

**A systematic review of the training of health care
workers within essential medicines supply programs in
developing countries**

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Abstract

Background

Deficiencies in Health Care Worker performance in developing countries are due to a variety of causes. These include for instance lack of health resources, low skill, undefined work processes. Regardless of the cause of poor Health Care Worker performance, the traditional solution has been to provide training. Consequently, many health training programs are conducted. These include the training activities within Essential Medicines supply programs. The training programs employ variety of approaches and methods. Developed on developed country models, the methods and approaches are often program depended. Incidentally, there is growing evidence that these resource-intensive training programs are not always effective. The evidence for the training effectiveness and sustainability appears weak or lacking. Therefore; demand is growing for other interventions that might help improve Health Care Workers' performance more efficiently and cost-effectively.

Objectives

To investigate the effectiveness of training Health Care Workers within Essential Medicines supply programs in developing countries. this research will focus on pharmaceutical and clinical care practices at the Primary Health Care level in selected developing country regions, the impact of training will be explored. Specifically, the factors affecting the training program sustainability will be examined.

Search strategy

Using a pre-defined search protocol, the Cochrane Library was initially searched for existing reviews including reviews currently being undertaken in this area of research. The search was limited from 1990 to 2010 time period. The search activity was extended to MEDLINE, PubMed and Cinahl indexing databases. Scopus and Web of Science citation databases were also searched for a comprehensive location of relevant studies. Google Scholar and organisational websites

were searched for relevant published and non published literature. Finally, reference lists of retrieved articles were checked for additional articles relevant to the study topic.

Selection criteria

Trials eligible for inclusion in the review included cluster randomised controlled trials, randomised controlled trials employing various randomisation methods. In addition, intervention studies that objectively measured medicine use practices or health outcomes by Health Care Workers were eligible for inclusion.

Data collection and analysis

Using a pre-determined study inclusion criterion, relevant studies that qualified on all inclusion criteria were selected for review. Data from full articles was extracted using a standardised form and assessed for study quality. A meta-study was not a primary objective of this study and was not appropriate.

Results

Twelve randomised controlled studies met inclusion criteria. These employed varied randomisation procedures. Three studies focused on training in pharmacy supervised sites including untrained medicine retailer shops. The other eight studies focused on training interventions with clinical care workers. All studies focused on health services within primary care settings.

Conclusion

The result of the twelve reviewed studies showed training activities delivered in repeat sessions leads to improvements in Health Care Workers' performance. This study found evidence that training is better than no training and the knowledge from one training program may be transferable to other programs and work sites. However, because of the small number of studies,

differences in training methods, and weaknesses in study designs, it was not possible to conclude that in general, training improves Health Care Workers' performance in primary care settings. Consequently, well designed trials are therefore needed to provide strong reliable evidence on what these training programs achieve. To guide policy decisions regarding which training intervention to invest in, such studies should also include data on resources and cost-effectiveness of training interventions

Presentations and Publications

The work embodied in this thesis has been presented on a number of occasions and is being prepared for journal publication.

Presentations

- i. Systematic Review Methodology in Public Health research (oral presentation)

Mutie, M. and Cooper, G.

Confirmation of enrolment initial Seminar, University of Canberra. June 2009.

- ii. Education and training of pharmacy assistants across the developing countries (Poster Presentation)

Mutie, M. Cooper, G. and Brown, A.

APSA Conference, Hobart, Australia Dec 2009.

Papers in preparation

- i. Systematic review of the training of health care workers within Essential Medicines supply programs in developing countries.

(Under revision)

Mutie, M., Cooper G. and Davey, R.

- ii. Effects of new technologies on chronic disease management in developing countries.

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LIST OF ABBREVIATIONS

EM

Essential Medicines

EML

Essential Medicine List

NEML

National Essential Medicine List

NHMRC

National Health and Medical Research Council

HCW

Health Care Worker

CHCW

Community Health Care Worker

PHC

Primary Health Care

WHO

World Health Organisation

UNICEF

The United Nations International Children's Fund

INRUD

International Network for Rational Use of Drugs

ORS

Oral Rehydration Salts

DAP

Drug Action Program

Chapter 1 Introduction

1.1 Thesis overview

This thesis presents a systematic review of the literature regarding training of health care workers within Essential Medicines (EM) supply programs. The study focuses on training activities in developing countries covering time period from 1990 to 2010. This review however, excludes within the West Pacific World Health Organisation epidemiological region. The conceptual framework for this study is provided by the key elements of the Essential Medicines concept. This introductory chapter will outline the aim and scope of this research.

Following this introductory chapter is a background chapter which reviews literature on the historical development of Essential Medicines concept, the clinical application of the concept in Primary Health Care (PHC), then conclude with justification of the research. The methodology chapter discusses the theoretical framework of systematic review followed by chapters which present the systematic review process. The discussion chapter presents a discussion on the review findings. Implications for training in EM supply programs are discussed after which the study concludes with a chapter on review recommendations and direction proposed for future research.

1.2 Definition of terms

Based on the World Health Organisation Expert Committee Report of 2002, on Essential Medicines, the following definitions are adopted in this research:

Essential medicines (EM) are those medicines that satisfy priority health care needs of a population. Out of the total possible number of medicines available in the market, Essential Medicines are selected with due regard to individual country's disease prevalence, evidence of efficacy and safety, and comparative cost-effectiveness. Based on prevalent disease conditions in the country, the Essential Medicine list is updated every two years. This ensures suitability of available medicines to the health needs of the country. Essential Medicines therefore are tools available to health care workers to address the most prevalent disorders and diseases in a country.

Primary Health Care (PHC) for the purpose of this research refers to the activity of health care workers who act as the first point of consultation for patients. Generally, the care may be provided by clinicians who may be Physicians, Pharmacists, Nurses, Paramedics, Community Health Workers and various other workers trained for the purpose, and based in the community. While there are many definitions of PHC, in the literature, the principles of accessible, comprehensive, continuous and coordinated personal care in the context of family and community are consistent.

Health Care Workers (HCW) as used in this study refers to men and women working in the provision of health services, whether as individual practitioners or employees of health institutions and programs, whether or not professionally trained, and whether or not subject to public regulation.

Developing countries refers to countries identified by high child and high adult mortality within specified WHO epidemiological regions. The grouping is based on patterns of child and adult mortality. The groups range from A (lowest) to E (highest). These include, Africa AFR (D, E); Americas AMR (D); East-Mediterranean EMR (D) and south-East Asia SEAR (D).

1.3 Background to the study

In developing countries, most deaths have been identified to occur prematurely among children and adults (Black, Morris et al. 2003). It is possible that good quality care by health care workers could reduce these deaths. Consistently over the years, the World Health Organisation (WHO) has reiterated that these deaths could be prevented or reduced by use of cost-effective Essential Medicines by trained Health Care Workers.

Provision of appropriate care is however, depended on presence of adequately skilled personnel at the point of care (Bryce, Arifeen et al. 2003). To improve Health Care Workers' capacity to provide adequate care, training courses are conducted mainly within Essential Medicines supply programs (Reynolds, Toroitich-Ruto et al. 2008) across the developing countries. Other training

programs are conducted within training arms of disease oriented programs. which include but not limited to: Integrated Management of Childhood Illness (IMCI), Control of Diarrhoeal Diseases (CDD), Acute Respiratory Infections (ARI), Family Planning (FP) and Malaria Control programs (Milot 2006).

The Essential Medicines training programs were developed in recognition of poor skill development among pharmaceutical staff, particularly in the selection, procurement, distribution and use of Essential Medicines at the level of Primary Health Care. Typically, the training programs are short and intensive, with a structured approach to delivery. The aim is to improve pharmaceutical and clinical care for improved health outcomes.

Training, however, costs time and money. These costs include allowances for trainees, training materials transport and accommodation costs for participants. Apart from the high cost of training delivery, attendance at such sessions means that important health staff, particularly the instructors and participants are absent from their normal duties with potential disruption of patient care. Interestingly, despite the cost, training programs are a thriving industry in developing countries, where allowances may be seen as extra income for participants including the organisations that deliver the training.

In the hope that the training might improve the quality of care by Health Care Workers and therefore improvement in health outcomes, considerable global effort has gone into program funding and refinement to meet the individual country health needs (Laing 1989). Yet, despite this effort, it is reported in the literature that these training programs are rarely evaluated(WHO 2001). Furthermore, the reliance on this type of training by health organisations and donor agencies is suggestive of a belief that they play a positive role in improving Health Care Workers' ability to improve pharmaceutical and clinical care practices. In this framework however, a detailed evaluation of the training appears lacking.

1.4 Aim of the study

This study aims to examine and describe the training of health care workers in Essential Medicines supply programs. The study will document evidence for training effectiveness and best practice in training within Essential Medicines supply programs. To achieve this, the study will comprehensively explore the training infrastructure: the activities, methods employed, training contents and materials used. In the light of past research on the topic, the study will refine and update current knowledge on the effectiveness of training interventions aimed at improving pharmaceutical and clinical care practices by health care workers for improved health outcomes.

1.5 Research question

The lack of uniformity and co-ordination at both regional and national level in training has often been blamed for problems related to pharmaceutical and clinical care practices (Getahun 2002). Recent evidence suggests that this has contributed to disparity in medicines supply and clinical care practices and therefore poor health outcomes reflected by the high child and adult mortality in developing countries (EPN 2009). On the basis of the poor medicine supply, management and clinical care practices, governments, public and private health organizations conduct a multitude of training programs for health care workers across the developing countries (Laing 1991). A detailed evaluation of the training methods and strategies is rarely performed. In order to evaluate the training infrastructure, this study aims to answer the following questions:

- i. Does training of Health Care workers affect how medicines are used in Primary Health Care in developing countries?

- ii. Does this affect health outcomes?

To achieve this aim therefore, a systematic review of relevant literature is an appropriate methodology employ to provide evidence to address these questions. The next chapter reviews the literature on the historical development of Essential Medicines concept and the application of the concept in clinical care as it relates to training of Health Care Workers.

1.6 Summary

Appropriately planned training has been identified as necessary for quality health service delivery in Primary Health Care settings. However, training is generally expensive, time consuming and can divert staff from routine duties. Furthermore, training may not produce expected benefit; therefore evaluation of such training is required. Such evaluative activity is critical to guide policy on training Health Care Workers for improved care practices.

This chapter has briefly outlined the thesis overview, an introductory background for this research and identified the research questions. The next chapter comprehensively reviews the literature on the development of Essential Medicines concept, the application in Primary Health Care context, then concludes with justification of the proposed research.

Chapter 2 Background

2.1 Introduction

This chapter reviews the published literature related to training Health Care Workers in Essential Medicines for improved health outcomes. The review is divided in two sections: Part A, which discusses the historical development of the Essential Medicines Lists followed by Part B, which focuses on the application of these limited medicine Lists in primary care services in developing countries. Finally, this background chapter concludes with justification of the proposed study to be undertaken through a systematic review.

As Quick, Hogerzeil et al (2002) reiterate (Quick, Hogerzeil et al. 2002), most leading causes of death and disability in developing countries can be prevented, treated or at least alleviated by skilled Health Care Workers with cost-effective Essential Medicines. Despite this fact, studies from different regions in developing countries consistently report that millions of people do not have access to the much needed medicines (Pécoul, Chirac et al. 1999).

Although relative frequencies of specific illnesses vary across the countries, health services are faced with a common set of problems for which improved medicine access is a significant part of the solution. Furthermore, health experts argue that mortality figures across the developing regions reflect a huge burden of illness that could be reduced if carefully selected, low cost medicines were available and were appropriately used (WHO 2001). The evidence suggests that efficient, appropriate medicine supply and distribution is an essential component of an effective and affordable health care service. For appropriate supply to occur, Health Care workers need suitable training to reinforce care skills.

2.2 Part A: The Essential Medicines Lists

2.2.1 Historical development

In 1977, the World Health Organisation developed the first model list of Essential Medicines to provide countries as a guide for selecting medicines that best address public health needs (WHO 2002). Since then, the List has been revised every two years, to reflect pharmaceutical advancement and treatment regimes for new and emerging diseases (WHO 2007). Both the content and the process by which it is updated are intended to be a model for developing countries to guide at national level the health training, selection and procurement of national Essential Medicines.

The idea behind limited medicine Lists was and remains that the use of a limited number of medicines leads to low costs, improved supply expanded and improved access to medicines which therefore lead to improved health care. Today, some three decades later, National Essential Medicine Lists (NEML) are in place in most WHO member countries. They provide evidence to guide policies regarding, health training the use and supply of medicines and thus promotion of Primary Health Care services.

In the lead up to 1977 when the first model List was developed, health training was often used brand names of medicines, with little attention given to education on appropriate treatments for common diseases (Hogerzeil 2003). Today, using generic names is the norm in health training and the WHO guide to prescribing has been adopted in health training programs. Further to this initiative, researchers report that over 60% of the countries provide for generic substitution in pharmacies, whereby preference is given to less expensive, easily available medicines based on National Lists of Essential Medicines (NEML) (Quick, Hogerzeil et al. 2002).

The National Essential Medicine List (NEML) is a limited range of carefully selected medicines needed to treat the most common diseases affecting the population. Examples of common diseases addressed in NEML are malaria, diabetes, Human Immune deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) and pneumonia among others. Apart from disease

prevalence, individual medicines are selected for inclusion in the List on the basis of evidence for efficacy, safety, and comparative cost-effectiveness. The List is intended to be available, within the context of functioning health system, at all times and in adequate amounts, in the appropriate dosage forms, with assured quality, adequate information, and at a price that an individual and the community can afford (EPN 2009).

2.2.2. Selection process for inclusion in national essential medicines list

Within a country, the selection of Essential Medicines for development of a NEML is a two step process. Firstly; the medicine has to be registered in the country. Regulatory approval is usually based on a review of efficacy, safety, and quality. Secondly; from these registered medicines, Essential Medicines for a therapeutic class are then selected on the basis of comparative efficacy, safety, and cost. Once developed, the National List of Essential Medicines is then used to guide the procurement and supply of medicines in the public hospitals, health centres and dispensaries. In addition, National List of Essential Medicines is crucial for defining the content and scope in training of health workers (WHO 2002).

2.2.3. Advantages of limited lists of medicines

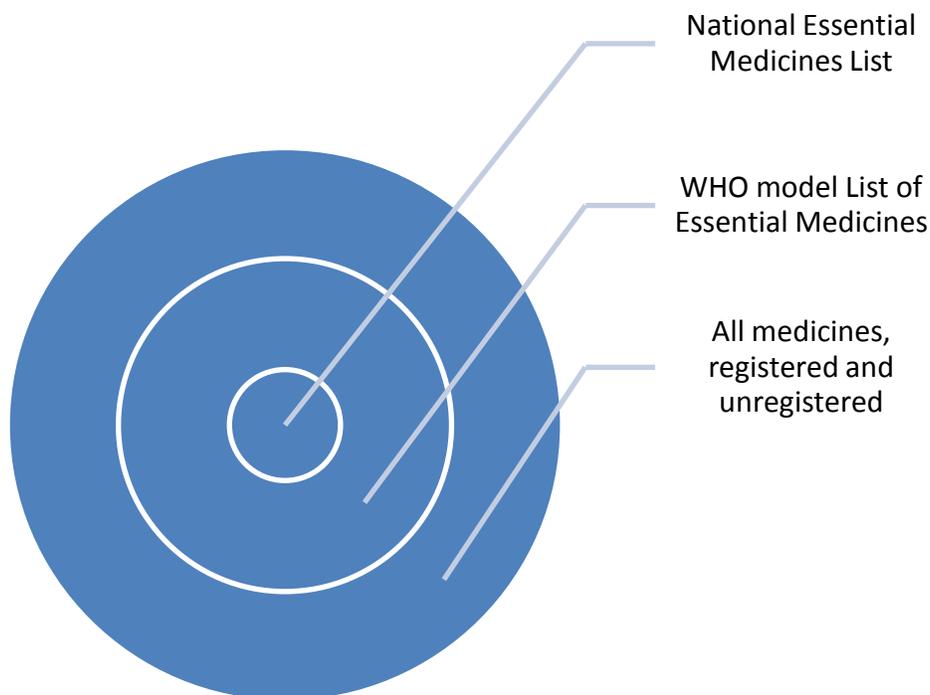
Examples of the advantages of the limited lists are well documented (Laing 2009). These advantages could be classified into two distinct categories- medical and economical. From a medical viewpoint, the evidence shows that when a National List of Essential Medicines is developed, introduced, and supported, leads to improved prescribing quality by Health Care Workers which leads to desired health outcomes (Hogerzeil 2004). The evidence shows that in different countries, these Lists provide a focus for dissemination of medicines information about the use including health training.

On the other hand from an economic viewpoint, available evidence demonstrates that utilisation of limited lists of medicines is cost-effective and leads to reduction in pharmaceutical costs through economies of scale. Overall, the evidence is strong that limited Lists lead to simplified systems of procurement, supply, distribution, and above all, minimisation of waste of

resources(Laing, Hogerzeil et al. 2001). The evidence for these benefits is consistently reported by independent researchers from developing countries.

Figure 1 below, illustrates the central position of NEML, which is a derivative of the WHO model List. The outer region demonstrates the relationship of all medicines, registered and unregistered. This forms the general pool of medicines from which Essential Medicines are selected.

Figure 1 Essential Medicines representation



2.2.4. The WHO model List of Essential Medicines

Having provided an overview of the development of National Essential Medicines List, it is necessary also to provide an outline of the current WHO model List. This is crucial to provide an insight into the derivatives of the NEML from the WHO model List of Essential Medicines. Authoritative evidence shows that, majority of medicines in the 16th WHO 2010 model List are well-known, well-established medicines, most of which are now ‘off patent’ and available from many sources. As a model, this updated List represents minimum medicine needs for a country

Primary Health Care (PHC) service (Hogerzeil 2004). Supported by current evidence, the List includes the most efficacious, safe and cost-effective medicines for priority diseases and conditions. Under the WHO Essential Medicines strategy, national governments are supposed to identify a List of medicines that satisfies the most urgent health needs of the majority of the population, and thereafter take steps to make the medicines available in the appropriate dosage forms in all government health facilities in the country (WHO 2003).

The WHO reports that to date, 156 WHO member states have established National Essential Medicine Lists. These derivative National Essential Medicine Lists for the countries provide guidance on procurement and supply of medicines in public health sector, schemes that reimburse medicine costs, donation and local production (Ruxin, Paluzzi et al. 2005). On the other hand, international organisations including WHO as well as both for-profit and not-for-profit Non-Governmental Organisations (NGO) are reported to adopt the Essential Medicines concept (Hogerzeil 2003). These organisations base their medicine supply and training activities, on National Essential Medicines List for the country they may operate in (Hogerzeil 2003). From this, it is clear that the National Essential Medicines Lists drive the supply of medicines in a multitude of ways across the developing countries.

2.3. Part B. Essential Medicines in Primary Health Care

Since the Declaration of Alma-Ata (former Union of Soviet Socialist Republics) by the WHO in 1978 on Primary Health Care, developing countries have put significant effort into maximising Primary Health Care services in terms of training of Health Care Workers (HCW) and allocation of health resources in order to increase health services coverage. Primary Health Care refers to health service which is accessible, meets the needs of the individuals and the community and represents the first level of care. While there are many definitions of PHC in the literature, the principles of accessible, comprehensive, continuous and coordinated personal care in the context of family and community are consistent (Lewis, Eskeland et al. 2004).

Access to appropriate medicines by Primary Health Care consumers is a primary concern for the WHO to enable timely treatment of prevalent conditions in the community (Hall and Taylor

2003). Appropriate treatments can only be achieved if the Health Care Workers are trained to ensure optimal care, thus, training is essential in this context.

The components of PHC include prevention, curative services and health education. In the context of primary care, Essential Medicines are a necessary tool. To ensure these activities are carried out, Health Care Workers must be trained and supervised to ensure quality of services. To ensure quality health outcomes, governments must regularly assess how accessible the skilled care services are to the community as implementation is carried out. The implementation of PHC services requires the following preconditions:

- i. qualified Health Care Workers,
- ii. adequate infrastructure,
- iii. accessible and affordable essential Medicines.

2.3.1. Essential Medicines supply programs in developing countries

Health experts involved in development of on Essential Medicines Lists have frequently described the List of medicines as the foundation for every public health program aiming at reducing morbidity and mortality in the developing countries (WHO 2002). Common public health programs that employ on Essential Medicines concept include but not limited to: Child Survival programs, Antenatal Care, Treatment of Enteric and Respiratory Pathogens, and Control of Tuberculosis and Malaria. Furthermore, it is heavily documented that the care of chronic diseases such as diabetes, HIV/AIDS, the provision of preventive care services such as immunisation and family planning are largely handled through these programs (Walker, Hogerzeil et al. 1990).

2.3.2. Skill and competence

Research evidence from the WHO and other researchers on medicine supply and use behaviour from developing countries demonstrate that the high patient mortality and poor quality of care as described in the concluded introductory chapter are related to Health Care Workers' skill and competence (INRUD 1997). Furthermore, irregular medicine supply overprescribing and poor

dispensing practices are often cited in the literature as common practices in developing countries (INRUD 1990). Thus, the relationship between training in medicines use and management and the improvement in primary care is clearly evident.

Inappropriate selection, purchasing, dosing of medicines and poorly regulated medicine access further increase the opportunity for misuse of medicines in this setting. Health Care Workers' failure to adhere to approved treatment regimes as provided in NEML and treatment guidelines has been cited as a practice that must stop in order to achieve the desired health outcomes (Ross-Degnan, Laing et al. 1992). Studies conducted in developing countries consistently report that millions of children and adults are needlessly dying because for them, appropriate medicines are unavailable, unsafe, or inappropriately prescribed and used (Black, Morris et al. 2003).

2.3.3. Medicines access gap

Reported high patient mortality when proven effective health intervention tools such as Essential Medicines are available in the country indicates presence of an access gap which must be closed in order to reduce morbidity and mortality. The evidence shows that reasons for this 'access gap' range from economic factors for instance, underlying poverty, high medicine prices and weak inefficient medicine supply chain (Quick, Laing et al. 1991).

Closing the gap entails action in key areas such as training in medicine supply strategies particularly the selection, procurement, storage, prescribing and rational use. In addition to poor medicines access, commonly occurring and endemic diseases have been described in the literature as a major reason why communities in developing countries remain trapped in poverty (DFID 2004). Either, individuals cannot afford the cost of health care service or, the cost is so high that they are pushed into debt and dependency (Niens, Cameron et al. 2010). The resultant effects are many and long lasting. For instance, parents may not afford to send children to school, working days are lost and economic productivity declines. In countries hit hardest by diseases such as malaria and HIV/AIDS for instance Sub-Sahara Africa in particular, development has been undermined (DFID 2004).

2.3.4. Affordability issues

A recent multi-country study by Niens et al (2010) examined the impoverishing effects of purchasing medicines in developing countries. Affordability was assessed in terms of the proportion of the population being pushed to below US\$2 per day poverty level because of the purchase of medicines. During the study, the price of salbutamol 100mcg/dose inhaler, glibenclamide 5mg/tablet, atenolol 50mg/tablet and amoxicillin 250mg/capsule were obtained from pharmacies using a standard survey methodology. The researchers used the World Bank's poverty measurement indicators (Baulch and Masset 2003) to assess household expenditure data and information on income distribution. In the countries studied, the authors conclude that purchasing these medicines would impoverish up to 86% of the population (Niens, Cameron et al. 2010).

Furthermore, other researchers on a related study have reported that original brands of medicines are significantly more expensive than the generic equivalents (Burapadaja, Kawasaki et al. 2007). In the Philippines, for example, the original brand of atenolol would push an additional 22% of the population below the US\$2 per day, whereas for the generic for this demographic shift is 7%. Given the related prevalence figures, a huge population is affected by the costs of medicines (Niens, Cameron et al. 2010). The findings in the study therefore suggest that affordability limits accessibility to the much needed Essential Medicines in these countries.

Ironically, cost-effective public health tools for fighting ill health do exist. Essential Medicines Lists have been singled out in studies as one of those tools and should be supported (Pécoul, Chirac et al. 1999). Such support aims at increasing the medicine access through training to improve health care worker skills on appropriate selection and procurement; storage for safety and efficacy; and appropriate use. Health experts argue that through these practices, the health of populations in the countries would improve and therefore households and countries would secure development gains (DFID 2004).

2.4 Strategies used for quality health outcomes in developing countries

To ensure, expanded access to medicines in developing countries, skilled Health Care Workers are required. Currently, training is the main strategy used to deal with problems of Health Care Workers' technical competence to improve skill (Ciccio, Makumbi et al. 2009). The literature suggests that often, the training conducted in a centralised, short-term, predominantly in 'classroom' style fashion (Awofeso 2008). Moreover, the training is organised at regional, national or international level. Further, the decision as to what kind of training, who to train and the approach to delivery is often driven by availability of the available resources, funds in particular (Ciccio, Makumbi et al. 2009). For instance the Malaria, Leprosy and Tuberculosis, plus Family Planning programs all with management centres in Western countries, are reported to conduct disease specific training programs for health care workers in developing countries (Management Sciences for Health 2009), (Opiyo and English 2010). By this account therefore, an overall picture of a non-co-ordinated approach to training is apparent.

Interestingly, some HCWs in a local district who need training may be left out because the funds are insufficient to cover 'everybody'. As a result, fragmentation of training occurs. Moreover, leaving out some health care workers only serves to further fragment the training at the local level. Therefore; the training may not have the expected impact on health outcomes. With the fragmentation therefore, it is likely that many lessons already learned, both positive and negative are being repeated and current best practice is not applied.

This review study seeks to consolidate what is already known about training in Essential Medicines supply programs, to inform policy makers and health planners in decision making. This is necessary to ensure a co-ordinated approach to training and thus improve medicine supply in developing countries.

In the present systematic review, a limited number of reported studies examined medicine supply from policy perspective. Other studies of varied research designs examined effects of health interventions, almost exclusively from clinical perspective and few others from the consumer perspective. These activities are conducted within independent disease programs. An obvious

tendency in these programs is duplication of health intervention objectives and themes. Moreover, with fragmented disease programs, which are often uncoordinated, repetition of health intervention research with similar or related themes within and across the countries is apparent.

2.5. Justification of this research

Irregular supply of Essential Medicines, uncoordinated training programs for Health Care Workers have been identified in the literature as a hurdle to effective and high quality care in developing countries (Ratanawijitrasin and Wondemagegnehu 2002). The evidence links the training deficiency and poor care by health care workers to the high mortality in developing countries (Radyowijati and Haak 2003).

Yet at the present time, few Health Care Worker training activities in Essential Medicines supply programs are reported. Considering the amount of resources invested in these programs, this is unjustifiable. A systematic follow up of the trainees' performance post training is rare. Many researchers from all regions of the world, in the reviewed literature in the past two decades have consistently alluded to health authorities about the apparent lack of published studies and called for the urgent attention to public health research focusing on training issues for Health Care Workers in developing countries (Ross-Degnan, Laing et al. 1997; Radyowijati and Haak 2003).

Without this information, experience cannot be shared or built on. This study intends to fill this gap. This lack of detailed information into the training will be examined by a systematic review of the available literature, to form some baseline data on this extremely important issue (Ross-Degnan, Laing et al. 1997).

The findings of this review will provide some seminal understanding regarding the effect of training in Essential Medicines supply programs for improved health outcomes. To a great extent, the results of this work will be useful to international health agencies, such as the WHO, organisations in Essential Medicines supply programs in developing countries including but not limited to United States Agency for International Development project(USAID/DELIVER), Management Sciences for Health (MSH) and national governments of developing countries in

implementation of training programs. Furthermore, the comparative aspect of this study provides insight in which countries may have already learnt and adopt best practice in training programs.

2.6 Assumptions

The following assumptions were made in the following study:

- i. Developing countries in the selected WHO regions, though geographically and socio-culturally different all share similarities in Essential Medicines supply needs under the World Health Organisation supported Essential Medicines concept.

- ii. Factors contributing to problems of medicine access are similar across the countries studied.

2.7. Summary

The World Health Organisation's Essential Medicines concept is a key strategy to help improve access to Essential Medicines for quality health outcomes in developing countries. The literature convincingly suggests that Essential Medicines concept is evidence based, is simple, promotes equity, and is rooted in public health principles. This strategy is a proven success but it needs to be continued and strengthened. However, innovative ways of training implementation have to be explored, to improve capacity of Health Care Workers to provide Essential Medicines to communities. The current research is an effort to refine and define training interventions for primary health care workers in developing countries. The following methodology chapter will outline how a systematic review of the literature could be employed to achieve the study objective.

Chapter 3 Methodology

3.1. Introduction

This chapter will outline the theoretical framework which guides the conduct of systematic reviews. In order to provide the background knowledge for the skill necessary to conduct a systematic review the chapter briefly discusses the background of systematic reviews, research paradigms in relation to systematic review, then outlines the key features and components of systematic review process.

3.2. Systematic review definition

In methodological terms, systematic review is a summary of the evidence. It collates all available evidence that fits pre-defined eligibility criteria in order to answer a review question (Hemmingway and Brereton 2009). In order to conduct a systematic review, the reviewer usually uses an explicit systematic method selected to minimise bias, hence providing reliable findings from which conclusions are drawn and decision made (Higgins and Green 2009). Systematic review aims to identify, evaluate and summarise the findings of relevant individual studies, thereby making the available evidence more accessible to decision makers (Popay, Roberts et al. 2006). When appropriate, combined the results of several studies provide a more reliable and precise answer to a research question than one study alone (Popay, Roberts et al. 2006).

3.3. Why are systematic reviews needed?

Health professionals and policy makers are faced with huge amount of information from which to make informed decisions. In practice, it is impossible that they will have the time to appraise this evidence and apply it into health care decisions. Systematic review experts respond to this challenge by summarising the available research evidence and presenting it in a usable format for decision making (Higgins and Green 2009). Moreover, due to the comprehensive search process for available evidence, systemic reviews also help determine what has been done and therefore

pinpoint gaps in knowledge and so identify future areas of research. This process is driven by a set of guidelines, here after referred to as protocol. It is by the review protocol that reviewers ensure comprehensiveness and seek the evidence from published and unpublished literature sources (Reeves, Koppel et al. 2002). The summary of this evidence into a format that supports all the available evidence is known as systematic review (Kitchenham 2004).

3.4. The review protocol

Higgins and Green describe a review protocol as a plan of steps to be followed in a review (Higgins and Green 2009). The review protocol specifies the research question and methods that will be used to locate, select and critically appraise studies related to the research topic. The protocol in addition specifies how to extract and analyse data from the studies that are included for review.

A pre-defined protocol is necessary to reduce the possibility of error and researcher's bias. For example, without a protocol, it is possible that the selection of individual studies or analysis may be driven by researcher beliefs, therefore risk of researcher's bias. Thus review protocol is considered a crucial element in a systematic review. The components of review protocol include:

- i. background of the study and rationale,
- ii. research question that the review is intended to answer,
- iii. the method to be undertaken to answer the research question.

Although some stages must proceed sequentially, some stages can be undertaken simultaneously. The review protocol ensures consistency in the method undertaken in the review process therefore reliability and validity of the results.

3.5. Reliability and validity

The terms reliability and validity have been described by theorists as essentially tools of positivist epistemology (Golafshani 2007). Systematic reviewers use the positivist research paradigm and employ explicit methods to test hypothetical research questions (Denzin and Lincoln 2005). Other authors on the topic (Creswell and Miller 2000) define reliability as the

extent to which results are consistent (Hoepfl 1997). The authors argue for reliability as virtue in all forms of research. This therefore means an accurate representation of the total population under study.

If the results of such review can be reproduced under similar methodology, then the systematic review is considered reliable (Creswell and Miller 2000). Reliability in systematic review is demonstrated through documentation of the strategies used to minimize bias and include the review protocol, inclusion/exclusion criteria, data collection and analysis in a manner that facilitates reproduction of the search, combination of data and subsequent results (Creswell and Miller 2000).

Creswell and Miller provide the following explanation of what validity is in quantitative research: validity determines whether research truly measures that which is intended to measure or how truthful the research results are (Creswell and Miller 2000). Reviewers generally determine validity by asking a series of questions and will often look for the answers in the research of others. (Glesne and Peshkin 1992),(Kumar 2005). In order to ensure reliability and validity of the results, a systematic review process utilises a standardised fashion in selection of the studies for review (Healy and Perry 2000). This involves examination and allocation of evidence as claimed in each individual article (NHMRC 2009). To guide reviewers, a standard guideline for judging the evidence of research articles has been recommended by the Australian National Health and Medical Research Council (NHMRC).

3.6. Critical appraisal

Critical appraisal is “the process of systematically examining research evidence to assess its validity, results and relevance before using it to inform a decision” (Burls 2009) Once a study is deemed appropriate for inclusion, it is then assessed for rigour in order to prevent misdirection of the systematic review due to poor methodological quality (Whittemore and Knafl 2005). This is necessary in order to ensure review findings are based on reliable research. Studies with methodological flaws and thus unreliable results are rejected at this stage.

The NHMRC provide guidelines for utilisation in assessing individual studies for methodological quality. Based on published systematic review checklists, Table 1 illustrates the most common questions and components addressed during critical appraisal as suggested by NHMRC (NHMRC 2000).

Table 1 Components of critical appraisal

Focus	Specific question
Question	<ul style="list-style-type: none"> • Is the specific purpose of the review stated? • Is the review question clearly and explicitly stated?
Literature search	<ul style="list-style-type: none"> • Were comprehensive search methods used to locate studies? • Was a thorough search done of appropriate databases? • Were other potentially important sources explored?
Study selection	<ul style="list-style-type: none"> • How were studies selected? • Are inclusion/exclusion criteria reported?
Critical appraisal	<ul style="list-style-type: none"> • Was validity of included studies assessed? • Was validity of studies assessed appropriately? • Are validity criteria reported?
Similarities or differences	<ul style="list-style-type: none"> • Are treatments similar enough to combine? • Were reasons for any differences between individual groups explored?
Data synthesis	<ul style="list-style-type: none"> • Were findings from individual studies combined appropriately? • Are the methods to combine studies reported?
Methods documented	<ul style="list-style-type: none"> • Are review methods clearly reported?
Summary of findings	<ul style="list-style-type: none"> • Is summary of findings provided? • Are specific directives for new research proposed? • Were the conclusions supported by the reported data?

Source: NHMRC 2000

3.7. Data collection and analysis

In systematic review, data is collected in a standardised data collection form. Data is only collected after a study has been ruled appropriate for inclusion (Greenhalgh 1997). This enables systematic gathering of all relevant data and limits potential for error or bias. Systematic accumulation of data from the studies retrieved would help identify missing data from published articles. To access all relevant research published or unpublished, contact is then made to expert researchers in the field with an aim for obtaining any unpublished data (Sandelowski 2000).

While in primary studies the investigators select and collect data from individual study subjects, in a systematic review, which is actually a secondary study, the researcher selects and collects

data from primary studies, therefore a systematic review is a secondary study. Analysis may be narrative, such as a structured summary and discussion on the review findings. Alternatively, analysis may be quantitative thus involving statistical analysis (Atkins, Lewin et al. 2008; Higgins and Green 2009; Harden 2010).

3.8. Meta-synthesis versus Meta-analysis

Meta-synthesis of qualitative research is parallel to meta-analysis in quantitative research but has important differences. The approach to meta-synthesis is interpretive rather than deductive (Atkins, Lewin et al. 2008). Quantitative meta-analysis aims to increase certainty in cause and effect conclusions, whereas qualitative meta-synthesis seeks to explain and understand phenomena (Walsh 2005). In the event homogenous studies are uncovered in the current study, recommendation from this project will be that another study is undertaken, whose protocol design and methodology will be for a meta-study. This is necessary as meta-study is not the primary endeavour for this research.

3.9. Summary

The theoretical framework of systematic review has been outlined in the preceding chapter. The next chapter describes the methods in this systematic review.

Chapter 4 Methods

4.1. Introduction

This chapter presents the methods used to conduct the systematic review of the literature concerning training for Health Care Workers in Essential Medicines supply programs in developing countries.

4.2. Objective

This study aims to examine all published and unpublished studies reporting on training of health care workers to improve Essential Medicines supply and management activities in developing countries. In addition it will examine the evidence for training effectiveness in prescribing and dispensing practices by health care workers in developing countries. This will be achieved by examining studies that meet pre-identified methodological criteria for validity in study design and content in terms of:

- i. study participants,
- ii. training intervention-methods, materials, themes,
- iii. study context,
- iv. outcome measures.

Overall, the study aims to identify training methods, content and materials used that are effective in improving medicine use and clinical practices by health care workers at primary health care level in developing countries. The research will then elaborate aspects of training for the support to improve health outcome at primary level of health care.

4.3. Criteria for considering studies for review

This review considers all published quantitative studies that report on training in Essential Medicines supply programs or public health interventions that aim to change Health Care Workers' prescribing and dispensing practices for improved health outcomes. The studies to be reviewed were conducted between 1990 and 2010 inclusive time and published in English language literature. The year 1990 was accepted as a reasonable starting point as it coincides with adoption of the widely accepted prescribing and dispensing indicators recommended jointly by the World Health Organisation and the International Network for Rational use of Drugs (WHO 2009).

4.4. Search strategy and identification of studies

Prior to commencing the search, a scoping review of the literature was conducted by searching the Cochrane Library, Medline including the Joanna Briggs Institute Library of Systematic Reviews to ensure that there was not a pre existing or current review regarding training in essential medicines supply programs in developing countries. The scoping exercise demonstrated that a systematic review on training in the current research perspective had not been carried out. In addition, scoping helped in mapping out the availability of relevant literature addressing the topic and facilitated decision making on the following:

- i. description the types of interventions that have been evaluated,
- ii. description of the sorts of study designs used,
- iii. assessment of the volume of potentially relevant literature.

Following the scoping of the literature was the extended search which was undertaken in three stages:

Stage I: Guided by an expert key Librarian at University of Canberra library, an initial limited search was undertaken in Medline and PubMed databases to identify key words contained in title

or abstract and index terms used to describe the relevant terms to be used. This involved searching existing reviews and primary studies consistent with the study objective.

Stage II: The search extended to other relevant databases using the identified key words and index terms. Initially, extended search revealed limited studies from developing countries meeting the inclusion criteria. A strategy was then adapted in recognition that most evidence for the research topic will firstly come from peer reviewed journal articles, secondly documents from relevant organisations that are authorities in Essential Medicines supply concept, and thirdly, lesser quality evidence may be found in non-refereed articles and narrative reports.

Stage III: In the third and final step we searched reference lists of chosen articles and websites of relevant organisations for additional primary studies relevant to the research topic. See Appendix A for the full list of search words and combinations used in the review.

It is acknowledged that every database has its unique indexing terms and although many of the terms used are similar, individual search strategy was adopted for each database. During the search process, consideration was given to the diverse terminology used and the synonyms of the key words as it may influence identification of relevant studies. (See Table 2 for the list of the searched databases and organisations containing information considered relevant for this review.

Table 2 Databases and organisations searched in the review

Databases and organisations searched
Indexing databases
Medline(via EBSCO)
Pub Med- includes Pub Med Central
CINAHL and Health Source
Highwire
Citation Databases
Scopus -includes EMBASE
Web of Science
Multi-disciplinary scholarly literature
Google Scholar
Journal collections
Wiley Online Library -via Databases and other Resources link on UC Library Web
Springer via Databases and other Resources link on UC Web
Organisations for Grey literature
WHO
USAID/DELIVER
Jhpiego
Management Sciences for Health
African Medical Research Foundation
Swiss Tropical Institute

4.5. Pre-determined criteria for including studies in the review

In this review, we set to include before-and-after experimental studies with controls but excluded uncontrolled ones because any secular trend or sudden change makes it difficult to attribute observed changes to the intervention. Before-and-after studies can also be strengthened by time-series analysis or by observing the experimental group before, during, and after a well-defined intervention period or crossover designs. For these reasons we limited our review to evaluations that used one or more of the following study designs: cluster randomised, randomised cross-over, and simple randomised, controlled before and after trials and interrupted time series studies. See Table 3.

Table 3 Study designs considered acceptable for inclusion

Inclusion

- i. Cluster randomised controlled trials
 - ii. Randomised control trails (RCT) that used methods of randomisation such as:
 - i. crossover (alternating allocation to either control or experimental arms)
 - ii. educational intervention aiming for change in medicines use or health outcome
 - iii. study populations of health care workers-physicians, pharmacist, nurses, community health workers and volunteers or supply managers
 - iv. measurements of health care worker performance based on medicine use indicators or health outcomes
 - v. interrupted time series
-

4.6. Exclusion

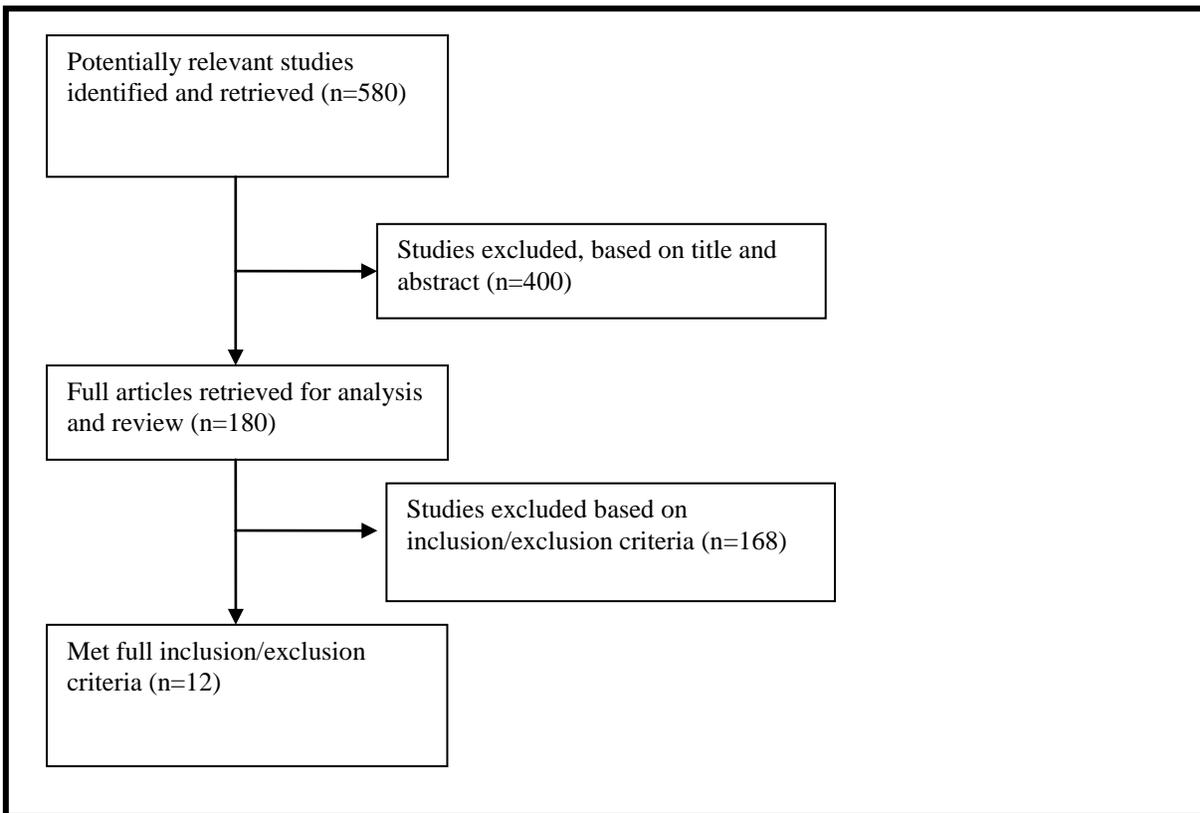
Using the pre-determined exclusion criteria, this review excluded all descriptive studies as a different study design was considered most appropriate for descriptive research. In addition, studies conducted in developing countries within the WHO West Pacific Regional Office (WPRO) were excluded to avoid duplication of effort as a related study is covered elsewhere.

4.7. Study selection process and assessment for quality

The primary reviewer assessed all retrieved studies against the eligibility criteria. To ensure study quality, all potentially eligible studies were assessed for eligibility and cross-checked against the methodological design, type of study participants and context. With reasons, all decisions made were documented throughout the process to ensure transparency. To avoid duplication of work, EndNote reference management software was used to merge results of all the extracted studies and to exclude duplicate records. All potentially eligible studies were further assessed for methodological quality using the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) Working Group approach (Higgins and Green 2009).

Finally, twelve studies met the full inclusion criteria and were included for review. Data was extracted using a standardised form (Appendix B). These were cross-checked by two independent supervisors for eligibility and methodological validity prior to data analysis and synthesis. Any differences in eligibility that arose between the reviewer and supervisors were resolved through discussion. Figure 2 illustrates the full study selection process in this review.

Figure 2 Study selection process



4.8. Summary

This review employed a comprehensive search for studies for review. Using a pre determined search protocol, potentially useful studies were retrieved. Further, a pre-defined eligibility criteria was applied. Consequently, eligible studies that passed the eligibility criteria were selected for review, others were excluded.

This chapter has outlined the methods undertaken in the review of identified articles that met the inclusion criteria for this study. The next chapter presents the results of the review.

Chapter 5 Results

Chapter 5 . Results

This chapter presents the results of the systematic review of the literature, undertaken to examine the training of Health Care Workers in Essential Medicines programs in developing countries within the studied WHO epidemiological regions. According to the inclusion/exclusion criteria, the developing countries within the WHO West Pacific Region (WPR) were excluded.

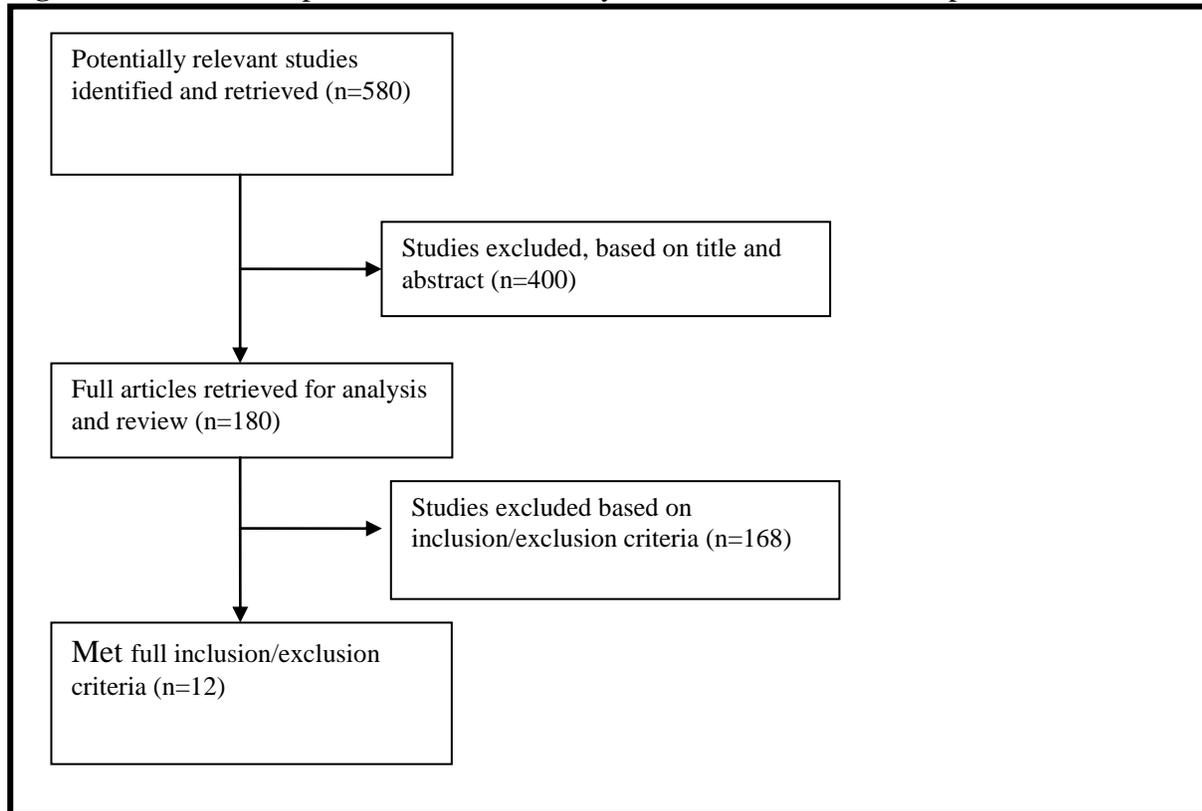
5.1. Overview of search results

Using a pre-determined search protocol, a total of 580 studies were identified. Of these, 400 studies were judged irrelevant based on title and abstract and were consequently excluded. In the next stage, the remaining 180 were judged potentially relevant based on text words in title and abstract. Consequently, full articles were retrieved. All the 180 full articles were analysed but only 12 met the full inclusion criteria, the other 168 were excluded. The whole process of study selection process following the application of inclusion/exclusion criteria (See Table 4) is schematically illustrated in Figure 3.

Table 4. Inclusion/exclusion criteria

Included	Excluded
i. Cluster randomised controlled trials	i. Descriptive, qualitative studies
ii. Randomised control trails (RCT) that used methods of randomization such as: crossover (alternating allocation to either control or experimental arms)	ii. studies conducted in Western Pacific WHO epidemiological region
iii. educational intervention aiming for change in medicines use or health outcome	iii. Non-English language literature
iii. study populations of health care workers-physicians, pharmacist, nurses, community health workers and volunteers or supply managers	
iv. measurements of health care worker performance based on medicine use indicators or health outcomes	
v. interrupted time series	

Figure 3. Schematic representation of the study assessment and selection process



During the assessment of the potentially relevant 180 studies, they were found to have study objectives closely related to the review aims. They were reviewed then assessed against the review inclusion/exclusion criteria. Consequently 168 studies were excluded. Reasons for exclusion included lack of detailed reporting, inadequate or weak study design, and ineligible study participants while other studies were simple reviews and commentaries without detailed data but only qualitative discussion. Finally, twelve studies met the inclusion criteria and were included for review.

5.2. Overview of the studies included for review

The twelve included studies were all primary studies, and employed randomised control design. From these, all of the reported evidence of effectiveness in training Health Care Workers for improving prescribing and medicine management practices in developing countries came from South East Asia and Sub-Sahara Africa regions. Diverse countries of varied medicine supply systems and health contexts are the study sites for all the included studies. The Latin American and Mediterranean regions lagged behind the other studied WHO epidemiological regions in generating evidence on training.

The studies were all reported in refereed English language journals and retrieved using a search protocol as described in detail in the methods chapter. The studies were grouped into two groups, based on target participants. Descriptive summaries of the studies in both groups are presented. The first group of three studies targeted pharmacist supervised study sites including licensed but untrained medicine retailers.

5.3. Group A studies: Pharmacists and untrained medicine retailers

5.3.1. Ross-Degnan et al, conducted in Indonesia and Kenya, published 1996

This multi-country study focusing on dispensing practice in pharmacies was published in Health Policy and Planning Journal. The trial presents results of a field test using the World Health Organisation –Control of Diarrhoeal Disease (WHO-CDD) program for improving diarrheal treatment practices by Pharmacists and licensed but untrained drug sellers in the two countries. The program's specific objectives were to.

- i. increase the capacity of the national CDD program
- ii. undertake a training intervention,
- iii. improve the knowledge of target pharmacists and counter attendants about pharmaceutical care of diarrhoea,
- iv. improve knowledge of pharmacists on case management

- v. improve overall pharmaceutical practices in pharmacies, and
- vi. increase sales of Oral Rehydration Salts (ORS).

This trial had an overall objective to have a reduction in sales of the antimotility class of antidiarrhoeal medicines at the primary level of care. Outreach educators from the WHO-CDD program, in both study countries, were trained about diarrhoea and its appropriate management. Data on current practices, and techniques of interactive communication for adult learning were used as resource materials for training.

In both countries, the intervention began with brief one-on-one meetings with pharmacists and licensed but untrained medicine retailers discussing key training messages and ways to deal with perceived barriers to practice recommendations. This was followed by training of all counter attendants in group sessions of five to ten attendees. These sessions of two to three hours, on a single day in Kenya, two days in Indonesia covered the aetiology of diarrhoea, its effects on the body, and its proper management. Trainees received posters and patient education materials for display in their pharmacies and shops. All trainees were not informed that their sales and dispensing practices in their pharmacies would be evaluated.

Using trained surrogate patients posing as mothers of a child under five with diarrhoea, the researcher measured sales of oral rehydration salts (ORS), sales of antidiarrhoeals agents; and evidence for history-taking and advice to continue fluids and food.

At evaluation, measurements were obtained for the short-term impact of this intervention using a before-and-after comparison group design in Kenya, and the randomised controlled designed trial in Indonesia, with the pharmacy as unit of analysis in both countries (n = 107 pharmacies in Kenya; n=87 in Indonesia).

Major reporting variation was found at baseline between reported and observed behaviour. For example, 66% of pharmacy attendants in Kenya, and 53% in Indonesia, reported selling ORS for the previous case of child diarrhoea, but in only 33% and 5% of surrogate patient visits was ORS actually sold for such cases. Reasons for variation were not reported.

After training, there was a significant increase in knowledge about diarrhoea and its treatment among counter attendants in Kenya, where these changes were measured. Sales of ORS in intervention pharmacies increased by an average of 30% in Kenya (almost a two-fold increase) and 21 % in Indonesia compared to controls ($p<0.05$). Antimotility class of antidiarrhoeal medication sales declined by an average of 15% in Kenya and 20% in Indonesia compared to controls ($p<0.05$). There was a trend toward increased communication with customers in both countries. In Kenya alone, significant increase in discussion of dehydration concern during pharmacy visits was observed that ($p<0.05$).

From the findings in this trial, it was concluded that face-to-face method of training for pharmacy staff and medicine sellers that targets deficits in knowledge and specific problem behaviors may result in significant improvements in appropriate management of disease, therefore improve health outcome at this level of care (Ross-Degnan, Soumerai et al. 1996).

5.3.2. Chalker et al, conducted in Vietnam and Thailand, published 2005

The second multi-study in the review, published in Social Science and Medicine Journal, examined effectiveness of a multi-component intervention on dispensing practices in pharmacies in Vietnam and Thailand. The study took the form of a randomized, controlled trial using urban private pharmacies in Hanoi ($n= 68$) and Bangkok ($n=78$) as study units. The research started with a baseline measurement, followed by three different interventions:

- i. enforcement of regulations,
- ii. training,
- iii. peer-review.

Applied sequentially, each intervention was designed by the local pharmaceutical association and so was contextualized to the different practice environments. Each intervention was implemented over a three-month period, followed by a wash-out period of at least a month, followed by three months of monitoring of provider practice through trained simulated client visits. Educational intervention for pharmacy staff focused on good case management using Question, Advice and Treatment (QAT) strategy to improve case management. Following this intervention were the

trained simulated clients, who presented standardised histories of conditions at the pharmacy, asking the trained pharmacy staff for advice and treatment. Questions, advice and treatment given were recorded after leaving the pharmacy.

The trial concluded that a multi-component intervention can have a profound effect in changing professional practice but the effect is dependent on the context and the method of implementation. The results of this study suggest that training may have a positive effect in improving dispensing practice. However, the study does not provide clear statistical figures to allow detailed analysis (Chalker, Ratanawijitrasin et al. 2005).

5.3.3. Abuya et al, conducted in Kenya, published 2009

This study, published in American Journal of Tropical Medicine and Hygiene, evaluated the impact of Ministry of Health (MOH) training programs on the knowledge and practices of untrained anti-malarial medicine retailers. The study was designed and conducted as a cluster randomized trial across ten administrative divisions, each with an average population of between (n=50,000) and (n=100,000) people, as the units of randomization.

Training was delivered to the randomly selected antimalarial medicine retailers in two-day workshops at local venues. The training covered:

- i. signs of simple and severe malaria,
- ii. malaria treatment and prevention,
- iii. drug resistance,
- iv. when to refer,
- v. storage,
- vi. expiry of medicines and
- vii. communication skills.

Public information activities were based on local public meetings and use of posters outside medicine outlets (shops) and in public places. Using a surrogate client survey strategy (pre-trained simulated client), research assistants posing as clients presented at trained medicine seller shops with standardised scenario, which entailed asking for amodiaquine medicine for a child. If

asked the researcher provided standardised information on the child illness, including age of three years. Details of the transaction were recorded immediately away from the medicine outlet.

Assessment of appropriateness of advice of amodiaquine was based on consistency with national malaria guidelines

Generally in Kenyan context, including developing countries in the studied WHO epidemiological zones, general shops vary in size and sell general household merchandise alongside Over The Counter (OTC) medicines such as amodiaquine, painkillers and cough syrups. They are however not licensed to sell Prescription Only Medicines (POM). Although pharmacies are licensed to sell both OTC and POM, in often times, most of them are not staffed by professional Pharmacists.

During this study, a total of (n=716) medicine outlets were surveyed. The findings in this study indicated that 30.7% and 5.2% of program and control retailers, respectively, sold amodiaquine anti-malarial with correct advice on use to surrogate clients (OR = 8.8; 95% CI: 2.9, 26.9; $p < 0.001$) (Abuya, Fegan et al. 2009).

Similarly, 61.8% and 6.3% of program and control retailers, respectively, reported correct knowledge on dosing with amodiaquine. From this study it is clear that retailer training programs within the national malaria control framework led to significant improvements in retailers' practices across three studied districts. This study provides evidence of effectiveness of training programs involving wider medicine outlets for improved health outcome at a national level (Abuya, Fegan et al. 2009).

5.4. Group B studies: Clinical Health Care Workers

The next group of studies in this review comprised of nine randomised controlled trials that evaluated effectiveness of training interventions in prescribing and clinical care practices by health care workers.

5.4.1. Angunawela et al, conducted in Sri Lanka, published 1991

The authors in this study, published in International Journal of Epidemiology, evaluated the impact of drug information on prescribing behaviour in outpatient settings. This was studied in selected and randomised state health institutions (n=15) involving prescribers (n=45) and utilised a common drug formulary. Groups of prescribers were randomised into three groups. The groups received:

- i. newsletters alone,
- ii .newsletters reinforced by a group seminar,
- iii no intervention (control).

The training intervention lasted for two months and focussed on rational prescribing of antibiotics. During the trial, specially prepared and attractive newsletters were mailed fortnightly in five issues to the two intervention groups. The information provided guidelines for rational prescribing of antibiotics with an emphasis on:

- i. appropriate treatment of common infections,
- ii. encouraging use of targeted penicillins as opposed to broad spectrum antibiotics,
- iii. discouraging use of antibiotics for viral infections,
- iv. elimination of tetracycline use in children,
- v. risks of antibiotic resistance due to inappropriate use.

In addition to newsletters, posters were also produced for the participating institutions. After the training, the researchers collected and analysed randomly selected (n=19000) outpatient prescriptions.

The study shows a trend towards a decrease in the proportion of patients prescribed antibiotics. This was seen in the intervention groups with a mean difference of 74% in written and 7.3% in written plus seminar group. But also the control groups showed a decrease with a mean difference of 0.4%. The change was not statistically different from the control group ($p>0.05$). The antibiotic prescribing pattern also did not change between the pre-and post-intervention

periods in any of the three groups. There was a decrease in antibiotic prescribing to patients given a diagnosis of viral fever in the two intervention groups.

Though significant, this decrease could also be mainly due to the very high (>90%) baseline measure of antibiotics prescribing in each intervention group. From this trial, we may therefore conclude that overall provision of drug information is instrumental in influencing prescribers' clinical practice (Angunawela, Diwan et al. 1991).

5.4.2. Bexel et al, conducted in Zambia, published 1996

This study, published in International Journal of Clinical Epidemiology, evaluated the impact of educational seminars on quality management and rational drug use. The study was designed as a randomised controlled trial. Clinical officers in health centres (n=16) were randomly allocated to an intervention or control group of eight members per group. Two-day seminars were conducted for the prescribers from the intervention health centres. The content of the seminars included standard treatment guidelines for common illnesses seen in primary health care. Diagnosis and treatment for individual diseases were discussed with trainers from Essential Drugs Programs, Control of Diarrhoeal Diseases (CDD) and Acute Respiratory infection (ARI) disease programs.

A total of (n=6000) patient cards were analysed for quality case management and rational drug use. In the intervention health centres, the average number of drugs prescribed per patient decreased from 2.3 to 1.9 (p=0.005) and the proportion of patients managed with non-pharmacological treatment increased from 1% to 13.2%. Recorded history taking, examination, and diagnosis improved in the intervention health centres. More drugs were correctly chosen in the intervention group compared to control health centres.

The findings in this study provide positive evidence that training in the form of repeated seminars is effective in influencing prescribers and promoting rational drug use in primary health care (Bexell, Lwando et al. 1996).

5.4.3. Santoso study, conducted in Indonesia, published 1996

This study published in Social Science and Medicine Journal was designed to investigate the impact of two educational interventions: small group face to face sessions versus formal seminars for medical and paramedical clinical care practice staff in local district health facilities focusing on management of acute diarrhoea at primary care.

Six districts were randomly assigned to three groups of health centres. Study health centres (n=15) were selected from each district. Group (i) underwent a small group face-to-face intervention. Those in group (ii) underwent attended a formal seminar. Health Care Workers in group (iii) served as control, therefore did not receive an intervention. Both interventions were given on a single occasion.

Written materials covering the appropriate management of acute diarrhoea were developed and provided to all prescribers in the intervention groups. Focus group discussions involving prescribers and consumers in the six districts were carried out to indentify various underlying motivations of drug use in acute diarrhoea in children below five years of age. The findings of the focus group discussions were included as part of intervention materials. To evaluate the impacts of these interventions on prescribing practice, a prescribing audit on prescriptions written for acute diarrhoea was carried out in health centres covering three month period before and after the intervention.

The results showed that both interventions are equally effective in improving levels of knowledge of prescribers about appropriate management of acute diarrhoea in children less than five years old. They were also partially effective in improving appropriate use of drugs, reducing the use of non-rehydration medications. There was a highly significant reduction in antimicrobial usage, either after small group face-to-face intervention from 77.4% to 60.4%; $p<0.001$ or formal seminar 2.3% to 73.3%; $p<0.001$. There was also a significant reduction in the use of antimicrobials after both interventions from 20.3% to 12.5%; $p<0.001$. In both intervention groups, formal seminar had significantly greater impact than small group face to face intervention; ($p<0.001$).

Although the results show that small group face to face intervention did not offer greater impacts over large seminars in improving appropriate use of drugs in acute diarrhoea in children, this could be due to the fact that unit cost is less costly than seminar (Santoso 1996).

5.4.4. Trap et al, conducted in Zimbabwe, published 2001

This study was published in Health Policy and Planning Journal. The study is designed as a randomised controlled trial to evaluate the effectiveness of training program, adherence to standard treatment guidelines and stock management protocols. The study compared three different groups of randomly selected health facilities in Zimbabwe.

To select study health facilities, intervention health centres (n=48) were randomly selected and ranked on the basis of their total score on stock management in the baseline study. They were then paired according to performance. This was achieved by paring two facilities with the lowest performance on the overall score, the next two and so on, making up of (n=24) per group. The control group (n=18) did not receive any intervention and had overall performance scores in the same range as intervention facilities for both stock management and rational drug use.

After baseline survey, each intervention group was randomly allocated to receive supervision on either stock management or rational use of drugs. A second survey was carried out following two supervision visits, six months later. Final evaluation was undertaken eight months later after the last supervision visit.

Evaluation of adherence to stock management system was based on a sample of twelve drugs selected from the Essential Medicines list. The study assessed performance on different indicators relating to drug availability, use of stock cards, calculation of minimum stock and monthly ordering, for the twelve drugs. Four common conditions were chosen; acute respiratory infection, diarrhoea, urinary tract infection and chancroid.

This study showed that even when supervision is focussed on another area of work; it may have positive effect on overall performance of health care worker. Assessed indicators showed

improvement between 16% and 30% ($p < 0.001$) following supervision. Overall stock management score showed moderate improvement of 7% after the intervention. However, in the comparison group, there was an overall deterioration of all assessed indicators by 9.5%. The findings in this study suggest supervision, as an educational intervention is an effective strategy to improve health care worker clinical practice.

5.4.5. Mohan et al, conducted in India, published 2007

This cluster randomised controlled trial was published in the British Medical Journal. The researchers aimed to assess whether training doctors in counseling improves care seeking behaviour in families with sick children in India. In this trial, pair matched, community randomised trial conducted in 12 primary health centres doctors in intervention centres were trained in counseling, communication, and clinical skills, using the Integrated Management of Childhood Illness (IMCI) strategy.

Children aged less than five years presenting for curative care and their mothers were recruited and visited monthly at home for six months. A total of ($n=2500$) children were selected, ($n=1248$) allocated to intervention and ($n=1200$) control groups respectively.

Post intervention, it was found that for episodes of illness with at least one reported danger sign, 15% of intervention group mothers and 10% of control group mothers reported having sought care from an appropriate provider promptly. However, this difference was not statistically significant ($p=0.07$). One month after training, intervention site doctors counseled more effectively than control group doctors, but at six months their performance had declined. A greater proportion of mothers in the intervention group than in the control group recalled having had at least one danger sign explained (45% versus 8%; ($p=0.02$)).

The results of this study show that mothers' understanding of the need to seek prompt and appropriate care for sick children increased following counseling by trained doctors. This trial therefore supports interventional training Health Care Workers for improved clinical practice (Mohan, Iyengar et al. 2004).

5.4.5. Fairhall et al, Conducted in South Africa, published 2005

This pragmatic cluster randomised controlled trial, published in the British Medical Journal. The study evaluated the effect of educational outreach to nurses on tuberculosis case detection and primary care of respiratory illness.

This trial was conducted among, 40 cluster randomised primary care clinics staffed by nurse practitioners in South Africa. A total of (n=2000) patients aged 15 years and over with cough or difficult breathing were enrolled. a total of (n=1000) patients were randomly assigned to the intervention clinics, while the other half (n=1000) to the control clinics. The intervention delivered took an educational outreach model, which is a non-commercial, short, face to-face, in-service interactive education by an experienced trainer from the Ministry of Health department. Almost all recruited patients (92.8%) completed the trial. Between two to six outreach education sessions were delivered to practicing nurses. The emphasis was on key messages drawn from the customized clinical practice guideline for the outreach program, with illustrative support materials.

Although sputum testing for tuberculosis was similar between the groups 22.6% in outreach group versus 19.3% in control group, the case detection rate for tuberculosis was higher in the outreach group 6.4% versus 3.8% in the control group. Prescription number for inhaled corticosteroids was also higher 13.7% versus 7.7% in the control, but the number of antibiotic prescriptions was similar 39.7% versus 39.4% in both groups.

This study therefore suggests that combining educational outreach with integrated case management provides a useful model for improving quality of care and control of priority respiratory diseases in poorly resourced settings. The results of this trial are consistent with other studies that combined methods of training are effective in changing practice (Fairhall, Zwarestein et al. 2005).

5.4.6. Qureshi et al, conducted in Pakistan, published 2007

This study published in the British Medical Journal, was a cluster randomised controlled trial to determine the impact of family based home health education and specially trained general practitioners on blood pressure management.

Using a multi-stage random sampling technique, researchers selected 12 out of 5000 geographical census based clusters in Karachi. This is equivalent to 250 households in each cluster. From these 12 clusters, three clusters were randomly assigned to special care by general practitioner and usual care also by general practitioner.

All general practitioners located in clusters randomised to special care attended a one day intensive training session on hypertension management. Components of the course included non-pharmacological and pharmacological interventions, prescribing low cost and appropriate generic drugs, preferential use of single dose drug regimens, scheduled follow-up visits, stepped care approach for titration of drugs to achieve target blood pressure levels and satisfactory consultation sessions for patients, with explanations of treatment.

A total of (n=200) patients were enrolled and the equivalent of 89% (n=178) successfully completed six weeks of follow-up. Adherence was significantly greater (65%) in the special care group than in the usual care group (48%). Adherence was also higher among patients who had higher levels of education ($p<0.001$), were encouraged by family members ($p<0.001$), believed in the effect of drugs ($p<0.001$), and had the purpose of the drugs explained to them ($p<0.001$).

From these results, it can be seen that training of general practitioners in management of hypertension, emphasising good communication between doctors and patients, is effective and this can be expanded to care in the communities (Qureshi, Hatcher et al. 2007).

5.4.7. Reynolds et al conducted in Kenya, Published 2007

This trial employed controlled cluster randomisation design and published in Health Policy and Planning Journal. This trial was undertaken to evaluate the effectiveness of the training intervention. The study used an experimental design with pre- and post-test measures and

randomly assigned intervention and control groups. For this study, the on-site in-charge supervisor was defined as in-charge of Maternal and Child Health (MCH) and Family Planning in a district hospital or the in-charge in a health centre. Providers included in the study were supervised by the in-charge.

The study sample included (n=72) health facilities where providers were trained in use of family planning guidelines. The training package was pre-tested in one district of Kenya, and lessons learned were incorporated into a final package which included a reference manual, trainer's guide and trainee's notebook. In addition, during the training supervisors developed action plans to utilise their updated knowledge, skills and materials. The training was implemented by Jhpiego (not an acronym) with the Ministry of Health (MOH) officials in a one-week training carried out with two groups of 15 supervisors over 2 weeks.

At the end of the training workshop, supervisors were surveyed for necessary knowledge, attitudes and skills required of a supervisor using the performance quality improvement checklist. surveyed in-charge supervisors showed they had acquired knowledge on tools to use in family planning practices which included a checklist for preparing a meeting, a job description example, 'do's and don'ts' of active listening, and sample client exit interview.

The finding in this study show that in terms of job knowledge, supervisors in the training groups were significantly more likely to be able to name elements that are important to team building, planning meetings or conducting meetings. Although this study does not provide clear statistical analysis of the results, the evidence for effectiveness of supervisor training on system performance is clear (Reynolds, Toroitich-Ruto et al. 2008).

5.4.8. Arifeen et al, conducted in Bangladesh, published 2009

Based on the WHO and UNICEF strategy on Integrated Management of Childhood Illness (IMCI) on childhood mortality and nutrition, this study, published in the Lancet employed a cluster randomised design. In this cluster randomised trial, twenty first-level government health facilities in Bangladesh were paired and randomly assigned to either IMCI (intervention; ten

clusters) or standard care (comparison; ten clusters). The three components of IMCI training strategy were:

- i. health care worker training
- ii. health-systems improvements,
- iii. family and community activities

These were delivered to all intervention groups with exception of the control cluster groups.

Village health workers (untrained) participated in two-day training course for management of sick children. The project trained 387 Muslim Imams as village health workers to convey crucial messages during Friday prayers. In addition, movie script messages addressing IMCI messages were developed. In the next phase, two theatre groups were trained to present to the public open-air shows in the selected IMCI village areas, once every 8-9 months and to communicate key messages.

Assessment included household and health facility surveys tracking intermediate outputs and outcomes, and nutrition and mortality changes in intervention and comparison areas. Primary endpoint was mortality in children aged between 7 days and 59 months.

Analysis was by intention to treat. The yearly rate of mortality reduction in children younger than 5 years (excluding deaths in first week of life) was similar in IMCI and comparison areas (8.6% versus 7.8%). In the last two years of the study, the mortality rate was 13.4% lower in IMCI than in comparison areas corresponding to 4.2 fewer deaths per 1000 live births.

Implementation of IMCI led to improved health-worker skills, health-system support, and family and community practices, translating into increased care-seeking for illnesses. In IMCI areas, more children younger than 6 months were exclusively breastfed (76% versus 65%) and prevalence of stunting in children aged 24 to 59 months decreased more rapidly with a change in the rate measured 7.33% in comparison to IMCI areas (Arifeen, Hogue et al. 2009).

Group A: Pharmacists and untrained medicine retailers

Reference	Country	Trial design	Setting	Participants	Intervention	Before and after tests	Methodological quality	Outcome
Ross-Degnan et al (1996)	Indonesia, Kenya	RCT	Private pharmacies	Pharmacists, pharmacy assistants	One-on-one meetings and small group training * diarrhoea case management	done	Kenya; employed quasi experimental design	Short-term improvement in product sales
Chalker et al (2005)	Thailand & Vietnam	RCT	Private pharmacies	Pharmacists, pharmacy assistants	methods: face-to-face, large group and peer review *dispensing practices	Employed pre-post data analysis	Success of intervention dependent on quality of implementation	Profound effect in changing dispensers' behaviour
Abuya et al (2009)	Kenya	RCT	Local community medicine outlets	Medicine retailers in pharmacies, shops	Two sessions of workshop-based training with posters, charts*medicine use & counselling	Not described	Loss of randomisation in one group led to reduced statistical power	Improvement in retailer practices

*-Intervention theme

GROUP B: Clinical health care workers

Reference	Country	Trial design	Context	Participants	Intervention	Before and after tests	Methodological quality	Outcomes
Angunawela et al (1991)	Sri Lanka	RCT	Outpatient care facilities	Doctors, assistant medical practitioners	Two months training-printed material and seminar *guidelines for antibiotic use	Pre-to post-intervention periods analysed	Change in outcome not statistically significant due to small sample size	Decrease in antibiotic prescribing (40% to 34%)
Bexell et al (1996)	Zambia	RCT	Primary care facilities	Clinical officers	Two-day Seminars* standard treatment guidelines for common diseases & rational use of drugs	Not described	Only 3 seminars were conducted due to resource limitation	Improved case management skills, drugs stock levels
Santoso (1996)	Indonesia	RCT	Health centres	Medical, paramedical prescribers	Face-to-face training plus seminar* diarrhea case management	No baseline measure	Single session intervention	Feasibility of different interventions to improve drug use
Trap et al (2001)	Zimbabwe	RCT	Health facilities	Pharmacists, pharmacy technicians	Two-week training *communication skills, essential drugs concept	Achieved	Possible supervisor bias	Improved stock management, health worker performance

*-Intervention theme

Reference	Country	Trial design	Setting	Participant	Intervention	Before and after tests	Methodological quality	Outcomes
Mohan et al (2004)	India	RCT	Rural health facilities	Doctors	IMCI strategy 5-day training *clinical skills, counseling	Not described	Intervention limited to families who sought care at health facilities	Improved care seeking by mothers of sick children, counseling performance by doctors
Fairhall et al (2005)	South Africa	RCT	Primary care clinics	Physicians, Nurses	in-service, face-to-face, educational outreach *clinical guidelines for the management of RTI	Not described	Nurse practitioners not blinded	Case detection of TB and syndromic management of respiratory diseases improved
Qureshi et al (2007)	Pakistan	RCT	Community household units	General practitioners	One day training *hypertension	Not described	Possibility Patient selection bias or recall bias due to long duration between training and survey	Correct dosing with increased adherence to treatment

*-Intervention theme

Reference	Country	Trial design	Settings	Participants	Intervention	Before and after tests	Methodological quality	Outcomes
Reynolds et al (2008)	Kenya	RCT	Family planning health facilities	Maternal and child health provider supervisors	On-site training * performance quality improvement	Pre-and post-tests attempted	Inconsistency in pre-and post test measurements	Improved quality of care by providers
Arifeen et al (2009)	Bangladesh	RCT	First-level government health facilities	Community health workers	open-air theatre shows for 9 months *IMCI training messages on sick children	Not described	Analysis done by intention to treat	Improved health worker skills led to reduction in mortality, decreased stunting in children

5.5. Summary

The problem of both pharmaceutical and clinical care in developing countries has been well documented (Hogerzeil , Walker et al. 1989; Walker, Hogerzeil et al. 1990; Ross-Degnan, Laing et al. 1997; Laing, Hogerzeil et al. 2001; Ratanawijitrasin, Soumerai et al. 2001). Millions of children and adults die prematurely each year although many health programs and interventions exist to prevent such deaths (Black, Morris et al. 2003). Health authorities however acknowledge that trained and skilled health care workers are essential in implementing and delivering these program interventions. These include Essential Medicines supply programs which occur in many countries. In many of the programs, a training component exists for which the training is related to drug supply and the rational use. In many countries, subjects taught often range from managerial to clinical care including drug ordering and storage procedures, standard treatment, and dispensing guidelines. In this review, we examined the training in these programs for improved care.

Included studies in this review show a varied pattern of training in pharmaceutical and clinical care. These studies suggest that multifaceted training methods are more effective than single training method. Supervision and feedback as an educational method is generally more effective than dissemination of written guidelines. However, to date the effectiveness of training in these programs has not been evaluated with rigorous study designs. Such studies are urgently needed to guide policy.

It is clearly evident that training is better than no training and the learning from one program of training may be transferable to future programs. However, more research is to generate the evidence to support this opinion.

Chapter 6 . Discussion

6.1. Introduction

This chapter will discuss the results of the twelve reviewed studies. The discussion spirals around the issues identified in training Health Care Workers in Essential Medicines supply programs in developing countries. Key issues will be identified to that form an agenda for future research.

6.2. General comments

6.2.1. Overview of study quality

The quality of evidence within the reviewed studies is limited. For quality assessment of the reviewed studies, the Grades of Recommendations, Assessment, Development and Evaluation Working Group (GRADE) approach for Cochrane Reviews was employed (Higgins and Green 2009). This is a recognised approach developed for grading the quality of evidence within clinical trials. In this approach, the quality of evidence is defined as the extent to which a reviewer is confident that an estimate of effect is close to the quantity of measured outcome. Measuring the quality of evidence involves consideration of methodological quality, directness of evidence, heterogeneity, and precision of outcome estimate and risk of publication bias. The GRADE approach in this review entailed assessment of the quality of a body of evidence for each individual trial outcome for which four levels of quality of evidence are specified in table 5

Table 5.GRADE approach for levels of quality of evidence

Quality rating	Description
High	Randomised trials
Moderate	Downgraded randomised trials
Low	Double downgrade randomised trials
Very low	Triple downgraded randomised trials

The highest quality rating is for randomised trial evidence. Interestingly, review authors can downgrade randomised trial evidence to moderate, low or even very low quality, depending on presence of four factors (Table 6) (Higgins and Green 2009).

Table 6. Factors that may decrease quality levels of evidence

Factors	
i.	Limitation in design and implementation of study suggesting likelihood of bias.
ii.	Indirectness of evidence (indirect participants, intervention, control, outcome).
iii.	Unexplained heterogeneity, inconsistency of results.
iv.	High probability of publication bias.

Usually, quality rating falls by one level for each factor up to a maximum of three levels for all factors. If for instance, limitation in design, blinding, concealment, or loss of follow-up, are apparent, the randomised trial evidence may fall by two levels. It is by this criterion therefore, that the quality of evidence of the reviewed studies was judged low to very low.

6.2.2. Training interventions

Considering the magnitude of problems of pharmaceutical and clinical care in developing countries, as was discussed in the background chapters in this study, it is clear that our level of knowledge on training health care workers in Essential Medicines supply programs is limited (Laing, Hogerzeil et al. 2001). Inappropriate drug use was by far the most common issue studied; Essential Medicines supply programs are the least studied or reported. Reviewed studies showed general lack of evidence on the training methods employed as the focus was primarily on the clinical outcomes, and not training achievement and sustainability. Where training was shown to be effective, little investigation of the methods of training was explored to improve skills in those who delivered or received the training.

6.2.3. Training methods

The most frequently employed training methods include seminars, workshops, and formal training courses, face-to-face and outreach educational meetings. In almost all, print materials in form of flow charts, newsletters, bulletins and simple forms of leaflets are used (Ross-Degnan, Laing et al. 1997). The distinction between these methods is not always clear, neither in practice nor in the literature (Le-Grand, Hogerzeil et al. 1999). Characterisation of training methods in this study are presented as they were described in the studies (Radyowijati and Haak 2003).

6.2.4. Training characteristics

Training programs per se, whether conducted in small or large groups, can successfully improve targeted health outcome if well planned and implemented (Awofeso 2008). The characteristics of training approaches that have great impact on target health outcomes include training methods such as lectures, group problem-solving, role playing and practical skills orientation, single theme focus, on-site training and use of opinion leaders as trainers. This improvement is only realised in limited period of time therefore repeat training programs are important for sustainability (Le-Grand, Hogerzeil et al. 1999). Moreover, little evidence in reviewed studies explained cultural appropriateness of the training.

6.2.5. Group training

The evidence shows that group training strategy has great potential for improving pharmaceutical and clinical care practices (Oshiname and Brieger 1992). Training strategies that involve peer review and commitment to treatment standard guidelines or dispensing protocols are reported to create and sustain change (WHO 2001). The group training approach also appears to have moderate impact on medicine use behaviors among patients when community members and health care workers are involved in participatory and interactive approach to care services (Ofori-Adjei and Arhinful 1996).

6.2.6. Supervision, audit and feedback

Supervision and performance monitoring for compliance with standard treatment guidelines, dispensing protocols and limited medicine lists, all in combination with audit and feedback to prescribers has proved to be highly effective in improving health care practices (Trap, Todd et al.

2001). Combining these approaches with peer-education, individual development of guidelines or dissemination of guidelines has resulted in considerable improvement in compliance with treatment guidelines or medicine lists. Overall, continuous supervision post study period coupled with feedback and peer review are needed to sustain the training effect or change in practice (Charleston, Johnson et al. 1994).

6.2.7. Community case management

Reviewed studies on community case management as a training approach show clear evidence of effectiveness in reducing child mortality from diarrhoea or respiratory infections (Charleston, Johnson et al. 1994). This has been supported by the study by Fairhall et al (2005) on tuberculosis case detection and the study by Arifeen et al (2009) in integrated childhood illness strategy on childhood mortality and nutrition in primary care. Therefore, while planning for training in this area, the common case management strategy is an effective ongoing tool for training.

6.3. What has failed?

A strategy that has consistently failed to cause significant improvement in pharmaceutical and clinical care practice by health care workers is the simple dissemination of print material on treatment standards or protocols (Le Grand, Hogerzeil et al. 1999) without engagement and follow up. Furthermore, according to the reviewed studies, a strategy that seems to achieve low impact on practice when used alone is the use of health managers in development of practice standards and guidelines (Ross-Degnan, Laing et al. 1997; WHO 2001). This therefore suggests need to regional support to maintain improvement and change in practice.

6.4. Limitations in this review

6.4.1. Experts in the field

Authors of articles not available electronically from the University of Canberra (UC) library as well as experts in the field were not contacted due to time constraints. However, where possible, effort was made to obtain relevant articles through the UC inter-library document delivery service. As a comprehensive search strategy is distinctive of a well conducted systematic review, this is an accepted limitation of this study as some articles identified in the search were not obtainable by the researcher.

This is ironic given the costs of these programs. From a policy perspective, it would be expected these programs are routinely evaluated and reports published to guide future program implementation and possibly reduce cost.

6.4.2. Limited number of studies

The number of identified studies for review is small, which means under reporting in this research area or these training programs are rarely studied. Though expensive to undertake, sponsored multi-country strategies studying large population or prospective studies would offer a more rigorous way of examining training in developing countries. However, the evidence in this review suggests that this area of research is consistently under resourced in the country regions studied (Ruxin, Paluzzi et al. 2005).

6.4.3. Inconsistency in reporting

Finding studies in Essential Medicines supply programs reporting on training activities in developing countries was difficult. Few published studies were indexed as ‘intervention’ and had to be searched on many different key words for intervention studies such as peer-review, medical training, nurse education and evaluation. This shows that clearly, the language in this research area is inconsistent. Categorizing the studies was difficult because the wide and varied terminology used for reporting different training strategies, without a clear definition of the terms used. One study may use the term seminar; another study may refer to training, while both discuss same the approach. Similarly, two studies may say they present the results of evaluation of a treatment guideline but they may not be comparable because each study uses different

participants or context. With these, challenges in reporting, this is truly an area for future intervention and research.

6.4.4. Publication bias

This review may be biased toward including published studies carried out by academic and health programs sponsored by international health agencies. Because of this bias, the results may overstate the ability of interventions as usually conducted to change medicine use or dispensing practices. Due to this limitation, the review made no attempt to summarise the size of effects.

6.4.5. Methodological bias

Our focus on randomised controlled trials based on methodological quality systematically excluded the results of other research designs that would provide additional valuable insights into health care workers' medicine use behavioural change.

It is clear that many training interventions to change medicine use behaviour are not evaluated with robust study designs (Ross-Degnan, Laing et al. 1997). Because of this bias, effects of training activities such as formal training courses ad hoc medicine supply improvement in-service seminars and rational use of medicine conferences; all designed to improve or change medicine use practices are not published because they are often not evaluated. For those that were evaluated, a large number employ inadequate research designs that affected the validity of the findings (Quick, Laing et al. 1991).

6.4.6. Comparative studies

There are challenges when examining studies of training intervention that employ diversity of participants, objectives, methods, contexts and outcomes. Most of the included studies are difficult to characterise in simple themes or trends. Training, the study phenomenon in this review may be conducted in many different ways with a broad range of objectives. Training themes like Essential Medicines supply program or community case detection blur contexts in which these medicine use and clinical care practice interventions are implemented.

6.5 Gaps in knowledge

6.5.1. Health setting and context

The reviewed studies were conducted mainly in public health primary care settings, leaving private sector practices unexamined. Interestingly, studies have reported that health service in developing countries is largely through private sector (Kafle, Gartoulla et al. 1992). Therefore training in this sector remains inadequately studied and reported. As a result, this is an opportunity to extent research to this sector.

6.5.2. Communication by health care worker

Apart from the community case management, training interventions in respiratory diseases, in the context that medicines are prescribed correctly in the correct dose, we know nothing of the compliance with prescribed medicines by patients. In particular, we have no case studies to find determinants of poor medicine use and any examples of training interventions to change this. Therefore, very little is known about whether modern technological interventions directed at prescribers and dispensers and changes in their practices result in improved patient health outcomes (Mills, Nachega et al. 2006). Dispensing encounters for example, have been identified as crucial mediums of educating patients and motivating them to use medicines in clinically effective ways. (Ross-Degnan et al 1997). In this context, it is important to know how improved communication by health care workers particularly through modern technologies for instance, through the use of mobile phones, improves patient knowledge about disease treatment and compliance with recommended treatment (Ciccio, Makumbi et al. 2009).

6.5.3. Pharmacies and untrained medicine sellers

More than 80% of people in developing countries when unwell use medicine shops and pharmacies (Kafle, Gartoulla et al. 1992) but only two of these studies evaluated pharmacies and medicine shops. The studies evaluated pharmacies with training intervention and showed short-term improvement in product sales and communication to customers. The effectiveness of such intervention in the long term is unknown.

6.5.4. Comparative cost-effectiveness

Among the 12 included studies, only one study highlighted the cost-effectiveness of the small group training over formal seminar (Santoso 1996). All other studies did not evaluate the cost-effectiveness of their training approaches. In order to choose between possible training approaches to improve medicine use practices as well as justifying the use of a particular approach over another, data on cost-effectiveness is essential. The development of simple standardised approaches can help in collection of data on cost-effectiveness and selection of other feasible training strategies. These gaps in knowledge are further discussed in the next chapter.

6.6. Summary

These review findings, in common with previous related reviews, demonstrate a positive evidence for effectiveness in repeat combinations of training methods and approaches. We need to build on work already established to improve training methods. However, with few studies but evidence of benefit, it is uncertain whether such training approaches consistently improve medicine use and dispensing practices in various in primary care settings in different developing countries. Considering the limited number and quality of the studies, in this review, there are limitations on the applicability of this evidence to wider policy decisions.

Chapter 7 Recommendations

In this final chapter, recommendations will be proposed for development and sustainability of training programs for health care workers in developing countries. These recommendations are based on the evidence drawn from this systematic review. In addition, to inform ongoing knowledge in this area, well designed published studies need to be undertaken in the future. The end result of training is improved commodity supply that will lead to improved health outcomes in a much needed population.

7.1 Recommendation 1-Training principles

Training for health care workers in developing countries should be appropriate to the setting and need. Education experts have always argued that training should be carefully designed to prepare health care workers to do the jobs under the actual conditions that prevail (Godwin 1993). In such training, it is clear that a distinction must be made between procedural, task-oriented learning, and training for high-order problem solving skills. Where trainees have not already developed problem solving skills from tertiary education, particular care must be given specifically to these skills. Trainers of health care workers must be specifically selected, not only on familiarity with the role their students need to undertake, but also for personal skills as educators (Godwin 1993). These principles may not be new. However, the crucial issue is how trainers are used practically to deliver effective training. It is suggested that in future, renewed emphasis should be placed on these principles: contextual learning and trained educators with knowledge on the context of the workplace.

7.2. Recommendation 2-Co-ordination for capacity building

Training providers need to co-ordinate training programs to ensure resource optimisation in both financial and human resource terms. Coordination among training organisers must be improved to maximise the financial and human resource investment in training. For example, inviting health care workers who have already participated in other training programs is a missed opportunity to expand knowledge and skills to others (Afori-Adjei and Arhinful 1996). It is

obvious that once a group of workers has trained in one area of health service, they are able to expand their role rather than taking untrained workers and developing them from scratch. The evidence suggests that a number of factors contribute to this phenomenon. Donor programs often operate autonomously; while Ministry of Health Departments organise centralised training. Rarely does communication occur between sponsors of programs. In this situation, the training may not always be tailored to local district requirements, often leading to program overlap and duplication. A solution to the duplication issue may be to involve workplace supervisors in the selection of training participants among those already trained to build expertise. An inventory or database of staff training is strongly suggested to serve as a starting point. This could be shared among agencies, including non-government organisations training providers.

At the national level, coordination of training requires commitment to a broader view focusing on both country and regional needs. This would ensure capacity growth for current and future health needs. Before any training is undertaken, all program officials as a minimum should be required to develop training plans and objectives that include ongoing translation of the learning. In this way, training agencies will build capacity on past efforts and reduce expenditure.

7.2.1. Recommendation 3-Training to improve commodity supply

Health commodity supply depends on trained Health Care Workers. From the review evidence, much of the in-service training is often program dependent. Incidentally, health care workers require management and supply logistics training alongside professional development to ensure long-term capacity to practice over a range of programs. Apart from usual pharmaceutical and clinical care work, they are often required to carry out managerial and essential logistics activities for which they receive limited training.

It is essential that all health care workers are trained in managerial and supply logistics skills to ensure translation of those skills to a range of programs. Ideally, training in this critical area should be undertaken at training school or tertiary level, if possible. Currently, health departments often manage the shortage of trained personnel by continuous donor support, which is unsustainable. A long term solution is needed for educating personnel skills not often included in tertiary level curricula. This review recommends implementation of management and logistics

course at training schools to provide commodity supply skills build expertise within existing labor force. This will obviously reduce donor dependency and build capacity in the training workforce.

7.2.3. Recommendation 4-Competency based training

Training for health care workers should be competency based (Wuliji 2009). Until recently, medical training schools in developing countries concerned themselves mainly with what is taught and little with how it is taught or what is done with knowledge acquired. The main aim of training health care workers was to instill as much information as possible, largely by means of lectures. However, some improvements have been reported in the last few years (Godwin 1993). Where this occurs, training is based on definition of the role and functions to be performed in relation to various other health care workers. Functional training is what is known as “competency based approach”, a practice fully embraced in the developed world.

Reviewed studies have clearly pointed out that with in these programs; training takes place in relatively short periods of time. Trainers should choose training methods appropriate to the objectives of the training program. In most cases, this will mean concentration on demonstration discussion and supervised practical assignment rather than emphasis on traditional theoretical material delivery. The trainer should concentrate on increasing the trainees’ capacity to solve problems. Identification of endpoint competencies on completion of training would highlight skills developed.

7.3. Recommendation 5-Training expansion

Affordable training should be provided to sustain ongoing capacity. The review evidence shows that health care workers consider training useful. This is consistent with the evidence from earlier reviews that recommended regular training (WHO 2001). Though sensible to repeat training in order to refresh and reinforce new ideas, it has often been impractical. To lessen reliance donor funds for outsourced training managers, it is recommended that urgent effort be channeled into building training capacity within developing countries This would provide regular training opportunities which could then be delivered widely, reaching as many health care workers as possible on an ongoing fashion.

7.3.1. Recommendation 6-Improved communication

Improved communication concerning programs and their content or theme is needed to reduce duplication of programs. In most of the reviewed studies, it was evident that training participants often have no prior information about the training event. This clearly means that often those attending have little advance knowledge of the content. This has been identified as a common reason for duplication of training effort with some participants attending training for skills already developed.

7.3.2. Recommendation 7-Improved reporting

Improved reporting of training methodology, and desired outcomes of interventions of training programs is recommended to ensure rigor and translation results. Future reports of trials on training should include clear and detailed descriptions of the interventions, including the proportion of the target audience that attended, the size of groups at meetings, the length and number of sessions, the teaching techniques, and whether there was any skills practice. These evaluations should use cluster randomised designs, whenever possible, together with process evaluations to further our understanding (Diwan, Eriksson et al. 1992).

Among the reviewed studies, provision of training hand-out as training materials was consistent. Sharing the recently acquired knowledge with fellow staffs is not reported. What is clear is that, trainees retain these training materials for personal use, even moving with them, when transferred to another work station. However, it is not reported whether any assessment of the physical presence of the training materials at the health facility was done in the study. Additionally, the literature does not show any record of any study that tried to assess the adequacy of the content, practical usefulness of the hand-outs. This clearly pinpoints areas of future research to justify the appropriateness of these training materials.

7.3.3. Recommendation 8-Training assessment

Post-training assessment is required to validate and provide feedback to the program planners. It is often assumed that the performance of those trained will improve post the training. Reviewed evidence supports assessment of trainees post the activity to ensure that training is being correctly

applied at the workplace once the trainees resume duty. This would essentially require a work site visit. Regular follow up is instrumental in both identifying gaps in training and offering guidance as acquired skill is consolidated and customised. Instituting a steady follow up program from all training events at national level is essential to increasing staff confidence and motivation, and informing trainers of potential weaknesses in the curriculum. Moreover, this study recommends that, program organisers should plan and provide a budget for follow up visits, as part of an ongoing program evaluation.

In order to sustain close and regular follow up long term., technical supervision and coaching could be provided by locally-based supervisors. This would lead to local capacity building so that these could eventually be involved in training programs as trainers. Additionally, effective supervision could involve assessment of performance, which will enable career development opportunities to be identified and appropriate incentive provided.

7.3.4. Recommendation 9-Training to meet primary health care goals

A range of Health Care Workers should be trained to provide contextual training for a range of workers. The evidence indicates that training is a useful tool for building country's ability to provide commodity security, therefore reduce reliance on in-service training to provide Health Care Workers with the needed skills. Pre-service training would additionally ensure that health care graduates receive managerial and logistics education. When professionals throughout the health system are trained, the system runs smoothly and countries have internal capacity to ensure health commodities and services are accessible to every individual who needs them, therefore meeting the primary health care goals for the region.

7. Recommendation 10-Health cadre specific training

Studies have not discussed about the trainer, though little literature exists in this area(Quillian 1993). However, selection of training personnel is as important as selecting the of trainee participants. Within training components of the health programs, it should be an essential prerequisite for establishment of health cadres of the various health care workers. This review recommends an urgent research to validate assess the adequacy of trainers for various classes of Health Care Workers. Where possible, trainers for specific cadre should not be selected for

reasons other than desire and ability to train. For these, specific training in educational and training methods should be mandatory.

7.5. Recommendation 10 Essential medicines concept as training theme

Adoption of the WHO/INRUD drug use indicators as training theme is recommended. The WHO recommends that activities to strengthen medicines supply systems be organised under the umbrella of the Essential Medicines concept. In many countries, a national Essential Medicine supply program exists. These programs lay strong emphasis on drug selection, procurement, distribution and use in the public sector. This study recommends policy options that relate to training to appropriate use of medicines based on current evidence.

Before activities aimed at improving appropriate drug supply and the appropriate use are undertaken, efforts should be made to obtain baseline data of the issues. Well established survey methods are available and should be utilised. An assessment method recommended by the WHO is the prescribing and patient care survey using the WHO/INRUD facility drug use indicators (WHO 2005). These quantitative indicators are widely accepted as a global standard for problem identification. The indicators can also be used to make comparisons between regions and countries and to measure impact of interventions. An indicator-based assessment can be followed by more detailed studies on individual drugs and diseases. A focused approach to training that utilises the Essential Medicines concept would be an achievable and easily evaluable methodology.

7.6. Recommendation 11-adoption of the CONSORT guidelines

Design of health interventions should conform to the CONSORT guidelines. This review provides us with an opportunity to assess whether quality reporting of trials has improved over time since the publication of Consolidated Standards Of Reporting Trials (CONSORT) guidelines by in 1996, revised 2001 and 2010 (Hopewell, Dutton et al. 2010).

Recognised by the World Committee of Medical Editors and Medical Journals worldwide, the CONSORT guidelines provide recommendations for authors regarding consistency in reporting of trial findings. The guidelines aim to facilitate complete and transparent reporting and their

interpretation. As it has been discussed earlier in this review, many items in the CONSORT checklist (Schulz, Altman et al. 2010) such as details of sample size calculation, primary outcomes, randomisation process, concealment and attrition were inadequately described in the reviewed trials, in this review thus making quality appraisal difficult.

Ideally, this review recommends that researchers should adhere to the CONSORT guidelines for conducting and reporting research findings. This will ensure strong evidence based outcomes for what are costly health interventions. Full and clear reporting of studies in this area will translate to practice more rapidly.

7.7. Recommendation 12-Research and Development

Medicines supply programs should institute research and development units within and involve the researchers in design and implementation of national medicines supply programs in order to strengthen and better evaluate their impacts on health outcomes. Medicines supply and management improvement programs should be implemented based on quantitative and qualitative assessment of problems and evidence of success for a particular intervention approach. A training program can waste scarce resources on a poorly designed approach. To facilitate stronger and high impact training programs, international health authorities should support national governments and agencies in implementation of well designed programs with potential for replication in other settings.

In addition, there needs to be greater understanding and communication between national governments and medicine supply programs and medicine agencies about how to translate effective training interventions into national programs. An example in this review includes experiences from Zimbabwe Essential Drugs Action Program (ZEDAP), that it is possible to promote multi-national medicine supply programs at regional level (Laing 1989). The Zimbabwe example suggests that all national essential medicines supply programs could devote resources to improve medicine use practices by implementing some of the effective intervention strategies highlighted in the discussion chapter.

Researchers should establish minimum standards for evaluating public health interventions. These should include acceptable methodological designs such as randomised controlled studies, interrupted time series. All studies should employ pre-post tests, adequate sample size and measurable outcomes. More work is needed to establish standards in this area. This will limit waste of research effort because of unreliable research findings.

Apart from the WHO database of studies on medicine use, at present, no process for systematic compilation of information on medicine use is available globally. Without such data, stakeholders will have a challenge grasping the problems of inappropriate medicine supply and use. Ideally, a program to monitor medicine use on a regular basis should be established at the global level. The program objective should be to provide evidence to guide policy decision making.

Regular medicine use surveys could be conducted in national Essential Medicines supply programs. Supported by health authorities and governments, these surveys should form invaluable tools in tracking long-term program performance, evaluation of pharmaceutical and clinical care practice by health care workers across the countries and regions. National governments and professional organisations and other agencies involved in quality improvement should restructure in-service training programs using approaches and methods that have been proven effective.

These approaches include combined multiple training methods delivered in timed repeat sessions instead of traditional ad hoc class-room approaches. Single theme focus at the work-site supported by supervision and follow up strategy should be strengthened for sustainability. While the evidence on which interventions are most effective is limited due to limited number of available studies, it is recommended that medicines supply programs involve researchers in design and implementation of programs in order to strengthen and better evaluate their impacts on health outcomes. These results should be published to guide future program implementation and to avoid duplication of effort.

7.8. Summary

This review is limited by being conducted by a single researcher, which could lead to bias in the review process. However, the review process has been conducted in systematic manner, in a transparent process to enable its replication according to systematic review protocol (Khan, Kuhn et al. 2003). Despite this limitation and the limited number of studies included for review, the main conclusions of this review are two fold. Firstly, an international collaborative research initiative focusing on public health research should be developed and supported to generate badly needed information about the cost and effectiveness of different training strategies to improve pharmaceutical and clinical care practices in developing countries.

This initiative should have an emphasis on which methods are best adapted to different cultural contexts and health areas. Such an agenda could have three parts:

- (i) research on determinants of provider practice aimed at developing testable theories that explain health-worker practices,
- (ii) rigorous cost-effectiveness trials of training methods to achieve and maintain high-quality performance,
- (iii) work on summarising study results and developing standard language and guidelines for conducting public health intervention research in developing countries.

Although health service provision is a continuous activity, drug supply programs have a lifetime. It is acknowledged individual studies could take years to complete, and if multiple methods must be tested, the timeframe should be at least one or two decades. Moreover, this initiative should provide opportunities to train new researchers, to strengthen research capacity.

Our second recommendation is that Ministries of Health and international health organisations should fund and translate research results into programs to improve health-worker performance, and thereby improve health outcomes. Specifically, organisations such as the WHO, UNICEF, and The World Bank should make special efforts to remain aware of recent research and recommendations, work with national governments to shape policy, fund research to develop and strengthen skilled capacity in key health areas.

Simply scaling up medicine access in weak health systems that deliver poor quality services is likely to waste precious resources and fail to show the anticipated improvements in health. Collaboratively, support should be provided for International professional conferences, where researchers and policymakers meet to learn about country experiences, present new research and showcase intervention research priorities. Global Funds and other donor organisations must support improvement of health-worker performance through training alongside the provision of financial support for health programs.

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Appendices

Appendix A

Search words and combinations

Initial key words

#1 MESH In-service training expl

#2 MESH Health Personnel expl

#3 MESH Essential Drugs expl

#4 MESH Developing countries expl

#5 #1 AND #2 AND #3 AND #4

#6 staff or employee or prescriber or nurse or midwiv or pharm* or retail* or doc*

#7 train* or educ* or course or teach*

#8 on-the-job training

#9 orientation program

#10 employee orientation program

#11 health provider

#12 developing nations

#13 developing world

#14 third world

#15 developing nations

#16 underdeveloped nations

#17 under developed countries

#18 essential medicines

Extensive search MEDLINE via EBSO limiters MH English 1990-2010

1 expl in service training/

2 expl health personnel

3 exp essential drugs

4 exp essential medicines

5 staff or employee* or prescriber or nurs* or midwiv* or pharm* or provider*

6 train* or educ* or continous medical educ*

- 7 inservice or in-service or continuous educ*
- 8 use and combine 1-7
- 9 developing countries or developing nations or under developed countries or under-developed nations or less developed countries or less developed nations or third world countries
- 10 1 and 2 and 3
- 11. 1 and 2 and 3 and 4 and 9
- 12 peer-reviews
- 13 workshops
- 14 seminars
- 15 supervision
- 16 conferences
- 17 2 and 9 and 12-16
- 18 3 and 9 and 12-16
- 19 evaluation
- 20 effect tw
- 21 intervention tw
- 22 impact
- 23 prescribing behaviour/
Dispensing behaviour/
- 24 prescribing practice/
- 25 dispensing practice/
- 26 retailer/
- 27 medicine ret/
- 28 provider behave/
- 29 1 and 19-28
- 30 2 and 29
- 31 integrated management childhood illness tw
- 32 essential drugs program tw
- 33 standard treatment guidelines tw
- 34 family planning programs tw
- 35 community health worker programs tw

- 36 case management tw
- 37 acute respiratory infections tw
- 38 diarrhoeal diseases tw
- 39 1 and 2 31-38
- 40 program improvement tw

Extensive search CINAHL via EBSCO limiters MH English 1990-2010

- 1 expl continuous medical educ/
- 2 expl health personnel
- 3 essential drugs or essential medicines
- 4 essential drugs programs tw
- 5 in-service training tw
- 6 seminars/
- 7 workshops/
- 8 conferences/
- 9 community educ/
- 10 case management tw
- 11 community educ/
- 12 developing countries
- 13 Program training tw
- 14 staff or employee* or doc* or prescriber or nurs* or pharm* or medicine ret*
- 15 program evaluation tw
- 16 nurs* train*
- 17 pharm* train*
- 18 primary health care tw
- 19 drug supply program tw
- 20 pharmaceutical train/ tw
- 21 primary care tw
- 22 program*
- 23 2 and 13-19

- 24.health program tw
- 25 health prevention program tw
- 26 disease prevention tw
- 29 disease program tw
- 30 health educ/
- 31 distance educ/

Websites searched

World Health Organisation

http://www.who.int/topics/essential_medicines/en/

Management Sciences for Health

<http://www.msh.org/global-presence/sub-saharan-africa/kenya.cfm>

USAID/DELIVER Project

<http://deliver.jsi.com/dhome>

Jhpiego

<http://www.jhpiego.org/>

African Medical Research Foundation

<http://www.amref.org/news/africas-health-worker-crisis--an-interview-with-dr-peter-ngatia/>

International Network for Rational Use of Drugs

<http://www.inrud.org/>

Appendix B

DATA EXTRACTION FORM
General information Date of data extraction Identification features of the study Record number (to uniquely identify study) Author Article title Type of publication (e.g. journal article, conference abstract) Country of study
Study characteristics Aim/objectives of the study Study design Study inclusion and exclusion criteria Recruitment procedures used (e.g. details of randomisation, blinding) Unit of allocation (e.g. participant, GP practice etc.)
Participant characteristics Characteristics of participants at the beginning of the study e.g. Age Ethnicity Socio-economic status Disease characteristics Co-morbidities Number of participants in each characteristic category for intervention and control group(s) or mean/median characteristic value (record whether it is the number eligible, enrolled, or randomised that is reported in the study)
Intervention and setting Setting in which the intervention is delivered Description of the intervention(s) and control(s) (e.g. dose, route of administration, number of cycles, duration of cycle, care provider, how the intervention was developed, theoretical basis (where relevant)) Description of co-interventions
Outcome data/results Unit of assessment/analysis Statistical techniques used For each pre-specified outcome: Whether reported Definition used in study Measurement tool or method used Unit of measurement (if appropriate) Length of follow-up, number and/or timed off follow-up measurements For all intervention groups and control group(s): Number of participants enrolled Number of participant included in analysis

Number if withdrawals, exclusions, lost to follow-up

Type of analysis used in study (e.g. intention to treat, per protocol)

Results of study analysis e.g.

Dichotomous: odds ratio, risk ratio and confidence intervals, p-value

Continuous: mean difference, confidence intervals

If subgroup analysis is planned the above information on outcome data or results will need to be extracted for each patient subgroup

Additional outcomes

Record details of any additional relevant outcomes reported

ReAdverse events

NB: Notes fields can be useful for occasional pieces of additional information or important comments that do not easily fit into the format of other fields.