How can we achieve and maintain high-quality performance of health workers in low-resource settings?

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In low and middle income countries, health workers are essential for the delivery of health interventions. However, inadequate health-worker performance is a very widespread problem. We present an overview of issues and evidence about the determinants of performance and strategies for improving it. Health-worker practices are complex behaviours that have many potential influences. Reviews of intervention studies in low and middle income countries suggest that the simple dissemination of written guidelines is often ineffective, that supervision and audit with feedback is generally effective, and that multifaceted interventions might be more effective than single interventions. Few interventions have been evaluated with rigorous cost-effectiveness trials, and such studies are urgently needed to guide policy. We propose an international collaborative research agenda to generate knowledge about the true determinants of performance and about the effectiveness of strategies to improve performance. Furthermore, we recommend that ministries of health and international organisations should actively help translate research findings into action to improve health-worker performance, and thereby improve health.

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Introduction

The problem of inadequate health-worker performance in low and middle income countries is particularly urgent. Millions of children and adults die prematurely each year[1,2] even though many interventions exist that can prevent such deaths,[3] and health workers (defined broadly to include public and private providers based in health facilities or communities) are essential for delivering these life-saving interventions. However performance (defined as adherence to an accepted standard or guideline) is very often inadequate, as documented in studies of child health, sexually transmitted diseases, family planning, obstetrics, mental disorders, injuries, and diabetes.[4–18] Governments and non-governmental organisations spend many resources on health workers and the systems that support them, and such investments could produce greater benefits to society than they currently do. Poor health-worker practices contribute to low use of health facilities by vulnerable populations, and improved performance might increase use of health services.[19–22] Additionally, health-worker practices can be harmful (eg, giving sedatives to children with pneumonia,[16] or prescribing unnecessary antimicrobials[23–25]), and such errors of commission must be eliminated.

We aim to address the issue of achieving and maintaining high-quality performance of health workers in low-resource settings. We briefly outline the determinants of performance, discuss the effectiveness of strategies to improve performance, and describe knowledge gaps that, if filled, might lead to better interventions (or a better ability to select appropriate interventions) for achieving and maintaining high-quality performance. We acknowledge that the topic is vast, with many perspectives and actors. Because of limitations of space and, indeed, of the existing studies, this Review is an overview, based mainly on review articles of research undertaken in low and middle income countries and centred on public-sector workers in health facilities. In some cases, we refer to individual studies and research from industrialised countries.

Determinants of health-worker performance

Sources and quality of evidence

An essential first step towards improving performance is understanding the factors that influence it. Such factors fall into two categories: interventions (eg, training) and non-intervention determinants (eg, patient's age). Theoretically, the best source of evidence about the effect of interventions is a randomised-controlled trial; however these are rare in low and middle-income countries. Other study designs (eg, observational designs), although inherently more susceptible to some types of bias than randomised studies, can show what happens in real-life, and might be the only feasible choice.[26] Non-intervention determinants cannot usually be studied with randomised designs, but observational

Search strategy and selection criteria

We searched MEDLINE from 1966 to March, 2004. Search terms were ("quality assurance, health care" or "diffusion of innovation" or "quality of health care" or "preventive health services" or "inservice training" or "intervention studies" or "randomized controlled trials" or "health services misuse" or "clinical competence" or "guideline adherence" or "evaluation studies" or "outcome assessment [health care]" or "delivery of health care" or "medical staff, hospital" or "peer review" or "total quality management" or "quality improvement" or "nursing care" or "health worker performance"), and ("developing countries" or "low income countries" or "Asia" or "Africa" or "Latin America"), and review articles. We also searched websites of organisations working on projects to improve health-worker performance in low and middle income countries, reference lists from identified reports, and references provided by colleagues. Where appropriate, we used studies and reviews from industrialised countries.

studies can be useful for generating hypotheses about which factors might be important determinants of performance.

Qualitative methods are useful for describing contextual factors and latent influences (eg, motivation), and for understanding which aspects of an intervention work well and which do not,[27] as can be so-called positive deviance case studies (eg, to determine why, in poor settings, some health facilities function unusually well). Understanding contextual factors is particularly important because they can limit the applicability of results from one setting to another. Other sources are studies from industrialised countries and industry.[28–30]

Although numerous studies have examined determinants of health-worker performance, many have important limitations: methods are not well documented, samples are small and not probability samples, confounding is not addressed, statistical methods are inappropriate, few determinants are examined, and performance outcomes can be difficult to interpret (eg, percentage of all patients with an antibiotic prescribed, with no indication of whether antibiotics were needed).

Panel: **Factors or environments that might influence health-worker practices**

- Health-worker factors: knowledge (especially of guidelines), skills, motivation and job satisfaction, remuneration, experience (outcomes of past patients), fear of a bad clinical outcome, attitudes towards the guidelines (perceived self-efficacy, or a health worker's confidence that he or she can implement the guidelines; belief that the guidelines are effective), professional values (including attitudes towards corruption), personal goals (including profit motives), perceptions of patients' demands and fear that unsatisfied patients will go to another health worker, comprehension of work responsibilities, and the health worker's own health
- Patient or client factors: severity of illness, patients' demands, and patients' sociodemographic factors (eg, age, sex, education, wealth, race, and ethnic origin)
- Attributes of the work: complexity and clarity of guidelines, health topic addressed by guidelines (acute *vs* chronic care), and changes in guidelines over time
- Health facility environment: clinical practices and attitudes of co-workers, peer pressure, leadership of the director, supervision, presence of quality improvement processes, patient caseload, availability of supplies and equipment, communication (eg, a mobile phone or two-way radio), health facility type (public *vs* private, small clinic *vs* hospital), location (urban *vs* remote village), organisation (flow of patients, health-worker deployment), and health-worker participation in planning and organising work
- Professional environment: colleagues, professional associations, and certifying bodies
- Educational environment: formal and informal educational opportunities
- Administrative environment: rules governing health-worker behaviours and working conditions, amount of salary and regularity of payment, non-financial incentives, job security, leadership of administrative chiefs, presence of quality improvement processes, supervision of supervisors, availability of information, and decentralisation (degree to which local health authorities have ownership of the planning and implementation process)
- Employment environment: employment opportunities, which can lead to absenteeism (health workers leave a public-health post to work in a private clinic)
- Commercial environment: promotion of drugs by pharmaceutical companies
- Community environment: how the health worker is perceived by the local community and media
- Sociocultural environment: traditions and values of society
- Economic environment: economic conditions of the country and health system
- Political environment: ideologies, political structures, and corruption

Environments can influence health-worker practices directly or indirectly (ie, a more distal environment might affect a more proximal environment, and the proximal environment directly influences practices).

Conceptual frameworks to explain health-worker practices

Many theories or conceptual frameworks have been proposed to explain health-worker practices. Lomas and Haynes[29] introduced the concept of individual policy (ie, the real-world practices or internal algorithms of individual health workers) and postulated that it could be influenced by various patients', personal, administrative, and economic determinants. Similarly, others have described a series of environments or contexts that influence practices.[9,31–33] Environments are essentially categories that include a wide range of specific influences (panel). For example, the patients' environment includes illness severity and patients' demands for treatment. This conceptual framework is supported by empirical studies from low and middle income countries that have identified relations between specific factors and performance,[12,15–17,24,33–35] and an ethnographic study from England that described how individual policy (or so-called mindlines) develops and evolves.[36]

This framework suggests a dynamic situation in which health workers are continuously facing changing environments and then adapting their practices to satisfy professional values and personal goals. Thus, even if health workers are taught a new guideline and comprehension is perfect, they probably do not simply replace their pre-existing individual policy with the new guideline, but rather modify their practices to incorporate none, some, or all of the new guideline. This framework might explain why correct knowledge often does not predict correct performance.[13,15,34] The implication is that if managers want to promote certain practices, such as those in a guideline, they need to understand the existing and often evolving influences that promote desirable and undesirable practices, and be adept at using their resources to alter environments to promote the desired practices.[9]

A special point must be made about health-worker motivation as a determinant of performance. Although it is difficult to study reliably, motivation has been considered a critical influence on performance.[33,37] Researchers and theorists suggest motivation can both influence performance directly and mediate the effect of other factors. Thus, motivation and interventions that improve motivation and job satisfaction (eg, salaries, prestige, work conditions) are likely to be important determinants.[38]

Various behavioural theories have also been used to explain health-worker practices, show how practices can

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Theory	Assumptions	Interventions based on theory
Adult learning theories	Change occurs when individuals have personal experience with a problem and helped develop the solution	Develop guidelines through local consensus, small-group interactive learning, problem-based learning
Cognitive theories	Undesirable behaviours are caused by a lack of information	Improve knowledge by disseminating information on evidence-based guidelines (eg, by training or disseminating written materials)
Health promotion, innovation, and social marketing theories	Behaviours can be changed with clear and attractive products and messages that meet a need of the target audience	Needs assessments, adapting change proposals to meet local needs, creating clear and attractive messages, and disseminating them via multiple channels
Behavioural and learning theories	Behaviours are a result of external stimuli	Audit and feedback, reminders, modelling correct performance, incentives, sanctions, removing factors that are demoralising
Social learning and innovation theories, social influence and power theories	Change occurs through the interaction and influence of important people, and through development of new social norms	Use opinion leaders or respected peers to disseminate guidelines, pressure from patients to use an innovation
Management theories, system theories	Errors can be prevented by improving the design of health systems and processes	Total quality management, total quality improvement approaches, changing structures and tasks
Coercive approaches	Change occurs because of pressure and control	Laws and regulations, licensing, budgeting, complaints procedures, and legal pursuits
Stages of change model, and the PRECEDE model	To change, individuals pass through stages (precontemplation, contemplation of change, preparation for change, action, and maintenance), and different interventions are needed at different stages.	Predisposing strategies, to progress from precontemplation to contemplation (education activities, conferences); enabling strategies, to progress from contemplation to action (clinical guidelines); and reinforcing strategies, to progress from preparation to maintenance (audit and feedback, peer review)

Adapted from Grol,[39] Grol and Grimshaw,[40] and Woodward.[31] PRECEDE=Predisposing, reinforcing, and enabling causes in educational diagnosis and evaluation.[41] Other relevant theories not included in table include: theory of planned behaviour,[37] diffusion of innovation theory (described by Marquez[32]), and social rule system theory (described by Naimoli[12]).

Table 1: **Behavioural theories applied to changing health-worker practices**

be changed, and justify interventions to promote change (table 1). The theories have different perspectives (individual, social, organisational) and could very well be complementary—each explaining certain behaviours in certain circumstances.[40] Unfortunately, little is known about how well the theories predict health-worker practices or success of interventions.

For decades it was assumed that poor performance was due to a lack of knowledge and skills.[9,14,42] As a result, most interventions concentrated on training, which has had mixed and sometimes disappointing long-term results. For example, although use of oral rehydration salts greatly increased during the 1980s and 1990s, after more than 2000 training courses on management of diarrhoea cases and supervision from 1988–93 in more than 120 countries, the median percentage of children correctly rehydrated by health workers (from 22 surveys) was only 20%.[42] Although contemporary theories might be incomplete and supported by limited evidence, they can move us beyond the old paradigm that most performance problems can be solved by training alone, and provide a foundation for understanding what truly determines performance.

Strategies for improving health-worker performance

Specific interventions

We examined two fundamental questions: which interventions are most effective (or cost effective); and, in what situations should a particular intervention be used? To answer the first question, we identified 11 literature reviews of studies about 15 strategies (table 2). Five were systematic reviews of studies from low and middle income countries,[14,25,49,52,54] four were non-systematic reviews of studies from industrialised and low and middle income countries,[45–48] one was a systematic review of studies from industrialised and low and middle income countries,[43] and one[44] included studies from low and middle income countries that were part of a larger systematic review by the Effective Practice and Organisation of Care Cochrane group. Summarising these reviews proved difficult, since many strategies had mixed results, many individual studies had methodological limitations, and the reviews themselves had shortcomings. Despite these non-trivial caveats, the reviews revealed several trends: (1) dissemination of written guidelines without additional interventions was generally ineffective; (2) supervision and audit with feedback was generally quite effective; (3) non-traditional training methods such as computer-based training might be less expensive than and as effective as traditional methods; and (4) community case management was effective at reducing child mortality (although community health-worker performance was not directly assessed in these studies). Additionally, multifaceted interventions (eg, training plus supervision), which address multiple determinants of performance, might be more likely to improve performance than single interventions.[9,11,14,31,32,55]

See http://www.epoc.uottawa.ca/

We note, however, that reviews of studies from low and middle income countries sometimes have different conclusions from reviews of studies from wealthier settings. Specifically, one extensive review by Grimshaw and colleagues[43] of studies that were almost all (232 of 235, 99%) from industrialised countries found no association between number of component interventions and effects of multifaceted interventions, and that dissemination of educational materials might have a small positive effect.

Regarding our second question, few studies have compared different interventions in the same setting or the same intervention in multiple settings, and results

Intervention	Citation (number of studies in review)	Conclusions*
Disseminate printed information, guidelines	14 (4)	Ineffective as a single intervention
Education intervention (eg, training seminars and workshops)	14 (12), 25 (13), 43 (1), 44 (4)†	Mixed results; interventions with low effect had large groups, were didactic, short, not focused on a single problem; better results evident with smaller groups, focused topic, with multimethod training (eg, role playing, practical skills development)
Combined managerial and educational approaches	25 (16), 44 (1)	Mixed results, although this category included studies listed below as community case management, which had moderate-to-large effects; most remaining studies had lower effects, one had a large effect
Managerial approaches (eg, supervision; audit and feedback)	14 (6), 25 (4), 43 (1)	Consistently had moderate to large effects
Economic approaches (eg, changing fees)	25 (1)	Only one study with strong design (in which flat fees were changed to item fees), which had a moderate effect
Group processes (eg, health worker discussion, develop guidelines, peer review)	14 (5), 44 (1)	Moderate effects
Job aids	45 (39), 43 (1)	Often useful for preventive and acute care; few studies of job aids alone (job aids often studied with other interventions); more successful when large behaviour change is not required and when health worker already accepts the guideline
Self-assessment	14 (1), 46 (15)	Only one study with strong design, which had a large effect. Other studies suggested mixed results; self-assessment might be useful with other interventions, such as supervision; it has low-to-moderate validity for evaluating health-worker performance
Computer-based training	47 (23)	Training leads to knowledge scores that are no lower than traditional training; some evidence to suggest cost is lower
Distance learning	48 (11)	Mixed results; better for in-service training than preservice training; often low completion rates; may not be much less expensive than conventional training; unclear whether distance learning programs can be sustained or replicated
Integration of services	49 (4)	Few studies; mixed results. Sometimes integrated programme better; sometimes vertical programme was better, although this one review included no studies of IMCI, which is effective[12,19,23,50,51]
Telemedicine	52 (2), 53‡	Few studies (none with control group); systems based on e-mail are feasible and useful in hospital settings, but require functioning e-mail and clinicians to respond to questions
Community participation or mass media	14 (1), 44 (1)	Community education alone had no effect, but community education plus other interventions aimed at health workers (eg, training and supervision) had a moderate (in one study short-lived) effect.
Community case management	14 (12)	Moderate to large effects, with mortality reductions shown; although quality of community health worker performance not assessed
Essential drugs programme	14 (1), 54 (18)	Studies had weak designs; one showed large negative effect after active programme implementation was discontinued; others suggested that supplying drugs to health facilities and training health workers might be more effective than only supplying drugs

IMCI=Integrated Management of Childhood Illness. *Effect size generally refers to largest improvement in targeted outcome, with effect defined as follows. POST=outcome measured after intervention. PRE=outcome measured before intervention. For outcomes measured as a percentage, effect=$(\%POST-\%PRE)_{intervention\ group}-(\%POST-\%PRE)_{control\ group}$. For outcomes measured as rate or performance score, effect=$([POST-PRE]/PRE)_{intervention\ group}-([POST-PRE]/PRE)_{control\ group}$. Low effect is <10% improvement. Moderate effect=10–25% improvement. Large effect is >25% improvement.[14] †Studies included in references 14, 25, 43, and 44 overlapped substantially; and for references 43 and 44, only results from low and middle income countries were included. ‡Single study (not a review article).

Table 2: **Summary of reviews about interventions to improve health-worker performance**

from these few studies do not clearly favour any one choice. For example, a randomised controlled trial in Sri Lanka compared two intervention groups (distributing newsletters, and newsletters reinforced by group seminar) with controls, but neither intervention was effective.[56] Similarly, in Indonesia, two interventions (small group face-to-face intervention, and formal seminar) were compared with controls; for one performance indicator the former intervention was more effective, and for another indicator, the latter was more effective.[57]

In two instances, the same intervention was evaluated in multiple settings. Chalker and others[58] tested a multifaceted intervention to improve dispensing practices in private pharmacies in two sites. In Hanoi, Vietnam, the intervention improved several practices (eg, reducing dispensing of illegal steroids and low-dose antibiotics); however, in Bangkok, Thailand, only one component of the intervention improved only one practice. More consistent results came from the Integrated Management of Childhood Illness (IMCI) Multi-Country Evaluation, which reported that the IMCI strategy improved performance in four sites (Bangladesh,[19] Brazil,[23] Tanzania,[50] and Uganda[23]), and seems to have reduced child mortality in Tanzania.[51]

Some reviews[32,40] suggest that interventions targeted at perceived causes of problems (or obstacles to change) are more effective than those that are not; but the evidence is inconsistent, possibly because of difficulties in defining obstacles and assessing their relative importance. Thus, although it would be reasonable to consider choosing an intervention because it addresses the cause of a problem in a particular situation,[43] other factors should be considered, such as cost and the skills of those who would implement it.

Supervision

Supervision as an intervention deserves special attention. First, randomised trials have shown that it can improve performance, at least in the short term.[14] Second, if correctly done, supervision could be a mechanism for providing professional development, improving health workers' job satisfaction, and increasing motivation.[59] Third, although often

dysfunctional,[60] supervision systems are ubiquitous. Fourth, with decentralisation, district supervisors are increasingly the only human contact between health workers in remote villages and the rest of the formal health system.[61] Fifth, most policymakers and managers already think supportive supervision is valuable. The main challenges for supervision are improving quality, increasing the time supervisors actually spend with health workers, and measuring its cost-effectiveness.

These challenges, however, are large. Too often supervisors lack skills, useful tools, and transportation, and are burdened with administrative duties.[60,61] Supervisors and health workers often miss planned supervision visits because of their superiors' priorities, donors' financial incentives (per diems) to attend workshops and trainings, and the perception that no one seems to care whether supervision is done. Supervisors can become demoralised because they lack support from their superiors or face hostility from the health workers they supervise (who may understandably dislike supervision that involves inspection and criticism, takes up time, and provides little of value). Finally, although many senior policymakers and managers understand these challenges, unrealistic supervision plans can be made, but no one challenges them and planners are seldom held accountable for failed plans.[59]

But these challenges can be overcome. There are clear parallels between improving the performance of health workers and supervisors. Thus, determinants of supervisor's performance should be understood and strategies can be implemented to support supervisors and improve their performance.

On a closely related topic, system-level interventions such as low-cost strengthening of decentralised district health-management teams and supervisors can quickly improve performance of much larger numbers of front-line health workers. In Tanzania, for example, such managerial strengthening can take the form of locally available training in administration and management, team building, delegation, and community negotiation. When accompanied by practical managerial tools that assisted priority setting, resource allocation and supervision, the quality of health-worker performance and delivery of health care improved.[50,62]

The quality-improvement process

Some have advocated use of a quality-improvement process (figure).[63] Although it is a specific intervention, which improved quality in trials in Colombia[64] and South Africa,[65,66] it has also been considered more generally as a series of steps to help health workers and managers identify and solve problems of inadequate performance. It is analogous to the process that clinicians use when caring for a patient with a chronic illness (periodically assess the patient, identify and diagnose problems, prescribe treatment, follow up with the patient, and if a particular regimen does not work, try a different treatment). Thus, the quality-improvement process shows where specific interventions (eg, supervision, incentives, job aids) fit into the larger process of managing health workers and health systems. Despite its popularity, however, remarkably little high-quality evidence exists as to its effectiveness.

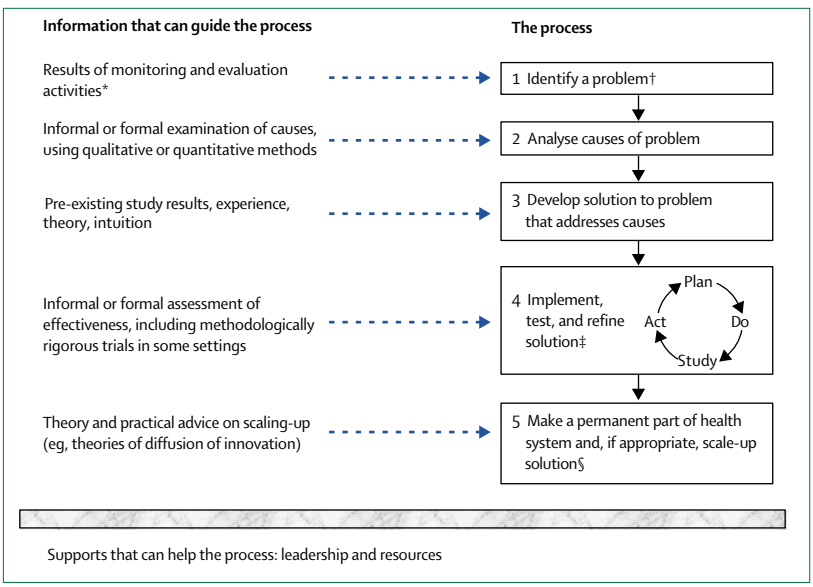

Figure: **The quality-improvement process**
Adapted from Massoud and colleagues.[63] *For example, a health management information system that includes indicators on quality of health-worker performance, routine supervision, and special surveys. In addition to providing information to guide the process, after solution is implemented, these data-gathering activities can provide information about quality to show whether solution continues to work well. †First step of quality-improvement process in figure assumes that standard of performance already exists. If no standard exists, then first step should be to develop (or adopt pre-existing) standard. ‡This cycle means: (1) plan (develop plan to implement and test solution, collect baseline data or make baseline observations—and plan to collect more data or make additional observations after intervention is implemented—to measure effects of solution, inform people of plan to implement and test solution to promote acceptance of solution); (2) do (implement solution, verify that it is implemented and document any changes from original plan, collect data or make observations to measure effects of solution); (3) study (compare baseline and postimplementation data to measure any improvement); and (4) act (communicate results of test, if solution did not yield desired results then modify or abandon solution and repeat earlier steps in process to develop another solution; if solution was successful then proceed to next step in process—make a permanent part of the health system and scale-up). §Moreover, monitor and assess to collect information about quality to show whether solution is still working well.

Improving quality in the private sector

Private health workers, broadly defined as any provider outside the public sector whose aim is to treat or prevent illness,[11] are relevant because they are a common source of health care, and their performance is often inadequate and at times harmful.[9,11] Although often overlooked by governmental strategies, private health workers are a common element of most health systems. Indeed, the very distinction between the public and private sectors may be blurred, as health workers in public health facilities might also have private practices (sometimes even based within public facilities).[11] According to some experts, private health workers are so important that disease control objectives in low-income countries are unlikely to be achieved without involving them.[9,11]

The differences between public and private health workers are that private health workers are not civil servants, different factors might influence their practices, they might operate illegally, and they could be difficult even to identify. Also, the private sector includes a broad range of providers. At the higher end of the socioeconomic scale, private doctors provide care for the wealthy who are unwilling to attend government clinics; at the lower end, drug vendors or quack doctors provide care for the poorest who have limited access to public services.[67] The qualifications and motivation of different cadres of private providers are widely different, and interventions to improve their performance will have to deal with such diversity. Many interventions have been proposed (Montagu,[68] and figure 2 of Brugha and Zwi[9]), including some that have also been proposed for public health workers. Few of these approaches have been rigorously evaluated, and those that were had mixed results: some improved performance, some had no effect, and some had unintended negative consequences (eg, when supplied with prepackaged antimalarials, pharmacists sold the antimalarials to street vendors, who then sold them as individual tablets).[11,25,58] As mentioned above, Chalker and colleagues[58] tested the same intervention in Vietnam and Thailand and found different effects, illustrating how context and method of implementation can greatly affect an intervention's effectiveness.

Key points of our review of private health-worker performance in low-resource settings are that: performance can be improved; monitoring performance is especially important, since interventions can have negative effects; regulation might not have a major result because it is difficult to do effectively; and although the organised, formal private sector is easier to work with, in many countries poor people more often use informal, illegal private providers.

Knowledge gaps

We begin with the overarching goal that new knowledge should help achieve: a health system with high-quality performance that also can adapt rapidly to change while maintaining performance. We emphasise both aspects because standards change as new diseases and technologies emerge, and some existing technologies (especially antimicrobials) become less effective. For example, an evaluation of 17 clinical guidelines in the USA reported that the median time for a guideline to become outdated was 5·8 years.[69]

To attain this goal, several things are needed. First, the validity of methods for measuring performance needs to be better defined, both in terms of data collection (eg, direct observation, chart review, simulated clients),[17] and analysis (ie, which performance indicators are best).[55] Failure to understand bias in performance measurement can lead to erroneous conclusions about the adequacy of performance and biased estimates of the effect of interventions to improve performance. Additionally, information about the costs of different methods will help create or refine guidelines[70–74] on monitoring and evaluating performance for district and national health managers.

Second, better understanding of the true determinants of health-worker performance is needed. Although there is no shortage of ideas for improving performance, improved understanding of these determinants could lead to development of better strategies, and those most likely to be successful could be identified and tested first. For some essential determinants (eg, motivation), it will be important to develop measurement methods with greater validity and standardisation.

Third, high-quality studies are needed to assess strategy options (including single interventions and combinations) to judge long-term effectiveness (eg, over 5 years), cost, minimum infrastructural requirements, and the determinant(s) addressed by each strategy. It would also be useful to know which strategies are better for achieving versus maintaining high-quality performance. Table 3 shows the foundation of such a research agenda, including interventions that have been tried, suggestions from colleagues, and our own ideas. We caution that few have been rigorously assessed. Thus, table 3 does not represent our recommendations for what interventions should be used now; rather, it illustrates how interventions can address specific determinants and presents ideas that might be considered for future assessment. Strategies should be appraised not only for effectiveness and cost, but also for the mechanisms by which they work. Such results could contribute to more refined theories and effective interventions.

To ensure that study findings have practical value, it will be important to understand the extent to which results for one setting and health area can be applied to other settings and health areas. Examples of different settings include place of contact (inpatient, outpatient, or community setting; non-profit *vs* for-profit setting), type of health worker (paediatrician, surgeon, nurse, or illegal drug vendor), and general level of development (urban middle-income areas with a well-developed infrastructure, or rural areas in countries emerging from a war). Examples of different health areas are prevention, acute disease management, and chronic disease management. The apparently contradictory results from some of the studies reviewed highlight a major challenge of health-systems research—contextual factors can substantially modify the effect of the same intervention. A similar issue exists regarding studies from industrialised countries: to what degree do results from such studies apply to low and middle income countries?

Fourth, and perhaps most important, an evidence-based guideline about how to implement guidelines is needed. Just as clinicians often lack the time and

expertise to digest all relevant studies on a particular clinical problem, policymakers and managers in low-resource settings are unlikely to master all the published work about implementing guidelines. Such a guideline would be enormously helpful for selecting a performance-improvement strategy that is appropriate for a given setting and health area.

In addition to these four points, other questions deserve study. What motivates policymakers and managers at the country level to implement strategies for improving quality? How can large-scale improvements be achieved and sustained?[55,75] And, how can international organisations such as WHO provide leadership and facilitate action at the country level?[28,76]

Determinant of performance	Interventions related to the determinant	Level of implementation				
		Community	Health worker	Health facility	District	National
Health worker factors						
Health worker knowledge and skills	Training (preservice, in-service [off-site or at health facility], distance learning), especially problem-based training about guidelines and essential drug lists			x	x	x
	Be more selective about who becomes a health worker, by licensing or credentials or selection process (especially for voluntary community health workers)	x			x	x
Health worker motivation	Address factors that demoralise health workers (eg, poor salaries, dilapidated health facilities, conflicts between health workers, and demoralising supervision)		x	x	x	x
	Incentives (eg, financial, non-financial, promotion)	x		x	x	x
	Sanctions (eg, criticism by supervisor, penalties)			x	x	x
	Ownership or buy-in (eg, setting standards collaboratively with health workers)	x	x	x	x	
Health workers' perceptions of patients' demands	Hold meetings of health workers and community members to help the former understand patients' true preferences (especially treatment preferences)	x	x	x		
Health worker understanding of work responsibilities	Develop and disseminate guidelines and job descriptions			x	x	x
Patient or client factors						
Severity of patients' illness*	During training and supervision visits, emphasise importance of following guidelines even when illness does not seem severe*			x	x	x
Patients' demands for inappropriate treatments	Make guidelines culturally acceptable†	x		x	x	x
	During training and supervision, strengthen health workers' communication skills so that they can effectively explain why certain treatments are (or are not) given		x	x	x	x
	Community education to explain why treatments are given (or not given)	x				
Patients' demands for appropriate care	Community-based or health-facility-based education to create expectations in patients and clients that promote quality‡	x		x	x	x
Work factors						
Complexity and clarity of clinical guidelines	Simplify and clarify guidelines			x	x	x
	Integrate guidelines (eg, IMCI covers several childhood illnesses)				x	x
	Job aids			x	x	x
Guidelines change over time	Disseminate new guidelines; re-train health workers; use new technologies to update health workers about advances in knowledge		x	x	x	x
Health facility environment						
General work environment, norms and attitudes of co-workers	Create a worker-friendly, quality-promoting, enabling environment (eg, adequate light for examinations, relatively comfortable setting, staff has esprit de corps and expectation of quality)		x	x		
Caseload	For high caseloads, redistribute health workers' responsibilities, or increase staffing			x	x	
	For low caseloads§, refresher training, bring health workers to health facilities in which unusual cases are more common, redirect patients to health facilities with more experienced workers (eg, for complex surgical procedures)			x	x	
Availability of equipment and supplies	Provide necessary supplies and equipment				x	x
	Regulate environment (eg, only provide recommended drugs)				x	x
Supervision	Supportive supervision that improves health workers' knowledge and skills, motivates health workers (eg, via praise), and models correct practices, which health workers may emulate			x	x	x
Accreditation	Accreditation and reaccreditation (potentially with progressively increasing standards)				x	x
Evaluation	Monitor performance (eg, with indicators), which can motivate health workers via Hawthorne effect, provide information to modify interventions designed to improve quality, and draw attention to problems (ie, when problems are known, decision-makers might be more motivated to solve them)			x	x	x
	Monitor performance (as above), but also give feedback on performance to individual health workers or entire health facility, which can improve health worker knowledge and skills, and help health facilities reorganise to improve efficiency (eg, flow of patients)			x	x	x
Communication	A two-way radio or telephone to open avenues for improved quality (eg, scheduling collection of salary with less health facility downtime, rapid response to diseases with epidemic potential such as cholera, and consultation with referral levels to alleviate need for some referrals), and to reduce sense of isolation for health workers in remote locations			x	x	x
Charter of patient rights	Standards about what patients can expect at health facilities, beyond appropriate clinical treatment (eg, equity, confidentiality, and respect)	x		x	x	x
Performance contracts	Codify agreements about performance (eg, to follow a particular guideline)			x	x	x

(continues)

(continued)

Determinant of performance	Interventions related to the determinant	Level of implementation				
		Community	Health worker	Health facility	District	National
Administrative environment						
Support for supervisors	Training, job aids, and regular supervision of supervisors to ensure that supervisors maintain good clinical and interpersonal skills				x	x
Availability of information	Reform HMISs so that they are used more for managing performance and quality (eg, HMISs could routinely collect data on cost, coverage, and HW performance).				x	x
Decentralisation	Provide enough authority and technical support to local health officials so they can develop and implement their own plans (real ownership of these processes could increase commitment to actually doing the plan, compared with centrally-planned systems)			x	x	x
District health management teams	Strengthen district health-management teams				x	x
Programmes that promote improved performance	Create an essential drugs programme, with essential drug list					x
Political and economic environment						
Educational infrastructure	Strengthen capacity to increase number of health workers by creating new training centres and incentives to attract students					x

HMIS=health management information system*For example, children with IMCI-defined malaria (fever or history of fever) were more likely to be treated with antimalarial if child had high fever at consultation.[15,17] †For example, if patients expect treatment, even when no drug is medically indicated, guidelines could recommend that all patients be treated with something (eg, treat cough with safe remedy that soothes throat). ‡For example, pregnant women in malarious areas should expect intermittent preventive treatment for malaria; caretakers of ill children should expect waiting times to be longer when health workers use IMCI guidelines because physical examination and counselling are more carefully done. §In particular, if certain conditions are not common (eg, severely ill neonates), or if certain procedures are not commonly done (eg, paediatric cardiac surgery).

Table 3: **Ideas for interventions by determinant of performance**

Recommendations

We make two recommendations. First, an international collaborative research agenda should be developed and financed to generate badly needed information about the cost and effectiveness of different strategies to improve performance, with special emphasis on which strategies are best adapted to different settings and health areas. Such an agenda might have three parts: (1) research on determinants of performance aimed at developing testable theories that explain health-worker practices; (2) rigorous cost-effectiveness trials of strategies to achieve and maintain high-quality performance; and (3) work on summarising study results and developing guidelines for implementing guidelines. This agenda should have a realistic timeframe: individual studies could take years to complete, and if multiple generations of strategies must be tested, the timeframe should be at least one or two decades. Moreover, this agenda should provide opportunities to train new scientists, especially in low and middle income countries.

See http://www.who.int/imci-mce/index.htm

With our recommendation for more research, we add a word of caution. It is unclear whether researchers working on their own can produce the necessary knowledge in a timely manner. For example, the review by Grimshaw and others[43] of 235 rigorous studies on guideline implementation generated surprisingly little practical advice: "This review highlights the fact that despite 30 years of research in this area, we still lack a robust generalisable evidence base to inform decisions about strategies to promote the introduction of guidelines or other evidence-based messages into practice." Thus, we strongly recommend that the proposed agenda be well coordinated and aligned with other initiatives on health systems research,[38,77,78] so that time and resources are not wasted.

See http://www.developmentgoals.org

Here are some practical first steps. For the first and third parts of the agenda, updated systematic reviews should be done that have transparent methods, are published in peer-reviewed journals, and provide electronic access to unpublished reports in the review. For the second part of the agenda, a first-generation of strategies should be tested that focus on a few, very important health areas. These results, including details of the interventions, should be shared broadly via the Internet and peer-reviewed scientific publications. The IMCI Multi-Country Evaluation is a good example of this type of research and dissemination.

Our second recommendation is that ministries of health and international organisations should actively help translate research results into action to improve health-worker performance, and thereby improve health. Specifically, organisations such as WHO, UNICEF, and The World Bank should make special efforts to remain aware of recent research and recommendations, work with countries to shape policy, help fund initiatives to improve performance, and strengthen systems to monitor performance. Additionally, support should be provided for international conferences, such as the International Conference on Improving Use of Medicines, where researchers and policymakers meet to learn about new research and develop consensus statements about interventions and research priorities.[55]

There is a growing imperative to scale up delivery of key health interventions to meet the Millennium Development Goals. However, simply scaling up interventions in weak health systems that deliver poor-quality services is likely to waste precious resources and fail to show the anticipated improvements in health. Global Funds and other investments must support the strategic improvement of health-worker performance

while they provide commodity support for interventions. We hope that this Review, which coincides with the beginning of the Decade for Human Resources for Health,[38] provides encouragement and guidance for fostering such improved performance.

Contributors

C G Victora conceived the review. A K Rowe had primary responsibility for the initial draft of the manuscript and doing the literature review. All authors contributed substantially to the methods, intellectual content of the review, writing, and finalisation of the manuscript.

Conflict of interest statement

We declare that we have no conflict of interest.

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