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European Journal of Heart Failure (2024)
doi:10.1002/ejhf.3485

RESEARCH ARTICLE

Applicability of heart failure clinical practice guidelines in low- and middle-income countries

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Received 26 April 2024; revised 23 September 2024; accepted 28 September 2024

Aims Clinical practice guidelines are commonly written by professional societies in high-income countries (HIC) with limited anticipation of implementation obstacles in other environments. We used heart failure (HF) guidelines as a paradigm to examine this concern, by conducting a survey to understand clinicians' ability to implement HF guidelines and their perceptions of the current HF guideline applicability in low- and middle-income countries (LMIC).

Methods and results An online survey of physicians in the database of the Translational Medicine Academy who treat HF patients was offered by email from 5 October to 27 November 2023, inquiring of participants' demographic information, experience, and views of HF guidelines as related to their practice. Of 2622 participating clinicians, 1592 partially completed, and an additional 1030 fully completed the survey. Participants were from 138 countries; 668 practiced in HIC, and 1954 in LMIC. Those from LMIC regarded HF guidelines to be less applicable in their country than did those from HIC ($p = 0.0002$). Of all those responding, 75.3% indicated that it was somewhat or mostly true that the HF guidelines were mostly applicable to HIC. Those from LMIC, but not HIC indicated that the greatest implementation obstacle was that the guidelines were for HIC (51.3% vs. 43.1%; $p = 0.0387$). A significantly higher proportion of respondents from LMIC indicated that resources for caring for their patients were somewhat or mostly limiting in most cases, than did those in HIC (41.6% vs. 32.5%, $p = 0.0068$).

Conclusion This survey examined the widely-held thought that HF guidelines are broadly applicable to all regions of the world, concluding that such a perception is incorrect. Clinicians from LMIC view the absence of consideration of local resource limitations as the greatest obstacle for guideline implementation. The results regarding HF guidelines likely also have implications for other guidelines and resultant patient outcomes.

Keywords Clinical practice guidelines • Survey • Implementation • Obstacles • Low-income countries • Middle-income countries • Heart failure

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Introduction

International clinical care guidelines evolve over time and incorporate new evidence-based procedures and pharmacologic therapies, both of which may require substantial resources. These globally-intended guidelines are commonly developed by academic medical societies and organizations based in the high-income world by experts who practice in that same environment. The unrecognized barrier of implementation of evidence-based guidelines into patient care and the resultant gaps[1,2] lead to many patients not receiving the recommended care and are likely amplified in low- and middle-income countries.[3,4] As of yet, relatively little consideration has been given to the proposition that clinical 'guideline recommendations produced for one health care setting are often not directly applicable to another'.[5]

The global burden of heart failure is substantial, with a prevalence of 1–3% in most countries surveyed and reaching as high as 6% in some.[6] This translates to a worldwide burden of approximately 150 million people. Despite advances, 1-year mortality is as much as 30%.[6] Several guidelines have been published,[7–14] but there is recognition of poor implementation of evidence and innovations proposed by guidelines.[15,16] The most recognized and promoted guidelines for heart failure are written by experts from and directed to high-income countries. Other countries, with different resources, cultures, languages, and health literacy could face challenges in their implementation. Values and preference statements within guideline documents may acknowledge the importance of resource consideration,[12] however, clear elucidation of alternative steps in the context of limited availability of resources, pharmaceuticals, and interventions is not presented. A 2020 guideline by the Heart Failure Society of South Africa[17] and an extensive position statement of 2018 by the Cardiological Society of India[18] were specifically devised to be relevant to their countries, but the extent to which these or the European or US guidelines are consulted in South Africa or India is not clear.

We sought to understand clinicians' ability to implement HF guidelines and their perceptions of the applicability of the current HF guidelines in low- and middle-income countries. We tested our hypothesis that there is a broad belief among clinicians that heart failure guidelines are more applicable to high-income countries than low- and middle-income countries.

Methods

We conducted an international, internet-based survey of physicians who treat patients with heart failure, from 5 October to 27 November 2023. The invitation to participate was offered by email notification to the physicians in the database of the Translational Medicine Academy (TMA), a non-profit medical education organization based in Basel, Switzerland. Its main objective is to enhance patient care and improve patients' outcomes globally by developing and disseminating research and educational programmes addressing unmet medical needs. TMA's educational resources, including online conferences, web site, and webinars, are available for free to healthcare professionals worldwide. The invitation was sent to 35 707 practitioners a total of five times (original invitation plus four reminders) and was posted on social media, as well. The invitation included the purpose of the survey. Both the invitation and the survey were in English. The database consists of all those who participated in any of the TMA educational programmes in the past decade. The survey inquired of participants' demographic information, experience, and views of heart failure guidelines as related to their practice. QuestionPro® was used for survey dissemination and data accumulation. All questions were multiple choice, save one, which was not analysed owing to the nature of the responses. Responses to each question were included from all survey respondents whether the survey was partially or fully completed.

We compared responses from clinicians in high-income countries (as categorized by the International Monetary Fund[19]) with those from other countries with Fisher's exact test for categorical variables for 2×2 tables, Chi-square for larger tables, and unpaired *t*-test for continuous variables. Because there are clinical practice differences between cardiologists who specialize in heart failure compared to those who do not,[20] we also compared the view of heart failure guideline implementation between those whose practice is ≤40% heart failure with those whose practice is ≥60% heart failure. A *p*-value ≤ 0.05 was considered statistically significant. Continuous data are presented as mean (standard deviation); categorical data as number (%).

Results

Of the 35 707 who were invited to participate, 5789 (16.2% of those invited) accessed the survey, of whom 1030 fully completed the survey, and an additional 1592 partially completed the survey; 45.3% of those who accessed the survey provided responses. Those participating in the survey were from 138 countries; 668 practised in high-income countries, and 1954 in other nations (*Table 1*). The countries in each category with the most respondents were: high-income countries: US, 163; UK, 113; France, 47; Greece, 45; and Spain, 37; low- and middle-income countries: India, 591; Saudi Arabia, 114; Mexico, 113; Qatar, 85; Egypt, 76; and United Arab Emirates, 75.

The majority of respondents were aged 35 to 54 years, and there was no difference for respondent age distribution between high-income and other countries. Of all respondents 29.3% were female, with the high-income country responders having a higher fraction of females (46.5%) than other countries (23.4%; $p < 0.00001$). Of the participants who responded to questions about the guidelines, 94% were practising cardiology, either as certified cardiologists or in a cardiology training programme, with approximately two-thirds of those having had more than 5 years of practice. The pattern of career stages differed between high-income and other countries, with the low- and middle-income countries having a higher fraction of those in cardiology training (20.1% vs. 14.1%; $p = 0.0267$) and lesser fraction with more than 5 years of practice (65.4% vs. 75.0%, $p = 0.0031$).

There was near universal consultation of either the European Society of Cardiology (ESC) or the American College of Cardiology/American Heart Association/Heart Failure Society of America (ACC/AHA/HFSA), or both, heart failure guidelines, by 95% of all respondents. Clinicians in high-income countries consulted them significantly more, albeit only by a small amount, than those in low- and middle-income countries (95.7% vs. 94.4%; $p = 0.0113$). As for the use of local guidelines in a low- or middle-income country, 97.7% of clinicians in India, the only low- or middle-income

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Table 1 Survey respondents' demographics

	All	High-income	Low- and middle-income	*p*-value
Respondents[a]	2622	668	1954	
Sex				
Total	1174	301	873	<0.00001
Male	827 (70.4)	159 (52.8)	668 (76.5)	
Female	344 (29.3)	140 (46.5)	204 (23.4)	
Age (years)				
Total	1178	302	876	0.508
25–34	164 (13.9)	43 (14.2)	121 (13.8)	
35–44	421 (35.7)	100 (33.1)	321 (36.6)	
45–54	300 (25.5)	74 (24.5)	226 (25.8)	
55–64	182 (15.4)	50 (16.6)	132 (15.1)	
≥65	111 (9.4)	35 (11.6)	76 (8.7)	
Career stage				
Total	1103	284	819	
Cardiology training	205 (18.6)	40 (14.1)	1654 (20.1)	0.0267
Cardiology ≤5 years	149 (13.5)	31 (10.9)	118 (14.4)	0.158
Cardiology >5 years	749 (67.9)	213 (75.0)	536 (65.4)	0.0031

Data are number responding (% of responders).
[a]Respondents are those that answered any question. All other data are from all who answered that specific question.

country for which we had sufficient data to make analysis reasonable, consulted the ESC or ACC/AHA/HFSA guidelines, while only 18% consulted the Indian statement as well, but only 1.7% of these clinicians consulted only the Indian statement.

When asked to score, on a scale of 0 to 5, whether the guidelines were applicable in their country, those from low- and middle-income countries responded less favourably than did those from high-income countries (3.52 ± 1.10 vs. 3.83 ± 1.06, $p = 0.0002$; *Table 2*). Overall 75.3% of all those responding indicated that it was somewhat or mostly true that the guidelines were mostly applicable to high-income countries (*Figure 1*). This response did not differ between high-income and low- and middle-income countries (72.7% vs. 76.2%, $p = 0.276$). Less than 10% in each group considered that this was either somewhat or mostly untrue. This response did not differ whether a practitioner's practice consisted of ≤40% or more than ≥60% heart failure for both high-income countries and low-and-middle income countries (p range 0.42 to >0.99). When asked to select the obstacles to implementation of the guidelines, those from low-and middle-income countries indicated that the greatest impediment was that the guidelines were for high-income countries (51.3% vs. 43.1% for high-income countries; $p = 0.0387$), while the most frequent impediment cited in high-income countries was that the guidelines were 'too text heavy' (46.7% vs. 31.3% for low- and middle-income countries; $p < 0.00001$; *Figure 2*). A substantial fraction of respondents (39.3%) indicated that resources for caring for their patients were somewhat or mostly limiting in most cases, with this being more frequently specified by those in low- and middle-income countries than those in high-income countries (41.6% vs. 32.5%, $p = 0.0068$; *Table 2*). This aligns with the clinicians' estimates that a greater proportion of patients with heart failure in the low- and middle-income countries pay for most of their medical care for everything except hospitalization than do their patients in the high-income countries (60.0% vs. 33.5%; $p < 0.00001$; *Table 2*). Of those patients who do pay for most of their care, more paid for all of their drug costs than for all of their device costs, in both high- and mid- low- income groups, but with twice the prevalence for both costs in the latter group (*Table 2*).

Overall, using a scale of 0 to 5, there was a strong desire to have guidelines co-authored by those from their country or region (score 4.05 ± 1.27) and to have specific recommendations for patients with differing socio-economic status (score 3.79 ± 1.28). For both of these, the request was stronger in the low- and middle-income than in the high-income countries ($p < 0.0001$ and $p = 0.0169$, respectively). Similarly, overall there was a very strong agreement that heart failure guidelines should have more inclusive and diverse (sex, age, geographical) writing committees (89.8% of all respondents), with a higher fraction in the low- and middle-income countries than in the high-income countries agreeing (92.5% vs. 81.9%; $p < 0.0001$; *Figure 3*).

Discussion

This survey found that most clinicians conclude that current heart failure guidelines are mostly applicable to high-income environments, and that this is the most significant obstacle to their implementation in low- and middle-income countries.

Clinical practice guidelines are most frequently written by those from high-income countries. While it is not the intention that they be directed for clinicians and patients solely in the higher socio-economic environments, by the nature of the data and experts' experience, and with appropriate attention to newer pharmaceuticals, devices, and interventions, the result is that they are perceived in that manner. More than half of the respondents from

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Table 2 Survey responses

	All	High-income	Low- and middle-income	*p*-value
Guidelines most frequently consulted[a]				
n	1001	254	747	
ESC	813 (81.2)	228 (89.8)	585 (78.3)	<0.00001
US	556 (55.5)	125 (49.2)	531 (57.7)	<0.00001
Either ESC or US[b]	948 (94.7)	243 (95.7)	705 (94.4)	0.0113
Asia-Pacific	57 (5.7)	13 (5.1)	44 (5.9)	0.7546
Australia/New Zealand	45 (4.5)	9 (3.5)	36 (4.8)	0.4847
Canada	81 (8.1)	3 (5.1)	68 (9.1)	0.0459
Local/National	249 (24.9)	78 (30.7)	171 (22.9)	0.0148
Guidelines are mostly applicable to high-income countries				
n	1007	256	751	
Mostly true	392 (38.9)	114 (44.5)	278 (37.0)	
Somewhat true	366 (36.3)	72 (28.1)	294 (39.1)	
Mostly or somewhat true[b]	758 (75.3)	186 (72.7)	572 (76.2)	0.276
Neutral	176 (17.5)	55 (21.5)	121 (16.1)	
Somewhat untrue	48 (4.8)	12 (4.7)	36 (4.8)	
Mostly untrue	25 (2.5)	3 (1.2)	22 (2.9)	
Obstacles to implementing guidelines[a]				
n	935	225	710	
Text too heavy	327 (35.0)	105 (46.7)	222 (31.3)	<0.00001
Mostly for high income	461 (49.3)	97 (43.1)	364 (51.3)	0.0387
Not digital friendly	144 (15.4)	46 (20.4)	98 (13.8)	0.0196
Not applicable to practice	93 (9.9)	26 (11.6)	67 (9.4)	0.371
Does not consider affordability	388 (41.5)	95 (42.2)	293 (41.3)	0.816
Guideline applicability in your country[c]				
n	958	244	714	
Mean (SD)	3.600 (1.099)	3.828 (1.059)	3.522 (1.102)	0.0002
Importance for specific recommendations for different socio-economic status[c]				
n	968	243	725	
Mean (SD)	3.790 (1.277)	3.621 (1.493)	3.847 (1.192)	0.0169
Desire for guideline co-authors to be from your country/region[c]				
n	982	249	733	
Mean (SD)	4.054 (1.272)	3.771 (1.497)	4.150 (1.171)	<0.0001
Heart failure guidelines should have more diverse (sex, age, geographic) writing committees				
n	1011	260	751	
Mostly true	667 (66.0)	145 (55.8)	522 (69.5)	
Somewhat true	241 (23.8)	68 (26.2)	173 (23.0)	
Mostly or somewhat true[b]	908 (89.8)	213 (81.9)	695 (92.5)	<0.00001
Neutral	66 (6.5)	29 (11.2)	37 (4.9)	0.0011
Somewhat untrue	20 (2.0)	6 (2.3)	14 (1.9)	
Mostly untrue	17 (1.7)	12 (4.6)	5 (0.7)	
Mostly or somewhat untrue[b]	37 (3.7)	18 (6.9)	19 (2.5)	0.0032
What are resource limitations when caring for your patients?[a]				
n (responders)	1150	292	858	
Mostly without constraint	330 (28.7)	93 (31.8)	237 (27.6)	0.178
Occasionally restrained	574 (49.9)	156 (53.4)	418 (48.7)	0.176
Somewhat limiting in most cases	324 (28.2)	78 (26.7)	246 (28.7)	0.574
Severely limiting in most cases	128 (11.1)	17 (5.8)	111 (12.9)	0.0005
Somewhat or mostly limiting in most cases[b]	452 (39.3)	95 (32.5)	357 (41.6)	0.0068
Respondent-estimated patient financial contributions for their care				
≥50% mostly self-pay	609 (53.4)	94 (33.5)	515 (60.0)	<0.00001
Pay for all drugs	634 (55.6)	83 (29.5)	551 (64.1)	<0.00001
Pay for all devices	302 (26.5)	40 (14.2)	262 (30.5)	<0.00001

Data are number responding (% of responders); *n* is the number of responders to that question.
[a]More than one selection was allowed for these questions. The data are for total number of responses; *n* is the number of responders.
[b]Calculated from the individual responses for that question.
[c]For these questions, respondents were asked to rate the response from 0 to 5.
P-value is for responses from practitioners in high-income vs. low- and middle-income countries.

the low- and middle-income countries regarded this as the most important obstacle to their ability to implement the guidelines. Important gaps between guideline recommendations and their implementation are well-recognized,[15,21,22] as is the need to identify implementation obstacles.[1,4,21,23] Indeed, differences in diagnosis and therapeutic interventions for heart failure exist, even between the high-income countries assessed, which was attributed to differences in healthcare and insurance (including 'universal coverage') systems.[24] Challenges in addressing the large burden of heart failure in low- and middle-income countries[6] include younger age,

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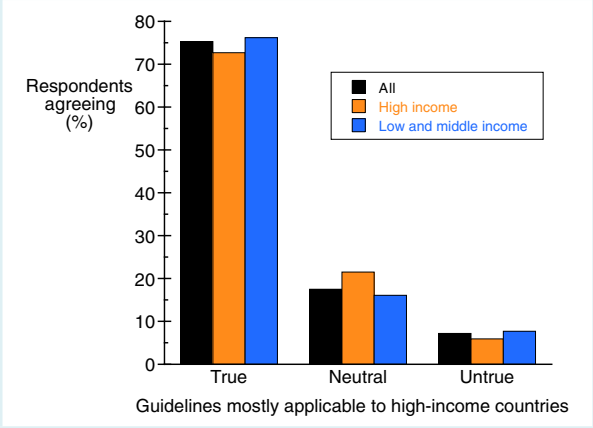

Figure 1 Percent of responders agreeing that heart failure guidelines are mostly applicable to high-income countries. There was no significant difference between responses from those in high-income compared to low-/middle-income countries.

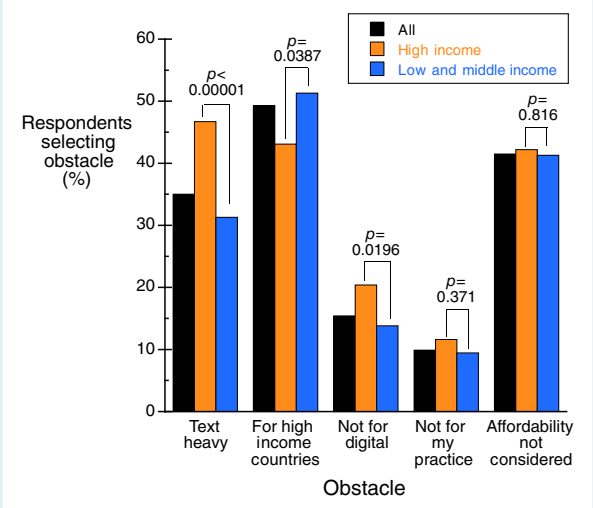

Figure 2 Responders' selection of obstacles that hinder their ability to implement heart failure guidelines. *P*-values are for comparisons between respondents from high-income and low-/middle-income countries.

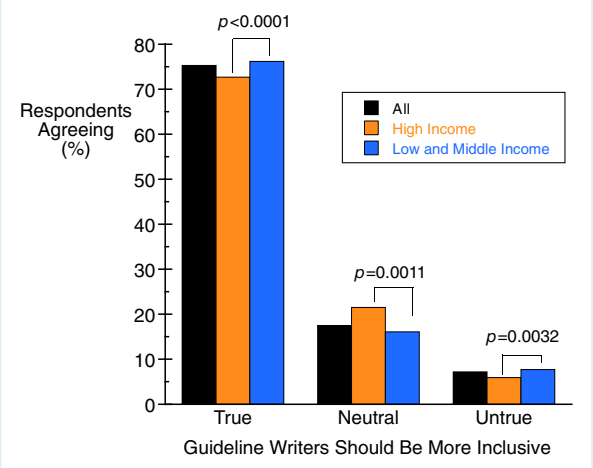

Figure 3 Percent of responders agreeing that guidelines should have more inclusive and diverse (sex, age, geographical) writing committees. *P*-values are for comparisons between respondents from high-income and low-/middle-income countries.

lower proportion of patients with health insurance, and worse clinical presentation.[25] The latter may be due to lesser access to health care and thus, delayed presentation. Our finding that more than twice the proportion of practitioners' patients pay for their drugs and devices in mid- and low-income countries as in high-income countries supports the concept that resources are an important guideline implementation barriers in the former group. Others have similarly found cost to be an implementation barrier for guideline-recommended implantable cardioverter-defibrillators (ICD)[26] and pharmacological treatment of heart failure.[27,28] In addition, patient culture, language, and health literacy may be impactful. Furthermore, economic drivers could also contribute to sex-based variation in implementing guidelines with lower rates of beta-blocker and sacubitril/valsartan prescription and ICD implantation reported in women enrolled in the Global Congestive Heart Failure (G-CHF) registry, especially in low to middle income countries.[29]

The field of 'implementation science'[1,3,15,16,23,24,30] has developed with the aim of improving adherence and patient care, with attendant improved patient outcomes. There is a developing interest in assessing the success of implementation of heart failure guidelines.[31] Barriers to implementation, including resource utilization, have been acknowledged.[2] A recent international online survey of 520 physicians, including 449 cardiologists, identified cost/reimbursement issues as an important barrier to implementing guideline recommendations for pharmacological therapy for heart failure.[28] However, while some guidelines compare the cost-effectiveness of some pharmacological therapies,[7] there have been limited efforts to produce comprehensive guidelines for circumstances of limited resources. Additionally, although there has been a call for full consideration of resources (infrastructure, facilities, personnel, finance), here, too, when considered it has been in the context of examination of cost-effectiveness.[12]

There are generally accepted recommendations for the writing of guidelines, however, the view that it is important to know which strategies work for a particular type of evidence in a particular setting[1] and the need for local adaptation[21] has been underexplored. This is especially so for the writing and implementation of guidelines that are to be applied in low- or middle-income countries.

The survey respondents indicated a strong desire to have guidelines co-authored by those from their country or region and to have specific recommendations for patients with differing socio-economic status, with these thoughts being more prevalent from respondents in low- and middle-income countries compared to those in high-income countries. Of the two most commonly

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consulted current guidelines (AHA/ACC/HFSA[7] and ESC[9]), none of 26 named authors of the former[7] and two of 30 of the latter[9] were from low- and middle-income countries. The sole country-specific guideline from a low- or middle-income country that we could assess for its impact[18] appears to be consulted infrequently in that country, despite its extensive, well-directed, and well-referenced nature, although we do acknowledge that it was 5 years old and may have been perceived as dated in its recommendations.

This survey and the interpretation of the data have significant limitations. As with any survey, those that chose to respond may have views or biases that differ from the population invited to participate, or the larger relevant population.[32] While there were 2622 respondents, perhaps the largest survey for this topic, that does not eliminate this concern, and although 45% of those who accessed the survey responded, that was <10% of those invited. The survey was sent to those who had registered with a medical education organization, and thus, may not represent fully the practising community. Indeed, 87% of those responding to the question practice in a public setting, and only 13% in private practice. Thus, the latter is under-represented in our analyses. Similarly, the comparison between practitioners with a minority versus a majority or their practice being heart failure should be viewed with caution. There can be significant differences between these groups.[20] Although we did not find a difference for the issue posed that could have been impacted by the under-representation of private practitioners. In addition, the survey was conducted in English only, and those who do use English may not represent accurately all those caring for patients with heart failure in their milieu. Additionally, if English is not their native language, they may have had limited comprehension of the questions or the available responses. In this survey, there was a higher proportion of respondents who were female from high-income than from low- and middle-income countries. A recent survey in Spain noted that female physicians follow more frequently new heart failure guidelines than do male physicians.[33] Some low- and middle-income countries (e.g. India and China) and some high-income countries have a wide range of socio-economic status among the population, and thus, the views of the survey respondents may not accurately reflect the heterogeneity of heart failure care in their country. Furthermore, we could not assess the impact, direct or indirect, of other important patient factors, such as culture, language, and health literacy, that could have influenced the results. Furthermore, as the survey and the US and European guidelines for heart failure are in English, there may have been invitees who did not respond owing to language difficulties. If so, the implementation barriers may have been underestimated.

We did not assess the extent to which guidelines were followed or whether the cited implementation obstacles were reflected in clinical outcomes. This would have been a difficult task in 138 countries, and in any case that was not our intention. We sought only to assess the perceived obstacles to implementing guidelines in low- and middle-income countries compared to high-income countries; it is generally recognized that implementation of guidelines improves patient outcomes. It would be useful to confirm the perceptions and estimates reported here with real-world data for actual drug use (i.e. the degree of guideline implementation) in different countries with different economic environments.

In conclusion, this survey of 2622 practising physicians, of whom 1103 are practising cardiologists, points to a widely-held perception that heart failure guidelines are mostly applicable to high-income countries, and that practitioners from low- and middle-income countries view this as the greatest obstacle for guideline implementation.

The results of this survey regarding heart failure guidelines likely have implications for other guidelines, as well. Locally developed guidelines, written for locations with limited resources may not have sufficient impact to address the clinical needs of practitioners in limited-resource environments. Developers of widely-consulted guidelines may wish to consider and construct recommendations to have greater relevancy and implementation, in settings of limited resources.

Funding

Translational Medicine Academy (TMA) provided funding for the license fee for the questionnaire platform used, and for website management. TMA as an organization had no input/influence on the design or questions of the survey, the interpretation of the results, the writing of the manuscript, or the decision to submit the manuscript for publication in the *European Journal of Heart Failure*.

Conflict of interest: S.Z. received research grant support, served on advisory boards for, or speaker engagements with AstraZeneca, Bayer, BMS, Boehringer Ingelheim, Cytokinetics, Eli Lilly, GSK, Janssen, Medtronic, Merck, Novartis, NovoNordisk, Otsuka, Pfizer, Roche, Salubrisbio, Servier and Vifor Pharma; and serves on a clinical trial committee or as a national lead for studies sponsored by AstraZeneca, Bayer, Boehringer Ingelheim, Merck, Novartis and Pfizer. Non industry: Canadian Medical and Surgical KT Group, CCS, CHFS, Charite, EOCI, Liv, Medscape, Ology, PACE-CME, Radcliffe, Reach MD, Translational Medicine Academy. C.I.S.G. reports speaker fees for AstraZeneca, Novartis, Servier, Abbot, Medtronic, Pfizer, Roche, Sanofi, Boehringer Ingelheim, Elly Lilly, Bayer and Merck, MSN; principal investigator for Amgen, Novartis, Merck, Bayer; advisor for Medtronic, Novartis, Bayer, AstraZeneca, Boehringer Ingelheim, Servier, Novo Nordisk. F.P. reports speaker fees, advisory board: AstraZeneca, Abbott, Boehringer Ingelheim, Medtronic, Novartis, Philips, Servier, Vifor. S.D.A. reports grants and personal fees from Vifor and Abbott Vascular, and personal fees for consultancies, trial committee work and/or lectures from Actimed, Amgen, AstraZeneca, Bayer, Boehringer Ingelheim, Brahms, Cardiac Dimensions, Cardior, Cordio, CVRx, Cytokinetics, Edwards, Farraday Pharmaceuticals, GSK, HeartKinetics, Impulse Dynamics, Occlutech, Pfizer, Regeneron, Repairon, Scirent, Sensible Medical, Servier, Vectorious, and V-Wave. Named co-inventor of two patent applications regarding MR-proANP (DE 102007010834 & DE 102007022367), but he does not benefit personally from the related issued patents. J.B. reports consultancies for Abbott, American Regent, Amgen, Applied Therapeutic, AskBio, Astellas, AstraZeneca, Bayer, Boehringer Ingelheim, Boston Scientific, Bristol Myers Squibb, Cardiac Dimension, Cardiocell, Cardior, CSL Bearing, CVRx, Cytokinetics, Daxor, Edwards, Element Science, Faraday, Foundry, G3P, Innolife, Impulse Dynamics, Imbria, Inventiva, Ionis, Lexicon, Lilly, LivaNova, Janssen, Medtronics, Merck, Occlutech, Owkin, Novartis, Novo Nordisk, Pharmacosmos, Pharmain, Pfizer, Prolaio, Regeneron, Renibus, Roche, Salamandra, Sanofi, SC Pharma, Secretome, Sequana, SQ Innovation, Tenex, Tricog, Ultromics, Vifor, and Zoll. V.C. reports speaker fees from Novartis, Astra, Sanofi, NovoNordisk, Boehringer, Pfizer, Sun

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pharma, Glenmark, Mankind, Lupin, Intas, Dr. Reddy's. VD: Translational Medicine Academy. G.F. reports lecture fees and/or advisory and/or trial committee membership by Bayer, Boehringer Ingelheim, Servier, Novartis, Impulse Dynamics, Vifor, Medtronic, Novo Nordisk. J.L.Z. reports speaker honoraria from Bayer, Daiichi, Pfizer. R.B.W.: Translational Medicine Academy. Y.C. is n employee of MedEd Global Solutions (a medical education company). All other authors have nothing to disclose.

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