Impact on Carbon Footprint: An LCA of Disposable vs Reusable Sharps Containers in a Large US Hospital

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Background. 54% of US hospitals' greenhouse gas (GHG) emissions are derived from supply chain goods and services. Replacing disposable products with reusables can reduce these GHG. We estimate annually US hospitals dispose of their needles, scalpels, etc, into 35 million disposable (DSC) or reusable (RSC) sharps containers generating >100,000 metric tons of carbon dioxide equivalents ($MTCO_2eq$) in their manufacture, use and disposal. Northwestern Memorial Hospital (NMH), an 850 bed hospital in Chicago IL, converted from DSC to an RSC associated with 57% less disposal-related sharps injuries. Using a product life cycle assessment (LCA), we compared the global warming potential of DSC and RSC.

Method. We developed a product (sharps-containers) LCA tool and calculated GHG emissions (CO_2, CH_4, N_20), expressed in $MTCO_2eq$ for 12 months before and after NMH's conversion from polypropylene DSC (BD, Franklin Lakes NJ) to the RSC (Daniels Sharpsmart Inc, Chicago IL). Container contents were excluded. The DSC were not recycled nor had recycled content. Disposable chemotherapy SC were included for both systems. Annual GHG of RSC and other reusables' manufacturing stage was proportioned to expected lifespan.

Results

Table 1. Annual Waste & GHG Comparison: Disposable vs Reusable Sharps Containers

	Disposable SC	Reusable SC
Containers manufactured /yr	34,396	2,481 (yr 1 only, 637 chemo thereafter)
Containers landfilled/yr	34,396	47
Containers exchanged by staff/yr	34,396	23,891 (-31%)
Wgt plastic landfilled/yr(kg)	30,900	123
Wgt cardboard/yr(kg)	5,020	116 (for chemo SC)
MTCO2eq GHG/Yr	139.1	25.1 (P < 0.001)
Average Occupied Beds	574	629
MTCO2eq GHG/100 Occ bed-Yr	24.2	4.0 (-83.5%; p <0.001)

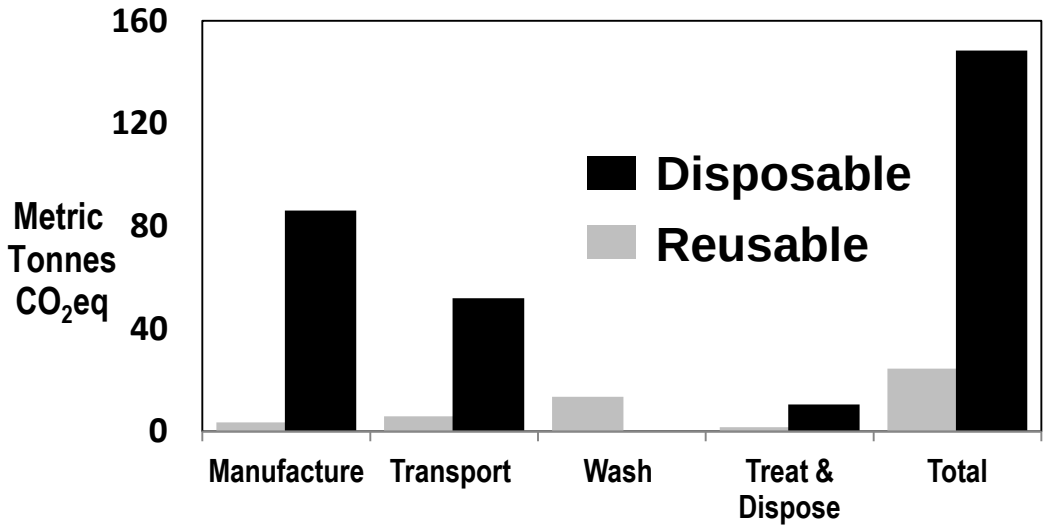

Fig 1. Annual greenhouse gas emissions by life cycle stage

Comment

The 84% reduction of CO_2eq emissions with the RSC system exceeds the 2020 reduction target for US federal hospitals. If RSC were used nationally we estimate annual US hospital GWP would fall by 64,000 $MTCO_2eq$. While only a small fraction of the 115 million MT CO_2eq generated by US hospital supply chain emissions it is a positive sustainable step.