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JAMA. 2007;298(16):1937-1939 (doi:10.1001/jama.298.16.1937)

http://jama.ama-assn.org/cgi/content/full/298/16/1937

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INNOVATION IN HEALTH CARE INCLUDES IMPORTANT CHALlenges: to find or create technologies and practices that are better able than the prevailing ones to reduce morbidity and mortality and to make those improvements ubiquitous quickly. In many respects in the pursuit of global health, the second challenge—the rapid spread of effective changes—seems to be the greater. Many sound (even powerful) solutions exist, such as new medicines and innovations in health care delivery, but their adoption is unreliable and slow. Often, they remain hidden in pockets around the globe, flourishing locally without reliably reaching those in need elsewhere. Some such solutions come from biomedical research, but even more take shape at the point of care, in settings where local problem solvers create effective new approaches to problems that others who live far away face as well.

Failure to deploy improved technologies and practices widely and quickly is a form of waste that donors, researchers, clinicians, and, most of all, communities in developing nations cannot afford. It behooves those who sponsor biomedical science to make commensurate investments in operational sciences that can inform and energize the active dissemination of new solutions. This is a crucial, but as yet largely neglected, global project: to rapidly spread effective prototypes to entire populations. Scaling up should become a major and sustained enterprise in the global health community. It has its own scientific foundations.

Current Prevailing Paradigm

At present, innovators in global health, especially scientists, often operate with an implicit theory of spread: the theory that good ideas demonstrated in successful prototype projects will reach audiences through publication, market forces, or communication networks. Putting their faith in journals, Web sites, and conferences, innovators dutifully generate guidelines, normative reports, descriptive recommendations, and clinical training programs, hoping that front-line practitioners and health care organizations will find successful innovations, adapt them, and adopt them.

That theory is weak; good ideas, even when their value is thoroughly demonstrated in one place, will not reliably spread into action through normal communication channels at a pace truly responsive to the enormous health care challenges in resource-poor settings. A significant barrier is overload: the sheer volume of new studies, interventions, and reports overwhelms all but the most conscientious clinicians. Even when health care system leaders or clinicians become aware of a promising innovation, their ability to introduce it is often severely constrained by limitations of time, resources, and skill. Those in potentially adopting sites face the difficult work of transitioning from learning about a concept to meaningful action in their own local setting, which requires leadership, sociological sophistication, and attentive management. Most innovative technologies (such as sound antiretroviral therapies) and most innovative clinical processes (such as new roles for community health workers) must be actively, not passively, spread, or they may not spread at all.[1]

Successful, informative examples of introducing change on a large scale do exist in global health.[2] For example, some major public health projects have changed the profile of disease in entire populations (eg, smallpox eradication, the control of polio, and the work of the Bangladesh Rural Advancement Committee to reduce morbidity from diarrhea[3]); some innovations in roles for the workforce, such as nurse-based scale-up of antiretroviral therapies in Zambia, have moved from experiments to prevalent norms[4]; some countries have broadly introduced and adapted enhanced-care guidelines (eg, Niger and Ecuador have observed significant reductions in birth complications in programs sponsored by the US Agency for International Development's Quality Assurance Project[5,6]); and some of our own programs, supported by the Centre for Rural Health (University of KwaZulu-Natal, Durban), the Reproductive Health Research Unit (University of the Witwatersrand, Johannesburg), and the Institute for Healthcare Improvement, have successfully expanded antiretroviral treatment in several provinces in South Africa.[7]

The best of these initiatives, even when targeting a specific disease, have operated within existing public health care structures, building system-wide skill at rapidly adopting better practice that can be applied to the management of other acute and chronic diseases. Each of these projects sought not only to spread the news of best practice or to demon-

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strate it in pilot sites but also to devise detailed strategies deeply rooted in logistics and systems and network science[8-10] to reach enormous numbers of people quickly.

Science-Based Models for the Spread of Change

The diffusion of innovation in social and technical systems has been the object of decades of scholarship in numerous industries and social sectors.[11,12] The successful programs listed above, and others, have that scientific tradition at their roots. They attend to 3 key questions: How does the potentially adopting community perceive the proposed changes? What is the nature of the social system in the potentially adopting community? And, which structural approach to spreading better practice will be used?

How Does the Potentially Adopting Community Perceive of the Proposed Change? Rogers[13] has described 5 characteristics of an innovation, as perceived by the potentially adopting community that are positively associated with the rate of diffusion: (1) *Relative advantage*—how well does the innovation appear to address needs as perceived by the potential adopter? (2) *Compatibility*—how closely does the innovation (and its purveyor) appear to align with the existing belief systems and contextual circumstances of the potential adopter? (3) *Simplicity*—how simple and understandable does the innovation appear to the potential adopter? (4) *Trialability*—to what extent does the potential adopter have the opportunity to test the innovation—under a variety of conditions—before committing to it? (5) *Observability*—how transparent is the innovation and its results from the viewpoint of the potential adopter?

Each of these perceived characteristics contributes to reducing what Rogers asserts is the fundamental obstacle to the spread of change: the adopter's perception of risk. Rogers' model is descriptive, not prescriptive, but it nevertheless suggests tactics for the design and packaging of promising innovations. Importantly, the extensive empirical literature that Rogers draws on includes several studies in non-Western and developing nations.[13]

What Is the Nature of the Social System in the Potentially Adopting Community? Effective spread agents pay attention to the nature of the social network into which they wish to disseminate new practices. Is it reticent? Compliant? How often, where, and how do members of the social system meet? Who are their first adopters and influential leaders? How quickly can the adopting system absorb a new idea? Is it important to pilot on a smaller scale to build will? Or, is it conceivable to go to full scale immediately? Every social system contains complexity—stemming from independent, self-interested parties, competing ideas and rules, and resource constraints, which are particularly acute in developing nations with inadequate supplies and infrastructure and acute shortages of medical personnel.[14,15] Successful dissemination projects view these as important considerations, supporting efforts to remove or address barriers without using them as justifications for inaction.

Which Structural Approach to Spreading Better Practice Will Be Used? Agents of dissemination can choose from a wide range of strategic designs for large-scale improvement all of which consider available resources and known constraints. Examples of such spread strategies include *executive mandates*, which may be appropriate for a simple change that can be immediately implemented in a hierarchical system (eg, removing from pharmacy stocks a medication newly found to be ineffective); *campaigns*, which may be appropriate for relatively simple interventions that rely on broad will-building and learning networks[16,17]; *collaborative improvement projects*, which bring together teams from numerous, often interdependent facilities, for structured learning and exchange via a variety of media around shared aims, measures, and goals[18,19]; and *extension agent methods*, which use itinerant health care workers or natural community leaders to spread ideas and best practice.[3]

How Leaders Can Support Large-Scale Change

No matter which structural design for spread is used, effective leaders of large-scale change understand the difference between simply raising awareness of a new practice and ensuring broad implementation. To get results, they attend to 3 major streams of support: the cultivation of will, the supply of ideas for change, and the day-to-day execution of change. This simple triad—"will," "ideas," and "execution"—offers practical guideposts for action.[20,21]

Cultivation of will involves building and maintaining a sense of purpose for improvement, including clearly identifying why the status quo should no longer be an option and creating optimism regarding the possibility of improvement. Key to successful will building are clear, quantifiable, and ambitious aims articulated by leaders; consistent attention to those aims[22]; celebration of success; and expressions of confidence in the creative potential and good will of the workforce.

Supplying sound ideas for change involves leaders' empowering local workforce and communities to look for and hear about innovations and for individuals to offer, without fear of criticism, their ideas about improvements. Leaders committed to ensuring the supply of ideas encourage local creativity and show respect for the challenges associated with accepting and adapting ideas from elsewhere.[23]

Attending to the details of execution involves the processes of day-to-day application and learning that allow an innovation from somewhere else to take root in a new setting. The best leaders of change know this, and they focus energetically on logistics. They have patience—even affinity—for the tedium of specifics, showing endless creativity in removing the bureaucratic or infrastructural barriers to change. They capitalize on any available resource at every level of the care system (from tertiary centers to primary care clinics to the community). They recognize the need for data on how change is progressing and are skilled at creating tools that furnish actionable information to those driving local

change. They encourage cooperation, dialogue, and trust among groups pursuing common goals and emphasize speed and pace in the change process.[24]

Advancing the Science of Large-Scale Change

Health care system leaders around the world have much to learn about how to spread effective interventions and best practices methodically. Global health leaders trying to manage large-scale improvement projects need better opportunities to engage in ongoing conversation and learn faster and more continually from each other. Equally important, this dialogue should link to existing scientific foundations regarding the spread of innovation and advance that science with as much energy and intent as is seen in the advancement of biomedical science. Among activities that interested donors and development agencies should consider sponsoring are the following:

- Building optimism and interest through rapid success by establishing examples of complete success, in an extremely short time frame (eg, spreading a life-saving intervention, such as antiretroviral therapy, across an entire nation that has lacked a record of achievement at that scale);
- Building leadership capability by identifying a cadre of leaders, managers, and clinicians at work on large-scale improvement in several nations and by bringing them together periodically, via electronic communities and face-to-face exchange, to analyze their ongoing activity and to deepen the science of large-scale change;
- Fostering learning by analogy through systematic study of other fields skilled at mobilizing large-scale change (eg, agriculture, military organizations, multinational corporations, and grassroots political organizations);
- Developing a common lexicon, and decision-support tools to assist leaders of large-scale change in identifying appropriate dissemination approaches at the local level—suited to the nature of their intervention, the scale of their project, and the level of their resources—as they plan and implement major programs;
- Increasing investment in major projects that disseminate best practices in scale-up and funding further, formal scientific exploration in the field.

The Future

The global health community, at least regionally and perhaps at a worldwide level, can pursue a goal of enormous significance by ensuring that any new practice of merit be embraced, shared, and broadly implemented in a matter of months or even days by skilled leaders, health systems managers, clinicians, and other health care workers. Such a goal, while surely seeming too optimistic to some, has 2 supports strongly in its favor: a body of science regarding the diffusion and management of change that has generated useful lessons on systems improvement and that could, with investment, be even better; and the demand for justice in global health, which is inconsistent with the toll paid when great innovations fail to reach all of those who could benefit from them.

Financial Disclosures: The authors report that they receive salary support from the Institute for Healthcare Improvement, which works on large-scale change initiatives in several nations. More information on these activities is available at http://www.ihi.org. Dr Massoud received prior salary support from the USAID Global QA Project for the work in the Russian Federation that this commentary references.

Other Contributions: We thank Jane Roessner, PhD, for her contribution to the preparation of this article as part of her regular duties at the Institute for Healthcare Improvement.

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