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# Shaping global health

## The indispensable role of biomedical engineers

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# Shaping global health: The indispensable role of biomedical engineers

**Tim Horeman[1], Dhananjaya Sharma[2] and Michael Cotton[3]**

Modern medical science stands at the crossroads of technology, precision and innovation. An enormous variety of technological marvels proliferate in modern medical practice, which many take for granted, such as ultrasound, CT and MRI imaging, portable sensors, implants of almost any part of the anatomy including skin, endoscopic contrivances of mind-blowing complexity, robotics, and an abundance of medication quite undreamt of just 50 years ago.

Behind the panoply of gadgetry available lies the expertise of biomedical engineers (BMEs), who design, refine, and maintain the tools that enable precision and patient safety. Partly due to its scientific and technical character, BMEs' contribution remains under-acknowledged, particularly in low- and middle-income countries (LMICs), where resource challenges add unique dimensions to their role.[1,2] Medical needs need technological solutions,[3] which need to be tailored to existing clinical realities.[4,5] The synergistic relationship between health professionals and BMEs thrives on mutual respect and understanding. A recent study has documented c.400 successful innovations.[6] such as affordable solar ventilators and anaemia testing kits,[7–9] the Jaipur Foot, a low-cost prosthesis,[10] hand-held ECG devices, gasless laparoscopic instruments, smartphone-based diagnostics, portable diabetes testing, low-cost 3D-printed casts, a 'Bilikit' neonatal jaundice test kit, satellite-based telemedicine in vernacular language for remote areas.[11,12] to name but a few.

Despite their contributions, BMEs remain under-appreciated in healthcare. This is due to several factors: (a) lack of direct patient interaction, (b) successes attributed to clinical teams whilst engineers remain in the background, principally because of marketing issues, (c) fragmented collaboration being often the norm and (d) geographical displacement as innovations may be adapted and implemented in a totally different area by a different team. Closing this gap requires structural changes in how we approach medical education, healthcare innovation, and professional acknowledgment.

Biomedical Engineering could be integrated into Medical Education.[13] This requires a hands-on exposure to medical environments,[14] with engineering students exposed to epidemiology, product design, economics, ethics, human-centred design, global health and community engagement.[7] Specifically directed grants, fellowships, and awards could help, thus prioritising interdisciplinary teams to tackle pressing healthcare challenges, particularly where funding for *non-glamorous* biomedical research remains modest.[15] Conferences, journals and professional societies could dedicate platforms to highlight the achievements of BMEs in healthcare.[16]

Solutions include; (a) building collaborative environments, in the form of field or living laboratories where engineers and clinicians can work side-by-side; encouraging collaboration between Global North and Global South[17–20] (b) inspiring young engineers to take up the challenge as 'Engineers without Borders'[7,21]

1. The key to improving healthcare equity by biomedical engineering lies in (i) improving diversity and equity in biomedical research; (ii) increasing research of under-investigated areas; and (iii) considering diverse communities in the research design process.[22]
2. Holding hackathons involving health professionals, BMEs, medical and engineering students to solve global health (GH) challenges and thinking up local affordable solutions is an attractive idea, especially for the younger generation.[23]
3. Harnessing the synergy between Western sustainability trends and frugal innovation is critical for the Global South. In regions where local collaborations are few owing to a limited presence and financial constraints, promoting the demand for context-specific, bare-minimum life-saving solutions can be transformative. Such innovations can secure alternative funding by demonstrating their profitability as financially sustainable alternatives in Western markets[24]
4. And finally, commercial and regulatory ecosystems, which are geared for big corporations from the Global North, must be modified for biomedical innovations for and from GH.

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## Conclusion

BMEs are more than just contributors to GH – they are enablers of transformative change and have been recognised as such by the World Health Organization. Their innovations have reshaped how diseases are diagnosed, treated, and managed, often in ways clinicians alone could not achieve. However, their contributions remain under-recognised in a system that prioritises visible patient-facing roles. For GH to advance equitably and sustainably, we must champion a culture that values and promotes interdisciplinary collaboration with BMEs. Elevating the partnership between BMEs and the health profession will not only enhance healthcare innovation but also ensure that solutions are inclusive, scalable, and efficacious. It is time to bring BMEs into the spotlight they have long deserved —not merely as the architects of medical technology but as equal partners in the global pursuit of health for all.

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