Gaps in Hypertension Guidelines in Low- and Middle-Income Versus High-Income Countries

A Systematic Review

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Hypertension, a leading cause of other cardiovascular diseases, is also a leading cause of disability and death worldwide.[1] Over 1 billion people are diagnosed with hypertension, such that 1 in 3 individuals has elevated blood pressure in numerous countries.[2] About 90% of the burden of cardiovascular disease is borne by the low-and middle-income countries (LMIC) that have only ≈10% of the research capacity and healthcare resources to confront the scourge.[3]

Hypertension had been regarded as a disease of the affluent people of the world.[4,5] However, it has emerged in the LMIC where it affected ≈1 in 5 adults in 2013.[5] This rate has been projected to increase such that 3 in 4 adults will be living with hypertension by 2025 in LMIC.[6,7] Awareness and levels of hypertension control in LMIC are still low when compared with that in HIC.[8] For instance, hypertension control in United States is 52% compared with 5% to 10% in Africa.[9] The major reason for this disparity could be the lack of awareness of access and adherence to implementable hypertension guidelines in LMIC.[10]

Furthermore, hypertension management is complicated by choice, availability, and affordability of appropriate medications. The cultural aspects of life-long use of medications for hypertension, variable needs of individual patients, and inconsistent designs and outcomes from clinical trials have also compounded the management.[11] The different genetic architectures of individuals with hypertension[12,13] may determine the choice and response to treatment. Some of these antihypertensive agents are costly and not evenly accessible and distributed in LMIC.

Therefore, guidelines that work in HIC settings may not be acceptable, effective, implementable, and applicable to LMIC because of the lack of supporting resources. In addition to broad international guidelines tailored to the needs of large regions with similar socioeconomic implementation contexts, it may be crucial for every country to further adapt implementation aspects and dissemination channels of key recommendations by engaging and empowering all relevant stakeholders thereby enhancing adherence and impact.

This review is necessitated by the need to bring hypertension control to the individual's doorstep by developing and deploying such pragmatic hypertension guidelines in these countries to significantly reduce the burden of associated cardiovascular morbidities and mortalities.

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We performed a systematic review to compare the quantity and quality of published clinical practice guidelines for hypertension in individual LMIC to HIC over the past decade in terms of their number, quality of evidence, socioeconomic and ethical–legal contextualization, ability to be implemented and dissemination to actively engage and empower all relevant stakeholders. Overall, we aimed to identify the gaps and to propose suitable solutions to enhance the quality and impact of hypertension guidelines in LMIC.

Methodology

Using the Preferred Reporting Items for Systematic Review and Meta-Analyses guidelines,[14] a systematic review was performed with hypertension, high blood pressure, and guideline as the primary search items. Secondary search items included clinical practice, implementation, translation, and prevention, whereas the tertiary search items included World Health Organization, United States, American, International, European, African, Asian, Japanese, South and Latin American, Society, Association, League and Group.

Inclusion and Exclusion Criteria

The review included guidelines published from January 1, 2005, to December 31, 2015, in PubMed, Google Scholar, African Journals Online, Excerpta Medica Database, and Directory of Open Access Journals databases. Guidelines in other languages that we were unable to translate into English were excluded.

Eligible guidelines were also searched country by country and region by region. For instance, the following countries categorized as low-income countries were searched online for hypertension guidelines: Cambodia, Chad, South Sudan, Tanzania, Zimbabwe, Comoros, Haiti, Benin, Nepal, Mali, Sierra Leone, Burkina Faso, Afghanistan, Uganda, Rwanda, Mozambique, Togo, Guinea-Bissau, North Korea, Ethiopia, Eritrea, Guinea, Gambia, Madagascar, Niger, Democratic Republic of Congo, Liberia, Central African Republic, Burundi, Malawi, and Somalia. Some unpublished guidelines obtained by direct contact with clinicians in some countries were also included. Duplicates were excluded.

The guidelines were characterized according to income level, evidence class, recommendation level, and number of reviews performed during the study period.

Data Extraction, Critical Appraisal, and Synthesis

Google translate was used to translate the Brazilian hypertension guideline from Portuguese to English.

To determine the quality and the developmental processes of the guidelines, 2 independent reviewers extracted information on each guideline in terms of compliance with the Institute of Medicine's (IOM) [15,16] standards for developing clinical practice guidelines that include transparency, conflicts of interest, multidisciplinary approach, systematic reviews, strength or recommendations, external review, and regular updates. Other quality indices include coverage of the cardiovascular quadrangle[17] (surveillance and research, prevention, acute care, and rehabilitation), contextualization and translatability, attention to socioeconomic, ethical, legal, and psychological issues, and deployment through multiple dissemination channels to all stakeholders. Stakeholders included physicians, nonphysician healthcare providers, primary caregivers, policy makers, payers, patients, the populace, and implementation partners. Proportions of quality indices fulfilled in LMIC guidelines were compared with those in HIC.[18]

Results

Fifty hypertension guidelines are found Figures S1 and S2 in the online-only Data Supplement, including 20 from PubMed and 30 from Google Scholar databases. Six additional unpublished guidelines were obtained after consultation with colleagues involved in hypertension control and management across the globe through the Global Alliance for Chronic Diseases.[19–24] No guideline was found in African Journals Online, Excerpta Medica Database, and Directory of Open Access Journals databases. After the removal of duplicates, 39 guidelines from 28 countries were left. Of these, 16 were excluded because they were not written in English and could not be translated. Only 1 was found from the 31 countries in the low-income category, whereas 9 guidelines were found from middle-income countries. The remaining 13 were from HIC. Five guidelines from the United States were excluded leaving the American Society of Hypertension/International Society of Hypertension, which is the only one officially endorsed. Eighteen guidelines were included for qualitative and quantitative syntheses.

The guidelines were characterized according to organizations that developed them, year of publication, number of reviews, level of evidence, clinical spectrum addressed, and adherence to IOM recommendations (Tables 1 through 3). Appraisal was also based on country of origin (Table 4; Tables S1 through S3). Many guidelines from HIC were not named after individual countries unlike those from LMIC that were specific for the individual countries. Rather, guidelines from HIC were adopted by the countries in which the associations that developed them are based.

None of the guidelines retrieved utilized the Grading of Recommendations Assessment, Development and Evaluation system.[42] Few guidelines covered the entire spectrum of the cardiovascular quadrangle (Table 4), ethical, social, legal, psychological, and economic considerations, or elaborated plans to deploy and disseminate recommendations to all relevant stakeholders (Table 4; Tables S1 and S2). None of them applied translatability weighting to their recommendations (Table S2).

More of the hypertension guidelines from HIC followed the IOM recommendations. However, the South African Hypertension Guideline[26] and the 2010 Chinese guideline from LMIC were developed with strict adherence to the IOM recommendations (Table 3). The 2010 Chinese guidelines[8] described the treatment of hypertension in chronic kidney disease, stroke, and coronary artery disease. The recommendations were based on high level of evidence (randomized controlled trials), meta-analysis, and local studies.[8] Guidelines from Nigeria and Mexico have not been updated because they were published (Table 1).[25] Compared with the guidelines from HIC, the spectrum of the associated clinical issues addressed and the choice of antihypertensive agents were not clearly discussed (Table 2; Table S1).

Table 1. Summary of the Hypertension Guidelines

Guideline/Title	Authors	Organizations	Country	Year	Strategy	Income	No. of Revisions*
1. Guidelines for the management of hypertension in Nigeria	Onwubere and Kadiri[25]	Nigerian Hypertension Society, Enugu	Nigeria	2005	PubMed, Google Scholar	Middle	0
2. South African hypertension guidelines	Seedat and Rayner[26]	Hypertension Guideline Working Group	South Africa	2011	PubMed, Google Scholar	Middle	5
3. Brazilian guidelines on hypertension	Socieda et al[27]	Brazilian Society of Cardiology, Hypertension and Nephrology	Brazil	2010	Google Scholar	Middle	2
4. 2010 Chinese guidelines for the management of hypertension	Liu[8]	Chinese Hypertension League, CDC	China	2011	PubMed, Google Scholar	Middle	3
5. Clinical guidelines for detection, prevention, diagnosis and treatment of systemic arterial hypertension in Mexico	Rosas et al[28]	National institute of Cardiology	Mexico	2008	Google Scholar	Middle	0
6. The Japanese Society of Hypertension guidelines for the management of hypertension (JSH 2009)	Shimamoto et al[29]	Hypertension Committee for Guidelines for the Management of Hypertension	Japan	2009	Google Scholar	High	2
7. Hypertension guidelines	Aronow[30]	American Heart Association	America	2011	Google Scholar	High	0
8. 2013 ESH/ESC guidelines for the management of arterial hypertension	Mancia et al[31]	ESH and the ESC	Europe	2013	Google Scholar	High	2
9. JNC 8	James et al[32]	Not endorsed. Previous version endorsed by NHLBI.	America	2014	PubMed, Google Scholar	High	7
10. Management of hypertension in adults: the 2013 French Society of Hypertension guidelines	Blacher et al[33]	French Society of Hypertension, general practitioners	France	2013	PubMed, Google Scholar	High	0
11. 2010 Guidelines of the Taiwan Society of Cardiology for the management of hypertension	Chiang et al[34]	Hypertension committee of the Taiwan Society of Cardiology	Taiwan	2010	PubMed, Google Scholar	High	Not stated
12. ASH/ISH	Wood[35]	ASH/ISH/Asia Pacific Society of Hypertension	America	2013	PubMed, Google Scholar	High	Not stated
13. ACCF/AHA	Aronow et al[36]	ACCF/AHA	America	2011	PubMed,Google Scholar	High	Not stated
14. CHEP	Dasgupta et al[37]	CHS, Blood Pressure Canada, The Canadian Stroke Network, The Canadian Society of Internal Medicine	Canada	2014	PubMed, Google Scholar	High	Not stated
15. AHA/ACC/CDC	Go et al[38]	AHA/ACC/CDC	America	2013	PubMed, Google Scholar	High	Not stated
16. AHA	Calhoun et al[39]	AHA	America	2008	PubMed, Google Scholar	High	Not stated
17. NICE	Ritchie et al[40]	BHS, NICE, ESH, patients representatives	UK	2011	PubMed, Google Scholar	High	4
18. Practical guidelines for hypertension management	Rau and Nayak[19]	Association of Physician of India	India	2012	Unpublished	Middle	Not stated
19. Clinical practice guidelines	Wijesisiwardene and Mohideen[20]		Sri Lanka		Unpublished	Middle	Not stated
20. Guide to management of hypertension 2008[23]	Not stated	National Heart Foundation of Australia	Australia	2010	Unpublished	High	2
21. Ethiopia standard treatment guidelines	Yewondwossen Tadesse et al[21]	Food, Medicine and Healthcare Administration and Control Authority of Ethiopia	Ethiopia	2014	Unpublished	Low	2

(*Continued*)

Table 1. Continued

Guideline/Title	Authors	Organizations	Country	Year	Strategy	Income	No. of Revisions*
22. Sudan hypertension guidelines	Sulima and Aboud[22]	Sudan Society of Hypertension, FMoH-NCDs Directorate	Sudan	2012	Unpublished	Middle	Not stated
23. 2009 Kenya guideline for hypertension management	Crouch[24]	Ministry of Medical Services, Ministry of Public Health and Sanitation	Kenya	2009	Unpublished	Middle	Not stated

ACC indicates American College of Cardiology; ACCF/AHA, American College of Cardiology Foundation/American Heart Association; ASH/ISH, American Society of Hypertension/International Society of Hypertension; BHS, British Society of Hypertension; CDC, Centers for Disease Control and Prevention; CHEP, Canadian Hypertension Education Program; CHS, Canadian Hypertension Society; ESH/ESC, European Society of Hypertension/European Society of Cardiology; FMoH-NCD, JNC 8, Eighth Joint National Committee; and NICE, National Institute for Clinical Excellence.

*How often each guideline has been reviewed since its first publication.

Significantly more guidelines from HICs were developed with involvement of high-quality systematic reviews of relevant evidence (63.5% versus 10.0%; P=0.033). Overall, the proportions of guidelines that applied IOM recommendations, underwent frequent reviews, and developed active dissemination channels to engage all relevant stakeholders were higher among the HIC (Table S3).

Discussion

It is clear from this review that there is dearth of hypertension guidelines in the LMIC, particularly in low-income countries where only one existed.[21] The available guidelines in the middle-income countries are just limited to several countries; 4 of which were not published in peer-reviewed journals and not accessible in any of the online databases.[19,20,22] This is not in accordance with the recommendation of the World Health Assembly and the World Health Organization Regional Committee for Africa that countries in the region should be encouraged to establish country-specific recommendations for the prevention and management of hypertension.[5,25]

There is an urgent need for this as the genomics,[43] socioeconomic context, and healthcare policies of these countries vary from region to region, especially on healthcare financing and implementation of lifestyle modifications[44,45] such as smoking cessation and reduction in alcohol consumption. However, healthy lifestyle is an essential component of any effective hypertension treatment guideline, and it is recommended for the entire populace.[46] The process of generating LMIC-specific fine-tuning of recommendations can be facilitated and fast-tracked by first generating guidelines with unique recommendations that are broadly implementable in the socioeconomic setting of LMIC.

Currently, guidelines from LMIC are not unique to LMIC setting as they were adopted from the existing HIC guidelines without due considerations about their implementability.[26] They were not based on contextually relevant locally derived evidence. Indeed, as alluded to in the 2012 South African Hypertension guidelines,[26] the HIC guidelines have some recommendations that LMIC may not be able to implement because of the socioeconomic context within the countries.[11]

Moreover, many of the LMIC guidelines did not specify the level of evidence and did not address hypertension management in special situations such as chronic kidney disease, coronary heart disease, heart failure, diabetes mellitus, and stroke. The choice of medications and the target BP levels for hypertension in special situations were also not addressed.

Conversely, more HIC guidelines underwent frequent reviews, applied IOM recommendations, and developed active dissemination channels. However, guidelines from HIC also have rooms for improvement. For instance, the American Society of Hypertension/International Society of Hypertension guideline[35] did not follow all the IOM recommendations. Even, the authors recommend that the readers should not consider the guideline as an evidence-based set of recommendations. Although, this guideline addressed the management of hypertension in people with comorbidities, the evidence for its recommendations is mostly based on the expert opinion. However, the American College of Cardiology Foundation/American Heart Association hypertension guideline[36] complied with some of the IOM recommendations for the development of formal guidelines. Its focus is mainly on the management of hypertension in the elderly and so it is not comprehensive. Other guidelines that address management in the elderly include the European Society of Hypertension/European Society of Cardiology,[31] National Institute for Clinical Excellence,[40] and Canadian Hypertension Education Program[37] hypertension guidelines.

The American Heart Association, South African Hypertension guidelines, and National Institute for Clinical Excellence guidelines are the only hypertension guidelines that recommend specific drugs for the management of resistant hypertension.[40] Despite the fact that the Joint National Committee 8 strictly followed the IOM recommendations, its recommendations are not officially endorsed and are not comprehensive.[32] This is because its development was based only on randomized controlled trials, unlike the European Society of Hypertension/European Society of Cardiology guideline that included data from meta-analysis and observational studies.[31]The European Society of Hypertension/European Society of Cardiology guideline that is comprehensive enough addressing detection, evaluation, and treatment of hypertension can be useful, where there is limitation to direct application by virtue of different health systems, standard of care, and availability of antihypertensive agents, especially in the LMIC.[31]

For implementation of these guidelines, both in LMIC and HIC, nonpharmacological and multidisciplinary approaches to the total care of the patients were advocated.[31] However, the multidisciplinary approach was limited to the physicians

Table 2. Evidence Level and Spectrum of the Hypertension Guidelines

Guideline/Title	Level of Evidence	Clinical Parameters Addressed	Hypertension in Special Situations	Other Considerations
1. Guidelines for the management of hypertension in Nigeria	Not stated	Not stated	Not discussed	Nil
2. South African hypertension guidelines	Adoption of ESH/ESC guidelines	Weight, height, BMI, waist circumference	DM, CKD	Black, Asians, children, adolescents, HIV/AIDS
3. Brazilian guidelines on hypertension	Not stated		DM, CKD, stroke	…
4. 2010 Chinese guidelines for the management of hypertension	RCTs, meta-analyses, Chinese studies	Blood pressure, weight, height	CKD, stroke, coronary artery disease	…
5. Clinical guidelines for detection, prevention, diagnosis and treatment of systemic arterial hypertension in Mexico	Expert review	Blood pressure, weight	Obesity, DM, dyslipidemia, smoking	Pregnancy, adolescents
6. The Japanese Society of Hypertension guidelines for the management of hypertension (JSH 2009)	Systematic review	Blood pressure, weight	Stroke, MI, CKD	Not stated
7. Hypertension guidelines	Expert medical opinion	Blood pressure	Coronary artery disease, CKD, Diabetes mellitus, Heart failure.	A therapeutic target of <140/90 mm Hg in patients <80 y and a systolic blood pressure of 140–145 mm Hg if tolerated in patients aged ≥80 y is reasonable
8. 2013 ESH/ESC guidelines for the management of arterial hypertension	Class 1; Level of Evidence A	Systolic hypertension, weight	Diabetic patients, elderly	Diuretics, β-blockers, CCB, ACEI, and ARB are viable options for initial hypertension therapy. For DM, goal BP <140/85 mm Hg.
9. JNC 8	Most were based on expert opinion. Some systematic review, RCTs, Class 1; Level of Evidence A.	Systolic and diastolic blood pressure	CKD, DM, Nonblack, black	β-Blockers are no longer considered as an initial therapy option
10. Management of hypertension in adults: the 2013 French Society of Hypertension guidelines	Systematic review, literature analysis, meta-analysis, Consensus conferences, previous hypertension recommendations	Blood pressure	CKD, DM	…
11. 2010 Guidelines of the Taiwan Society of Cardiology for the management of hypertension	RCTs, meta-analysis, epidemiological data: Taiwanese cohort studies	Blood pressure	Stroke, coronary artery disease, CKD	Not stated
12. ASH/ISH	No classification or grading provided	Blood pressure	DM, CKD, coronary artery disease. BP <140/90.	Intended to be a primer with general information
13. ACCF/AHA	Expert opinion, not RCTs	Blood pressure	…	No recommendation with regards to antihypertensive agent selection
14. CHEP	No classification or grading provided, RCT and systematic review of RCT	BMI, waist circumference	Stroke, DM, CKD	…
15. AHA/ACC/CDC	No formal recommendation	Blood pressure	Stroke, CKD	Specific recommendation regarding the diagnosis, evaluation or treatment of hypertension are not provided
16. AHA	No formal recommendation	Blood pressure	Stroke, CKD	A scientific statement for the diagnosis, evaluation and management of patients with resistant hypertension. Not a formal guideline. Consider incorporating mineralocorticoid receptor antagonist (amiloride or spironolactone). Consider administering at least 1 antihypertensive at bedtime.

(*Continued*)

Table 2. Continued

Guideline/Title	Level of Evidence	Clinical Parameters Addressed	Hypertension in Special Situations	Other Considerations
17. NICE	No classification or grading provided, systematic literature search	Blood pressure	CKD, MI, stroke	Thiazides are no longer recommended as first line drugs. BP target for people >80 y is 150/90 mm Hg while it is 140/90 for others.
18. Practical guidelines for hypertension management	Not stated	Blood pressure, weight	CKD, heart disease, DM, elderly, pregnancy, resistant hypertension	Not stated
19. Clinical practice guidelines	Adoption of JNC 6, JNC 7, WHO/ISH, ESH/ESC	Blood pressure, weight	CKD, DM,	Not stated
20. Guide to management of hypertension 2008	Literature review	Blood pressure, weight, JVP	CKD, DM, stroke	Not stated
21. Ethiopia standard treatment guidelines	Adoption of JNC 7	Blood pressure, BMI	CKD, DM, heart disease	Not stated
22. Sudan hypertension guidelines	Adoption of JNC7, WHO/ISH, BHS, ESH/ESC, International society of hypertension in black guidelines for management of hypertension	Blood pressure, weight, height	CKD, DM, heart disease, stroke, elderly	Not stated
23. 2009 Kenya guideline for hypertension management	Adoption of JNC7	Blood pressure	Not stated	Aim is to reduce diastolic BP to 90 mm Hg

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; ACEI, angiotensin-converting enzyme inhibitors; AHA, American Heart Association; ARB, angiotensin receptor blockers; ASH/ISH, American Society of Hypertension/International Society of Hypertension; BHS, British Society of Hypertension; BMI, body mass index; BP, blood pressure; CCB, calcium channel blockers; CDC, Centers for Disease Control and Prevention; CHEP, Canadian Hypertension Education Program; CKD, chronic kidney disease; DM, diabetes mellitus; ESH/ESC, European Society of Hypertension/European Society of Cardiology; JNC, Joint National Committee; JVP, jugular venous pressure; MI, myocardial infarction; NICE, National Institute for Clinical Excellence; RCT, randomized controlled trials; and WHO, World Health Organization.

in their respective fields with little attention to the nurses, the pharmacists, and the dieticians in the guidelines from the LMIC (Table S1). Nearly all the guidelines from the HIC put this into consideration except the 2010 Guidelines of the Taiwan Society of Cardiology for the management of hypertension (Table S1). Indeed, almost all the guidelines regard management of comorbidities as a component of hypertension treatment.

Other considerations in the development of these guidelines such as translation, legal, and social issues were poorly addressed. In addition, there was no consideration of the psychological and economic situations of the targeted population. Socioeconomic situations of the targeted populace were only considered by the National Institute for Clinical Excellence and IV Brazilian hypertension guidelines, whereas only the Canadian Hypertension Education Program guidelines put the dissemination channels and hypertension surveillance into consideration (Table S2). Each guideline is expected to be updated every 3 years[47] to include new evidence or treatment. Among the guidelines available for review as at the time of this publication, only the guidelines from Japan, Europe, and the United States are up-to-date.

Strengths and Weaknesses

Our search strategy included all countries, and we critically appraised all available guidelines using rigorous and comprehensive criteria. However, only the hypertension guidelines written in or translated to the English language were included in this review. Other guidelines written in other languages[29,41,48–55] might have been missed.[56] Furthermore, because we used the IOM recommendation to assess the quality of the guidelines, we did not use other similar parameters such as the Global Rating Scale.[57] The World Health Organization/International Society of Hypertension guideline (2003)[47] was excluded because it was not covered in the stipulated time frame for our review.

We did not include the World Heart Federation Global cardiovascular disease Roadmap[58] in this review because it is not a guideline per se. It enumerates the challenges to hypertension control and suggests some ways to overcome them in the delivery of hypertension care to the populace. However, it did not demonstrate the developmental process of the recommendations that are to be delivered and the contextualization and other pertinent implementation issues for hypertension guidelines. If these are faulty, hypertension control will still be a Herculean task.

Conclusions and Future Plans

Hypertension guidelines are necessary for proper and adequate prevention, early detection, evaluation, treatment and control of hypertension.[44,59] However, they must meet basic criteria including validity, reliability/reproducibility, clinical applicability, clinical flexibility, socioeconomic, and ethical–legal contextualization, clarity, multidisciplinary process, scheduled review, and rigorous dissemination plan.[60] Unfortunately, none of the available guidelines meet all of these criteria. This could explain why hypertension is still difficult to control in many regions of the world, as possible

Table 3. Compliance With Institute of Medicine's[15,16] Standards for Developing Clinical Practice Guideline

Guideline/Title	Transparency	Conflicts of Interest	Multidisciplinary Approach	Systematic Reviews	Strengths of Recommendation	Clarity of Recommendation	External Review	Updates
1. Guidelines for the management of hypertension in Nigeria	No	No	No	No	No	No	No	No
2. South African hypertension guidelines	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Brazilian guidelines on hypertension	No	No	No	No	No	No	No	No
4. 2010 Chinese guidelines for the management of hypertension	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Clinical guidelines for detection, prevention, diagnosis and treatment of systemic arterial hypertension in Mexico	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. The Japanese Society of hypertension guidelines for the management of hypertension (JSH 2009)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Hypertension guidelines[41]	No	No	No	No	No	No	No	No
8. 2013 ESH/ESC guidelines for the management of arterial hypertension	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. JNC 8	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Management of hypertension in adults: the 2013 French Society of Hypertension guidelines	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11. 2010 Guidelines of the Taiwan Society of Cardiology for the management of hypertension	No	No	No	No	No	No	No	No
12. ASH/ISH	No	No	No	No	No	No	No	No
13. ACCF/AHA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14. CHEP	No	No	No	Yes	Yes	Yes	No	Yes
15. AHA/ACC/CDC	No	No	No	No	No	No	No	No
16. AHA	No	No	No	No	No	No	No	No
17. NICE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18. Practical guidelines for hypertension management	No	No	No	No	No	No	No	No
19. Clinical practice guideline	No	No	No	No	No	No	No	No
20. Guide to management of hypertension 2008	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21. Ethiopia standard treatment guidelines	No	No	Yes	No	No	No	No	No
22. Sudan hypertension guidelines	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
23. 2009 Kenya guideline for hypertension management	No	No	No	No	No	No	No	No

AHA/ACC/CDC indicates American Heart Association/American College of Cardiology/Centers for Disease Control and Prevention; ACCF/AHA, American College of Cardiology Foundation/American Heart Association; ASH/ISH, American Society of Hypertension/International Society of Hypertension; CHEP, Canadian Hypertension Education Program; ESH/ESC, European Society of Hypertension/European Society of Cardiology; JNC, Joint National Committee; and NICE, National Institute for Clinical Excellence.

valuable channels for the dissemination and implementation of guidelines are not harnessed.

It is obvious from this review that efforts are needed to develop hypertension guideline(s) for the LMIC (Table 5). The expected guideline(s) should be broad based, flexible, adaptable, socioculturally acceptable, and economically attainable for better health-related outcomes in patients with hypertension. As exemplified by National Institute for Clinical Excellence guideline, patients' participation should be incorporated to enhance adherence to these recommendations.

Because de novo guideline development is time consuming, labor intensive, and costly, any guideline that fulfills most of the criteria used for this review may be considered as a template for the development of guidelines for LMIC, while incorporating local evidence only as available. This will be a more realistic approach to avoid duplication of efforts

Table 4. Components of the Cardiovascular Quadrangle Addressed

Countries	Income Level	Primordial Prevention	Prehypertension	Age-Specific Treatment	Nutrition	Exercise	Acute Care/ Emergencies	Conventional Care	Rehabilitation
America	High	No	No	Yes	Yes	Yes	No	Yes	No
Australia	High	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Brazil	Middle	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Canada	High	Yes	No	Yes	Yes	Yes	No	Yes	No
China	Middle	No	No	Yes	Yes	Yes	No	Yes	No
Ethiopia	Low	No	Yes	No	Yes	Yes	Yes	Yes	No
Europe	High	No	Yes	Yes	Yes	Yes	Yes	Yes	No
France	High	No	Yes	Yes	Yes	Yes	No	Yes	No
India	Middle	No	No	Yes	yes	yes	yes	yes	No
Japan	High	No	No	No	Yes	Yes	No	Yes	No
Kenya	middle	No	No	No	Yes	Yes	Yes	Yes	No
Mexico	Middle	No	No	No	Yes	Yes	No	Yes	No
Nigeria	Middle	Yes	No	No	Yes	Yes	No	Yes	No
South Africa	Middle	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Sri Lanka	Middle	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Sudan	Middle	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Taiwan	High	No	No	Yes	Yes	Yes	No	Yes	No
United Kingdom	High	Yes	No	Yes	Yes	Yes	No	Yes	No

Only Europe, Nigeria, and Sudan addressed epidemiological surveillance and research agenda (one of the pillars of the quadrangle).

while waiting for direct high-level evidence to accrue from the LMIC. Such guidelines should be socioculturally acceptable and cost-effective for successful implementation in the resource-poor regions of the world.

Developing and disseminating evidence-based pragmatic guidelines with concise implementable recommendations relevant to LMIC needs and socioeconomic context is urgently needed. With the active involvement of all stakeholders, the recommended care and commodities could be made acceptable, accessible, available, appropriate, affordable, and effective to reduce the global burden of hypertension.

Table 5. Suggested Suitable Solutions to Enhance the Quality and Impact of Hypertension Guidelines in LMIC

Collaboration among professional organizations to develop hypertension guidelines.
Involvement of patients, key opinion leaders, and policy makers in the development of hypertension guidelines.
The social, psychological, and economic situations of the region or country should be put into consideration while developing the guidelines.
Robust engagement of all stakeholders (stakeholders include physicians, nonphysician healthcare providers, primary caregivers, policy makers, payers, patients, populace, and implementation partners) during development, implementation, and evaluation.
Development of concise key active recommendations specially packaged and disseminated to all stakeholders (stakeholders include physicians, nonphysician healthcare providers, primary caregivers, policy makers, payers, patients, populace, and implementation partners).
Performance of high-quality studies in a context-specific manner in LMIC.

LMIC indicates low- and middle-income countries.

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None.

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