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A Leak in the System: Addressing the Environmental Impact of Urologic Care

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1. Introduction

Climate change is the single greatest threat to global health. If current trends continue, climate experts predict a future that includes rising sea levels, increases in climate-sensitive infectious disease, drought, and famine [1,2]. These impacts disproportionately affect vulnerable populations such as children, elderly individuals, and low- and middle-income nations [3]. Health care systems, which will need to accommodate the greater burden of disease and disability induced by climate change, are not simply innocent bystanders in this process.

The global health care industry is a major contributor to greenhouse gas (GHG) production and is responsible for 4.4% of all emissions [4]. If the global health care industry were a country, it would be the world's fifth largest carbon emitter [5]. In the USA, inpatient hospitals are the third most energy-intensive commercial buildings, after food sales and service-related buildings [6]. Hospitals also produce a tremendous amount of waste. In 2021, the main campus of Stanford Health Care (SHC) generated an average of 150 tons of municipal waste weekly, which is roughly equivalent to the weight of the Statue of Liberty.

Within hospitals, operating rooms (ORs) are a resource-intensive area. In 2021, 28% of hospital waste at SHC could be attributed to the ORs. Per square meter, ORs consume three to six times more energy than other areas of the hospital [7]. Previous interventions in the OR have been well reviewed by other authors, and generally fall into the categories of waste reduction, improving reuse of materials, proper segregation of waste, and energy efficiency.

As surgeons we have an opportunity to reduce the carbon footprint of the procedures we perform, and to advocate that our hospitals prioritize environmentally sustainable practices. In this article we highlight some areas of interest in urology, as well as opportunities for surgeon-led initiatives to reduce the energy and waste footprint of urologic care.

2. Reusable versus single-use endoscopes

In 2016, Boston Scientific brought the first single-use digital ureteroscope to market. Since then, several other single-use ureteroscopes and cystoscopes have been commercialized. These disposable products are attractive, as they require neither processing nor maintenance, and they work well within the flow of a busy clinical setting. However, their environmental impact has come into question. In a recent study, Kemble and colleagues [8] found that per case, single-use cystoscopes have more than four times the carbon footprint of reusable cystoscopes. By contrast, Davis and colleagues [9] found that per case, the carbon footprint of a single-use ureteroscope was equivalent to the footprint of a reusable Olympus digital ureteroscope. This discrepancy can be explained by a greater number of uses in the typical life cycle of a reusable cystoscope in comparison to a ureteroscope. The greatest proportion of the energy consumption for reusable endoscopes can be attributed to resterilization [8,9]. Across specialties, the energy expenditure for production, reprocessing, packaging, and disposal can vary greatly by device [10]. For the average busy urologist, this just causes confusion. To help urologists to make

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real-world decisions grounded in evidence, we need quality studies evaluating the life cycle of all urologic instruments.

Regardless, both reusable and single-use endoscopes should be manufactured with greater environmental consideration. For single-use endoscopes, decreasing packaging waste and recycling components of the endoscope should be a priority. For reusable endoscopes, making products that require less energy-intensive sterilization would make an impact. Considering the number of endoscopic procedures performed globally, small improvements will have a dramatic cumulative impact.

3. Intermittent catheterization

Urologic policy recommendations have an impact beyond the OR. In 2008, Medicare changed its policy on clean intermittent catheterization to decrease urinary tract infections. Medicare went from covering four reusable catheters to covering 200 single-use disposable catheters per patient every month. However, to date there is no definitive evidence to suggest that sterile catheterization with single-use catheters actually decreases rates of infection or hospitalization related to genitourinary infections [11–14]. Without considering the financial cost of this decision, the environmental impact alone is staggering. Every year, 85 million pounds of waste is generated in the USA from single-use catheters alone. Placed end to end, these catheters could circumscribe the world 5.5 times and fill 80 Olympic-sized swimming pools [15]. This complex issue is an area of ongoing research in urology [16]. Given the substantial impact of such policies, urologists should consider the "triple bottom line" (financial, environmental, and patient impacts) of our common clinical practices.

4. Surgeon-led interventions

There is already great interest in the surgical community in curbing waste production in the OR. In a recent survey study performed at two major academic centers in the USA, Meyer and colleagues [17] evaluated surgeons' perspectives on waste in the OR. Some 90% of responding surgeons agreed that waste of sterile surgical items was a problem, and 95% stated a willingness to change their OR workflow to reduce waste [17]. Surgeon-led initiatives often include streamlining of instrument trays, editing of preference cards to remove unused items, and shifting from disposable to reusable instruments and supplies. As an additional bonus, waste reduction incentives frequently align with cost incentives.

In the SHC urology ORs, simply asking urologists to edit their surgical preference cards to indicate optional instruments reduced the waste generated from disposable items by more than 90% in the span of 4 weeks. In just two urology ORs, the potential savings for this intervention would be approximately $20 000 annually [18]. In other specialties, waste audits have proven effective in identifying areas of preventable waste [19–21]. There is also potential to sterilize and reuse some single-use materials in urology ORs including guide wires, balloon dilators, and stone baskets [22]. However, further evaluation is needed to assess the energy expenditure for production versus reprocessing of such products. Surgeon-led initiatives like these take modest effort and have the potential to decrease waste and GHG production and reduce costs.

5. Global initiatives

A group of ophthalmologists have recently established EyeSustain, a coalition of ophthalmologists and worldwide eye societies working to make eye management and surgical care more sustainable. Through the organization they have published position papers with the backing of multiple ophthalmologic societies on topics such as conservation of multidose topical medications, advocacy for energy-conscious cleaning and sterilization of surgical instruments, and reuse of single-use instruments that can be safely resterilized [23–25]. The group has worked with industry collaborators to develop an environmental sustainability scorecard advocating for a decrease in packaging waste and replacement of polystyrene foam in packaging with more environmentally responsible materials [26].

As a specialty, we should learn from our ophthalmology colleagues and unite to advocate for more environmentally preferred practices from our manufacturers and vendors. The global urology device market was valued at $32 billion in 2021 and is projected to grow over the next decade [27]. Devices we use in our ORs require production, packaging, transport, and disposal, and sterilization for reusable devices. Each of these steps is an opportunity to decrease the carbon footprint of these products. Establishing specialty-wide product sustainability standards and collaborating with suppliers to reduce their environmental impact will be key in achieving larger-scale reductions in emissions. In conjunction with hospital-based efforts, these changes in practice have significant potential to promote a healthier planet, and thus healthier patients.

Conflicts of interest: The authors have nothing to disclose.

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