

# Investigating the Carbon Footprint of Privately-Owned Orthotic Facilities

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### INTRODUCTION

- Climate change is one of the greatest challenges faced by the world today.<sup>1</sup>
- The health care sector is responsible for a significant portion of greenhouse gas (GHG) emissions.<sup>2-4</sup>
- Prosthetic & orthotics (P&O) facilities should be aware of their GHG emissions so they can work to mitigate their environmental effects.
- One way to determine this, is by calculating the carbon footprint (CF) of a facility. CF is the amount of GHGs produced directly and indirectly by a person or group.<sup>3</sup>
- Other healthcare facilities have done this; there exists no literature on the carbon footprint of a P&O facility.<sup>5-9</sup>

### OBJECTIVE

- Calculate the carbon footprint of privately-owned orthotic facilities.
- Identify areas of improvement, where facilities can make the most impact to reduce their carbon footprint.

### RESULTS

GHG Emissions by Scope

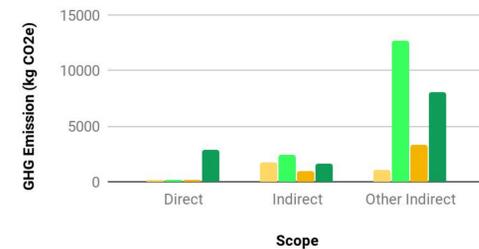


Figure 1: Annual emissions broken into the three scopes.

GHG Emissions by Category

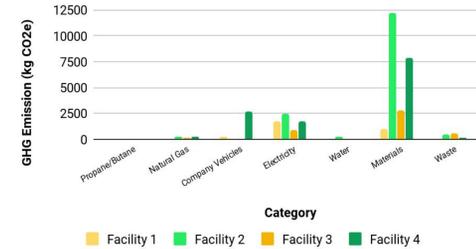


Figure 2: Annual emissions broken down into activity categories.

GHG Emissions per Patient

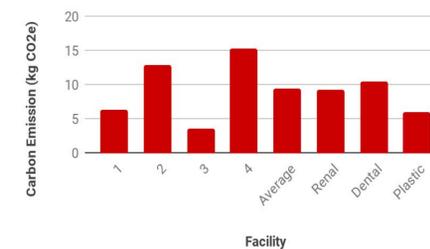


Figure 3: Annual emissions per patient of the 4 participating facilities and 3 other health care facilities.

GHG Emissions by Scope (Average)

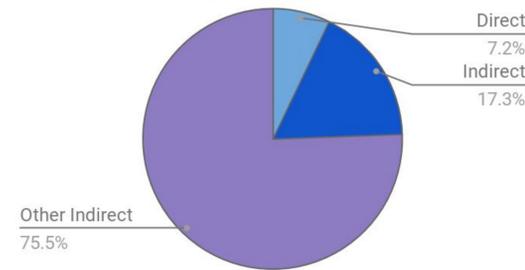


Figure 4: Weighted average of all 4 participating facilities

GHG Emissions by Material Type

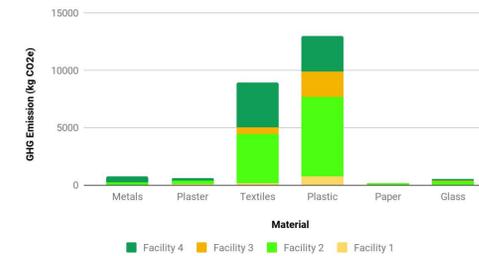


Figure 5: Annual emissions from material procurement; broken down into specific material types.

### METHODS

- Used the Greenhouse Gas (GHG) Protocol.<sup>10</sup>
  - Includes 3 Scopes of Emissions (Figure 1)
- Based on the GHG protocol, sources of GHG emissions were selected for each scope (Table 1)
- Data was collected from 4 orthotic facilities
  - Facilities that were chosen to participate:
    - privately-owned
    - small-medium sized (1-6 full-time or part-time clinicians)
    - located in Ontario (3 in the GTA)

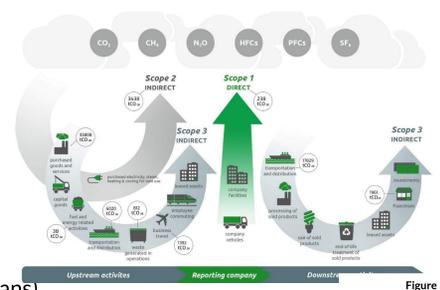


Figure 1

Carbon emissions for each activity were calculated using conversion factors from UK GHG Protocol for Company Reporting:<sup>11</sup>

$$\text{EMISSION} = \text{ACTIVITY DATA} \times \text{CONVERSION FACTOR}$$

- These values were extrapolated to an annual value, based on the time period the data was collected (Table 2)

Data Collected	# Butane/Propane Torches	Vehicle Use	Electricity	Natural Gas	Water	Materials	Waste
Time Period	1 month	1 month	1-12 months	1-12 months	1-12 month	1-6 months	1 week

Table 2

Scope	Activity Data (Source of GHG Emission)
1	# of Butane & Propane Torches Company-Owned Vehicle Use (for company activities)
2	Electricity Usage Heating from Natural Gas
3	Water Usage Material Procurement Waste (from day to day activities)

Table 1

### DISCUSSION

- The average carbon footprint from a privately owned orthotic practice is 10 587 kg CO<sub>2</sub>e.
- Scope 3 is the largest contributor of emissions.
  - This is consistent with other carbon footprint studies done in a healthcare facility.<sup>6-9</sup>
  - Within Scope 3, material procurement is the largest contributor and plastics are the largest component of this.
  - Most orthotics are fabricated from thermoplastics. The majority of these materials are dispensed to patients and therefore are a necessary source of emissions.
  - Textiles were the second largest component of emissions from material procurement, despite significantly less usage than plastic.
    - This is due to emissions from textile production being much higher than plastic production.
    - The conversion factor for textile production is seven times higher than average plastics.
- Emissions from waste were smaller than expected.
  - Majority of materials were disposed of in landfill, which has a very low emission factor, due to no decomposition occurring in landfill.
  - However, there are other environmental impacts of plastics and other materials which remain indefinitely in landfill.
- Per-patient GHG emissions from orthotic facilities had similar results to other healthcare fields.<sup>5-7</sup>
  - 3 of the 4 participating facilities followed this trend. Facility 3's per-patient emissions were lower. This is likely due to the types of devices (foot orthoses made with foam based materials) fabricated at this facility.

### LIMITATIONS

- Carbon footprinting itself does not provide a complete assessment of the environmental impact of a service.<sup>6</sup>
- Material emission calculations were limited by the emission factors that were available; if not available, a conversion factor from a similar material was used.
  - i.e. no specific conversion factor available for foams (EVA etc.)
- UK conversion factors were used.
- Annual emission values were extrapolated.
- Public facilities were not included due to the difficulty of extracting utility information from P & O clinics within larger facilities (eg. hospitals)
- Scope 3 activities are optional:
  - This study did not include patient & employee transportation using personal vehicles<sup>12</sup> & Particulate waste from grinding

### CONCLUSION

- Carbon footprint of a P&O facility was comparable to other healthcare fields on a per patient basis.
- Material procurement was the biggest contributor to emissions. Plastic was the largest component of this.
- P&O facilities can investigate methods of reducing emissions from the material procurement section.
- Investigating the use of different materials may be a more effective solution than limiting the amount of current types of plastic.

### NEXT STEPS

- Calculate the CF of a public facility & larger private facilities.
- Calculate the CF of a prosthetic facility.
- Identify strategies that could be implemented by P&O facilities to reduce their CF and quantify the impact of these strategies.

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