Health Information and Global Health Inequity: Point-of-Care Knowledge Systems as a Foundation for Progress

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Point-of-care clinical knowledge systems play an increasingly important role in providing information for health care providers in high-resource settings, and there is evidence of strong interest among providers within low-resource settings. Unfortunately, systems developed for high-resource settings have a range of elements that make them suboptimal for low-resource settings. We discuss what a point-of-care clinical knowledge system designed for low-resource settings would ideally contain, and argue that such a system is worthy of further study and funding, towards the overarching goal of reducing global health inequity.

KEY WORDS: medical informatics; global health; medical education-computer/web-based learning.

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HEALTH INFORMATION—POOR ACCESS IN LOW-RESOURCE SETTINGS

The 2013 Ebola outbreak in West Africa drew support from a range of actors, including the health information publishers Elsevier and Wolters Kluwer, both of whom provided free access to their point-of-care knowledge systems for affected nations.^{1,2} Similarly, the National Library of Medicine activated its Emergency Access Initiative program, allowing free access to full-text articles for many biomedical journals within the affected area.^{3,4} As the outbreak subsided, several articles pinpointed weak health systems as the key factor causing the situation to spiral out of control.^{5,6} These articles concluded that strengthening of health systems formed the cornerstone of an effective response to Ebola, and that building robust health systems throughout low-resource settings offered the best opportunity for preventing future crises. The interventions from publishers and the National Library of Medicine aimed to improve access to quality health information, implicitly acknowledging deficiencies in such access in these low-resource settings.⁷ While these efforts are laudable, their transient nature and the characteristics of the resources they provided left us painfully aware of the need to address the deficits in access to quality health information in a more sustainable

and broader fashion. We therefore propose a partial solution of developing a contextually appropriate, high-quality point-of-care clinical knowledge system.

The importance of health information in the delivery of excellent health care makes intuitive sense, and a number of studies show that care improves with better health information.^{8,9} The specifics of health information access in low-resource settings are poorly studied to date, but the data that do exist demonstrate a pronounced need.⁷ A 2007 study reviewing information resource use in several African teaching hospitals found that most physicians used textbooks, in large part due to limited access to the Internet and limited knowledge of free Internet resources.¹⁰ Other, smaller studies in low-resource settings found a similar need for better access to current information.^{11,12} Our personal experience in health care within Botswana, Haiti, India, and Rwanda corroborates these findings. We see our colleagues seeking clinical answers via textbooks, often outdated; via WHO or national guidelines, which are highly relevant but constrained in their size and range of topics; or through Internet searches of freely available websites, which carry the risk of providing haphazard information.¹³ Textbooks and generic Internet sources typically focus on the diseases, diagnostics, and therapies common to high-resource settings, and provide information in a relatively inefficient fashion. Meanwhile, in high-resource settings, textbooks have been displaced by point-of-care knowledge systems such as UpToDate, DynaMed, and Clinical Key, which provide expansive databases of clinical information that are focused, well-referenced, and easily searched. Limited data suggest that patient outcomes are improved in hospitals using these systems,¹⁴ that the use of these resources is increasingly common,¹⁵ and that the quality of information they provide seems to be improving as well.¹⁶

Considering this, the efforts to provide health information for West Africa during the Ebola epidemic fall far short of what was—and ultimately is—needed. Rather than being given context-specific information, these health professionals were provided tools developed for high-resource settings, tools providing temporary relief for a long-standing issue. We do not wish to detract from the good will of these donors—their efforts are commendable. But just as the market, combined with charity, did not deliver widespread antiretroviral therapy to low-resource countries, the provision of appropriate clinical knowledge throughout the world cannot be effectively delivered with an ad hoc donation system that

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reaches a select few clinicians and avoids confronting the larger global inequity in access to health information.

SEEKING SOLUTIONS

Finding answers to this quandary will start with better defining the requirements of the ultimate users. Assessment of health information deficits in low-resource settings is sorely needed, particularly given the differences in work flow between high- and low-resource health systems in terms of the time per patient and the training of the providers in question.¹⁷ While elements of the clinical encounter and the information desired remain constant across situations, the ideal way to integrate point-of-care information may well vary across settings. Cultural differences between health care systems might prohibit the application of a single information system globally. That said, the widespread use of US and European journals and textbooks throughout the world argues that the approach to health information in high-resource settings will certainly be important, and could become the dominant approach. Given the uptake in point-of-care clinical information systems in high-resource settings, we speculate that they will steadily disseminate into low-resource settings. The task is then to ensure that this advance in clinical information serves to reduce rather than increase global inequity; the low-cost, high-exposure capacity of the Internet makes this more feasible than many other health innovations.

A solution must both provide broader access to information and improve knowledge delivery. The World Health Organization's HINARI project, launched in 2001, supplies a possible model. HINARI provides access to a range of journals and textbooks for users from countries below a certain per capita income level. Access is offered globally rather than for individual regions, and in several languages. However, HINARI lacks many desired resources,¹⁸ provides a range of extraneous ones, and does so in a system that can be difficult to navigate.¹⁹ It is better suited for research or educational purposes than for information at the point of care, in keeping with the intent behind its design. An example of a resource that comes closer to the mark is the Digital African Health Library,²⁰ which combines a variety of resources, including the point-of-care system DynaMed, multiple Oxford handbooks, and pertinent national guidelines, into a single smartphone application with a single search engine. This program is available to healthcare practitioners from sub-Saharan Africa for an annual fee of US \$30, much less than the cost in high-income settings, and is readily accessible, although it lacks several other features that we feel are important.

We believe an ideal solution would be the creation of an evidence-based point-of-care clinical knowledge system available at low cost or free to clinicians in any country and in multiple languages (Table 1). Similar to resources such as the International Diabetes Federation guidelines,²¹ this system should describe different levels of evidence-based care, depending on the resources available, and should provide both

Table 1 Ideal Qualities for a Global Point-of-Care Clinical Knowledge System

Aspects available in present commercial systems	Aspects necessary for an ideal system
Comprehensive scope, covering common clinical presentations, diseases, and therapeutics	Accessible at low cost or free, ideally in all settings, but at a minimum for LMIC providers
Easily navigated, allowing for discovery of summary information within 1–2 min	Regionalized recommendations, reflecting epidemiological, cultural, and resource differences among areas
Evidence based, with citations for key references and discussion of points of contention with the literature	Available in multiple languages, including the primary languages in which medicine is taught throughout the world
Existing in multiple formats, including offline-enabled versions or downloadable formats that can be used on computers or smartphones in areas lacking consistent Internet access	Tiered recommendations, informing users what should be done at different levels of resource availability
Updated periodically	

LMIC = low- and middle-income countries

recommendation summaries and more detailed explanations of the evidence base underlying an article. For topics where epidemiology or management varies with location, such as fever, this system should offer diagnostic and therapeutic algorithms that shift with the region, ensuring that the suggestions are pertinent to the patient population being seen. Following the lead of the Digital African Health Library, national guidelines should also be incorporated into pertinent topics. This resource should be downloadable for areas lacking reliable Internet access, and should acknowledge the increasing use of mobile phone technology for health (mHealth) by supporting mHealth and smartphone access as well.²² Finally, cost and commercial independence are important considerations for clinicians in low-resource settings. A suitable system must be priced such that the range of health care providers active in these settings can afford it, and ideally would not be linked to a commercial system from a high-resource setting, where access is subject to the continued stability and charity of the parent corporation.

Implementation of our proposal is hindered by the lack of a clear choice of coordinating organization for what would be a large project—prior efforts to establish online medical materials, such as Medpedia, have floundered, though more focused websites such as OPENPediatrics have achieved stability. The WHO, a regional health organization, or a non-governmental organization (NGO) could all plausibly spearhead such an initiative, which could be initially aimed at a smaller set of countries before expanding towards a more global scope. A moderate level of funding by programmatic standards would be required for the initial development and to support the frequent updating and maintenance such a resource would require. Nominal user fees (for example, \$50 a year) could still provide a substantial amount of support, given the number of potential users, especially if the required payment is tiered based on a country's overall income. This does hinge upon uptake by clinicians, which in turn requires demonstrated utility. A model system could likely recruit experts

to write articles at minimal cost, and potentially use volunteers seeking academic credit to assist with editing and review, thus reducing the overall expense. There is a case for making information free for those in low-income countries, eliminating one barrier to providing the best possible care. This could be achieved through a combination of support from subscriptions in high- and middle-income countries, centralized support from ministries of health, and development aid from donor organizations and countries. Given the lengthy timeline realistically needed for development of such a system, interim donations or low-cost access to systems like UpToDate and DynaMed are a welcome bridging measure; they have much to offer clinicians in low-resource settings, but fall short of the ideal.

CONCLUSION

While access to medical information alone is not sufficient to reliably improve health outcomes, it is an important link in the chain of effective health care delivery. Less than 2 % of global health care expenditure goes to medical education, and only a fraction of that to continuing medical education (CME), which is itself a field with limited data showing an impact in clinical settings, though there is speculation that point-of-care systems may help improve CME as well.^{15,23,24} Investment in and increased access to point-of-care tools may lead to payoffs in patient outcomes, with further research required to robustly demonstrate this. Studies do show improved patient outcomes after focused training in low-resource settings,²⁵ and strong interest and uptake of UpToDate was found when provided at no cost within four African hospitals or via an ongoing charitable collaboration.^{26,27} In the two US hospitals where the authors work, point-of-care information systems provide doctors and nurses with a huge amount of clinically pertinent information at minimal effort and acceptable institutional cost. There is no reason why clinicians working in West Africa, or anywhere else, should not have affordable access to an excellent point-of-care system of their own, regardless of their location or income. Such a project would address the chronic disparity in health information globally, potentially improving the health of millions of patients, while helping to mitigate the effects of future global health crises when they inevitably occur.

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