

Sustainability in Surgery: An Initiative by the Surgical Society of Bangalore



Bodela Sree Vidhya



Prem Kumar A.

Climate change is one of the most significant global threats to human health, with healthcare systems contributing substantially to environmental degradation. The health sector is responsible for approximately 4.6% of global greenhouse gas emissions, and surgical services are among the most resource-intensive components [1,2]. Operating theatres function as high-intensity clinical environments, characterised by continuous energy demand and dependence on disposable resources, making them a critical focus area for sustainability interventions as surgical volumes expand globally.

Addressing sustainability in healthcare is increasingly recognised as a global priority and aligns closely with major international policy

frameworks, including the United Nations Sustainable Development Goals (SDGs). In particular, SDG 3 (Good health and well-being), SDG 12 (Responsible consumption and production), and SDG 13 (Climate action) underscore the need for health systems that are both environmentally responsible and socially equitable [3]. Building on these frameworks, the global surgical triple goal emphasises that surgical innovation must now be driven by sustainability to ensure that the expansion of essential care does not exacerbate global healthcare inequities [4]. This perspective shifts the focus from merely increasing surgical volume to ensuring that such growth is environmentally sustainable and ethically sound. The World Health Organization has further highlighted the urgent necessity of developing low-carbon, climate-resilient healthcare systems, especially in low- and middle-income countries where rapid expansion of medical services is occurring [5].

In this context, surgical practice warrants particular attention as a focal point for operational change. Operating theatres concentrate energy consumption, material use and waste generation within a single clinical setting, allowing targeted interventions to deliver measurable environmental benefits without compromising patient safety or clinical outcomes. This focus is particularly pertinent in India, where high surgical volumes, constrained public sector resources, and marked infrastructure variability mean that even incremental gains in efficiency can yield substantial environmental benefits and enhance healthcare system resilience.

Sustainability Strengths of the Indian Healthcare System

In India, the healthcare system serves a population of approximately 1.47 billion people, characterised by a high and heterogeneous disease burden, substantial reliance on resource-intensive hospital-based care, and pronounced urban-rural disparities in access and infrastructure. Consequently, healthcare delivery contributes to an estimated 2% of the national climate footprint, a proportion expected to increase with urbanisation, population growth, and rising demand for surgical care [2]. The heterogeneity of healthcare infrastructure across India provides a natural setting to assess the scalability and adaptability of sustainability initiatives across diverse clinical environments.

Over the past decade, three landmark national policies have strengthened environmental governance within India's healthcare sector. First, the Bio-Medical Waste (Management and Handling) Rules, first adopted in 1998 and revised in 2016, established standards for waste segregation and disposal. Second, the National Programme on Climate Change and Human Health was approved in 2019, under the National Health Mission, integrating environmental sustainability into health system planning. Third, the Health and Environment Leadership Platform, launched in 2017, has promoted the adoption of sustainable practices across Indian hospitals.

Linking Surgical Care with Sustainability Principles

Surgical care is inherently resource-intensive, requiring continuous electricity supply, substantial water use, energy-demanding sterilisation processes, and extensive reliance on single-use consumables. Life cycle assessment studies have shown that a single procedure is associated with a substantial carbon footprint, with reported emissions ranging from approximately 6 to over 800 kg of carbon dioxide equivalents depending on the type and complexity of surgery, anesthetic practices, energy use, and material consumption [6]. These challenges are particularly pronounced in high-volume public hospitals, where infrastructure constraints and workforce pressures limit the adoption of environmentally responsible practices.

In response to these challenges, the Surgical Society of Bangalore, under the leadership of Professor Prem Kumar (President), developed the Sustainability Initiative in 2025, to integrate global sustainability principles and practices into operating theatres within the Indian healthcare system. By improving sustainability in surgery, hospitals can enhance efficiency, reduce costs, and optimise resource utilisation. In fact, evidence indicates that environmentally responsible surgical practices can be implemented without compromising infection control standards or clinical outcomes [7]. Furthermore, the Sustainability Initiative aims to foster a culture of stewardship, accountability, and professional commitment across surgical specialties as well as throughout undergraduate medical education, postgraduate surgical training, and

continuing professional development (Photo 1).

These recommendations align with existing infection control



Photo 1. Professor Prem Kumar, President (2025) of the Surgical Society of Bangalore, promoted the integration of environmental stewardship and clinical excellence during a monthly clinical meeting at API Bhavan, Bangalore, in September 2025. Credit: Surgical Society of Bangalore.

Specifically, the Sustainability Initiative incorporated a strategic framework to promote environmental stewardship with improved clinical outcomes through improved surgical knowledge (Sustainability in Surgery Booklet), operational efficiency (Green Operating Theatre Checklist), and cultural accountability (Oath for Sustainable Surgery).

1. Sustainability in Surgery Booklet.

This booklet outlines practical guidance on energy optimisation, rational use of consumables, biomedical waste segregation, and environmentally responsible procurement within the Indian healthcare system. By integrating education, operational change, and accountability into routine surgical practice, it emphasises the need for sustained system-level transformation over short-term interventions.

standards and clinical governance standards, demonstrating that sustainability can be embedded into routine surgical workflows.

2. Green Operating Theatre Checklist.

This checklist supports perioperative teams in making environmentally responsible decisions across all workflow stages, focusing on high-impact areas such as low-global-warming anaesthetic use and energy optimisation. By reducing unnecessary consumables and auditing waste segregation, it embeds measurable resource conservation into surgical routines, promoting environmental stewardship without compromising sterility or patient safety.

3. Oath for Sustainable Surgery.

The introduction of a professional sustainable oath marks a

critical shift towards ethical accountability and cultural transformation in surgery. Inspired by traditional medical ethics, it extends the surgeon's duty of care to include minimising environmental harm. As a formal pledge to deliver high-quality outcomes while protecting community and ecological health, it integrates sustainability into surgical identify and fosters long-term behaviour change across healthcare systems.

Conclusion

Within the Indian healthcare system, rising surgical demands, combined with finite resources, makes sustainability in surgery both a practical necessity and an ethical obligation. The Surgical Society of Bangalore's Bangalore Sustainability Initiative demonstrates how locally led, professionally driven programmes can align global sustainability goals with national policy frameworks and routine clinical practice. By operationalising existing guidelines through education, structured tools, and ethical commitments, this model offers a scalable approach for other urban and teaching centres across India. Notably, it illustrates that sustainability initiatives can enhance efficiency and accountability without compromising patient safety. As climate change increasingly shapes population health outcomes, surgical communities must play an active role in reducing the environmental footprint of healthcare delivery.

References

1. Karliner J, Slotterback S, Boyd R, Ashby B, Steele K. Health care's climate footprint: How the health sector contributes to the global climate crisis and opportunities for action. Reston: Health Care Without Harm; 2019.
2. Romanello M, Walawender M, Hsu SC, Moskeland A, Palmeiro-Silva Y, Scamman D, et al. The 2024 report of the Lancet Countdown on health and climate change: facing record-breaking threats from delayed action. *Lancet*. 2024;404(10465):1847-96.
3. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development. New York: UN; 2015. Available from: <https://digitallibrary.un.org/record/3923923>
4. Meara JG, Greenberg SL. The global surgical triple goal: surgery must improve health, be equitable, and environmentally sustainable. *J Clin Chang Health*. 2025;13:100458.
5. World Health Organization. Safe, climate-resilient and environmentally sustainable health care facilities: an overview. Geneva: WHO; 2024. Available from: <https://www.who.int/publications/i/item/B09119>
6. Rizan C, Steinbach I, Nicholson R, Lillywhite R, Reed M, Bhutta MF. The carbon footprint of surgical operations: a systematic review. *Ann Surg*. 2020;272(6):986-95.
7. Brighton & Sussex Medical School, Centre for Sustainable Healthcare, and UK Health Alliance on Climate

Change. Green surgery: reducing the environmental impact of surgical care. London: UKHACC; 2023. Available from: <https://ukhealthalliance.org/sustainable-healthcare/green-surgery-report/>

AI Disclosure Statement

The authors used artificial intelligence tools for language editing and proofreading to improve grammar, structure, and clarity. The intellectual content, analysis, and conclusions remain entirely those of the authors.

Authors

Bodela Sree Vidhya, MBBS
Surgery Resident, Department of
General Surgery, Bangalore Medical
College and Research Institute
Bangalore, Karnataka, India
vidhyareddy1602@gmail.com

Prem Kumar A.,
MS, FICS, FIMSA, FACS,
FRCS (Glasg), PhD (MIS)
Professor and Head of Unit,
Department of Surgery,
Bangalore Medical College
and Research Institute
Bangalore, Karnataka, India
drpremk512@yahoo.co.in