

Rethinking arthroscopy: orthopaedic surgeons' responsibility in combating climate change through sustainable practices

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In recent months, South Africa has experienced a series of extreme weather events that underscore the growing impact of climate change on our planet. The rare and destructive tornado that struck KwaZulu-Natal in May and June of 2024, the unusual snowfall in Gauteng in 2023, and the devastating floods in KwaZulu-Natal and the Eastern Cape provinces serve as stark reminders of the changing climate. A startling truth has been revealed by recent studies: the healthcare sector is the third-largest emitter of greenhouse gases, responsible for an alarming 4 to 5% of these emissions globally.¹ Reports indicate that the healthcare sector would rank as the fifth-largest emitter of greenhouse gases if it were a country, highlighting the urgent need for immediate attention to this sobering reality.² The operating theatre is the most prominent example of this impact within the healthcare ecosystem, as the convergence of technological advancements and surgical practices has introduced an era of unprecedented consumption. In an effort to serve as an appeal to my colleagues, I have composed this editorial.

We must remain mindful of our ethical responsibility to the planet as we advance into an era of medical innovation that is unparalleled. The literature is replete with evidence of the environmental impact of our actions; however, the urgency of this message appears to be unheard. The industrial innovations are continuing to promote the use of single-use instrumentation and a significant quantity of plastic products. The emission of greenhouse gases in the theatre environment accounts for three to six times the hospital energy consumption related to ventilation, air conditioning and sterilisation processes.³ Arthroscopic surgery, in particular, stands as a focal point of concern. The rise of single-use instruments and garments, coupled with plastic waste products, has propelled arthroscopy into the spotlight as a leading contributor to greenhouse gas emissions within the healthcare sector.

The field of arthroscopic surgery has undergone remarkable transformations in recent years, but at what cost? The number of these procedures has increased in recent years, and the list of indications has expanded. I recognise the advantages of arthroscopy in comparison to the open procedure on patient recovery and outcomes. Inadvertently, arthroscopic surgery has become intertwined with environmental repercussions, despite its numerous advantages in patient care. The disposal of medical waste, the proliferation of single-use plastics, and the reliance on energy-intensive equipment all contribute to ecological degradation and greenhouse gas emissions. The recent weather events serve as a clear warning that progress is costly when it is not accompanied by sustainability. Arthroscopic surgery procedures require many single-use instruments, and the duration is longer than open procedures, resulting in increased energy consumption and large quantities of plastic waste.

As we adopt new technologies and enhance our surgical abilities, it is important to reflect on the past with a critical perspective, rather than with nostalgia. Are we genuinely making progress, or are we merely exchanging one set of obstacles for another? The solution is not solely found in the development of technology; rather, it is found in the prudent equilibrium between sustainability and progress. We are profoundly responsible for the carbon footprint that our practices generate and its broader implications for the planet's health. It is our responsibility to recognise this reality and take decisive action to reduce our environmental impact. It is essential that we acknowledge the dire reality: the consequences of climate change are not only imminent but are already having an impact on our field.

The carbon footprint of arthroscopic procedures is also evident in the literature. The estimated carbon dioxide emissions associated with waste processing are 6.2 tonnes, as Shah et al. have reported that over 15 kg of plastic waste is generated following arthroscopic rotator cuff repair and nearly 10 kg of plastic waste is generated following anterior cruciate ligament reconstruction.⁴ In contrast, de Sa et al. reported that the surgical waste from five hip arthroscopy cases for impingement to surgeries totalled 47.4 kg, with 46% of it being biohazardous waste and 14% being recyclable plastics.⁵

Orthopaedic surgery is unquestionably affected by this phenomenon. Orthopaedic surgery is confronted with a variety of challenges as a result of climate warming, including the exacerbation of specific musculoskeletal conditions and the modification of injury patterns resulting from environmental changes. The risk of heat-related illnesses such as heatstroke, increases as temperatures rise. Limitations in mobility, dehydration, and medications that interfere with thermoregulation may render orthopaedic patients, particularly those who are undergoing surgery or rehabilitation, more susceptible to heatstroke.⁶ There is evidence to imply that there may be a correlation between an elevated risk of falls and hip fractures during heatwaves.⁷ Major regions of central and northern South Africa encountered frequent heatwaves in 2023. These were observed to be more prevalent than in previous years.⁸ In recent years, coastal cities have also experienced frequent flooding. Some literature has also suggested that the risk of postoperative infections is higher during the warm months and heatwave seasons.⁹ This will undoubtedly influence the outcomes of any surgery and the availability of orthopaedic services.

I would like to contribute to the medical community's resounding call for reduction, reuse and recycling in healthcare and beyond. The initial pillar of this paradigm shift is reduction. Our carbon footprint can be substantially reduced by examining our consumption patterns and optimising processes. I suggest that we respond to this call in accordance with the guidelines established by other organisations. It is imperative that we conduct a thorough examination of our

procedures and prioritise interventions that reduce our ecological footprint. This encompasses the prudent assessment of surgical indications, the avoidance of single-use instruments, such as suture passers and disposables, and the preference for reusable metal over plastic cannulas to minimise waste. Other methods of bleeding control should be considered during the procedure, and the use of electro-ablators should be minimised. A tangible path to sustainability is presented by adopting the ethos of reuse. The environmental impact of orthopaedic surgery can be substantially reduced by developing innovative strategies for the recycling and reuse of surgical instruments and equipment. It is imperative to investigate methods for extending the lifecycle of these resources, including shavers, ablaters and infusion lines. By adopting this approach, we can substantially reduce the environmental impact of arthroscopic surgery, thereby contributing to the broader effort to address climate change.

Furthermore, it may be advantageous to implement a wide-awake anaesthetic approach (wide awake local anaesthesia no tourniquet – WALANT) for certain arthroscopic procedures. The benefits of WALANT are well documented in literature, and there is evidence to support this movement. WALANT enables the procedure to be performed without the necessity of anaesthetic gases or ventilation, thereby minimising emissions and energy consumption.¹⁰ Where general anaesthesia is unavoidable, the selection of volatile gases should be deliberated upon. Desflurane has been identified as one of the most significant contributors to the operating theatre's carbon footprint, with a global warming potential that is up to 2 000 times greater than that of carbon dioxide.¹¹ Volatile gases account for more than 50% of the operating theatre's carbon footprint.³ Healthcare institutions commonly achieve cost savings as a result of WALANT practices. Greater efficiency and financial responsibility can be achieved while optimising resource utilisation and reducing waste. Literature has also proposed innovations such as outpatient needle arthroscopy, which have been linked to benefits such as reduced energy consumption and waste reduction.¹² It is reasonable to suggest that procedures such as calcium removal, foreign body removal, and partial meniscectomy can be successfully performed with this procedure. These are merely a few of the strategies; however, effective action will necessitate collaborations among the various stakeholders.

Collaborative endeavours, such as 'The Intercollegiate Green Theatre Checklist,' and the 'Health Care Climate Council's three-pillar approach to climate-smart health care' are designed to establish standards for sustainable health and surgical practices, and we should familiarise ourselves with them.^{1,11} In order to foster sustainability in orthopaedic surgery, it is imperative to invest in research to drive innovation, inform evidence-based practices, and influence policy decisions.¹ By incorporating sustainable practices into their daily routines and utilising research findings to achieve zero emissions from healthcare systems, we can contribute to the success of commitments made by international leaders, such as the COP28 declaration on climate and healthcare.¹³ Additionally, we have a moral responsibility to promote and engage in research that is designed to create environmentally friendly surgical techniques and materials.

We can substantially reduce the carbon footprint of these procedures, support global efforts to mitigate climate change, and demonstrate leadership in the transition to sustainable healthcare by incorporating these practices. It is imperative that we act immediately, as we cannot afford to remain indifferent or complacent. Let us rise to the challenge, embracing a future in which healthcare and environmental stewardship are inseparable, thereby guaranteeing the well-being of both patients and the planet.

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