



Environmental Impact of Surgical Practice

INTRODUCTION

There is clear evidence that human activity is contributing to a rapid change in the earth's climate.¹ Since the late 19th century, the planet's average surface temperature has been observed to have risen by about 1.1°C.² Much of this change has occurred in the past four decades, with the five warmest years on record all occurring since 2010.³ Without immediate and drastic action, it is predicted that by the end of the 21st Century the average global temperature will have risen by between 2–4°C relative to the year 2000.⁴

Recognising the impact that a warming climate will have, the first Lancet Climate Change Commission stated in 2009 that "climate change is the biggest global health threat of the 21st century".⁵ Already, damage to the environment indicates that there will be an inevitable rise of the global average temperature over the next century. In order to avoid a rise beyond 2°C, and to limit the worst effects of climate change, strong leadership and a commitment to reducing emissions is needed.

KEY WORDS

Environment, surgical practice, climate change, global warming, sustainability, greening the operating room

RACS POSITION

Mitigate the impact of surgical practice

The Lancet Commission on Climate and Health has called for the health-care community to take a leadership role in advocating for emissions reductions, and to critically examine its own activities with respect to their effects on human and environmental health.⁶ Due to the high carbon footprint of operating theatres, surgeons are well placed to contribute to the implementation of high impact strategies.

Recommendations

RACS supports the call of the Lancet Commission on Climate and Health for the health community to take a leadership role in advocating for emissions reductions. RACS recommends surgeons and hospitals consider the principles of effective waste management to take suitable steps to reduce the impact of surgery on the environment.

One suggested approach is to implement initiatives underpinned by the 5 Rs:

- Reduce
- Reuse
- Recycle
- Rethink
- Research

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BACKGROUND

The effects of climate change are highly likely to have a profound impact on health across the world. Counter-intuitively, the health sector itself represents a significant source of pollution and is a major contributor to national carbon emissions world-wide. While the on-going provision of high quality surgical care and ensuring patient safety is a paramount consideration for RACS, the provision of this care currently has a high cost on the environment which subsequently affects the health of the patient.

REDUCING THE IMPACT OF SURGICAL PRACTICE ON THE ENVIRONMENT

The delivery of health care has a considerable carbon footprint. A study published in 2018 estimated that health care in Australia contributes to 7% of the entire country's CO₂e emissions, with around half of this contribution coming from hospitals alone.⁷ While no equivalent study has been conducted in New Zealand, it is likely that the figure is similar. Comparable findings have been made with regards to health care in the United States (10%)⁸ and in England (4%)⁹.

Surgical practice in particular has a large impact on the environment. Although occupying only a relatively small physical portion of a hospital, operating theatres produce around 20%-30% of an institution's waste.¹⁰ As this waste often needs to also undergo high-energy processing before it is safe for disposal, operating theatres, along with their heating, ventilation and air conditioning requirements, are estimated to be between three to six times more energy intensive than the rest of the hospital.¹¹

Anaesthetic gases, many of which are ozone-depleting,¹² also contribute significantly to the carbon footprint of the operating theatre.¹³ As only 5%-20% of anaesthetic gases are metabolised by patients, without recovery systems, the majority of remaining gases are released into the atmosphere. These gases can have a global warming potential over 2000 times that of carbon dioxide.¹⁴

Due to being one of the most resource-intensive areas of the hospital, strategies which target the operating theatre have the potential to have the highest impact within the health-care industry.¹⁵ However, it is essential that initiatives which reduce the impact that surgical practice has on the environment do not compromise patient safety or quality of care.

Research conducted by Smith and Maddern (2014) on surgery and climate change proposed that the impact of anaesthetic gases on the environment could be mitigated by a combined strategy of reducing, reusing and recycling.¹⁶ These basic principles of waste minimisation can also be effectively applied to wider operating theatre, and represent a straight-forward means of reducing the environmental impact of surgical practice. A 2012 analysis on the environmental impact of operating theatres in Canada by Kagoma Y. et al (2012) also proposed an efficient waste management approach, summarising as the 5Rs: Reduce, Reuse, Recycle, Rethink, and Research.¹⁷ The basic principles of this approach are outlined below.

Reduce

The central concept of initiatives which aim to reduce surgical waste is to avoid using resources which are not needed to ensure patient or staff safety. This can include reducing electrical expenditure by turning off machines when they are not needed, reformulating OR kits to reduce overage, and switching to hard metal cases to reduce blue sterile wrap usage.

Proper waste segregation also plays a large role in reducing resource use. Compared with normal solid waste, biohazard or regulated medical waste requires high energy processing, and is estimated to cost up to eight times that of normal solid waste.¹⁸ The improper segregation of waste can increase the amount that undergoes high energy processing, with some studies suggesting that up to 92% of a hospital's biohazard waste may be nonhazardous.¹⁹

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Reuse

Single use, disposable products, may be preferred over re-usable alternatives for sterilisation, infection control, or cost purposes. However, single use items and their packaging contribute to a considerable proportion of operating room waste and have a significant carbon footprint over their life-cycle, from manufacture through to disposal.

Compared by their up-front cost, reusable products are an expensive alternative to disposable products. When the whole life-cycle of these products are compared, including supply chain and waste disposal costs, reusable items are not only more environmentally friendly, but have a cost benefit over disposable items.

Recycle

Surgical procedures produce large volumes of plastic waste in addition to cardboard and paper, much of which can be easily recycled. Expanding on waste segregation principles, recycling in the operating theatre can reduce the amount of waste that undergoes high energy processing or is dumped in landfills.

Rethink

Many initiatives which aim to reduce the impact of surgical practice on the environment will require small changes to how staff perform their roles and how surgical departments operate, which may be seen as adding additional layers of complexity to procedures. As such, some of the largest obstacles to their implementation will be social, logistical and institutional barriers. Rethinking how surgical care is provided will be required at departmental, institutional, and at national levels. Professional bodies such as RACS also have a large role to play in rethinking how surgical care can minimise its impact on the environment.

Research

On-going, evidence based research into the environmental impact of surgical practice is needed, both to measure the effects that the provision of health care has on the environment, and to further develop technologies and practices to mitigate this impact. Although recent studies have estimated the impact of the Australian health sector on the environment,²⁰ no such research has been conducted for New Zealand. Research into the environmental impact of particular procedures, life cycle analyses and cost comparisons of materials, and the on-going development of devices which can maintain quality of care while minimising the environmental impact of the operating theatre are also needed.

Alongside reducing the carbon footprint of the operating room, efficient waste reduction strategies have the added benefit of lowering health care costs, and if implemented carefully, can do so without compromising the quality of patient care. In turn, the reduction of the operating theatre’s carbon footprint also contributes to improving population health.²¹ Efforts to develop more efficient, or “green”, operating theatres may therefore be viewed as delivering higher quality health care. Recognising this potential, a Lancet study in 2009 observed that “tackling climate change could be the greatest global health opportunity of the 21st century”.²²

Over the past decade, many hospitals have already developed initiatives aimed at limiting the impact that their institutions have on the environment. Based on best practices, initiatives such as *Greening the Operating Room* have developed a tool to guide health professionals who wish to implement green initiatives in their department.²³ This includes case study examples, step-by-step practical advice and checklists designed to make the transformation to a green operating theatre simple and effective.

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