Indian J Med Res 159, March & April, 2024, pp 259-262
DOI: 10.25259/ijmr_348_2024

Quick Response Code:

Editorial

Implementation science in health & the proverbial slip between the cup & the lips

Demonstrating 'what works' in disease prevention or clinical care for a defined health condition through experiments or insightful observation does not necessarily ensure their uptake by community groups, health systems or a country programme. One example, among many, is the work of Lind on the prevention of scurvy at a time when belief overpowered science. It took about 50 long years to change the professional as well as political opinion in favour of lemon juice among the authorities directing the naval service, and thus to the conquest of scurvy[1] in sailors as the British navy started providing lime juice to its ships. Non-uptake or inordinate delay in uptake of such innovations have been recorded in diverse socio-cultural and economic settings and takes place even today underlining why it is germane to study the science of implementation, which is complex and challenging. Until recently, biomedical scientists frequently sketched the process as a linear one, conceptualizing interventions through a series of stages starting from the laboratory, into the randomized trial environment, and then across real-world settings[2]. Metaphors like 'from test tubes to needle tip', 'pipeline', or 'bench to bedside' were used to reflect such process of translation. However, the path of translating evidence into action is indeed polymorphic and takes different shapes in different contexts, as does a river flowing through different countries with different landscapes. Analyzing contextual landscape and intervention nuances such as policy, organization, and system environment, conditions, resources, participant characteristics, *etc.*, therefore, remains critical to the practice of implementation science.

Dr Ignaz Semmelweis, in 1846, while working in Vienna General Hospital as a young obstetrician in his late twenties, recognized that over a tenth of the women were dying from puerperal fever while admitted to one of the two maternity clinics where male students were being trained to become doctors[3]. Surprisingly, such post-delivery deaths in women admitted to another maternity clinic in the same hospital where female students were being trained as nurses and midwives were strikingly low, less than half of what was encountered in the first clinic[3]. Critical examination of hospital records, of which Semmelweis was in charge, revealed this difference. By meticulously eliminating all possible differences between these two clinics, including cleaning of linen by different laundry contractors, it occurred to him (sparked by the death of his good friend Jakob Kolletschka, who got accidentally poked with a student's scalpel during a post-mortem examination) that the observed difference could be due to the doctors who were conducting autopsies[3]. The same doctors were also engaged in patient care without any intervening 'hand washing practice' in the first clinic. Important to note at this juncture is that women, as nurses and midwives, in those days, were not allowed in the Universities and could not gain a license to practice medicine[4] and consequently, being posted in the second clinic did not conduct autopsies.

Semmelweis sensed that doctors carried 'cadaverous particles' (germ theory was yet to come into existence) from the autopsy room to the women in labour they were attending to. By introducing chlorinated lime (to get rid of cadaveric particles and accompanying foul smell) for the physicians to wash their hands before attending to the women in labour in the first clinic in May 1847, Semmelweis could demonstrate a remarkable decline in the death rate in the clinic to two per cent by June[3]. In August the same year, for the first time, no one died of puerperal fever in the doctors' clinic[5]. All these were not sufficient for sustained uptake of hand washing by the physicians' community, who later actually dropped the practice. Semmelweis due to his insistence upon introducing hand-washing as part of hospital-based care protocol, was disliked by many, lost his job, was mocked, went into oblivion[6], and faced a torturous death at the age of forty-seven in a mental asylum in 1865. Recognition came much later to his 'seminal work'.

Fast forward to 2012; a multi-method study on hand hygiene (HH) in a state-of-the-art cancer hospital

in eastern India concluded that the availability of resources and prioritization of HH alone were not sufficient for HH compliance. Gaps were identified between perceived (>85%) and actual (>50%) HH compliance and knowledge. The study found that despite 82 per cent of the respondents knowing about proper HH moments, they did not act on it[7]. These findings indicated that resources, knowledge, and training might not be sufficient for improving HH and underscored the importance of addressing psychological barriers[7]. Close to this investigation, in Australia, an automated surveillance system with daily audit and feedback (peer comparison nudge) and a behavioural intervention component by asking staff to remind each other to take a moment for HH before entering patients' rooms (social norm and commitment nudge) was trialled in two wards in a tertiary teaching hospital[8]. Over seven months, HH in the medical ward, improved by one per cent, and that in the surgical ward improved by nine per cent; both, however, slid back to baseline when the verbal nudge was removed[8].

Nonetheless, laudable non-pharmacologic interventions, noteworthy discoveries at the bench-side and proof of clinical efficacy through randomized controlled trials (RCT) continue to generate expectations around 'health for all'. Concurrently, the question that looms large on the centre stage of discussion pertains to funding - *are we getting the value back for all the money spent?* By analyzing the value chain of different healthcare systems, one realizes that the fulfilment of expectations around 'health for all' would require characterizing and addressing challenges associated with multiple stakeholders - payers, producers and providers - at different layers (care delivery in public and private system) and different interfaces (communities and facilities). This requires novel approaches to data collection and analysis, ensuring that the adopted methodology matches the research question. Mixing methods, which are diverse yet coherent and flexible, thus becomes a key implementation research tool[9].

A recent investigation exemplifies how the question of under-utilization of oral rehydration salt (ORS) solution was addressed. It is estimated that ORS solution, a low cost, widely accessible and easy-to-administer intervention, has the potential to globally avert nearly 500,000 deaths in children each year[10]. Importantly, the role of ORS in saving lives was established over 50 years ago during the independence war of Bangladesh in 1971[11,12]; which the majority of healthcare providers in developing countries are aware of. Despite such development, why then today about half of the diarrhoea cases around the world do not receive ORS?[10]. To analyze this, 'know-do gap', investigators conducted an RCT involving 2000 providers in 253 medium-sized towns in the Indian States, Karnataka and Bihar[10]. The three leading explanations driving under-prescription of ORS: included *(i)* perception that patients do not want ORS, *(ii)* provider's financial incentive, and *(iii)* ORS stock-out. Assessment of these three issues was guided by the realization that solutions to overcome the barriers against ORS use would require understanding the driving forces behind under-prescription. The researchers concluded that the perceptions that patients do not want ORS explained 42 per cent of the under-prescription, whereas stock deficits and financial incentives explained only six and five per cent, respectively[10].

Identification of the enablers and barriers to adaptation and realizing how an adaptive system could fail[13] sit at the core of implementation research. Discussion about the expanse of implementation science, the steps involved in its practice and the importance of pre-intervention planning research are thus shaping this newly emerging field[14]. It is also obvious that effective networking between researchers, frontline field implementers and community groups, adoption of flexible and responsive research design, and ensuring earmarked funds remain crucial in this endeavour[15]. Evaluation in this evolving field of science necessitates creation of a space where rigour meets reality.

A noteworthy lesson on community engagement emerged from the rural outskirts of Vietnam in 1990. Jerry Sternin, in search of a practical and quickly implementable solution to malnutrition (as he was given only six months by the then foreign minister to make a difference), stumbled upon a few healthy children among a large number of malnourished kids in a local village; the macro-social milieu was equally disadvantageous for all with poor sanitation, poverty and inadequate supply of clean water[16]. This observation prompted Jerry and his team members to ponder 'Why bright spots were bright?'. While walking in the field, the bright-spot moms were found to feed their kids four small meals a day (the total amount being the same as with moms feeding two large size meals per day to their children), actively fed children, encouraged them to eat even when they were sick, and included sweet potato greens (although it was considered a low-class food), and mixed tiny shrimps and crabs collected from paddy field to their kids' rice (considered appropriate for adults but not for kids)[16].

These practices supplied children's food with much-needed protein and vitamins[16]. This observation helped develop an intervention programme in which mothers from the community assisted in organizing cooking classes where the participating families were required to bring sweet potato greens, shrimp and crabs. In modern-day discourses of implementation science, 'sensemaking' features as one where individuals and collectives give meaning to an experience that is somehow at odds with expectations to enable action; it is about giving structure to the unknown[17,18]. The field investigation in Vietnam captured one of the examples in this regard.

The efforts to find 'bright spots' are termed the 'positive deviance approach' (PDA). It reflects the observation that in most settings a few 'at-risk' individuals follow uncommon, beneficial practices and consequently experience better outcomes than their neighbours[19] who share a similar-risk environment. As early as the 1970s, policymakers used this concept to develop public health interventions and to scale them up beyond the field of nutrition, such as newborn care and pregnancy outcomes. The strength of PDA is that it uses locally available, effective and sustainable approaches, which facilitate three important processes namely – social mobilization, gathering of information, to craft intervention and behavioural change[20].

An example, similar to that from Vietnam, of volunteering by mothers from villages to run community-managed feeding and day care centres, called *Fulwari* (flower garden) to address the problem of malnutrition in children under three came from the Surguja district of Chhattisgarh, India in 2012. While volunteer mothers were taking care of the children at the centres, the rest of the mothers could go to work. The collaboration between the State Health Resource Centre (a non-government organization), the Government Department of Health and Family Welfare, and the *panchayats* (local village administration) of Sarguja under this initiative is worth recognizing. Kitchen gardens at the *Fulwaris* under this initiative were established using inputs from the Department of Horticulture. By the end of 2014, 2800 *Fulwaris* were functioning, reaching out to 35,000 children and 15,000 pregnant and lactating women in all 85 tribal blocks of Chattisgarh[21].

Lastly, a sub-speciality that merits consideration is emergency implementation science, relevant to time-limited single events (local outbreaks, earthquakes) or sustained and smouldering epidemics such as COVID-19[22] where decision-makers need to act upon incomplete information and implementation practitioners require facilitating change towards mitigation. Apart from examining regulatory issues, compassionate use, unmet medical needs in a pandemic situation[22] early, and active collaboration with programme officials and frontline implementers appear extremely critical in this context as we observed during the diarrhoeal disease outbreak investigation following tropical cyclone *aila*[23] and HIV outbreak investigation in the district of Unnao in north India[24]. Working with the district health officials and advocacy with the decision makers based on investigational findings succeeded in fostering changes in the desired direction in both these events; a change in prescription practices of physicians during the diarrhoeal disease outbreak and initiation of anti retroviral treatment centre along with community level intervention in the latter. However, the rapidity with which intervention nuances are reconstructed, and subsequently retained in real-world settings following an investigation, is guided by the tension between fast (heuristic) and slow (algorithmic) reasoning[25] at the individual, policy, programme and population level, the operative dynamics determining what and how much would slip between the cup and the lips.

Financial support & sponsorship**:** None.

Conflicts of Interest**:** None.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation**:** The authors confirm that there was no use of AI-assisted technology for assisting in the writing of the manuscript and no images were manipulated using AI.

Samiran Panda

Editor-In-Chief, Indian J Med Res & ICMR – Dr. A.S Paintal Distinguished, Scientist Chair, India

pandasamiran@gmail.com

Received April 19, 2024

References

1. Trohler U. Lind and Scurvy: 1747 to 1795. *J R Soc Med* 2005; *98* : 519-22.
2. Braithwaite J, Churruca K, Long JC, Ellis LA, Herkes J. When complexity science meets implementation science: A theoretical and empirical analysis of systems change. *BMC Medicine* 2018; *16* : 63.

3. Ataman AD, Vatanoğlu-Lutz EE, Yıldırım G. Medicine in stamps-Ignaz Semmelweis and Puerperal Fever. *J Turkish-German Gynecol Assoc* 2013; *14* : 35-9
4. Blumberg HM. Phantom Plague: How Tuberculosis Shaped History. *Emerg Infect Dis* 2023; *29* : 672-3.
5. Ellis H. Ignaz semmelweis: Tragic pioneer in the prevention of puerperal sepsis. *Br J Hosp Med (Lond)* 2008; *69* : 358.
6. Jay V. Ignaz Semmelweis and the conquest of puerperal sepsis. *Arch Pathol Lab Med* 1999; *123* : 561-2.
7. Dalen RV, Gombert K, Bhattacharya S, Datta SS. Mind the mind: Results of a hand-hygiene research in a state-of-the-art cancer hospital. *Indian J Med Microbiol* 2013; *31* : 280-2.
8. Kwok YL, Harris P, McLaws ML. Social cohesion: The missing factor required for a successful hand hygiene program. *Am J Infect Control* 2017; *45* : 222-7.
9. Rapport F, Braithwaite J. "Are we on the cusp of a fourth paradigm? Predicting the future for a new approach to methods-use in medical and health-services research". *BMC Med Res Methodology* 2018; *18* : 1-7.
10. Wagner Z, Mohanan M, Zutshi R, Mukherji A, Sood N. What drives poor quality of care for child diarrhoea? Experimental evidence from India. *Sci* 2024; *383* : eadj9986.
11. Mahalanabis D, Choudhuri AB, Bagchi NG, Bhattacharya AK, Simpson TW. Oral fluid therapy of cholera among Bangladesh refugees. *Johns Hopkins Med J* 1973; *132* : 197-205.
12. Fontaine O, Newton C. A revolution in the management of diarrhoea. *Bull World Health Organ* 2001; *79* : 471-2.
13. Cook RI, Render M, Woods DD. Gaps in the continuity of care and progress on patient safety. *BMJ* 2000; *320* :791-4.
14. Handley MA, Gorukanti A, Cattamanchi A. Strategies for implementing implementation science. *Emerj Med J* 2016; *3* : 660-4.
15. World Health Organization. *Implementation research in health: A practical guide*. Available from : *https://iris.who.int/bitstream/handle/10665/91758/9789241506212_eng.pdf?sequence=1*, accessed on April 15 2024.
16. Heath C, Heath D. *Switch: How to Change Things When Change Is Hard*. 1st ed. Random House Canada, Limited; 2010.
17. Aron DC, Leykum LK. Sensemaking: Appreciating patterns and coherence in complexity. In: Rapport F, Clay-Williams, Braithwaite J editors. *Implementation science: The key concepts*. 2022. p. 96-8.
18. Ancona D. Sensemaking: framing and acting in the unknown In: Snook S, Nohria N, Khurana R, editors.*The handbook for teaching leadership.* CA: Sage Publishing; 2012. p. 3-19.
19. Berggren WL, Wray JD. Positive deviant behaviour and nutrition education. *Food Nutr Bull* 2022; *23* : 9-10.
20. Marsh DR, Schroeder DG, Dearden KA, Sternin J, Sternin M. The power of positive deviance. *BMJ* 2004; *329* : 1177-9.
21. Poshan. International Food Policy Research Institute. *Panchayat-led nutrition and daycare centres – the fulwari scheme of Chattisgarh*. Available from: *https://www.ifpri.org/publication/panchayat-led-nutrition-and-daycare-centres-fulwari-scheme-chhattisgarh*, accessed on April 2, 2024.
22. Panda S. Looking back to move forward: A travel rule underlined by the current pandemic. *Indian J Public Health* 2022; *66* : 403-6
23. Panda S, Pati KK, Bhattacharya MK, Koley H, Pahari S, Nair GB. Rapid situation and response assessment of diarrhoea outbreak in a coastal district following AILA in India. *Indian J Med Res* 2011; *133* : 395-400.
24. Mane A, Kasibhatla, Vidhate P, Saxena V, Patil S, Rao A, *et al*. Phylogenetic analysis of the spread of hepatitis C virus identified during HIV outbreak investigation, Unnao, India. *Emerg Infect Dis* 2022; *28* : 725-33.
25. Kahneman D. Thinking: Fast and Slow. Farrar, Straus and Giroux (NY); 2011.