

Low-cost innovation in healthcare: what you find depends on where you look

Matthew Harris¹, Yasser Bhatti^{1,2}, Matt Prime^{1,2}, Jacqueline del Castillo^{1,2} and Greg Parston¹

¹Centre for Health Policy, Institute of Global Health Innovation, Imperial College London, London W2 1NY, UK

²Health Innovation Exchange (Helix), Institute of Global Health Innovation, Imperial College London, London W2 1NY, UK

Corresponding author: Matthew Harris. Email: m.harris@imperial.ac.uk

This article is one of a series on health policy.

Insanity is doing the same thing over and over again and expecting different results (Albert Einstein)

Professional groups such as clinicians are homophilius¹ and so they tend to be drawn to the same knowledge sources. On the one hand, trusted knowledge networks are useful to ensure agreed-upon techniques and guidelines, but, on the other hand, these can become self-reinforcing, preventing the introduction of new ideas, technologies and solutions. There are some standout examples where remarkable healthcare innovations have arisen specifically from exploring very unusual knowledge sources. The success of the Aravind Eye Hospital in India² arose from applying the principles of mass production to ophthalmic surgery. The impressive innovation to improve telemetric patient monitoring in intensive care services in Birmingham Children's Hospital was the result of examining Formula One technology.³ Close examination of the airline industry and the exhaustive cockpit checks that are required before, during and after air travel led to the World Health Organization surgical safety checklist which has helped to prevent countless 'Never Events' (serious, preventable incidents) in pre- and post-operative care.⁴ Clearly, cross-fertilisation between industries is important to develop applications that reduce cost in healthcare.

Looking to other countries is also important. Frequently, low-income countries develop frugal innovations, where the need for low-cost models of care is critical and necessary. Low-cost innovations, such as the use of mosquito net mesh to repair hernias⁵ (see Box 1), the use of sterilisable bags to replace the need for expensive, sterilisable surgical equipment,⁶ mobile phone platforms to integrate decision-making support systems for community health workers⁷ and community health workers'

models of primary care,⁸ offer exciting potential to improve the efficiency, equity and cost of health systems in both low- and high-income countries alike.

To what extent do healthcare professionals and decision-makers look to other industries and other countries to find those innovative low-cost models of care that benefit the system without compromising on quality? Where do people on the frontline of healthcare look for innovative solutions to the clinical and organisational problems that they and their patients face? This is important, because what you find depends on where you look.⁹

The Global Diffusion of Healthcare Innovation study^{10,11} recently explored which are the dominant sources of ideas for Frontline Healthcare Workers in the health systems of six countries (USA, England, Brazil, Tanzania, Qatar and India).¹² The study drew on quantitative surveys of more than 1350 Frontline Healthcare Workers and asked them where, in terms of industry, media and country, did their main idea to improve clinical practice in their health system in the last 12 months come from. The study found that the majority of Frontline Healthcare Workers (ranging from 91% in India to 82% in the US) stated that their ideas to improve healthcare practice or delivery were derived from their own clinical specialty. Only 5% of Frontline Healthcare Workers report that their idea was influenced by sectors unrelated to healthcare. Only 11% of Frontline Healthcare Workers reported that their ideas were influenced by practice in other countries, although higher proportions do so in Brazil (18%), Tanzania (12%) and, to a lesser extent, India (10%). Organisations that have the useful function of curating under-the-radar innovations from around the world (such as the Center for Health Market Innovations, the US Commonwealth Fund, in India the Centre for Innovations in Public Systems, in England the NHS

Health and Care Innovation Expo) were noted by only 10%.

The Global Diffusion of Healthcare Innovation study also asked respondents which three countries

Box 1. Mosquito mesh for hernia repair and Operation Hernia.

Operation Hernia is an independent, not-for-profit organisation founded in 2005. It provides professional and educational opportunities for surgeons and trainees to treat long-standing groin hernias at hospitals in rural areas in Africa and the developing world. It aims to provide high-quality surgery at minimal costs to patients with limited means. By using mosquito netting instead of traditional surgical netting in groin hernia repair surgery, Operation Hernia is able to lower the costs of surgery dramatically – mosquito netting is 4000 times cheaper and has been shown to be just as effective. In a double-blind randomised controlled trial with 302 patients, absolute risk difference for recurrence and post-operative complications were insignificant comparing mosquito mesh to standard mesh (0.7 percentage points; 95% confidence interval, -1.2 to 2.6; $p = 1.0$ and 1.0 percentage point; 95% confidence interval, -9.5 to 11.6; $p = 1.0$, respectively).⁵ Operation Hernia carries out surgeries at the Hernia Treatment Centre at Takoradi Hospital in Ghana. Teams of surgeons visit several times each year to operate on 50 – 100 patients. The Hernia Treatment Centre now employs one local surgeon, two nurses, one laboratory technician and one pharmacy staff member full-time. Operation Hernia is now working on several other sites in Rwanda and Ghana, with a target of providing better hernia treatment in the rural areas of Africa.

are most important as a source of useful ideas for their healthcare system. The USA and UK rank as the two most important sources of innovation across the six countries studied, with two-thirds of Frontline Healthcare Workers mentioning the USA and almost half mentioning England or the countries of the UK. Beyond these two countries, Canada (23%), Germany (20%), India (16%), France (13%) and Australia (12%) are the highest ranked. However, there were significant differences in the patterns between country-level responses, with healthcare workers from the UK tending to focus on high-income, OECD countries (Figure 1) and healthcare workers from Tanzania demonstrating a far richer diversity of influential sources (Figure 2).

The findings from this study set a benchmark but there are clear tendencies and trends, first that Frontline Healthcare Workers are not looking far afield, and are not being influenced by sources beyond their own intellectual and physical locale, but also that there are only a handful of countries, predictably perhaps, that are noted to be influential. It is unlikely that connections will be made between the diverse perspectives of different disciplines, and some contexts are perhaps discounted too early on. Little is known about what drives Frontline Healthcare Workers to consider knowledge from one context or industry to be relevant or useful, but certainly low- and middle-income countries are not an influential source in the developed economies that were included in this study. Perhaps this is a missed opportunity?

Figure 1. Countries most frequently cited as useful sources of innovation by Frontline Healthcare Workers in the United Kingdom (reproduced with permission from the Global Diffusion of Healthcare Innovation report 2016).

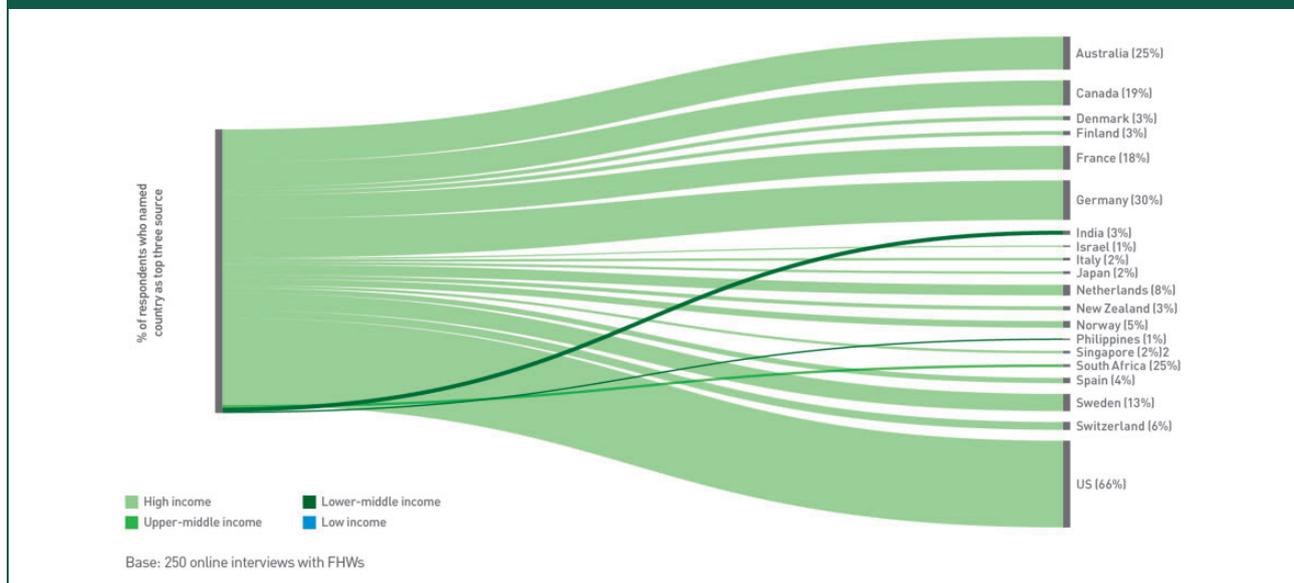
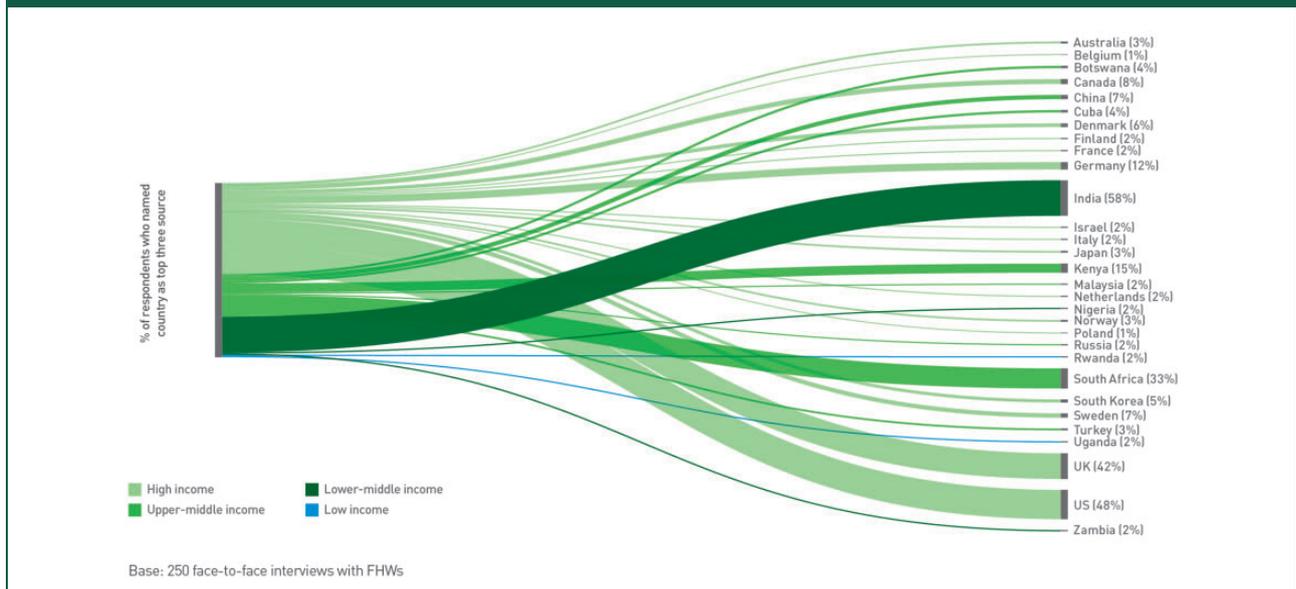


Figure 2. Countries most frequently cited as useful sources of innovation by Frontline Healthcare Workers in Tanzania (reproduced with permission from the Global Diffusion of Healthcare Innovation report 2016).



This focus on the demand or ‘pull’ for innovation, rather than the supply of innovation, is a novel perspective for the literature about diffusion of innovation, which traditionally emphasises how to ‘push’ innovations out into wider practice. However, if we do not understand clinicians’ appetite for knowledge and what constitutes legitimate sources of new knowledge, then we will not understand how to leverage new innovation from new sources.

Making connections and looking beyond one’s usual sphere of influence, wherever it may be from, is important to identify and capture the opportunities of low-cost innovation for the benefit of improved patient experience and improved quality of care. Reverse innovation occurs when models of care, technologies, procedures and products, developed by and for low- and middle-income countries, are implemented in high-income country health systems and, albeit a term that can appear paradoxical,¹³ challenges the assumption that high-income countries are best at innovating. Low- and middle-income countries can offer high-income countries simple and cost-effective, but potentially disruptive, healthcare delivery models and technologies for better health outcomes. In any country where resources are scarce, leaner, more efficient models are needed, wherever they are from. Sectors unrelated to healthcare, such as retail or transportation industries, can provide comparable lessons for improved management of healthcare supply and patient safety.

Health workers and leaders should welcome unusual sources of innovation. However, searching

is time-consuming. A critical enabler to finding low-cost innovation is the extent to which clinicians and health policy-makers are able to, or have the tendency to, look further afield than their own specific area of expertise or trusted knowledge network. How do people do things in other hospitals, other regions, other countries and other industries? New knowledge, new techniques, new ideas and new processes will be generated by not looking at usual sources. Important strategies for healthcare organisations include: first, to develop and communicate a strategy for innovation, including sourcing, where healthcare workers are encouraged to look as far afield as possible for inspiration. Second, to purposefully draw on the services of organisations that offer an innovation curator service (such as the Center for Health Market Innovations, the US Commonwealth Fund, in India the Centre for Innovations in Public Systems, in England the NHS Health and Care Innovation Expo) collating case studies of innovations from a diverse array of industries and countries and serving as valuable repositories of information of under-the-radar technologies and solutions. Third, to develop international health partnerships with hospitals and other clinical services in low- and middle-income countries and beyond. These partnerships should ensure that clinicians and managers are engaged in a genuine learning process with the partner organisation and actively seek to pilot innovations from other countries. Recent research has shown many benefits, particularly at the individual level, of international placements,¹⁴

but more work needs to be done to explicitly bring learning back to the UK and other high-income health systems.¹⁵ Finally, to address issues of clinical homophily, medical schools should consider education and training for innovative thinking, and to promote wider searching for innovation and deliberate lateral thinking.

Conclusion

In the UK, as in the USA, growing demands on care necessitate an open-mindedness to look to low-income countries as well as other industries. For the truly breakthrough opportunities in healthcare to emerge, Frontline Healthcare Workers will need to boldly go where they do not usually go to harness the power that linking disciplines or industry sectors has to create disruptive innovations.

Declarations

Competing Interests: None declared.

Funding: The authors acknowledge the Qatar Foundation for funding the Global Diffusion of Healthcare Innovation research programme.

Ethical approval: Not applicable.

Guarantor: MH.

Contributorship: MH wrote the first draft of the article; YB revised the article and made important intellectual contributions; MP revised the article and made important intellectual contributions; JDC revised the article and made important intellectual contributions; GP revised the article and made important intellectual contributions.

Acknowledgements: The authors are grateful to Prof. the Lord Ara Darzi for comments on an earlier draft.

Provenance: Not commissioned; peer-reviewed by Sondus Hassounah and Elizabeth Haworth.

References

1. Fitzgerald L, Ferlie E, Wood M and Hawkins C. Interlocking interactions. The diffusion of innovations in health care. *Hum Relat* 2002; 55: 1429–1449.
2. *Aravind Eye Care System*. See www.aravind.org (last checked 6 October 2017).
3. Birmingham Children's Hospital. *The RAPID (Real-Time Adaptive and Predictive Indicator of Deterioration) Project*. Birmingham, UK: BCH, 2015.
4. World Health Organization. *WHO Surgical Safety Checklist and Implementation Manual*. Geneva, Switzerland: WHO, 2008.
5. Lofgren J, Mordin P, Ibingira C, Matovu A, Galiwango E and Wladis A. A randomized trial of low-cost mesh in groin hernia repair. *N Engl J Med* 2016; 374: 146–153.
6. *Arbutus Drill Cover*. See <http://arbutusmedical.ca/> (last checked 6 October 2017).
7. *Medic Mobile*. See <https://medicmobile.org/> (last checked 6 October 2017).
8. Macinko J and Harris M. Brazil's Family Health Strategy – authors' reply. *N Engl J Med* 2015; 373: 1277–1278.
9. Heitmueller A, Bull A and Oh S. Looking in the wrong places: why traditional solutions to the diffusion of innovation will not work. *BMJ Innov* 2016; 2: 41–47.
10. Keown O, Parston G, Patel H, Rennie F, Saoud F, Al Kuwari H, et al. Lessons from eight countries on diffusing innovation in health care. *Health Aff* 2014; 33: 1516–1522.
11. Parston G, McQueen J, Patel H, Keown O, Fontana G, Al Kuwari H, et al. The science and art of delivery: accelerating the diffusion of healthcare innovation. *Health Aff* 2015; 34: 2160–2166.
12. Harris M, Bhatti Y, Prime M, del Castillo J, Parston G and Darzi A. *Global Diffusion of Healthcare Innovation: Making the Connections*. Doha, Qatar: World Innovation Summit for Health, 2016.
13. Harris M, Weisberger E, Silver D, Dadwal V and Macinko J. 'That's not how the learning works' – the paradox of Reverse Innovation: a qualitative study. *Global Health* 2016; 12: 36.
14. Kelly E, Doyle V, Weakliam D and Schonemann Y. A rapid evidence review on the effectiveness of institutional health partnerships. *Global Health* 2015; 11: 48.
15. Kulabasanthan K, Issa H, Bhatti Y, Prime M, Quinn M, del Castillo J, et al. Do international health partnerships contribute to reverse innovation? A mixed methods study of THET-supported partnerships. *Global Health* 2017; 13: 25.