

# Ain't that dental rubbish!?



Regardless of one's scope of practice, we are all health professionals working in a field responsible for significant greenhouse gas emissions.<sup>1</sup> We have to be accountable and improve the way we practice. As an inexperienced yet concerned first-year dentist in the real world, the primary author collaborated with other oral health practitioners working in sustainable dentistry to answer some real-world practical issues. The following is the waste audit experience for a change to sustainability at the Capital and Coast DHB (CCDHB) hospital dental department and subsequent implementation to change how we practice.

The World Health Organization has announced that the greatest threat to human civilisation in the 21<sup>st</sup> century will not be the COVID pandemic but rather the climate crisis we face.<sup>2</sup> Why is this so? To our detriment, environmental sustainability is compromised through advancements in human civilisation, as we continue to rapidly develop in an unsustainable manner, without fully respecting the consequences and impact on the environment. Healthcare contributes to such environmental damage, producing approximately 5% of total global greenhouse gases.<sup>1</sup> Ironically, the greenhouse gasses (GHGs) and pollution emitted from healthcare are harming the environment and the people it is supposed to be helping, not adhering to the fundamental principle of First, Do No Harm.

As oral health practitioners, we focus on our patients' oral health. However, there is a shift to treat patients with a more holistic view through more contemporary and indigenous approaches to patient care. However, a holistic approach to care cannot be divorced from environmental factors and must consider climate-related illness and ecosystems health. With human health compromised through air pollution, natural disasters, extreme heat, and supply of our clean water and food supplies, this can lead to greater costs, demand, and stress on our already burdened healthcare system.<sup>1,2</sup>

There has been much talk about climate change with the conclusion of the 26<sup>th</sup> COP26 UN climate summit in the UK. Now is the time to walk the walk. So, what are some of the more recent developments from New Zealand's government in this area? The Carbon Neutral Government Programme announced at the end of 2020 requires the public sector to be carbon neutral by 2025, which is only three years away!<sup>4</sup> Aotearoa plans to have an emissions reduction plan by May 2022 to outline our commitments for our country's way to net-zero (excluding biogenic methane) by 2050.<sup>5</sup>

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## Project Overview

This clinical waste audit was undertaken for many reasons, but primarily out of our passion for learning about sustainability and our subsequent responsibility to practice sustainably and be accountable for the harm we have been imposing on our environment. Regarding waste production, we know health care produces substantial amounts of waste. Audits are generally very good at presenting transparent data, for instance, identifying the scale of waste production and incorrect disposal.

This information allows health teams to reflect and plan actions to improve the work environment.<sup>6</sup> Since CCDHB does not yet have regular waste audits; it was an excellent opportunity to introduce sustainability into our hospital dental department. The following is a summary of the waste audit project and the subsequent changes that are taking place.



Figure 1: Collecting rubbish at the end of the day with Orianna (cleaner) for the waste audit.

## Project Aim

This project aimed to undertake a waste audit and estimate the carbon emission produced per patient. In addition, a baseline audit would also provide vital information to inform changes and make the practice a more sustainable workplace.

## Project Plan & Results

A four-week waste audit collected all the waste produced throughout the department. Manual data collection from Titanium allowed calculating the number of patients seen per day, patients seen by specific dentists, and the procedures within each appointment. Two values looking at the average waste production per patient were identified, allowing for comparison with other studies. The first was the department's **waste production**, which is the total amount of waste produced in the whole department (nonclinical and clinical waste) divided by the number of patients seen. This came to 275.<sup>2</sup> grams per patient, equivalent to 85.6 grams of CO<sub>2</sub> emissions per patient. The second was the **clinical waste production rate**, which involves inclusion and exclusion criteria. It included waste collected from surgeries, radiography rooms, dirty and clean rooms, but it excluded waste collected from reception, tea rooms, waiting room, and the lab. The total clinical waste divided by the number of patients came to 181.2 grams per patient, equivalent to 56.4 grams of CO<sub>2</sub> emissions per patient.

The Ministry for the Environment's detailed guide on measuring emissions provides us with methods to calculate the carbon dioxide equivalent emissions by multiplying the weight by the coefficient representing the type of waste, as provided in their tables.<sup>7</sup> For the above calculations, the general waste coefficient (Table 79) was applied.

## Global Benchmarking

Comparing these values to similar studies from Greece, Iran, and India, we produced three to four times as much waste per patient. Greece, Iran, and India produced 53.3, 48.7, and 45.1 grams of waste per patient, respectively.<sup>8,9</sup> We may be producing more waste due to the higher turnover of patients, increased specialist appointments, or perhaps the difference in cross infection control compliance and practice (Figure 2). Research is therefore required to understand the reasons for the differences between countries. Regardless, the sizable differences reinforce the need to reduce these emissions by changing our practice.

It may be easier to visualise these figures by placing them into perspective. For example, our estimated waste generation of 1,602 kg CO<sub>2</sub> emissions produced in a year is equivalent to the emissions of an economy flight spanning the whole of New Zealand 15 times or planting 114 native trees to offset these emissions.<sup>10</sup>



Figure 2: Substantial amount of waste produced from a single surgical procedure - Full dental clearance & removal of lingual tori.

## Sustainable Alternatives & Challenges Ahead

There are many sustainable and often more cost-effective alternatives to dental supplies which can ultimately reduce the amount of waste reaching our landfills. For example: using bioplastics that have similar properties to plastic but some which are biodegradable, stainless-steel cups rather than plastic or paper cups, washable reusable bibs can replace single-use plastic, paper, and styrofoam versions. Investing in dental technologies can also replace conventional methods of impression taking, film radiography, and the storage of patient data such as questionnaires, medical history forms, and letter correspondences can be digital.

Implementation of these alternatives may have challenges. One limitation commonly quoted from dentists is the costs involved in making changes. There is, however, general agreement in the literature that while adopting sustainability measures over current methods may on occasion seem costly, sustainable solutions can provide cost savings with benefits in health and for the environment.<sup>11</sup> Decision making currently revolves around finances, but we need to appreciate that these sustainable approaches to dentistry can no longer be avoided and will become a mandatory requirement to meet the national net-zero target by 2050. In this regard, public and private sectors will be accountable for our emissions productions and will have to manage ways to reduce these emissions.<sup>4</sup> Consumers of our services are also becoming more aware and demanding of sustainable providers and those not practising sustainability may be at a disadvantage also from a business point of view.





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## Product Life Cycles

It is vital to understand the complete life cycle perspective of a product, that is, how products are manufactured, packaged, transported, used, and finally disposed. This concept of the life cycle of a product is referred to as the Cradle to Grave approach to sustainability. This information is essential for us as consumers to make informed decisions on what we order and use. On the other hand, there is the potential for “green-washing” with potentially misleading “sustainable” packaging or labelling, which can ultimately lead to ineffective environmental decisions.<sup>12</sup> This calls for improved regulation and requests that manufacturers and suppliers be transparent in terms of sustainability.

Sustainable alternatives are a good start towards sustainable oral health practice. However, we should not rely solely on biodegradable products as they also need to go somewhere once finished, i.e., landfill. Encouraging the use of these products can also lead to waste production and may risk less thought being given to the Cradle to Grave concept mentioned above. Ultimately, the most effective decision we can make is to simply reduce and cut out any unnecessary sources of waste where possible. This can lead to cost savings whilst saving our planet’s valuable and diminishing resources.<sup>13</sup> This was also highlighted by Auckland dentist, Dr Fleur Woolford, in the July 2021 NZDA News about the need to reduce common single-use items in the dental clinic. For example, reducing coverings for headrests, light and tray handles and these covers cannot be considered a substitute for effective cleaning.<sup>14</sup>

This also brings up the obligation to practice evidence-based dentistry, as seen by the reactions to the COVID pandemic where everything is covered in plastic to feel better? Understanding the nature of airborne transmission of the COVID virus brought great concerns to the dental profession, where aerosol producing procedures can lead to higher cross-infection risk. Not only did we see an increased use of personal protective equipment (PPE), but this led to restrictions in providing necessary dental care where, due to the emerging nature of the pandemic, there was limited scientific evidence to inform and guide practice. A recent study looked at identifying microbiota from the saliva and whether it can be traced in the aerosols produced from different types of dental procedures. This brought to light that saliva contributed a median of 0% of aerosol microbiota. In fact, 78% of the microbiota could be traced from the dental water supply.<sup>15</sup> Amidst the climate crisis, we need to ensure that evidence-based selection and use of PPE and infection-control protocols are in place that simultaneously respect that we are not inadvertently doing more harm to our environment, health, and well-being.

## Summary

In summary, we produce a significant amount of waste and need to act on changes now. The following are some actions and movements in our department.

Action recommendations from the clinical audit:

- Investing in digital technology. We are currently in the process of implementing digital radiographs which reduce emissions compared to conventional methods. These also reduce the need for toxic developer fluids. There are also clinical benefits from improved diagnostic quality of radiographs, time efficiency, and the ability to store digitally with environmental benefits. Likewise, investing in intraoral scanners replaces conventional impression techniques, reducing the need for impression materials and trays.<sup>16</sup>
- Separating sterilising pouches to its paper and soft plastic components means that the paper can be placed in general paper recycling as per the supplier’s advice (Steriking®).
- We are also examining the use of stainless-steel cups. Since they are non-critical items, they can be processed through a dishwasher while abiding by our current cross-infection control standard.<sup>17,18</sup>

- Planning how to reduce waste, such as removing unnecessary coverings, and starting by sending letters through emails rather than printing and posting.
- We are also in the process of working with the Sustainability Trust. They have consultants who will assess how we practice and provide guidance towards a more sustainable workplace.
- Ultimately, more solutions will be achieved by liaising with other experts and dental teams practising more sustainably.

This article only scratches the surface of waste and emission production in dentistry. Further investigations in our procurement, travel, power, and water usage are significant considerations to audit to reduce emissions. We hope that this can initiate and stimulate further conversations and well-needed action. We can achieve a cleaner and sustainable planet for our future generations through our collective efforts.



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Riku is currently in his second year as a house surgeon working for Capital and Coast DHB. He thoroughly enjoys his work and is looking to pursue further work in the public sector, as well as continuing in his interest and passion for environmental sustainability.



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After graduating in 2019 with a Bachelor of Health Science (Oral Health) Hilary went on to complete an honours year, gaining first class honours. She is focused on waste management and sustainability within dentistry and has a passion for making the industry as sustainable and as green as possible, without compromising care. Hilary is currently working in private practice in Auckland.

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