

Comparing Reusable to Single use Anesthetic Equipment Western Health, Melbourne, Australia

GGHH Agenda Goals

Waste, Energy, and Water

Hospital Goal

The goal of this study is to compare the environmental and financial costs of using reusable and single use anesthetic equipment using life cycle assessment (LCA). This study was published in the British Journal of Anaesthesia in June, 2017.¹

Progress Achieved

For an Australian hospital with six operating rooms, the **annual financial savings of converting from single use to reusable anaesthetic equipment** are approximately **USD \$25,600 (AUD\$32,000)**, a 46% reduction from USD \$55,200 (AUD\$69,000) to USD \$29,600 (AUD\$37,000).

In **Australia**, converting from single use **to** reusable equipment would result in an **increase of CO₂ emissions** from 5,095 to 5,575 kg CO₂, a 480 kg CO₂, a **9% increase**.

Using the **UK/European** power mix, converting from single-use (5, 575 kg CO₂) to reusable anaesthetic equipment (802 kg CO₂) would result in an **84% reduction** (4, 873 kg CO₂) in **CO₂ emissions**.

In the **USA** converting from single use to reusable anaesthetic equipment would have led to a 2,427 kg CO₂ or **48% reduction** in **CO₂ emissions**.

In Australia, converting from single-use **to** reusable equipment would, over one year, **more than double water use from 34.4 to 90.6 kilolitres (tonnes)**, this increase in water use for reusables is approximately **equivalent to the direct household annual water use** for one person in Australia.

The Issue

There has been a move across large parts of the world to increasingly use single-use equipment in medicine. Anesthetists/anesthesiologists can substitute reusable with single-use equipment. There was a lack of clarity as to the financial and environmental costs associated with reusable and single use approaches. Often it is heard from marketing representatives that single use equipment is safer from an infection control standpoint, can save money, and may be environmentally preferable to reusable equipment as there is no need to wash equipment. We have not examined statements regarding infection control concerns, as these depend upon vigorous hospital quality assurance both for reusable and single use equipment.

We thus undertook a study examining the financial and environmental costs associated with both types of anesthetic equipment. We compared one hospital in Melbourne, Australia (Western Health) that uses primarily reusable anesthetic equipment with the Austin Hospital in the same city that uses primarily

single use anesthetic equipment. We used life cycle assessment to model the environmental and financial costs of different scenarios of replacing reusable anaesthetic equipment with single use variants. The primary environmental costs were CO₂ emissions and water use. We compared energy source mixes between Australia, the UK/Europe, and the USA.

We measured through 'time and motion' studies the labour costs to process reusable equipment. We also directly measured hospital washer and steriliser electricity, gas and water use. As we wished to know the financial consequences of substituting reusable with single use anaesthetic equipment from the viewpoint of the hospital, we examined real changes in labour times, electricity use etc. This study was a consequential LCA, which studied how environmental and financial flows changed according to the decisions made; if a hospital required more electricity because single use equipment had been replaced with reusable equipment, one would examine the source of each new kilowatt hour of electricity. Consequential LCAs highlight real changes occurring in the broader economy.

Implementation process

The study's results were presented at several hospital fora. Efforts by some staff to convert to single use anesthetic equipment because it saved money were refuted. As this study has been published in a peer reviewed anesthetic journal it was straightforward to provide convincing evidence to avoid practice change to single use equipment. In fact, without such published data, change to single use equipment may have been inevitable.

Tracking Progress

This study has indicated that using reusable anesthetic equipment at Western Health saves a considerable amount of money. If extrapolated to all 18 operating theatres, Western Health is saving approximately \$90,000 p.a. On the contrary, due to Australia's reliance on coal, cleaning anesthetic equipment at Western Health increases the CO₂ emissions from using anaesthetic equipment by almost 10%. Further, due to inefficient water use by washers and sterilisers there is greater water use. Consideration to carbon and water offsets could ameliorate these negative environmental consequences as could a switch to renewable hospital energy sources and more efficient water usage. Our prior research has shown that the water use of hospital sterilisers can be considerably improved.^{2, 3} On the contrary, single use anaesthetic equipment continue to be used at Austin Hospital, Melbourne, Australia.

Challenges and lessons learned

This project took two years from inception to publication to complete, including the literature review, study itself and writing up of the research. It is unclear what, if any, effect of such data will have upon the practice of operating room staff beyond Western Health, Melbourne, Australia.

Next Steps

To promulgate our findings to other sites in Australia and beyond. We realize that there may be significant regulatory factors precluding promulgation some of our findings in some countries. For example, the USA proscribes the use of anesthetic breathing circuits on more than one patient, even if each and every patient receives a unique bacterial/viral filter to avoid cross contamination.⁴

Beyond this current US CDC requirement though there is nought precluding our findings being evidence for 'returning to reusable' anesthetic equipment to save money. Further, in at least the USA and Europe returning to reusables will reduce the carbon footprint.

Demographic information

Western Health, Melbourne, Victoria, Australia.

Size: 4 hospitals (two main, acute hospitals), approximately 700 beds, operating theatres-18. All medical interventions excluding cardiac and cranial surgery are performed.

Quotes:

"I was amazed that using reusable anesthetic equipment saved money. All we ever hear from product reps is that single use items save money." Catherine O'Shea, Western Health

"This study shows the reach of coal; it's not just about electricity for your lights, the electricity source affects everything. In Australia, the reusable approach to using anesthetic equipment actually had a higher carbon footprint than the single use approach. In Europe and the USA the reusable approach had less than half the carbon footprint of using single use equipment. Even Texas is miles ahead of Australia!" Forbes McGain, Western Health

"Simply claiming that something is green, without demonstrating empirical benefits for human health and well-being, the environment and economics, is not enough."⁵

References:

- 1 McGain F, Story D, Lim T, McAlister S. Financial and environmental costs of reusable and single-use anaesthetic equipment. *BJA: British Journal of Anaesthesia* 2017; **118**: 862-9
- 2 McGain F, Moore G, Black J. Steam sterilisation's energy and water footprint. *Australian Health Review* 2016
- 3 McGain F, Moore G, Black J. Hospital steam sterilizer usage: could we switch off to save electricity and water? *Journal of health services research & policy* 2016; **3**: 166-71
- 4 Centers for Disease Control and Prevention (CDC). Guidelines for Preventing Healthcare Associated Pneumonia. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. March 26th 2004. Available from <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm> (accessed cited 1 March 2015)
- 5 Institute of Medicine of the National Academies. *Green healthcare institutions; Health, environment and economics (Workshop summary)*. Washington DC, USA: The National Academies Press, 2007

Photo: Reusable anaesthetic breathing circuits, laryngoscope handles and blades and face masks. Single use variants look very similar.

