

FRUGAL INNOVATIONS: THE FUTURE OF AFFORDABLE HEALTH CARE

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This paper is available online at www.jprhc.in**ABSTRACT**

Frugal innovations are cost-conscious innovations developed to meet the needs in resource-poor settings, without compromising quality. While there have been various innovations in the field of health care in the past decades, there is a vast difference in the distribution and utilization of these innovations between developed and developing countries. Frugal innovations can play a potential role in bridging the gap between countries and ensure affordable health care for all.

KEYWORDS:

Frugal innovations; disruptive, reverse innovation; health care; affordability

Frugal innovations (Disruptive or Reverse innovation) are cost-conscious innovations specifically developed to meet the needs of the world's poorest people in the most resource-constrained settings without compromising effectiveness.^{1,2,3} These innovations often born out of dire needs are developed at grass-root level using home-grown or self-created technologies. Healthcare delivery system is increasingly becoming dependent on technology. Availability of health technology is inversely related to health need.⁴ There is a gross mismatch in the use of available health technologies including medical devices, between high-income and low-income countries. Globally 13% of the population account for 76% of global medical device use.⁴

The last few decades have seen multiple innovations in health and health-related sectors which has provided new treatment possibilities in developed countries. But the utilization of these innovations in low-resource countries is not satisfactory. The possible barriers to the utilization include, absence of necessary technology in low-resource settings, due to cost issues; inaccessibility of existing technology due to constraints in cost, distribution system, human resources and unreliable energy supply; and reluctance to adopt the accessible technology due to social and cultural factors.¹ According to World Health Organisation's (WHO) guidelines for health care equipment donations, in sub-Saharan Africa, upto 70% of the medical equipments stands idle due to non-suitability of these equipments in low-resource settings.⁴ The solution to this problem lies in encouraging frugal innovations. The new innovations should focus on four crucial components, namely the 4 A's- Availability, Accessibility, Appropriateness and Affordability.⁵ Innovations are basically divided into two categories: product innovation, relating to new objects using indigenous technologies, and process innovation, whereby new approaches are employed to enable a product to be effectively implemented and used. Examples of process innovations include six sigma concept used in health care, mass immunization programmes to improve herd immunity, pregnancy tracking for better provision of maternal and child health.¹

There have been various frugal innovations, which have revolutionized health care in the past few decades. The following are few examples.

- Jaipur foot, a rubber prosthetic for people who have lost their leg and foot below the knee, is one of the most famous frugal technologies.¹
- Oral rehydration therapy (ORT), which has played a major role in reducing infant and child deaths due to diarrhoea¹
- Use of oral misoprostol as a less effective alternative to oxytocin in post-partum haemorrhage, to overcome problems due to refrigeration requirements¹
- Fixed-dose combinations of Anti-retroviral drugs to improve treatment coverage for Acquired Immunodeficiency Syndrome (AIDS)¹
- eRanger, durable rural ambulance to meet medical transport in rural Africa¹
- Food fortification with Iodine and Iron to reduce the burden of these micronutrient deficiencies¹
- Biofortification, to produce staple crops rich in micronutrients¹
- Low cost sanitary toilets¹
- Ponseti method, initially employed in Malawi, due to lack of orthopaedic surgeons is now the gold standard treatment of club foot¹
- Firefly, a phototherapy device to treat neonatal jaundice is under trial in Philippines and Vietnam⁴
- Lullaby baby warmer, developed by General Electric's, to prevent hypothermia in neonates, provides direct heat in an open cradle⁴
- Low-cost bubble continuous positive airway pressure device (CPAP), developed by biomedical engineering students of Rice University, Texas⁴

- Shakerscope, a light source for clinical examination of eye, ear and throat, developed by two anaesthesiologists at Morrision Hospital, Swansea, United Kingdom. It provides enough electricity for 3 minutes on shaking for 30 seconds^{1,6}
- Smart medicine pack for Tuberculosis to ensure regular drug intake by patients, developed by Bill Thies, Microsoft Research India⁷

The future of frugal science is not without challenges. For successful outcomes, the innovations should arise from work in the field. The users could play the role of co-designers.² Better cooperation is needed between public and private sectors to improve access to affordable technologies in developing countries.¹ Regulation policies are required to protect users and their ethical rights. Use of aid-budgets, cross-subsidisation and micro-insurance policies can ensure continuous implementation of frugal technologies without financial constraints.¹ Future research based on frugal technologies should strive for development of rapid diagnostic tests, point-of-care tests for infectious diseases and self tests for chronic diseases; indigenous implants, stents and assistive devices; standard treatment guidelines algorithm specific for various levels to enable early diagnosis, early referral and reduce clinic visits and cost.¹ Innovations in health-related sectors are needed for better agricultural produce, better sanitation and road safety.¹ With the ubiquity of mobile telephones, m-Health has huge potential for collection of health-care information, provision of mobile diagnostic tests and encouragement of healthy behaviours.¹ Concluding, frugal innovations have an enormous potential to bridge the gap in health care availability and affordability between developed and developing countries.

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