Strengthening clinical research capacity in low- and middle-income countries

Workshop report

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The Academy of Medical Sciences

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the interacademy partnership

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All web references were accessed in October 2017

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Executive summary

Key Context

A wide range of skilled individuals is essential for the development of clinical research and the translation of this knowledge into improving health. Despite the World Health Organization's (WHO) declaration in 2004 that 'well planned health research is fundamental to the improvement of health in all countries'[1], the reality remains that the vast majority of clinical research continues to be designed by and conducted on a small minority of the world's population living in high-income countries.[2] In order to strengthen clinical research in any country or geographic region, an important starting point is to understand the existing capacity of trained and active clinical researchers within that area. Such information can help develop policies and interventions to strengthen clinical research capacities.

Medical and health research councils in low- and middle-income countries (LMICs) have recognised a lack of expertise in health economics, epidemiology, anthropology and health policies coupled with a shortage of staff with statistical, analytical and managerial skills. These limited capacities pose a serious challenge for the effective translation of clinical research questions, the development and implementation of comprehensive research proposals and the ability to oversee complex clinical research projects.

In the discussions and regional breakout sessions of this workshop held at the Academy of Medical Sciences in London, participants discussed key gaps and barriers to clinical research, notable successes, opportunities to address the gaps and barriers, and finally collaborations to improve clinical research in LMICs. Using the outcomes from these discussions, participants identified several key themes that could contribute to progress in this important field.

Gaps and barriers

Workshop participants identified a number of key gaps and barriers in clinical research capacity across the different regions of the world:

- It was noted that there is a wide variation in funding commitments and sustainability from different countries which makes planning more challenging.
- The allocation of funds and setting of research priorities in many LMICs was deemed disjointed with poor decision-making.
- The appraisal of research by policymakers and public awareness of these activities are not sufficient to strengthen clinical research capacity in many countries.
- Workshop participants also noted a lack of resources and capacity, including role models, key skills, grant governance, education, clear career paths and early recognition and nurturing of promising young scientists.
- Language skills and workload capacities were other key gaps and barriers which participants felt were currently hindering clinical research capacity across different regions.

Successes

Despite these challenges, workshop participants were able to identify a number of examples of successes and high-quality clinical research in LMICs:

- There have been a significant number of networks established between and within countries, with regional networks having particular success.

- In certain countries, governments have committed and delivered a high portion of their gross domestic product (GDP) into research and development, bringing substantial benefits to the research community.
- Some world-renowned scientists have had a positive impact in encouraging young people to enter the field of clinical research and in demonstrating its benefits to society.
- Participants also noted examples of substantial funding for, and initiatives designed to, strengthen clinical research across different regions.

Opportunities

There are many opportunities to further strengthen clinical research in LMICs and to address some of the gaps and barriers identified by workshop participants:

- Career pathways in clinical research could be formalised, and incentives could be created to reduce the likelihood of the best scientists emigrating.
- Participants felt that recognising the potential of young scientists, and promoting the practice of clinical research early on in the course of professional training could help to attract good students into research.
- They also recognised that more should be done to introduce young scientists to the many stakeholders who have an interest or involvement in clinical research, and stressed the importance of maintaining strong communication with those sectors and with the public.

Collaborations and the role of national academies

The workshop concluded with discussions on opportunities for further collaboration between institutions and individuals:

- This included utilising the organisational structures of centres of excellence in LMICs.
- Mentorships, internships and institutional twinning were seen as key opportunities to effectively collaborate and strengthen clinical research across regions.
- Academies may be able to help by identifying regional funding opportunities, and by promoting networks through which local stakeholders could become increasingly engaged with clinical research.

Conclusions

Workshop participants quoted several examples of ways in which LMICs have successfully managed to promote and support their clinical research workforce. These complemented the discussions and highlighted key points and strategies that are needed for developing strong clinical research capacity in LMICs, including:

- Improved clinical research mentoring opportunities, both institutionally and individually.
- Academy networks that can offer learning and support opportunities.
- Support for LMICs to define their own clinical research agendas.
- Strengthened national and regional networks.
- Increased health research funding from national governments as well as from international donors.
- Advocacy and research diplomacy to demonstrate the impact of clinical research.
- Improved career pathways for clinical researchers in LMICs.

In order to make this possible, funding should be made available to map clinical research capacity and its environment, rather than simply determining the current state of research capacity. This would allow investigations into existing programmes and reveal where the gaps lie so that investment can be directed into delivering the correct solutions.

1. World Health Organization (2004), Geneva. World report on knowledge for better health: strengthening health systems.

2. Thiers FA, Sinskey AJ & Berndt ER (2008). Trends in the globalization of clinical trials. Nature Reviews Drug Discovery **7,** 13–14.

The workshop brought together representatives from 25 different countries to discuss clinical research in LMICs

Introduction

A wide range of skilled individuals is critical to create clinical research and knowledge, and to serve as a link between knowledge gained and new approaches to improve health. In order to understand the challenges and opportunities facing those engaged in clinical research in LMICs, it is necessary to recognise the existing capabilities and capacities of trained and active clinical researchers within a country or geographic region. This information can be used to identify needs and help to develop policies and interventions to strengthen clinical research capacities, with the ultimate aim of improving health.

Medical and health research councils in LMICs have noted that there is a particular need for expertise in health economics, epidemiology, anthropology and health policy.[3] This is coupled with a huge unmet demand for staff with statistical, analytical and managerial skills. Limited capacities in these areas reduce the ability to translate questions asked by policymakers into clinical research questions with appropriate methodologies. The absence of these skills also limits the ability to develop comprehensive research proposals, to oversee complex clinical research projects and to translate evidence and innovation into policy. These skills are also relevant to functions that need to be upgraded within national health systems such as disease surveillance, health and management information systems, quality assurance activities or vital registration systems.[4]

3. Sadana R, et al. (2004). Importance of health research in South Asia. British Medical Journal **328,** 826-830.
4. World Health Organization (2004), Geneva. World report on knowledge for better health: strengthening health systems.

It is critically important to find ways to strengthen existing clinical research capacities, and where necessary to build up new capacities, in LMICs. These competences should be tailored to each country, taking stock of evaluations of clinical capacity-building approaches from other countries.

The main objectives of this workshop, held jointly by the Academy of Medical Sciences and the InterAcademy Partnership for Health, were to define clinical research capacity in LMICs, consider the full extent of the gaps in this capacity and to encourage cross-country/region/continent knowledge sharing on solutions to fill these gaps. To achieve this, our aims were as follows:

- Bring together evidence from Africa, Asia, the Americas and the UK on the current 'state of play' for the capacity of clinical researchers in LMICs.
- Consider how countries currently respond to their clinical research capacity gaps, by discussing key challenges and barriers to having an adequate supply of suitably trained clinical researchers with appropriate resources and academic connections.
- On the basis of the evidence, suggest solutions that can be taken forward at a country and regional level for each of the identified gaps.
- Outline ways to develop the careers and skills pipeline of future leaders.
- Consider lessons that can be learned from each country and region.

This report sets out a summary of the themes that emerged during workshop discussions, including key knowledge gaps identified by the participants that could provide an outline agenda for future research. It should be noted that this document reflects the views expressed by participants at the meeting and does not represent the views of all participants or of the Academy of Medical Sciences.

The workshop was funded by the UK Government's Global Challenges Research Fund and was one of a series of policy workshops co-organised by the Academy of Medical Sciences that aim to:

- Enable partners (primarily national academies) in Official Development Assistance (ODA) eligible countries to consider how scientific evidence can help address key global health challenges.
- Build capacity in ODA countries for the provision of scientific advice.

Further information and reports from the programme of workshops can be found on the Academy of Medical Sciences' website.[5]

5. www.acmedsci.ac.uk/GCRF

Gaps and barriers

Wide variation in funding commitments and sustainability

Appropriate investment is a fundamental condition for a skilled workforce and good research. Workshop participants noted that there are different benchmarks for the proportion of national GDP that should be spent on clinical research across geographical regions. There was agreement that not all countries meet these benchmarks owing to a lack of political commitment, and that there is great disparity between LMICs: many fall far short of any benchmarks, while some actually exceed their spending targets. This disparity is also seen in the number of full-time equivalent researchers per million people. Participants also noted that more developed LMICs such as China and India are performing far beyond set targets and have displayed marked improvements in recent years.

Workshop participants observed that funding commitments typically fail to provide long-term research investment. With funding allocation typically based on short-term goals and with programmes often being dropped, the research base is left unstable and researchers are unable to sustain their work. The effects of the crisis in public health research in South America were highlighted as examples of the result of underfunding.

Funding allocation and the setting of research priorities

According to participants, an effective research strategy in a country requires the identification of national and regionally coordinated research priorities matched by sustained and adequate funding. However, it is widely recognised that there are major gaps in the alignment of strategy and funding. It was noted by some participants that influence from the private sector is seen as a major obstacle to this, particularly as governments often allocate funding to areas that resonate with the interests of the private sector to encourage their support and bring further investment. Nevertheless many examples of productive partnerships between government and the private sector were also recognised.

The lack of coordination of priorities often leads to the setting of research objectives that do not directly match the needs of the country, with the research agenda instead being set externally by high-income countries and focusing on profitable research such as drug and product development. These arrangements may contribute to certain diseases and conditions being neglected.

Private sector funding can, and sometimes does, contribute to research capacity. However, some participants reported a perception that it has become a particular threat in Africa where hospitals and universities are run for profit that then goes to shareholders rather than research.

Appraisal of research by policymakers and public awareness

Participants agreed that the engagement of scientists with governments in order to raise awareness and advocate for policies supporting clinical research is a key step to addressing many of the issues faced by the community. However, they noted that training and structures are needed on how to communicate with policymakers, and that very few scientists know how to approach the issue. This should be seen as an essential component of training for those embarking on a research career.

Grant governance and management

Workshop participants highlighted that even where funding is available, its effective use is often hindered by the weak capacity in grant writing and management in LMICs. These processes are commonly inefficient or ineffective because the necessary training and support are unavailable in many institutions. For instance, large grants often require multinational partners representing both developed and developing nations to complete the application process. Successfully doing so requires experience, supervision and established collaborations that are commonly unavailable in LMICs.

Key skills, quality and capacity

Strong clinical research requires not only well-trained scientists, clinicians and grant managers but also personnel equipped with key skills such as ethics, statistics, and data management. Participants noted that the availability of experts in these areas within clinical research in LMICs is commonly very limited or missing entirely.

Another area of great concern is the extent to which professionals are specialised in particular areas. Participants strongly agreed that research networks would be better served if doctors and nurses were also trained in the cross-cutting methodologies that underlie research, so that their skills could be applied to design and run studies of all kinds, qualitative and quantitative, in a broad range of topics.

The large disparity between the most and least developed LMICs has resulted in significant differences in terms of skills, quality and capacity. For example, Asia includes some of the wealthiest (China and India) and poorest countries (Nepal) in the world. Strategies for promoting research capacity must be as context-specific as possible.

Education and the lack of a clear career path

Workshop participants recognised that clinical research needs to be built into education and training considerably earlier than it is in the current system, to help nurture a culture where clinical research is valued highly. However, there is uncertainty about when is the best time in an individual's career for clinical research training. In addition, many groups of health professionals are not fully aware of the career pathways available to clinical researchers or the skills they require, which can potentially discourage research careers. Primary and secondary education need to include a better understanding of 'research' within their science curricula. Through doing simple health-oriented research schools and pupils can be exposed to attractive, engaging and affordable learning, and it can also introduce them to inspirational researchers as role models.

This issue is amplified by the lack of clear career pathways and opportunities for career development within researchers' countries. As training opportunities arise abroad, many researchers leave their countries and while this can build a skilled research workforce if they return, there is a risk that they remain abroad and exacerbate the brain drain from LMICs. A suggestion was made by some participants to include 'experimental medicine' as a medical speciality in countries where it does not currently exist. Resident and other training programmes in experimental medicine could then be created.

For example, in Africa, the increasing availability of high-quality PhD programmes was recognised as a strength, but moving beyond a PhD is problematic. This is particularly damaging for non-clinicians who become tied to laboratories and are unable to develop individual projects or provide clinical teaching. The roles for postdoctoral non-clinical scientists are typically as project-serving 'super technologists' rather than as scientists who define the research questions and strategies, and apply for competitive grant funding. The absence of national and institutional research funds means that many academics with 'research' in their job description actually do very little research; moreover, they are commonly burdened with high teaching and administrative loads.

Workload and overlapping activities

A strong research culture is fundamental for developing working conditions that promote clinical research. However, participants noted that many researchers have limited capacity to undertake research owing to demands from teaching or clinical practice. Access to patient populations is a key problem for researchers who do not practice in clinics directly, as it is commonly only granted to staff in service roles.

Lack of role models

Inspirational researchers and career stories play an important role in encouraging young people to pursue a career in research. However, it was widely agreed that examples of success and role models demonstrating the benefits and impact science can have are rarely presented. It was recognised that there is a strong need for mentors and role models which trainees can gravitate towards. Clinical trainees should interact with clinical researchers within their country but mentorship programmes are largely absent and need to be formalised. There are considerable difficulties in accomplishing this due to the lack of clear career pathways into clinical service or research.

For example, in South America, the lack of role models is particularly felt within universities where many well-known clinicians favour working in the private sector due to the higher financial rewards involved.

Lack of recognition

The feeling of ownership over one's own research is recognised as an important condition for the motivation and engagement of researchers. Much research from smaller countries is not recognised internationally, which may be due to low methodological quality, publication in low-impact journals or not being part of international collaborations. While partnerships can be highly beneficial for the publication of research in high-impact journals, it is important to be aware that shared authorship can reduce the sense of ownership of the work, especially for smaller partners.

The lack of recognition of the importance of some areas in health research was also seen as a barrier to good clinical research. There is a great and necessary emphasis on infectious diseases in many LMICs, but this focus should not be at the expense of other important areas requiring research, such as malnutrition, accidents, mental health and non-communicable diseases.

Language and geography

The mobility of researchers plays a key role in the establishment of research collaborations and in the development of beneficial projects. African participants noted that it is often easier for people to travel to Europe than to another African country, owing to geographical barriers and the greater availability of south-north than east-west travel services within the continent.

Participants recognised that language differences can also be a barrier when working between Anglophone, Francophone and Lusophone countries. Encouraging frontline health workers to go into research is already very challenging, and requiring them to do so in English can create an insurmountable barrier to research capacity training. Training materials in languages other than English are scarce and donors are rarely willing to provide funding for translations into other languages.

Participants from across Africa discussed and agreed on potential solutions to strengthen clinical research in their countries

Successes

Networks

Thriving networks and research groups are a major success of the clinical research community across the globe. Regional networks seem to be performing particularly well. In South Africa, researchers have been able to participate in major networks within the region, creating a regional model where grants are acquired from developed countries and funds are sent to multiple hubs in developing countries, encouraging trainees from these regions to come to South Africa for higher degrees such as PhDs and helping to establish collaborations between institutions.[6]

The INDEPTH Resource & Training Centre Network in Africa has been effective in building capacity and supporting routes into careers in both basic and clinical investigative research.[7] Participants heard about the European and Developing Countries Clinical Trials Partnership's (EDCTP) considerable success in building research capacity in clinical trials in Africa through the support of networks of excellence. Many networks are also being formed between national academies within continents such as the Inter-American Network of Academies of Science (IANAS), the African Academy of Sciences (AAS) and the National Academy of Sciences (NAS).

Political commitment

In certain countries, governments have committed and delivered a high portion of their GDP into research and development, bringing substantial benefits to the research community. In Mongolia, the government has already pledged two per cent of GDP to research, with Malaysia promising to do the same.[8]

A particular success in South Africa is the Research Chairs Initiative[9], a programme in which the government commits to an initial five-year period of support for a research leader that is renewable up to a total of 15 years. This shows a high level of commitment by government and encourages researchers to remain working in the region or to return from abroad.

Inspiration

Some world-renowned scientists have had a positive impact in encouraging young people to enter the field of clinical research and to demonstrate its benefits to society. Chinese researcher Youyou Tu, who received the Nobel Prize for the discovery of artemisinin in 2015[10], has helped inspire a new generation to go into clinical research.

6. Mandala WL, et al. (2014). Southern Africa consortium for research excellence (SACORE): successes and challenges. The Lancet. Global Health, **2(12)**:e691-2. doi: 10.1016/S2214-109X(14)70321-3.
7. http://www.indepth-network.org/
8. UNESCO (2015). UNESCO Science Report: Towards 2030, 680.
9. http://www.nrf.ac.za/division/rcce/instruments/research-chairs
10. https://www.nobelprize.org/nobel_prizes/medicine/laureates/2015/tu-bio.html

Local discoveries can also serve as encouragement for embarking on research careers. In the Philippines, the discovery of Conus peptides, components of snail venoms that could be used as a potential alternative to analgesic drugs,[11] has promoted the value of exploring local knowledge within research programmes. The discovery of such important peptides also illustrates the importance of biodiversity.

Funding and initiatives

Participants were able to describe a number of successful funding initiatives for clinical research in LMICs. An example of a success story in South America comes from Brazil's national science and technology agencies' support for certain undergraduate training programmes. Another example is the increased funding commitment in Peru from the National Council for Science, Technology and Technological Innovation (CONCYTEC).

In Africa, an increase in funding for research in some countries has helped to strengthen research capacity in many regions. The Wellcome Trust's Major Overseas Programmes are dedicated to capacity building. The EDCTP is a further example of the delivery of capacity development through networks of excellence, fellowships and trial grants. Smaller initiatives include the fellowship and researcher development programmes of the Africa Research Excellence Fund.

Novel funding strategies of matched funding, such as the Newton Fund, where national governments commit to provide funding to the same value as external grant-making bodies, are also being used to great effect.

11. Olivera BM (2006). Conus peptides: biodiversity-based discovery and exogenomics. Journal of Biological Chemistry **281(42),** 31173-31177.
12. http://www.cienciasemfronteiras.gov.br/web/csf

Opportunities

Career pathways

Participants highlighted that career pathways in clinical research need to be formalised and incentivised within countries to help encourage professionals to pursue research and avoid experts leaving to work abroad.

Designing undergraduate curricula which contain research modules can provide a mechanism to encourage young clinicians to enter research, cultivate research skills early on in their careers, and help establish a strong culture around the practice of high-quality research. There was widespread agreement that the establishment of MD-PhD programmes is seen as a particularly good path to engage young physicians in clinical research.

In addition, training healthcare workers in the principles of research can play an important role in opening up the field and encouraging new career avenues into research.

Recognising potential scientists

An important part of building career pathways comes from recognising the potential of young scientists and promoting the practice of clinical research early on. By making research a standardised component of undergraduate training, a new cohort of researchers could be cultivated from an early stage, encouraging the development of research networks. Promising qualified clinical researchers need to be identified and nurtured from the start of their careers by providing encouragement, mentorship and funding that enable them to move forward within their profession.

Recognising areas of research beyond the emphasis on infectious diseases was seen as a key mechanism for this, particularly in areas of other health challenges such as mental health and non-communicable diseases.

Public and patient engagement

In order to increase recognition of the value of research, there should be greater engagement and communication with all stakeholders involved in clinical research, including the public. Participants discussed the increase in involvement of the public in research (i.e. participatory medicine) as a promising strategy to promote the support of clinical research and strengthen it.

It was widely agreed that academies need to play a greater role in advocating for the benefit of research to their countries, using their neutrality and respect to advise and educate policymakers.

Biodiversity and sustainable development

Participants suggested that embracing the sustainable use of biodiversity could demonstrate the benefits of research to local communities and bring further benefits to clinical research. It could also offer a platform to promote respect for diverse resources and their protection for future generations.

Traditional medicine and natural products

Asian participants discussed the value in studying and re-evaluating the contributions of traditional medicine and natural products, such as those developed in the evolution of Chinese medicine. Meanwhile, African participants noted that it is necessary to enhance public understanding of the complementary values of traditional and modern medicine, as barriers to communication between these areas prevent effective research into their contributions to health care.

Language

While English is commonly accepted as the universal language of science, it was noted that addressing and overcoming any potential linguistic barriers can further research capacity and collaborations. Participants agreed that a large number of French-speaking researchers would welcome meetings in English accompanied by a Francophone 'buddy', a scientist who is comfortable in both languages and who can provide support, especially when healthcare workers and other stakeholders are involved.

National academies are well placed to provide support in this area by funding and making translations available. This will ensure that grant applications and research protocols can be fully understood and that they comply with published instructions and requirements.

Collaborations and the role of national academies

Through centres of excellence

Creating centres of excellence within regions is aiding research by bringing people together, building capacity, fundraising, and, more importantly, developing and transferring technologies to the setting of LMICs.

Centres of centralised ethics that have been developed in some countries may provide valuable models of organisational structures that can be established in LMICs. In return, developed countries can learn a great amount from the ethical experiences of LMICs. These collaborations can be applied to a variety of challenges such as obtaining informed consent, demonstrating the clear impact of clinical research, and tracking the deployment of funds. A coordinated approach that applies ethical principles to all aspects of the research process, can improve research strategies, procurement and management of funds, as well as the professional development of staff.

Through mentorships, internships and institutional twinning

Workshop participants highlighted their opinion that the provision of mentorships and internships within the clinical research field will help to encourage a greater interdisciplinary approach as well as providing more resources for early career cohorts.

The twinning of institutions could boost the linking of areas and offer great benefit to young researchers both in the UK and overseas. It could also serve to improve the implementation and sharing of good practices in clinical research.

Participants expressed the view that academies could consider promoting twinning programmes to help build a network across institutions, with the added benefit of allowing young researchers from the UK to work alongside those overseas. This suggestion could also work across specialities and bring both funding and expertise. Participants also suggested that organising programmes of 'young members' within the academies could greatly facilitate the interactions and networks among academies from different countries.

Provision of regional funding

Participants agreed that academies are best suited to help connect researchers within their regions by providing funding opportunities. For example, bodies such as the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) could be used to foster collaborations and create partnerships within regions.

There are also opportunities via bilateral (i.e. the Newton Fund[13] and the Wellcome Trust) and multilateral (i.e. the Global Challenges Research Fund[14] and the EU) schemes, alongside larger programmes such as Horizon 2020[15] and Framework 9 or other intergovernmental agreements.

13. http://www.newtonfund.ac.uk/
14. http://www.rcuk.ac.uk/funding/gcrf/
15. https://ec.europa.eu/programmes/horizon2020/

Participants argued that funding must be made available to map clinical research capacity and its environment, rather than simply determining the current state of research capacity. This would allow investigations into existing programmes and reveal where the gaps lie so that investment can be directed into delivering the correct solutions.

It was also suggested that funding opportunities need to be promoted more widely within the community and that the Global Health Network[16] may be best suited for this. Having all opportunities together, along with training materials with guidance on writing applications, would prove to be a practical and useful tool. It was confirmed that this information is already available on the Global Health Network but could be disseminated further through partnerships with fundraisers.

Establishment of networks and stakeholder engagement

It was agreed that beyond funding, academies can use existing regional networks more, and use them to bring researchers and programme managers together. This would promote research without the interference of underlying political motives and facilitate collaboration between institutions and investigators.

Research training centres allow countries to work together and prepare those providing training with the best knowledge and materials. For example, the WHO Special Programme for Research and Training in Tropical Diseases (TDR) enables trainers to return to their countries and incorporate what they have learnt into the curriculum. Establishing links between universities, as is currently done in South Africa, can help in the development of these programmes. In addition, The World Academy of Sciences (TWAS) has equivalent schemes where visiting fellows or professionals can spend time in an LMIC to assist in building curricula.

National academies are also seen to be in a strong position to influence national policies through existing links with government and policymakers. Strengthening their capacity to provide scientific advice to policy professionals would bring added benefits.

Publications

There was agreement in the group that more work needs to be done in terms of publishing and ensuring that good quality journals are available. 'Predatory journals' that offer easy publication for a fee are a risk, particularly to young researchers who need to increase their number of published papers but are not yet able to discern between journals of high and low quality. Research training programmes should include advice on how to assess journals and distinguish between those that are beneficial to publish in and those that are not.

Given the current emphasis on the number of papers published by each scientist, predatory journals have held an advantage, and combatting this issue is something that needs to be addressed by all countries. TWAS and UNESCO both publish lists of these journals already, but it was agreed that information and knowledge needs to be shared more widely as many participants were not aware of these lists.

The requirement for the publishing of datasets was raised as a barrier for researchers in the production of new analyses as many are reluctant to hand over their data. It was agreed that datasets should be divulged at an institutional level to maintain some control over the data whilst still promoting beneficial collaborations.

In the Asia Pacific region, the Asia Pacific Association of Medical Journal Editors has helped to create an index database of medical and health journals, to improve the quality of publications.[17] By working together, these editors have helped to promote publications, showing how countries can collaborate in specific groups. A similar network exists in Africa and it was agreed that a regional medical index for all regions would prove useful.

In addition, it was noted that there is a need for high-quality regional journals to recognise the value of papers reporting impactful regional research, as these tend not to be accepted in international publications.

16. https://tghn.org/
17. http://www.wprim.org/

Conclusions

The workshop identified several barriers and challenges encountered by LMICs when they seek to develop an adequate supply of clinical researchers and supporting experts. Many of the issues are centred on the lack of clear career pathways, insufficient mentoring and scarcity of role models for clinical researchers; equally problematic are the concerns over how to acquire sustainable funding that matches the country's needs, and how to build support structures for grant management and governance.

Workshop participants quoted several examples of ways in which LMICs have successfully managed to promote and support their clinical research workforce. These complemented the discussions and highlighted key points and strategies that are needed for developing strong clinical research capacity in LMICs, including:

- Improved clinical research mentoring opportunities, both institutionally and individually.
- Academy networks that can offer learning and support opportunities.
- Support for LMICs to define their own clinical research agendas.
- Strengthened national and regional networks.
- Increased health research funding from national governments as well as from international donors.
- Advocacy and research diplomacy to demonstrate the impact of clinical research.
- Improved career pathways for clinical researchers in LMICs.

In order to make this possible, funding should be made available to map clinical research capacity and its environment, rather than simply determining the current state of research capacity. This would allow investigations into existing programmes and reveal where the gaps lie so that investment can be directed into delivering the correct solutions.

The identified next steps outline the important role that can be played by building stronger collaborations between institutions, countries and regions, with national academies as a pivotal point of connection in establishing networks to strengthen clinical research capacity.

Annex 1: Workshop steering committee

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