

SHORT REPORT

Access to acute care resources in various income settings to treat new-onset stroke: A survey of acute care providers

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ARTICLE INFO

Keywords:

Emergency
Low resource
Access
Stroke
Cerebrovascular accident

ABSTRACT

Introduction: Stroke affects 15 million people annually and is responsible for 5 million deaths per annum globally. In contrast to the trend in low- and middle-income countries (LMICs), stroke mortality is on the decline in high-income countries (HICs). Even though the availability of resources varies considerably by geographic region and across LMICs and HICs, evidence suggests that material resources in LMICs to implement recommendations from international guidelines are largely unmet. This study describes and compares the availability of resources to treat new-onset stroke in countries based on the World Bank's gross national incomes, using recommendations of the American Heart Association and the American Stroke Association 2013 update. **Methods:** A self-reported cross-sectional survey was conducted of delegates that attended the April 2016 International Conference on Emergency Medicine using the web-based e-Survey client, Survey Monkey Inc. The survey assessed both pre-hospital and in-hospital settings and was piloted before implementation.

Results: The survey was distributed and opened by 955 delegates and 382 (40%) responded. Respondents from LMICs reported significantly less access to a prehospital service ($p < 0.001$) or a national emergency number ($p < 0.001$). Access to specialist neurology services ($p < 0.001$) and radiology services ($p < 0.001$) were also significantly lower in LMICs.

Conclusion: The striking finding from this study was that there was essentially very little difference between the responses between LMIC and HIC respondents with a few notable exceptions. The findings also propose a universal lack of adherence to the 2013 AHA/ASA stroke management guideline by both groups, in contrast to the good reported knowledge thereof. Carefully planned qualitative research is needed to identify the barriers to achieving the 2013 AHA/ACA recommendations.

African relevance

- The study highlights and compares available resources between LMICs and HICs to implement clinical guidelines for acute stroke care
- It addresses the link between the high mortality of stroke in LMICs in comparison to HICs
- It describes the barriers to the implementation of reference standard clinical stroke guidelines in LMICs

Introduction

Stroke affects 15 million people annually and is responsible for 5 million deaths per annum globally [1]. It is a major contributor to the growing burden of non-communicable diseases (NCDs), which

accounted for 68% of all deaths in 2012, up from 63% in 2008 [2]. The last two decades have seen a major transformation in the field of stroke care with the emergence of evidence-based stroke detection, access to advanced care, and emergency management of stroke [3]. In contrast to the trend in low- and middle-income countries (LMICs), stroke mortality is on the decline in high-income countries (HICs) [4,5]. Even though the availability of resources varies considerably by geographic region and across LMICs and HICs, evidence suggests that the available resources in LMICs to implement international recommendations are largely inadequate [5,6]. Arguably it is unlikely that these policies and guidelines, which are almost exclusively developed in HIC settings, would similarly apply in LMIC settings at all [6]. Our study describes and compares the availability of resources required for the acute management of new-onset stroke between LMICs and HICs, as self-

Peer review under responsibility of African Federation for Emergency Medicine.

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<https://doi.org/10.1016/j.afjem.2019.01.002>

Received 24 March 2018; Accepted 4 January 2019

Available online 18 January 2019

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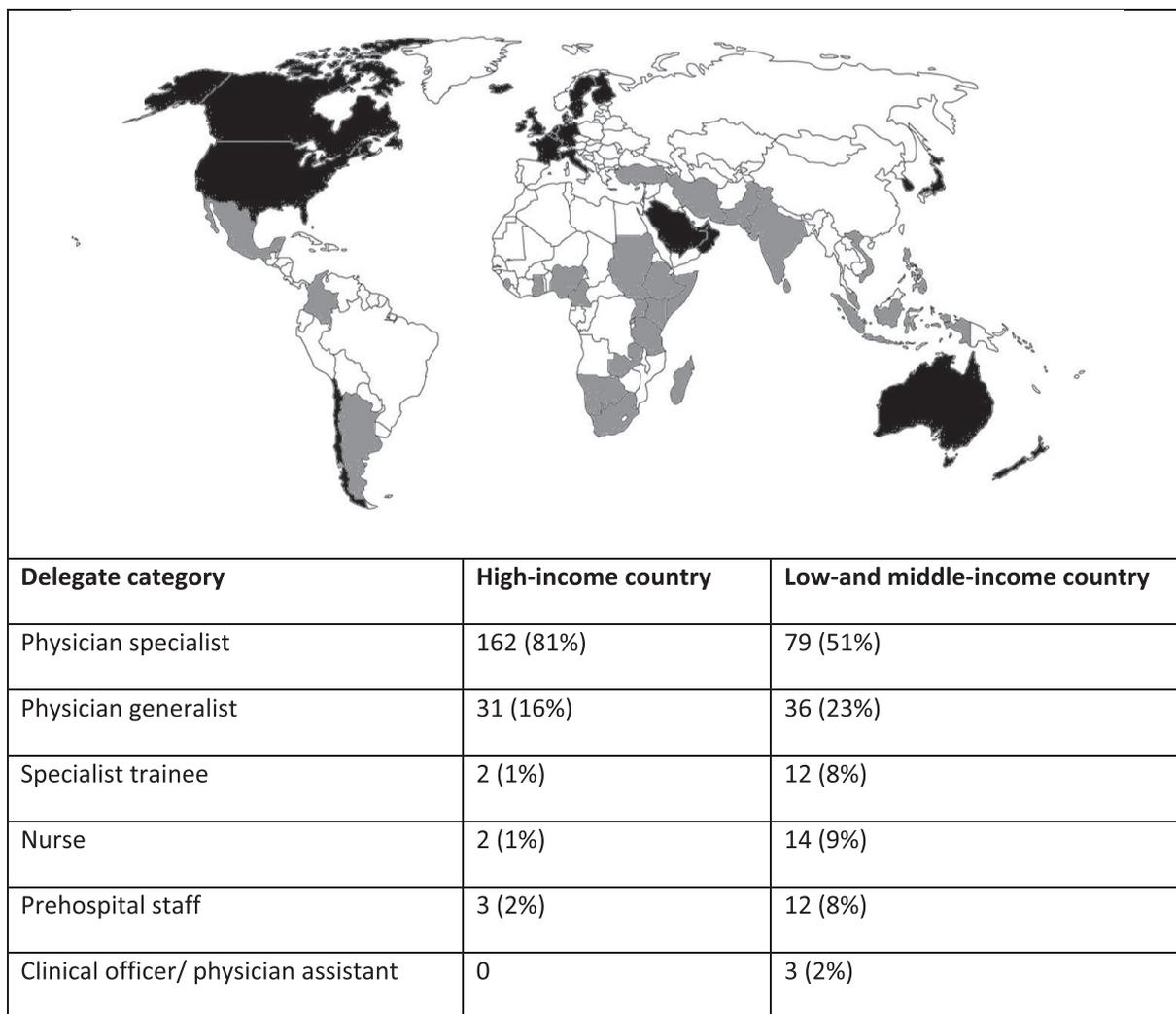


Fig. 1. The distribution of participants and breakdown of clinical roles. Black areas indicate high-income countries and grey areas indicate low- or middle-income countries represented.

reported by emergency care providers working in these settings, based on the recommendations of the American Heart Association (AHA) and the American Stroke Association (ASA) 2013 stroke guideline [3].

Methods

A self-reported survey, using the web-based e-Survey client, SurveyMonkey Inc. (Palo Alto, California, USA, www.surveymonkey.com), was conducted of delegates that attended the April 2016 International Conference on Emergency Medicine. We based the survey variables on the recommendations of the AHA and ASA 2013 stroke guideline [3]. Both the AHA and the ASA are reputable organisations and their guidelines are widely referenced. The survey assessed pre-hospital and/or in-hospital settings (depending on whether participants had dual or single clinical roles) and was piloted before use (survey tool available as Appendix A). Participants described access to various pre-hospital and/or in-hospital variables either as *yes* or *no*; or *always*, *sometimes*, *never* or *don't know*. Descriptive statistics were then used to summarise these. The strength of associations between responses from HICs and LMICs was tested using either the Fisher's exact test or the X² test, depending on the sample size involved. Significance was expressed as p < 0.05. Adherence to the AHA and ASA's main guidelines were summarised for LMIC and HIC respondents by providing the *always* proportion of the results. This study received ethical approval from Stellenbosch University (Cape Town, South Africa) Human Research Ethics Committee (S16/03/044).

Results

The survey was distributed and opened by 955 delegates and 382 (40%) responded. We excluded 26 surveys due to incompleteness leaving 356 (37%) split as 200 (56%) from HIC and 156 (44%) from LMIC. There were 79 (21%) respondents for the pre-hospital part of the survey (split 59% from HICs and 41% from LMICs) and 303 (79%) respondents for the in-hospital part of the survey (split 56% from HICs and 44% from the LMICs). The top five countries by contribution were: United Kingdom (n = 39, 20%), Australia (n = 34, 17%), United States (n = 24, 12%), New Zealand (n = 18, 9%) and Netherlands (n = 11, 6%) for HIC. It was South Africa (n = 88, 56%), Tanzania (n = 8, 5%), Ghana (n = 7, 5%), Ethiopia (n = 6, 4%) and India (n = 4, 3%) for LMIC (see Fig. 1).

Table 1 depicts the proportional access to resources indicated as always available for all level 1A and 1B recommendations from the AHA and ASA stroke guideline of 2013. A detailed description of individual resource availability, with a breakdown of the various responses (*always*, *sometimes*, *never*, *don't know*) is provided as data supplements in Appendix B.

Respondents from LMICs reported significantly less access to a pre-hospital service (split 4% from HICs and 21% from LMICs; p < 0.001) or a national emergency number (split 4% from HICs and 21% from LMICs; p < 0.001). Most of the respondents (301, 84%) reported that they were familiar with the 2013 AHA/ASA stroke guidelines (split 85% from HICs and 86% from LMICs; p = 0.38) and the majority of respondents (305,

Table 1

Proportional access to full resources, that are 24-hours, or always available, for treating acute onset stroke in the emergency centre, for the Class 1A and 1B recommendations of the AHA/ASA stroke management guideline of 2013.

Income setting	Proportional access to full resources for low- and middle-income country delegates n (%)	Proportional access to full resources for high-income country delegates n (%)
<i>Pre-hospital</i>		
Availability of a national emergency number system for activation by patients or other members of the public (Class I; Level of Evidence B)	84% (148/176)	95% (178/187)
Availability of prehospital stroke assessment tools, such as the Los Angeles Prehospital Stroke Screen or Cincinnati Prehospital Stroke Scale (Class I; Level of Evidence B)	41% (13/32)	49% (23/47)
Initial management of stroke in the field (Class I; Level of Evidence B)		
● Access to cardiac monitoring	78% (25/32)	74% (35/47)
● Access to IV cannulas	88% (28/32)	87% (41/47)
● Access to point of care glucometer	75% (24/32)	79% (37/47)
(access to dextrose-containing solutions)	98% (23/32)	96% (41/47)
● Stroke management guideline	47% (15/32)	49% (15/47)
Access to the most appropriate institution that provides emergency stroke care (Class I; Level of Evidence A)	41% (13/32)	32% (15/47)
Provision of prehospital notification to the receiving hospital that a potential stroke patient is en route so that the appropriate hospital resources may be mobilized before patient arrival (Class I; Level of Evidence B)	47% (15/32)	38% (18/47)
<i>In-hospital</i>		
Availability of a quality improvement committee to review and monitor stroke care quality benchmarks, indicators, evidence-based practices, and outcomes (Class I; Level of Evidence B)	48% (63/132)	46% (78/171)
Availability of an organized protocol for the emergency evaluation of patients with suspected stroke (Class I; Level of Evidence B)	73% (97/132)	68% (116/171)
Use of a stroke rating scale, preferably the NIHSS, is recommended (Class I; Level of Evidence B)	88% (140/160)	83% (165/198)
Assessment of blood glucose (must precede the initiation of Intravenous fibrinolytic therapy) (Class I; Level of Evidence B)	99% (131/132)	94% (161/171)
Access to electrocardiogram in patients presenting with acute ischemic stroke but should not delay initiation of Intravenous fibrinolytic therapy (Class I; Level of Evidence B)	95% (125/132)	90% (154/171)
Access to emergency imaging of the brain to exclude intracranial haemorrhage (absolute contraindication) and to determine whether cerebral ischaemia is present (Class I; Level of Evidence A)		
● Non-contrast-enhanced computed tomography (CT)	81% (107/132)	83% (142/171)
● Magnetic resonance imaging (MRI)	44% (58/132)	53% (90/171)
In intravenous fibrinolysis candidates, the brain imaging study should be interpreted within 45 minutes of patient arrival in the ED by a physician with expertise in reading CT and MRI studies of the brain parenchyma (Class I; Level of Evidence C)		
● Access to 24-hour radiology service	84% (111/132)	98% (167/171)
● Access to 24-hour neurology service	45% (59/132)	97% (166/171)
● Access to 24-hour tele-radiology service	45% (59/132)	27% (47/171)
Use of intravenous fibrinolytic therapy in the setting of early ischemic changes (other than frank hypodensity) on CT, regardless of their extent (Class I; Level of Evidence A)	83% (110/132)	80% (137/171)

85%) reported familiarity with the NIHSS stroke scale (split 83% from HICs and 88% from LMICs; $p = 0.34$).

Discussion

The two striking findings from this study was that there appeared to be poor adherence to the 2013 AHA and ASA stroke guideline irrespective of income-group and subsequently very little difference between the responses of LMIC and HIC respondents. Although participants reported good knowledge of the guideline and the NIHSS, adherence to clinical recommendations was overall much less enthusiastic, particularly concerning thrombolysis. In LMICs, pre-hospital service and national emergency numbers were lacking and in-hospital, significantly less access to specialist neurology and radiology services were reported. These findings fit with known reported delays in presentation and diagnosis [7,8]. It is most likely also what contributes to the reported poor outcome [9–11]. The reported better access to tele-radiology in LMICs were reassuring when considering the significant lack of specialised care.

It is concerning that no international reference standard for acute stroke management exists that also takes into account the lack of resources and services affecting the vast majority of the global population. Such guidance is necessary to prioritise available resources

appropriately; for instance, it is unlikely that intravenous thrombolysis has an important role in most LMIC settings especially where a reasonable prehospital, neurology or radiology service are lacking. Understanding limitations of care and using these to interpret scientific advances are an important part of knowledge translation. It is interesting to note that thrombolysis was not that well supported by the HIC cohort. This will need further exploring.

The small sample size and low response rate increase the risk of a type II error however we did find differences and the findings were in keeping with previously published work. South Africans were over-represented in the LMIC cohort and would likely have improved the perspective on access from a LMIC perspective. This has likely to do with the conference having been held in South Africa.

Conclusion

This paper suggests that neither HICs, nor LMICs are able to uphold a substantial number of the core recommendations for the acute management of stroke recommended for HICs. There are many biases and themes to explore in future studies that would be universal for either income setting. This will include considering the basics, such as providing tailored, acute stroke care guidance and setting up quality assessment systems that can monitor inputs and outcomes. Addressing

expensive resources (such as advanced imaging) are challenging, but again, systems that prioritise acute needs within income settings can ensure that the most are done for the most. In our view carefully planned qualitative research, exploring these priorities, is needed to identify the barriers to achieving a safe standard of care and direct further quantitative research, especially in LMICs. It is worth mentioning that adherence to a stroke guideline that is truly representative of global resources would be more achievable than one that ignores a large proportion of the global population.

Dissemination of results

Results from this study was shared with the Division of Emergency Medicine at both the University of Stellenbosch and the University of Cape Town - Results were subsequently shared with local hospitals. The results were also presented at informal academic meetings at local hospitals.

Author contribution

SB, CH and RC conceived the original idea. SB and RC designed the survey tool. CH, SB and RC collected the sample. CH and RC analysed the data. CH, RC and SB drafted the manuscript. CH and SB revised it critically for important intellectual content. All authors approved the final version and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of interest

Drs Clint Hendrikse and Stevan Bruijns are editors of African Journal of Emergency Medicine. Neither were involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. The authors declared no further conflict of interest.

Funding

The study was funded by the authors.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2019.01.002>.

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