *"continuity of patient care"/ or *"exp delivery of health care, integrated"/ or exp *patient care team/ or exp *patient-centered care/ or *point-of-care systems/ or *clinical competence/ or *guideline adherence/ or *"outcome and process assessment (health care)"/ or *peer review, health care/ or exp *quality assurance, health care/ or exp *quality improvement/ or exp *quality indicators, health care/) or (exp *"delivery of health care, integrated"/ or *community-based participatory research/ or *comparative effectiveness research/ or exp *quality assurance, health care/ or exp *evaluation studies as topic/ or *guideline adherence/ or exp *"outcome and process assessment (health care)"/)

13. 10 and 11 and 12

14. limit 13 to (english language and "all child (0 to 18 years)")

15. limit 14 to (clinical trial, all or clinical trial, phase i or clinical trial, phase ii or clinical trial, phase iii or clinical trial, phase iv or clinical trial or comparative study or controlled clinical trial or evaluation studies or pragmatic clinical trial or randomized controlled trial)



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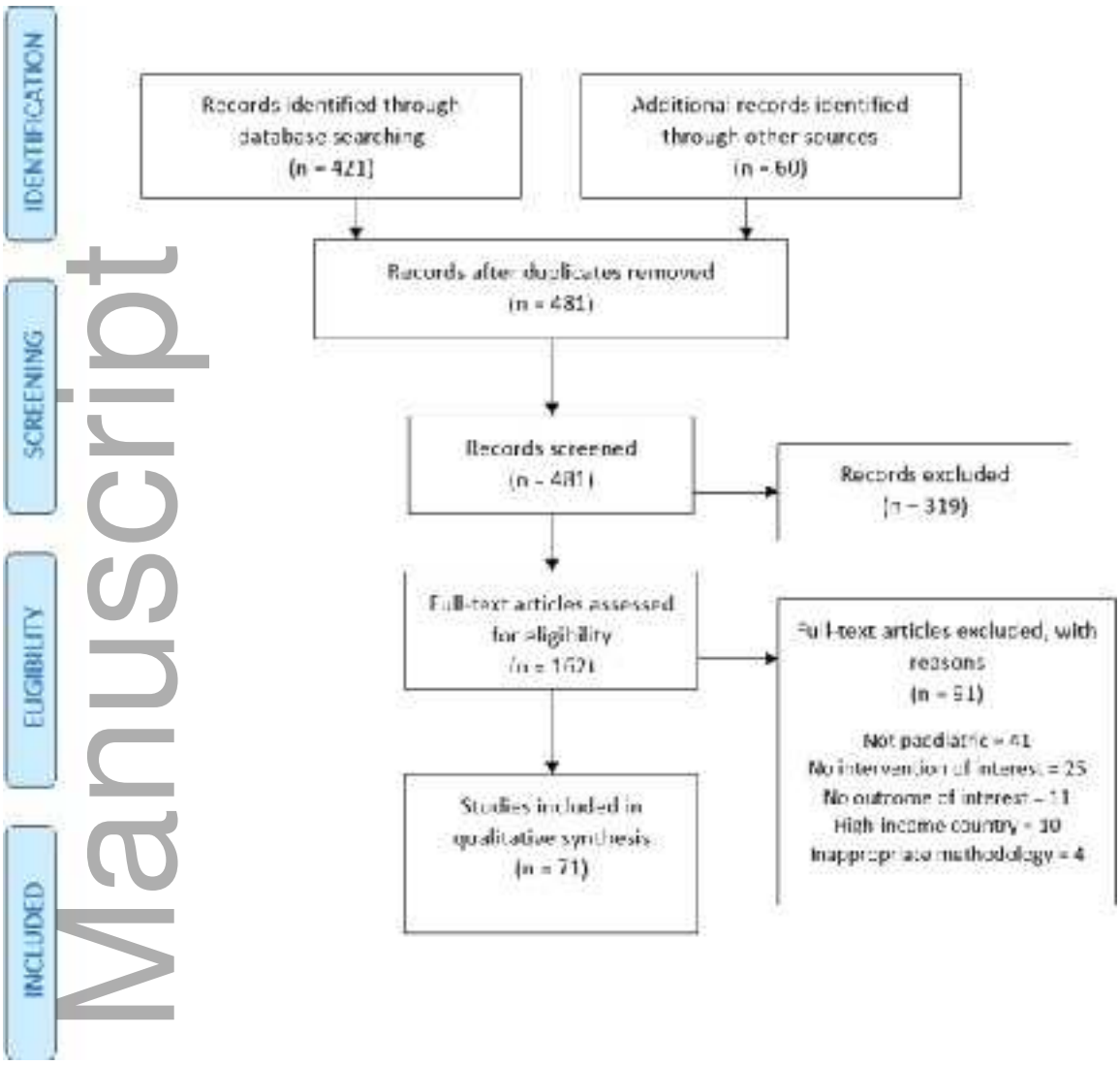

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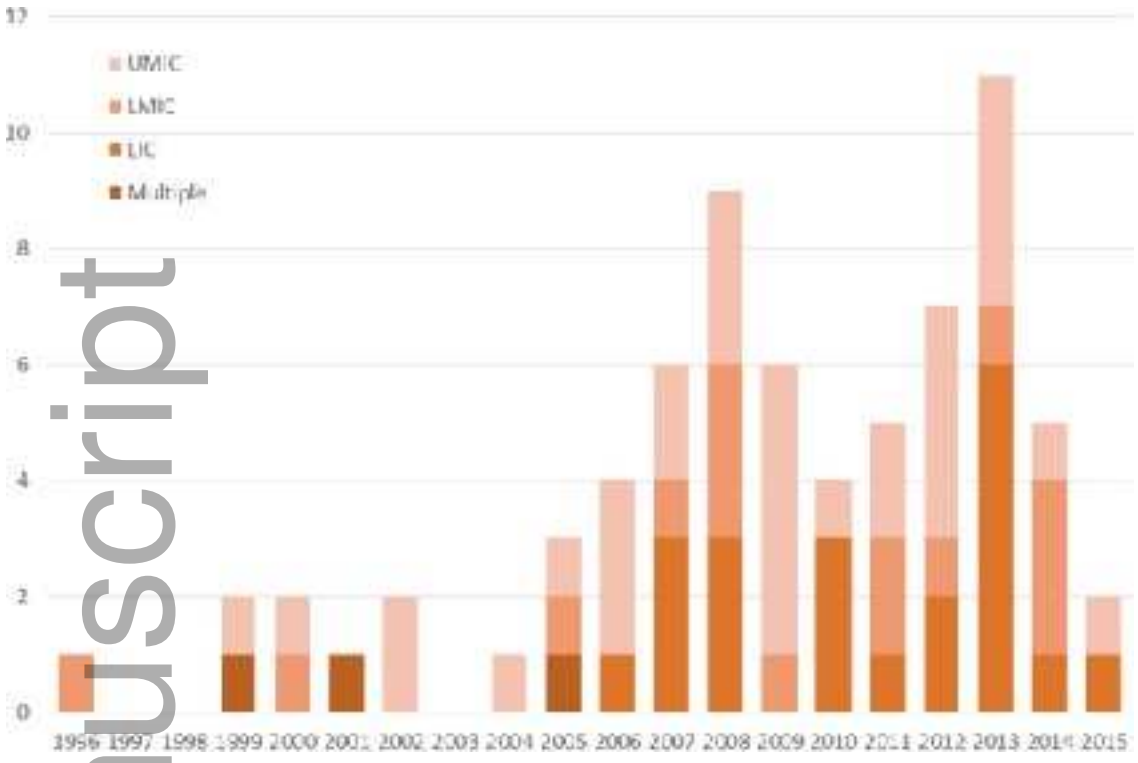

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