

Learning health systems in low-income and middle-income countries: exploring evidence and expert insights

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ABSTRACT

Introduction Learning health systems (LHS) is a multifaceted subject. This paper reviewed current concepts as well as real-world experiences of LHS, drawing on published and unpublished knowledge in order to identify and describe important principles and practices that characterise LHS in low/middle-income country (LMIC) settings.

Methods We adopted an exploratory approach to the literature review, recognising there are limited studies that focus specifically on system-wide learning in LMICs, but a vast set of connected bodies of literature. 116 studies were included, drawn from an electronic literature search of published and grey literature. In addition, 17 interviews were conducted with health policy and research experts to gain experiential knowledge.

Results The findings were structured by eight domains on learning enablers. All of these interact with one another and influence actors from community to international levels.

We found that learning comes from the connection between information, deliberation, and action. Moreover, these processes occur at different levels. It is therefore important to consider experiential knowledge from multiple levels and experiences. Creating spaces and providing resources for communities, staff and managers to deliberate on their challenges and find solutions has political implications, however, and is challenging, particularly when resources are constrained, funding and accountability are fragmented and the focus is short-term and narrow. Nevertheless, we can learn from countries that have managed to develop institutional mechanisms and human capacities which help health systems respond to changing environments with ‘best fit’ solutions.

Conclusion Health systems are knowledge producers, but learning is not automatic. It needs to be valued and facilitated. Everyday governance of health systems can create spaces for reflective practice and learning within routine processes at different levels. This article highlights important enablers, but there remains much work to be done on developing this field of knowledge.

INTRODUCTION

Since the initial articulation of the WHO building blocks framework,¹ there have been several incremental advances in thinking about health systems strengthening. The

SUMMARY BOX

WHAT IS ALREADY KNOWN?

⇒ There is a growing literature on learning health systems (LHS), mainly drawing from high-income experiences, but limited publications on LHS in low/middle-income countries (LMICs) which address whole-system learning.

WHAT ARE THE NEW FINDINGS?

⇒ Building on literature and expert insights, we highlight eight domains which enable learning: leadership, organisational culture, organisational design, resources and incentives, external linkages, health information systems and data use, competencies and mind-sets, and institutional processes.
⇒ We highlight common constraints across these domains but also positive case studies, where space has been created for learning.

WHAT DO THE NEW FINDINGS IMPLY?

⇒ Learning within health systems needs to be valued and promoted through addressing these domains.
⇒ More work is needed to examine LHS in LMICs conceptually, empirically and comparatively.



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most recent of these ideas is resilient health systems, which recognises the importance of the intelligent use of information to respond and react to shocks. More recently, there has been a growing interest in learning health systems (LHS), which focuses on the intelligent use of knowledge from emergent phenomena, and is considered to be a key feature of ‘strong’ health systems.^{2–7} As a conceptual lens, it has the potential strength that it is built on the recognition that health systems are complex, adaptive and social institutions that dynamically respond and adapt to changing needs and contexts. Further, it has a long-term orientation toward change and transformation that may go beyond resilience.

Extensive insights on conceptual frameworks for LHS has been developed in and for high income contexts (HIC), mainly focused on learning organisations.^{8–10} Different

underlying processes and levels are also highlighted: 'learning involves dynamic cognitive, social, and technical processes occurring at the level of individuals, groups, and the enterprise that, over time, explore new possibilities and exploit existing organisational knowledge'.⁸ The most commonly used definition for LHS is that which was created by the Roundtable on Value and Science-Driven Health Care in 2012: 'a learning health care system is one in which science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the care process, patients and families active participants in all elements, and new knowledge captured as an integral by-product of the care experience'. Key desirable features of LHS include (1) speed including real-time data and responses; (2) being a routine function and³ taking place at scale and across systems, which are important but pose challenges for traditional research methods and approaches.¹¹ Key challenges for LHS include ethical issues around use of big data and rapid advances in technology,¹¹ the rise of health expenditures due to cost escalation and fragmentation of healthcare markets, and management and accountability challenges including audits and quality assurance and lack of integration to the learning needs of health systems.¹²

While there is an emerging appreciation of LHS, studies focusing on models and experiences from LMICs have been limited to date. In a global context, however, health systems are seen more broadly in terms of how societies organise to protect and promote health. This understanding has been reinforced by the emergence of Universal Health Coverage (UHC) and health security as key goals in global health, the achievement of which depends on strong health systems.¹³ LHS will therefore have different models in LMIC settings, as well as different barriers and enablers.^{14 15}

In this paper, we examine conceptual and empirical evidence from different bodies of literature in LMIC settings and interviews to better frame LHS for these contexts. We also aim to understand enablers and constraints and to identify and describe important principles and practices, including illustrative examples and case studies, that characterise LHS.

METHODS

The review was based on two methods: (1) an exploratory literature review of published studies and grey literature, and (2) expert interviews.

Literature review

Scope

Studies that were initially included in the review included those that focused on LHS-specific studies, and also a wider set of related areas of enquiry, such as policy transfer and diffusion, health sector reforms, health system strengthening, resilience, health information and technology, evidence use in health policy formation,

and evidence-based policy and medicine. A wider range of studies were later identified through snowballing from included studies and from recommendations by key informants. In addition, targeted literature searches were conducted to identify case examples of mechanisms for learning related to aspects of the LHS framework.¹⁶ The identified literature was integrated into this paper to illustrate key themes and describe the context and key considerations to implementing different aspects of LHS in practice.

Studies were included if they either measured or reported the outcomes of a learning health system or an intervention or mechanism that contributed to a learning health system, or if they observed or proposed a conceptual framework or other typology for LHS. While studies were not excluded based on location, priority was placed on studies and reports from LMICs. The HIC papers were reviewed briefly to understand how LHS have been conceptualised in these contexts and to identify common themes and differences with LMICs.

Search terms and methods

The following initial search terms were used: "(learning health system OR policy transfer OR policy diffusion OR health information system OR electronic health record* OR health sector reform OR (health NEAR technology) OR evidence-based medicine OR resilience OR health system strengthening) AND (framework OR theory OR intervention OR program OR evaluation OR assessment) AND (low-income countr* OR low- and middle-income countr* OR LIC OR LMIC). Seven databases were searched: Ovid MEDLINE(R), Ovid Embase, Ovid Global Health, Web of Science, McMaster University Health Systems Evidence, Cochrane, and Campbell Collaboration Library. Studies were identified based on citation tracking, internet searches, the authors' knowledge and recommendations provided in expert interviews.

Selection and extraction

After a title and abstract screening, a full-text screening and data extraction was conducted.

Data extracted from collected studies included author and publisher information, methodology, name/type of framework, description or results, whether the study was a systematic review or not, whether the study was empirically based or drawn from previous observation or expert knowledge, level of the study (system, organisational), and the income level of countries in which the study was based (low-income, low-income and middle-income, high-income).

Expert consultation

As the literature specifically on learning in LMIC health systems was found to be limited and many useful insights and experiences were known to experts in the field, yet not formally documented, we supplemented our literature review with expert interviews. Experts were purposively selected based on recommendations by the

Box 1 Questions to key informants

- ⇒ How would you define learning in a health system context?
- ⇒ Are there specific frameworks which you have found useful for conceptualising this?
- ⇒ What different kinds of learning have you come across in your work? (By whom, when, how?)
- ⇒ What were the enablers of these LHS, their characteristics or preconditions?
- ⇒ How does learning differ by level of the health system?
- ⇒ Can you share any good case studies of strong LHS in particular LMIC settings? What were the important contextual factors which supported these?

LHS, learning health systems; LMICs, low/middle-income countries.

Alliance for Health Policy and Systems Research and snowballing from experts known to the authors. A short set of questions was prepared (box 1) and interviews were conducted remotely. Seventeen key informants were interviewed (nine female, eight male), with expertise from five regions: sub-Saharan Africa,⁹ Asia,⁴ Europe,² Middle East and North Africa¹ and South America.¹

Analysis

When reviewing data collected from included studies and from expert interviews, specific attention was given to: information on components and relationships in conceptual frameworks and typologies of LHS; evidence on mechanisms, facilitators, barriers and implementation details; the incentives of actors and stakeholders involved in implementing related interventions, programmes and evaluations; and outcomes. The results of this analysis informed the organisation of the results section of this paper.

Patient or public involvement

As the paper is primarily based on secondary literature and insights from a small group of global experts, there was no engagement of patients or the public in it.

RESULTS

In this section, we will focus on learnings from LMIC settings and present enablers for LHS, drawn from literature and lived experience, structured into eight domains which emerged inductively from the data. Box 2 summarises these eight domains and provides some key messages under each one. Finally, we outline a set of common drivers and constraints for LHS in LMICs.

Conceptualising LHS for LMIC settings

Akhniif *et al*⁶ conclude that no one has so far established an explicit link between learning organisations as a concept and UHC policies and the health system.⁶ Others also highlight that despite the interest in this concept, empirical studies are lacking.¹⁷ This is unsurprising as learning is by its nature intangible and is apparent through its products or their lack.

Box 2 Key messages across eight key enabling domains for LHS in LMICs

Leadership

- ⇒ The importance of leadership and governance in determining how and whose perspectives, insights and information are valued and shared (or not).
- ⇒ The need to protect the health system from politicisation and corruption.

Organisational culture

- ⇒ The importance of building human and relational capital in the form of trust and collaborative relationships, horizontally and vertically, across functional areas and sectors (public, private, informal, community).
- ⇒ Challenging the 'compliance culture' (passive mentalities, fear of sanctions for failure).
- ⇒ Developing a shared commitment to and ethos of serving the public good and providing equitable universal coverage.

Organisational design

- ⇒ The need for long-term applied research capacity building at all levels, including investing in policy-connected and financially sustainable research infrastructure.
- ⇒ Aligning accountability, authority and capacity to provide decision space to front line and mid-level actors, without which there is no ability and incentive to innovate or even manage well.
- ⇒ Ensuring inclusion and fora for sharing, not dominated by powerful interest groups (including commercial interests and donors).

Resources and incentives

- ⇒ Resourcing learning functions, including embedded research and evaluation teams, as well as in relation to routine sector process such as planning, priority setting, performance reviews, supervision, and knowledge management and sharing platforms (national and international).
- ⇒ Within academic settings, the importance of creating incentives for researchers to focus on policy-linked research, working closely with policy-makers and within policy processes.

External links

- ⇒ Building demand for LHS by demonstrating its value over time and gradual shifting norms within the political system through long-term exposure to evidence-based thinking.
- ⇒ The value of policy networks to build coalitions for research and influence across sectors and constituencies (research, practitioners, civil society and community groups, parliament or other public representatives, media, etc).

Health information systems and data use

- ⇒ Better understanding of HIS demand from communities, providers and managers.
- ⇒ Investment in interoperable and user-friendly health information systems and health information technology (IT) which can deliver operationally relevant data.
- ⇒ Implementing context-appropriate digital health strategies which build on early examples of successful e-health, health promotion and health security applications in LMICs.

Competencies, relationships and mind-sets

- ⇒ The needs for skills within health systems to engage with the politics of change and to be able to successfully challenge dominant (but erroneous) paradigms—skillsets which go well beyond

Continued

Box 2 Continued

presentation of research evidence but include engaging expertise in coalition building, communication and skilled use of narrative.

- ⇒ Developing skilled and respected health system managers at all levels through dedicated training.
- ⇒ Valuing and promoting learning within the health system and incorporating it into basic training curricula.

Institutional processes

- ⇒ Developing governance which values different types of knowledge, including experiential and operational, and creating safe spaces for reflection and testing of new approaches.
- ⇒ Supporting horizontal relationships through peer review and support, collaboration and lesson sharing.

LHS, learning health systems; LMICs, low/middle-income countries.

According to a recent review, many existing frameworks focus on three core domains of leadership, environment and processes to support LHS.⁵ In developing conceptual frameworks for LHS in LMICs, we posit that it is also important to understanding learning at different levels, from individual to international, with processes and mechanisms likely to vary across these levels.¹⁸ A focus on health systems also brings in specific interest in interactions between the building blocks of the formal systems, between the formal and informal systems, and between systems and communities.¹⁸ The LHS is embedded in the wider context and political economy, which will act as important enabler and constraint.

In this context, an LHS may be measured by the presence of active and appropriate institutional mechanisms designed to facilitate those on-going processes of development within and across the system blocks. The presence of such mechanisms are seen as a measure of the extent to which health organisations are likely to be effective in terms of performance, but also in ensuring that any organisation is capable of responding to need and being flexible in change, a quality summarised as ‘resilience’,¹⁹ in which learning functions are a key determinant.

LHS enablers

Beyond conceptualising LHS, an urgent requirement is to understand the conditions in which these arise and how the development of LHS can be supported. We draw here on literature and lived experiences to draw out common characteristics and enablers grouped into eight themes. These are mutually reinforcing and intersecting, and all rely on favourable contextual conditions for their development and sustainability.

Leadership

Most studies concur on the importance of leadership in developing a vision, mission, and goals for learning within the health system, according to a recent review.⁵ Leadership structures, beliefs and values are also important in validating learning and the role of evidence.⁸ Others highlight that leadership must not only help develop an

organisation’s vision, but also engage in hands-on implementation of that vision,²⁰ including through targeting and resourcing and keeping a focus on health improvement.¹¹ Factors favouring learning may also include leadership which sets a limited number of organisational priorities and ensures internal transparency of quality metrics.²¹

Competencies associated with leadership and governance include cognitive intelligence (including the ability to perceive multiple causal relationships), emotional intelligence (including the ability to perceive one’s own emotions and attitudes, their effects on others and on oneself and the ability to generate inspiration and commitment), and social intelligence (including the ability to network, develop trust, collaborate, empower others, display empathy and manage conflict).^{22,23} There are limited initiatives which support these adaptive leadership skills for health system leaders in LMICs, though some new models of support are being piloted, such as the Leadership for UHC programme.²⁴

There are however challenges to expecting powerful agents and elites, who are most able to push through change, to challenge systems from which they are benefiting, while those at the periphery may have motivation for change and ideas but lack power to put them into effect.²⁵ In this context, bridging organisations or other structures may be needed to link the agents with power to those with ideas, and spur a process of entrepreneurship, through which multiple agents combine to define and introduce change in their contexts. Managing these issues as leaders at any level requires resilience, which has been fostered through relatively stable governance structures and financing. In Kenya and South Africa, health systems have found that ‘everyday resilience’ is not enough to sustain initiatives and drive innovation, and therefore have worked to invest in leaders at every level of the health system to reframe challenge, engage staff in problem solving, and develop strong social networks within and between organisations in order to foster and support learning and innovation.¹⁹

Organisational culture

Organisational culture is another common element highlighted in literature on learning organisations and LHS, which is both a result of and key constituent in empowering people towards a collective vision,²⁶ building shared values⁹ and creating an LHS trusted and valued by all stakeholders.¹¹

Important elements within this collaborative and engaging organisational culture include:

- ▶ Teamwork and cooperation,²⁷ for example, collaborative work groups that include all the participants in a work unit or department⁸ and use team learning.^{5,9}
- ▶ Workforce engagement and informal knowledge sharing.⁸
- ▶ A supportive learning environment (with psychological safety which allows for learning from ‘failure’,

appreciation of differences, openness to new ideas and time for reflection).²⁸

- ▶ Promotion of inquiry and dialogue,²⁶ in which group members are encouraged to raise and explore questions.²⁹
- ▶ Systems thinking,³⁰ in which broad patterns and inter-relationships of components are examined.
- ▶ A culture hospitable to, and supportive of, change and personal development.⁷

In some LMICs, by contrast, health systems can be characterised by a top-down governance culture that fails to take account of innovation and creativity at operational levels.³¹ Decisions are politicised and knowledge is hoarded as an instrument of power.⁵ Governance modes are also influential on what evidence is valued and used. In a study from South Africa, Scott and Gilson argue that authoritarian governance arrangements are associated with checklists and audits, transactional governance with reporting and targets, and persuasive modes more likely to value experiential learning.³² All have their place, but they have different functions, and some are dominant at different levels.

Empowerment of teams, trust, communication, commitment, and flexibility and the multiple non-linear interactions of all of these are seen as key to developing learning and ‘post-bureaucratic’ organisations, which are deeply influenced by organisational culture. Organisational culture can and does change, but this is a medium-term to long-term project, according to expert informants.

Organisational design

This domain includes how organisations enact accountability,³³ the nature of ethics frameworks they apply,³⁴ and whether organisations are set up to be able to respond flexibly when unforeseen problems arise.^{20 21 35} Some suggest that integration between providers and payers, as well as between academics and clinical staff supports LHS.²¹ While there is no clarity on best organisational models, it seems clear that the health system needs points of integration where cross-organisational learning can occur; in many settings, like Thailand, this is the district, where resources can be pooled, services contracted, problems diagnosed and solved, and quality improvement activities managed.³⁶

There is however often a disconnect between the policy level and lower system levels, a weak meso level (eg, failure to capitalise on learning at the district level) as well as a lack of coordination among actors in LMICs. The literature on decision spaces highlights that accountability, authority and capacity are often not well lined up to support effective learning and action by managers and teams at the operational face of health systems.³⁷

The role of organisations to support health systems research and engage as bridges to policy-making has also emerged from the LMIC case studies and is illustrated in the literature on ‘successful’ health system reformers. In Mexico, for example, current reforms have reaped

the benefits of 20 years of sustained efforts to establish and nurture organisations such as the National Institute of Public Health and the Mexican Health Foundation. These centres have produced relevant research and policy analysis, trained researchers who occupy key policy-making positions, and done independent and credible evaluations, feeding into policy design as well as new technologies and changed community behaviour.³⁸ In a very different context, research organisations have been influential over the years in shaping the health system reforms in China.³⁹

There has been increasing investment in translational organisations to bring evidence into policy processes and respond to short-term evidence needs of policy-makers, but these often function at a high level, focusing on synthesis of global evidence, and their utility is still to be established. A recent study of learning across health systems found that evidence gaps in LMICs were more focused on operational than policy questions, suggesting a need for networking of different actors who are closer to service delivery, sharing more applied resources and experiential learning.⁴

Resources and incentives

A LHS clearly needs material inputs such as resource persons and some budget flexibility. This is highlighted in the wider literature which points to the role of external funding,²¹ funding conditionalities,⁴⁰ external cooperation³⁵ and an economically sustainable and governable LHS.¹¹ Developing research infrastructure can be, as we have seen, an enabler in some settings,⁵ and this requires stable and long-term funding.

Regulatory or legislative influence can also be an important factor,²¹ as well as an enabling environment which supports and drives change,⁴¹ which may include internal marketing within organisations⁴² but should also ensure motivational systems for staff to make learning meaningful and worthwhile.²⁹ Wider incentives in the health system are also key too. In a study of learning across six LMICs, uptake of policy was strongly driven in most settings by local political economic considerations. While barriers and facilitators to evidence use included supply and demand factors, the most influential facilitators were incentives and capacity to use evidence.¹⁸

External links

External links emerge from literature focusing on learning organisations but also have relevance for an LHS. Key elements here include connecting the organisation to its environment²⁶ and use of scanning approaches to learn about successes within the field, benchmarking, scenario planning and anticipating new trends in the market.^{8 20}

Some studies focus on the network features—for example, the importance of long-term relationships between policymakers and stakeholders.⁴³ In a study of the development of national policy analysis institutes in two LMICs,⁴⁴ organisational strategies for surviving and

increasing their relevance include twinning with international organisations and linking within core government decision making structures. This builds on earlier work which highlighted the importance of embeddedness for uptake of evidence from health policy and systems research organisations, including the quality and quantity of their connections to decision-makers.⁴⁵

An example of making effective connections at country level is Thailand's National Health Assembly (NHA), which brings together government leaders, academics, civil society and representatives from community groups and other associations and committees representing health and other sectors to foster dialogue on UHC planning and implementation. The NHA has enhanced mutual understanding among stakeholders, even as ensuring that the outcomes of these deliberations are prioritised in policymaking remains a challenge.²³

External links in an LHS can also be about reinforcing horizontal connections. This can be seen in, for example, as some recent initiatives have tried to support, with meetings and platforms which bring together district health managers in Benin and Guinea to share problems, data and action-oriented local research.⁴⁶ The aim of this initiative is to combat the hierarchical orientation of traditional health systems, as discussed under organisational culture, and build better horizontal cooperation across districts to identify and work on solutions to common problems.

The greater the number of 'gatekeepers' who bring knowledge into the system and advocates who promote a new idea, the more rapidly and extensively the learning will spread.²⁰ This has fostered the growth of peer learning communities,³³ communities of practice⁸ and digital learning networks.⁴⁷ In global health, there has been a growth in communities of practice with a range of topics of focus and membership profiles,⁴⁸ which aim to make evidence available through webinars and resources such as reading lists and newsletters, workshops to promote conversations, joint learning activities, digital platforms to provide real-time data sharing and visualisation, and facilitating dialogue within and across systems. Although they are relatively young, some reflections are emerging on factors supporting their healthy development.⁴⁹ These include a lack of knowledge-sharing platforms, especially involving wider groups, such as civil society.⁵

This active collaboration across constituencies, focused on collective intelligence, problem-solving and embedded in local communities, is core to how health policy and systems research aims to operate.^{50–52} Despite the recognition of the importance of co-production of evidence and action, the challenge remains of how to bring together communities and system stakeholders, especially in the context of the need to develop multi-sectoral actions on social determinants of health⁵³ as well as for growing health need areas like non-communicable diseases. Lack of timely data and lack of connections, even within and between health system levels, is a challenge. This has led to a number of initiatives to support

learning platforms to connect research evidence on local health priorities with the means for action and to enable new partnerships and deliberative processes between communities, government and research sites, including the Verbal Autopsy with Participatory Action Research programme in South Africa.⁵⁴

Health information systems and data use

Clearly, the flow of data to inform policy decisions and review is a key component in LHS^{8 55} and 'purposeful' design of data systems.²¹ Cresswell and colleagues highlight important factors and actions to take at different levels of the health system to strengthen health information flow, including micro-factors (influencing usability of systems and motivating users), meso-factors (developing infrastructures to facilitate the aggregation of data) and macro-factors (facilitating interoperability and data reuse at larger scales).⁵⁶

Health information systems in LMICs commonly face concerns around completeness, accuracy, inclusion of wider sectors (such as the private sector), as well as poor data demand and use, especially by the units which are generating data. In a study of LHS in six francophone African countries, the lowest score by surveyed local participants was for access to real-time data at all system levels.⁵ This is also an area which has benefited from less research in the HSS literature.^{18 57} Equally, research on the diffusion of information and communication technology innovations in LMICs is limited⁵⁸ and highlights capacity, partnership and regulatory challenges. However, many countries are now starting to develop more proactive digital health strategies. For example, district medical officers in Guinea used a digital platform called District Team to assess the availability of protocols and review processes for maternal deaths to improve documentation and have access to routine health information.⁵⁹

A recent study on health information use at facility level in South Africa suggests that managers do actively use information in decision-making but require a wide range of experiential information which is outside of the current, and indeed the globally advocated HIS.⁶⁰ From this experience, it is clear that managers require localised information about 'their staff, facility and community context, and need to develop experience-based knowledge of managing in this context' which often lies outside of the HIS and requires the connection between stakeholders including other staff and manager, clients and other stakeholders in order to ensure effective performance of their roles.

Many studies from LMICs and elsewhere suggest that data sources and processes influence its acceptability. A recent study, for example, found that governance data produced by intergovernmental organisations appears to exert greater influence and that assessments based on primary data and local knowledge are more influential than those that rely on secondary sources alone.⁶¹

A recent paper presents a framework to evaluate the artificial intelligence in medicine (AIM) readiness

of healthcare sectors in developing countries, which combines adequate technical or technological expertise, financial sustainability and sociopolitical commitment embedded in what the authors term a 'healthy psycho-cultural context'.⁶² Contrary to the clinical focus of AIM applications in high-resource countries, they find that AIM in LMICs is often related to automation technology, such as the mobile phone framework, concerned with the delivery of health information and health communication that could improve public health outcomes. For example, in Tanzania, the electronic version of the Integrated Management of Childhood Illness (IMCI) protocol, dubbed e-IMCI, has allowed local clinicians to use Personal Digital Assistants (PDAs) to classify and treat child illnesses, thereby in the long run, contributing to better paediatric healthcare at lower costs.⁶³ Not only could PDA and mobile phone-based tools improve the scope and efficiency of field health workers in low-income regions, they could also be of tremendous help in monitoring and containing chronic diseases and communicable diseases thanks to their wide availability.^{63 64} Under these programmes, also known as 'e-health', governments in several LMICs have successfully implemented community information systems for disease surveillance.⁶⁵ Although more research is needed on the impacts of e-health on outcomes and costs in these countries, several steps, such as text messaging for improving patients' self-care and automated telephone monitoring, have been shown to have positive outcomes in chronic disease management.⁶⁵

Besides mobile health technologies, case studies from clinics in Honduras and Mexico suggest that a cloud computing model, using automated self-management calls plus home blood pressure monitoring, could improve outcomes for hypertensive patients in low-income and middle-income settings.^{62 65} This means even areas with limited infrastructure for patient-focused informatics support could apply this model at their telecommunication centres.⁶⁵

In an attempt to better monitor risks of public health emergencies, a study has suggested low-resource countries also adopt 'syndromic surveillance', which uses prediagnostic data and statistical algorithms to rapidly detect epidemics and characterise unusual morbidity trends.⁶⁶ Some examples of this approach can be seen in the Early Warning Outbreak Recognition Systems that have been in place in Jakarta, Indonesia since 1998 and in Lima, Peru since 2005—both surveillance systems proven to be effective in detecting early disease outbreaks.⁶⁶

Competencies, relationships and mind-sets

Processes of institutional learning and change can only occur through changes in the behaviour, attitudes, relationships and activities of individuals. These can be supported by a range of mechanisms, including work-based supervision, support and feedback, mechanisms for peer-to-peer engagement and exchange, work-based learning objectives and context-targeted activities,

regular monitoring of outcomes, and scope to influence change at the institutional level.²³ Others highlight the role of formal training⁶⁷ including in problem-solving methodologies^{8 41} and advanced informatics,⁴⁷ creating continuous learning opportunities²⁶ and guided experiences,²⁰ and developing capacity and capability for change management and data analysis.⁵⁶ As an example, Sri Lanka provided training for leaders of its hospitals and other high-level positions that ensures that these individuals have first-hand experience with other health systems, acculturation to reviewing evidence and remain up to date with current literature and utilisation of health information.⁶⁸ By providing this ongoing education and critical and comparative perspectives, these leaders are best-placed to tackle challenges and maintain a learning climate in the programmes and agencies that they lead.

Individual and group mind-sets are also key and can be more challenging to change than 'hard' skills. An example of the long-term nature of this approach was a programme in South Africa focused on development of middle manager (and wider) leadership to nurture collective sense-making around primary healthcare (PHC) goals and empower front line health staff to take ownership of them.⁶⁹ Its hypothesis was that mind-set changes, focused on concern for the population being served, the broader social determinants of health, and a willingness to act collaboratively are likely to be the fundamental basis for strengthening and sustaining PHC. In Argentina, a long-term capacity building strategy to adapt guidelines to the country context found that learning by doing and ensuring that technical skill acquisition and social and team effectiveness skills needed to go hand in hand in order to facilitate effective engagement and utilisation of knowledge from this training.⁷⁰

Institutional processes

Institutional processes to support LHS take many shapes and functions, including management of how information and knowledge is transferred within and between organisations²⁹ experimentation^{27 71} and institutionalising learning by incorporating it into routines⁷² and roles.²⁹

A core element of learning within LMIC national health systems should be the planning cycle, in which performance is reviewed (typically annually) and objectives and budgets set for the next year accordingly (expert interviews). However, this topic—how functional these processes are and how they can be improved—is relatively under-studied in the academic literature, an example of bias in attention towards apparently novel ideas over routine practices.⁴

Supportive supervision is another core process for enhancing learning, yet is a chronic challenge in many LMIC settings. In many settings, supervision continues to be authoritarian and fault-finding (if not rent-seeking in some contexts). While there are good examples of improved practice,⁷³ extending and maintaining good supervision requires continuous efforts. Horizontal,

collegial and professional monitoring, feedback and review may work better in some contexts than hierarchically enacted checklists.

Another aspect of processes which is under-studied is how knowledge is managed within LMIC health systems, including pooling, storage and efficient retrieval and sharing of research and other evidence to enable institutional memory to be retained and avoid duplication of research and analysis (expert informants).

Quality improvement and assurance processes such as clinical governance and audits can be an important element in the LHS, however, these are often associated with meeting externally set standards, rather than promoting internally generated, bottom-up, organic processes of learning.⁶ Scorecards have been introduced in a number of LMIC settings but again may be perceived as external and punitive rather than oriented towards the needs of internal stakeholders.

Processes for priority setting and health technology assessment (HTA)⁷⁴ are also important potential parts of the architecture for learning within health systems, with some middle-income countries establishing strong institutional frameworks—for example, under the Health Intervention and Technology Assessment Programme HiTAP in Thailand.⁷⁵ However, regions like sub-Saharan Africa still need to adapt, integrate and institutionalise HTA tools.^{76 77}

Drivers and constraints to learning

Although there is limited literature on drivers to learning in LMIC health systems specifically, from wider literature we know that elements such as crises or ruptures can prompt innovation and hence learning,¹⁸ and that electoral pressures, social pressures, epidemiological change and change in expert opinion can all drive reforms and learning in health systems. There are however also important constraints,⁷⁸ which include the six key constraints outlined in [box 3](#).

DISCUSSION

Conceptualisation of LHS in LMIC settings is in its early stages, different stakeholders perceive the boundaries of the concept in different ways, and formal research has been limited by the difficulty of studying this emergent phenomenon. However, while formal documentation from LMICs with an explicit LHS lens is limited, lived experience is rich, and the case studies,⁷⁹ illustrated many promising examples, as well as challenges, from a range of settings. This is appropriate as one of the core messages emerging from this review is that learning comes from the connection between experience, deliberation, reflection, validation and analysis. Moreover, these processes occur at different levels. It is therefore important to consider experiential knowledge from multiple levels and experiences rather than focusing on a vertical process in which data are extracted from the frontline and analysed at other levels of the system.

Box 3 Some key constraints to learning

Under-supply of knowledge

Accessible knowledge is not always a reality. There can be restricted financial access to scientific information, as well as language barriers which restrict comprehension of published and grey materials. For example, Smith *et al*⁸² analysed more than 3000 papers in almost a thousand journals related with global health, and concluded that only 39% of papers published in a journal have open access, and 42% of scholarly articles require a subscription. Likewise, a policymaker's lack of access to a policy network related to their field of interest constrains the possibility to share information, experiences and concerns with like-minded people. Skills to support LHS are missing in many LMICs, reflecting narrow professional training. There is also a gap in knowledge of how to foster learning capacities to support systemic goals such as UHC and how to measure these capacities.⁵ On the decision-maker side, understanding of evidence-generating processes, research methods and cycles can also be a challenge⁸³ along with unaligned incentives, as discussed.

Time

Time is a scarce resource in public policy. Policymakers are always thinking about action, they are busy with day-to-day pressures. A detailed comparative analysis of experiences requires time and effort that policymakers sometimes may not be willing to spend. There is not always time and resources to accumulate sufficient evidence as desired.

Cost of policy errors

In some cases, civil servants will not be willing to take the risk of making a mistake by trying something new, if inaction is less risky.

The installed capacity

Of a country to respond to new challenges adaptively can be another barrier, particularly in low-income countries. This constraint can refer to human capacities, economic resources or logistic capacity, among others.

Inherited policies

One of the most important influences in learning is previous policies or the prior status quo. Policy legacies are meaningful, they generate a path dependence which can limit the scope of action.⁴⁸ For certain government programmes, it is easy to initiate them, but extremely difficult to stop them.

Political and personal interests

In the same way that political groups can motivate learning and the implementation of new policies, groups and individuals with enough veto power could inhibit experimentation and the execution of a particular course of action if it is detrimental to their interests and influence.⁴

LHS, learning health systems; LMICs, low/middle-income countries; UHC, Universal Health Coverage.

Creating spaces and providing resources for communities, staff and managers to access and use information (research, routine data, dashboards, etc), engage with each other (peer to peer, community engagement, workshops, conference, etc) and reflect on their challenges and find solutions, and then take action has political implications. Many barriers are created by political and economic factors, notably elite interests and controlling

organisational cultures. Nevertheless, countries like Thailand, Sri Lanka, Chile and Ghana, to select some examples, have managed to support their LHS and develop institutions, mechanisms and human capacities which help the health system respond to changing challenges and environments with ‘best fit’ solutions, which are shared and adapted in continuous learning cycles.⁷⁹

Many health systems have localised good examples of learning. However, scaling this up and sustaining it remains challenging, particularly when resources are constrained, funding and accountability are fragmented and the focus is short-term and narrow. Short time horizons, limited research capacity, inertia, political interests, risk-aversion, data shortages and silos, and turnover in key staff are all constraints to LHS. Another challenge is that LHS are a hard sell economically in that learning is intangible, more evident in its absence than presence.

The LHS is alert to new threats and opportunities, and while its products look different at different levels and in different areas of the health system, it should be informed by shared values of universality, equity and serving public health goals. Knowledge is embodied, as well as inscribed and enacted,⁸⁰ so human factors will always be important (such as trust, facilitation, software and leadership). Desirable approaches and features are shared with the concept of problem-driven iterative adaptation,²⁵ as well as with guidelines for evidence translation in complex settings,⁸¹ which emphasise scientific but pragmatic strategies, which engage and empower but also embrace complexity.

This review aimed to be exploratory and to highlight areas for further research and deliberation. Therefore, it is not a comprehensive or systematic review of all literature. This article highlights some important enablers and constraints, but there remains much work to be done on developing this field of knowledge. Not only are there few studies that specifically examined LHS in LMICs conceptually and empirically, but some of the core mechanisms through which health systems could learn are poorly analysed from this perspective.

CONCLUSION

It is clear from this exploratory review that LHS is a central concern for LMIC health systems, but also that relatively little is documented with this specific lens from the LMIC settings. There has been some emphasis on research systems, but learning (as a broader, more embodied knowledge function) has been overlooked. While formal documentation with an LHS lens is limited, lived experience is rich, however, and there is scope for greater capture and reflection on promising approaches from a range of settings.

Health systems are knowledge producers but learning, from both internal and external organisations to a health system, is not automatic. It needs to be valued and facilitated through action in all of the domains presented in this article.

Health systems are complex and adaptive systems so by their nature they will change, but reactions to change can be

supportive or negative in their consequences. An LHS has the ability to engage iteratively with problems at different levels and across system blocks, drawing on different forms of knowledge to create a common understanding and define appropriate solutions which feed into decisions. This collective problem-solving is a characteristic of LHS. Everyday governance of the health system can create spaces for reflective practice and learning within routine processes at different levels—focusing on skills, for example, at individual level, promoting dialogue and collaboration at team level, and providing vision but also sharing learning at national level. Health system leaders play an important role here in modelling learning, allocating resources to learning and using it to influence decisions.

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