Key challenges of evidence-based medicine in developing countries

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Abstract

Objective: Evidence-based medicine is gradually re-shaping the conduct of medical research in developing countries. With increase in the number of original studies conducted across various local settings, global health experts have looked for a way to systematically combine these smaller studies in order to synthesize results that are meaningful, logical, feasible, and also representative of a larger population group in the region under consideration. Evidence-based Medicine emphasizes the use of the best evidence from well designed and conducted medical research aimed at providing the best available evidence to inform health decision making. In many low- and middle-income settings however, evidence syntheses are not without some basic challenges. The study aims to identify the key challenges in evidence synthesis in developing countries and provide practical ways to address these.

Methods: An exploratory scoping literature search was conducted on PubMed and Google Scholar for relevant studies on evidence synthesis in low- and middle-income countries.

Results: Standardization and Limited Evidence Base were identified as the two main challenges of evidence synthesis in the developing world. The standards and guidelines employed in the collation of data and information, synthesis of results, and reporting vary widely across many research settings, making the combination of evidence gathered almost impossible. The evidence base for medical research in many developing countries is too limited in scope to evaluate the research question of interest, and study distribution often reveals a geographical pattern characterized by small clusters of well-researched urban areas surrounded by large under-researched rural areas. Improvement in country level health records and data through the establishment of a national health management information system was identified as an important and desirable way forward, with this requiring robust organizational, technical and financial backing .

Conclusion: With a potential improvement in data management in developing countries, researchers need to keep strictly to international standards and guidelines to provide evidence that can inform balanced and equitable population-wide decisions.

Keywords: Evidence-based medicine, medical research, international standards

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Les principaux défis de la médecine fondée sur les preuves dans les pays en développement

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Résumé

Objectif: la médecine fondée sur les preuves est progressivement en train de remodeler la conduite de la recherche médicale dans les pays en développement. Avec l'augmentation du nombre d'études originales menées dans divers milieux locaux, des experts mondiaux de la santé ont cherché un moyen de combiner systématiquement ces petites études afin de synthétiser les résultats qui ont un sens, logique, réalisable, et également le représentant d'un plus grand groupe de population la région considérée. Médecine fondée sur les preuves insiste sur l'utilisation de la meilleure preuve de bien conçu et mené la recherche médicale visant à fournir les meilleures données disponibles pour éclairer la prise de décisions de santé. Dans de nombreux milieux à revenu faible et moyen cependant, synthèses de preuves ne sont pas sans certains défis fondamentaux. L'étude est d'identifier les défis clés dans la synthèse de preuves dans les pays en développement et de fournir des moyens pratiques pour y remédier.

Méthodes: Une recherche de la littérature de cadrage exploratoire a été menée sur PubMed et Google Scholar pour les études pertinentes sur la synthèse des preuves dans les pays à faible revenu et à revenu intermédiaire.

Résultats: la normalisation et de la base de preuves insuffisantes ont été identifiés comme les deux principaux défis de la synthèse des éléments de preuve dans le monde en développement. Les normes et directives utilisées dans la collecte de données et d'informations, la synthèse des résultats et des rapports varient grandement à travers de nombreux paramètres de recherche, ce qui rend la combinaison des éléments de preuve recueillis presque impossible. La base de données pour la recherche médicale dans de nombreux pays en développement est une portée trop limitée pour évaluer la question de la recherche de l'intérêt, et la distribution de l'étude révèle souvent un modèle géographique caractérisée par des petits groupes de zones urbaines bien documentés entourées de vastes zones rurales sous-étudié. Amélioration dans les dossiers et les données de santé au niveau des pays à travers la création d'un système national d'information de gestion de la santé a été identifié comme un moyen important et souhaitable avant, avec ce qui nécessite le soutien organisationnel, technique et financier robuste.

Conclusion: Avec un potentiel d'amélioration dans la gestion des données dans les pays en développement, les chercheurs doivent tenir strictement aux normes et directives internationales de fournir des preuves qui peuvent éclairer les décisions ensemble de la population équilibrés et équitables.

Mots-clés: La médecine fondée sur les preuves, la recherche médicale, les normes internationales.

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INTRODUCTION

Health research, dissemination and utilization in developing countries, and Africa particularly, have attracted varying interests among experts, governments, and many international organizations. The collective view, however, is that stakeholders in the health sector of many countries in this region need more quality research, especially in the remote and rural areas, to provide policy makers with facts necessary for equitable and informed decision making (1). Indeed, the last three decades have witnessed increased research output in many low- and middle-income countries (LMICs); and while this has been acknowledged in many global health meetings, the challenge remains how relevant these researches are, and to what extent the authors followed standard international guidelines (2). Even when some of these basic problems have been addressed in the conduct of some researches, generalizing many of these studies to a larger population in a bid to address a wider public health issue has always been difficult (1). Moreover, a more generic problem affecting research in many developing countries is poor data management- a situation where regular and detailed record keeping has been relatively absent . These issues, yet again, bring into focus the need to re-examine research, data availability and the evidence gathered in the developing world- what are the key challenges?

Evidence-based Medicine (EBM) is a concept that has evolved over time and is now increasingly employed in collating and using evidence in healthcare. According to Best and Neuhauser, the use of knowledge as evidence in medicine can be traced back to 280 B.C, where the Greeks adopted various forms of knowledge gathered from previous experience when confronted with challenging health issues (3). In recent times, EBM has been tailored towards what is available, acquiring more knowledge, and increased curiosity around the knowledge acquired (4). The questions Where, Who, When, How, Why, among many others, have always trailed the conduct of research and dissemination of a new knowledge (4). Interestingly, answering these questions may further contribute to addressing the key challenges of evidence synthesis.

THE NEED FOR EVIDENCE SYNTHESIS IN MODERN DAY MEDICINE

Health professionals daily encounter new challenges in medicine. These challenges have mostly been addressed from detailed research, clinical trials, experiments, and relevant collaborations, all well-grounded in strong evidentiary platforms (4). Based on this, collating evidence in medical practice has gradually been adopted as a probable method of solving medical "riddles"; and with improvements in the various approaches to evidence synthesis in health care, it is now widely accepted in addressing many global health issues (4, 5).

In Modern day medicine, original researches are conducted regularly, but are usually restricted to a particular local area and on specific health topics. Many of these researches may only be useful in the local area where the study was conducted. It is however still important to make policy decisions that spread across countries, continents, WHO regions, World Bank income groups, ethnic groups and races, and the entire globe. Conducting original "massive" global or regional researches (which could have been a relatively good option) is quite difficult, expensive and time consuming (2). Although some research consortiums are currently in place addressing this, these are however few, and there are undeniably many pending global health issues that need be addressed (2). Besides, many of these groups still rely on active data collation at various country levels to update their researches . The need to review smaller studies conducted across various parts of the

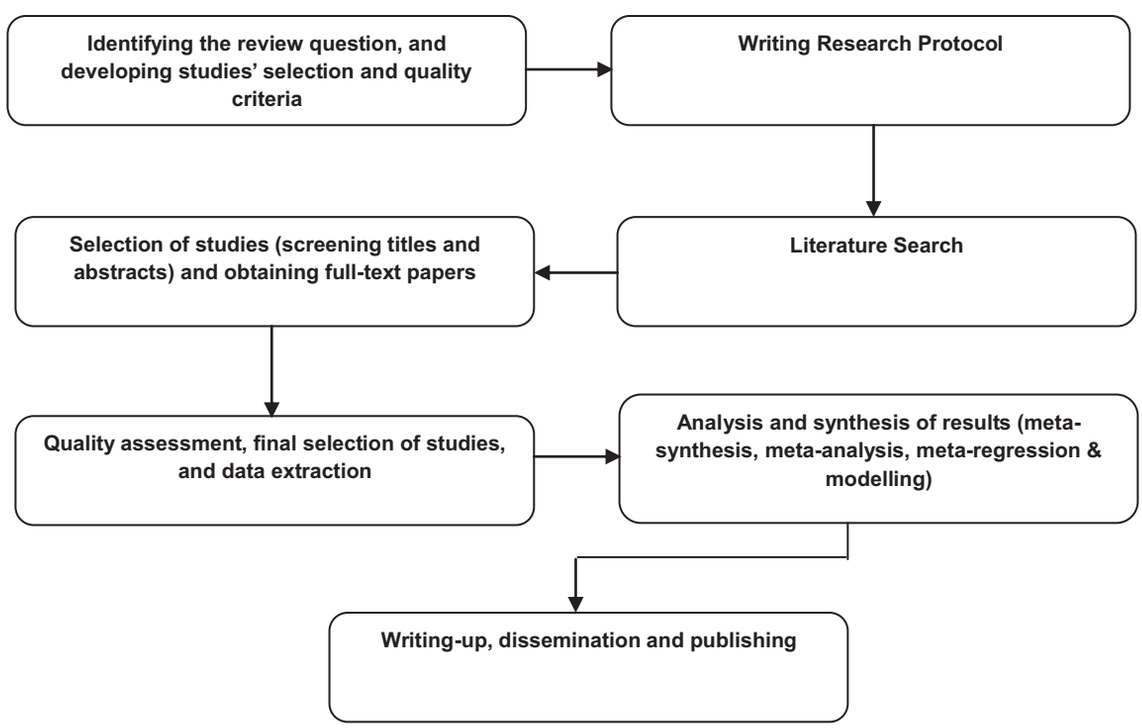
world therefore becomes very necessary. Global health experts have looked for a way to systematically combine these smaller studies to synthesize results that are meaningful, logical, feasible, and also representative of a larger population group in the region under consideration (5). Thus, medical practice has overtime, though not without some setbacks, steadily translated from Authority-based Medicine to Evidence-based Medicine (6).

Evidence-based Medicine (EBM) can be defined as the development and integration of best research techniques, with clinical expertise and patient values, to combine multiple sources of evidence towards optimizing decision making (7). In other words, EBM emphasizes the use of the best evidence from well designed and conducted medical research aimed at providing the best available evidence to inform health decision making (5).

STEPS IN EVIDENCE SYNTHESIS

Identification of a problem (or the need to address a particular health issue) and an understanding of the literature through some initial scoping searches usually precede the commencement of evidence synthesis. The basic steps in evidence synthesis are highlighted in the figure below.

Basic steps in evidence synthesis (adopted from *the* Cochrane Methodology (8))



The above flow diagram is a general description of the steps involved in evidence synthesis (or systematic reviews) in medical practice. As noted above, these steps are unambiguous and reproducible strategies aimed at identifying, appraising and synthesizing all relevant evidence on a specific health issue (8). This is quite different from a traditional narrative review, which is mainly subject to the experience of

the author, who in fact may or may not be an expert in the study field (8). It usually lacks clear, unbiased and objective methodology, which often affects the author's conclusions.

A concise approach to evidence synthesis was proposed by Pearson and colleagues in 2005, tagged the Joanna Briggs Institute (JBI) Model of Evidence-based Health Care (5). This approach is now widely used by policy makers, and it involves four basic steps described below.

- Evidence Generation: generating international evidence on healthcare that are feasible, appropriate, meaningful and effective
- Evidence Synthesis: encompassing the formal assessment called systematic review
- Evidence Transfer: disseminating information in appropriate and relevant formats to inform relevant stakeholders
- Evidence Utilization: designing programs to enable the effective implementation of evidence

THE KEY CHALLENGES IN DEVELOPING COUNTRIES

As noted in the introduction, developing countries are gradually embracing advances in medical research, science and technology. Despite this relative improvement, researchers are still faced with many challenges. Evidence synthesis, particularly, has not operated at the same levels as observed in many developed countries (9, 10). Experts in health metrics have the opinion that estimates reported in many global studies are not evenly distributed worldwide- stating that these estimates were mostly modelled from research and data collated in high income settings, patterned to fit into low- and middle-income settings, and therefore not necessarily reflecting the research and data originating from the developing world (2). On the overall, some scientific evidence may be misleading and/or not sufficient to influence appropriate decisions due to inherent challenges in the collation and synthesis of the evidence (11). Two key challenges of evidence synthesis in developing countries will be discussed- those relating to Standardization (spreads across all world regions) and Limited Evidence Base (more pronounced in developing countries)

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I. STANDARDIZATION

Information and Data Collation

Reports have shown that research studies on many relevant health issues in developing countries have not followed international standards (12). This has often been linked to lack of proper knowledge and skills relating to the medical condition, with researchers subsequently employing various substandard guidelines in the conduct of research (12). For example, various published reports have noted that symptoms of COPD and other obstructive airway diseases do overlap, which often complicate the case ascertainment during epidemiological surveys (13). Some clinical studies show that patients with bronchial inflammation and obstruction could present with signs and symptoms of asthma, chronic bronchitis and emphysema (13-16). In the absence of a standard guideline, collating and analyzing information in cases like this may be almost impossible. A properly conducted EBM should ensure selected studies comply with standard case definitions, sampling techniques and survey guidelines. The inclusion, exclusion and quality criteria should be explicit, justified and predefined, and issues related to inter-observer variations well handled.

Synthesis of Results

The statistical analysis of a high quality research has to be transparent and must normally follow agreed standards. In quantitative analysis (e.g. meta-analysis or meta-regression), the systematic reviewer is

confronted with ensuring heterogeneities within and between study population groups do not affect the synthesis of results. For example, one important issue in estimating the burden of any disease is to arrive at estimates that are closely representative of the population under study, while considering a host of inherent demographic factors (2). In Africa and many developing countries, this may appear difficult to achieve owing to wide heterogeneities within and between population groups, including those related to age, sex, urbanization, ethnicity, socio-economic groups, and literacy levels. Ideally, an analysis that involves pooling estimates from various studies must account for these heterogeneities, and each measure of heterogeneity can then further assist in appropriately interpreting the estimates reported. For qualitative analysis (meta-synthesis), it is also important that data are organized and presented in an analytic framework or summary tables to further clarify the similarities and differences among studies?

Reporting

Some basic reporting issues to be addressed to ensure standards are maintained include registering a protocol, the reporting guidelines to be adopted, e.g. PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses), STROBE (STrengthening the Reporting of OBservational studies in Epidemiology), CONSORT (Consolidated Standards of Reporting Trials), the assessment of risk of bias in included studies (publication bias), and the role of funding organizations (have they influenced the reporting and overall conduct of research?).

II. LIMITED EVIDENCE BASE

A general concern in many low- and middle-income countries is that vital registration and health management information systems appear to be in a static state, and too incomplete to provide the data needed (2). In many parts of Africa, health management information systems are virtually non-existent (2). In the last two decades, there have been gradual increase in population-, hospital- and registry-based studies conducted across many parts of Africa, but the incompleteness of information from these studies have prevented further research from which inferences and policy decisions can be made (17, 18).

Emerging evidence now suggest that some routine health service records may provide better information necessary for the estimation of disease burden than some epidemiological surveys, particularly when there is active registration, monitoring and evaluation of these records (19). However, population-based studies have been the hall-mark of many systematic reviews, which are mainly based on deliberate efforts by researchers to answer a specific research question, with very little or no contribution from routine health service records. These population-based studies are also limited in many developing countries. For example, existing reviews have identified only ten countries in Africa that have conducted and published research findings on COPD and these are mainly from selected populations and occupational settings where the case definitions were mostly based on observed respiratory symptoms and not a standard diagnostic guideline (13, 14, 20, 21).

The implication is that conclusions may be biased, especially when study designs, case definitions and selection criteria do not follow standard protocols. Besides, and just as noted above, their conclusions may be tailored along the interests of the funders of such studies, and may therefore not necessarily provide results that can inform effective public health response. While it is understandable that some national health records and results of some national surveys may actually exist in Africa, the fact that they are not publicly

available may still further imply that health management information system are functioning sub-optimally or even non-existent across many African countries (2). Largely, the evidence base for medical research in many developing countries is too limited in scope to evaluate the crucial research questions (scanty data). Study distribution often reveals a geographical pattern characterized by small clusters of well-researched urban areas surrounded by large under-researched rural areas (poor data quality). The lack of routine health service data has obviously contributed to poor research output, and evidence synthesis and policy response to many diseases have consequently remained very low.

THE WAY FORWARD

What are the feasible options that can effectively address these key challenges at various country levels?

Improvement in country level data through the establishment of a national health management information system may be an important and desirable starting point. However, considering organizational, technical and financial feasibility, this may be difficult to achieve in many developing countries. A feasible strategy may be for each country to adopt a policy that allows the selection of some regional health centres as special health management information centres, with each centre covering a population that is representative of a particular region in the country. Existing structures in these centres may be strengthened, so that data collation, recording, analysis and management may conform to international standards. Health management information specialists may also be assigned to these centres, who can train other health workers on the process of keeping up-to-date health data. Essentially, governments need to create adequate awareness among health workers in these centres and the general public to ensure a smooth conversion. The training of health workers on keeping timely, correct and complete record of health data may further help in sustaining the scheme. Data from these special centres can be regularly updated and modelled to be reflective of the total country population. Both crude and modelled data can then be incorporated into a national database, and made available to health researchers. There may be need to request technical assistance from the World Health Organization (WHO), and also partner with relevant international agencies like the INDEPTH Network, which have been a vital source of comprehensive, longitudinal population data that are generally unavailable in many parts of Africa (2, 22). This could further assist in developing this database and ensure better dissemination of data locally and internationally. This may possibly be a long-term solution to the non-availability of data in many African countries. According to Dr Margaret Chan, the WHO Director General, "the focus should now be on closing data gaps, especially across many low-and middle-income countries, to arrive at population representative estimates of the global burden of disease" . With this, the need for complex statistical modeling for burden of disease estimates would become less necessary (23).

One other option is a regular conduct of national surveys on relevant health issues across various country levels. National surveys on important health issues are currently being carried out in some developing countries, but there are concerns on the quality of these surveys and the long periods existing between surveys (24). Essentially, existing national protocols need to be improved, and adhered to international standards, like the WHO STEPwise approach to surveillance (STEPS), which is currently being employed in many countries (9, 10). For specific diseases, some surveys already conducted internationally with proven successes that can be adopted by many

countries include: the European Community Respiratory Health Survey in Adults (ECRHS) for chronic respiratory diseases, the Burden of Obstructive lung Disease (BOLD) survey for COPD, the International Study of Asthma and Allergies in Childhood (ISAAC) for asthma, the Epidemiological Trial of Hypertension in North Africa (ETHNA) survey for hypertension, and the International Stroke (INTERSTROKE) survey for stroke, among many others. Moreover, under the national survey schemes, periodic calls may be made to health experts within country to conduct original population-based (cohort or cross-sectional) or hospital-based studies across areas where there are limited data. Holmes and colleagues already noted that there is need for more longitudinal population-based studies in many low- and middle-income countries to help in better estimation of disease burden (24). This may also help address inequity in the geographical distribution of research, and all population groups within a country may be well-represented. Rudan and colleagues noted that special attention must be given to study designs during epidemiological surveys in many under-resourced settings, as this has affected the collation of data on disease incidence . Thus, with agreed international standards in design, case definitions, diagnostic criteria and outcome measures, bias and under-reporting may well be avoided.

Another complementary strategy that can improve the response to various diseases may be for countries to identify existing research centres (or units) focussing on a specific health issue within the country. Government can then invest in these health centres to improve research outputs and other activities carried out by these research units. Focussed strategies on capacity building, training and continuous medical education within the research units may also be needed, as this can help with improvement in organizational structures, performing investigations, and other mechanisms that can promote the conduct of research (25).

Within countries, there may be need for a leadership in the health sector devoid of ethnic, religious or political bias. This ensures that the observed gaps and challenges are addressed where and when needed. In addition, a good leadership can help in establishing an effective monitoring, evaluation and surveillance system, where the conduct of research, disease notification, and data collation and registration can be well addressed. This may further help in the sustainability of these strategies.

Largely, all these need adequate funding to be successful on the long term. It has been reported the lack of funds in many developing countries has affected the sustainability of many interventions (24). This is even more marked due to frequent shifts in leadership, political instability and civil unrest in these settings (1). A thorough understanding of how to successfully conduct research in difficult political terrains in many developing countries may further be needed.

CONCLUSION

Evidence synthesis will still continue to play important roles in medical research, as findings can help address the many policy gaps in health, and may in fact prompt further improved research efforts. It is however important that researchers keep strictly to international standards, conduct extensive searches, actively collate and present the data explicitly, explore both quantitative and qualitative synthesis where necessary, and explain the limitations of research more clearly.

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