Procurement in dentistry – sustainable purchasing of equipment and consumables

Reviewing your practice's procurement policies can play a significant role in making dentistry more environmentally sustainable.

Learning outcomes:

This article aims to assist the reader to:

- purchase environmentally safe products such as chemicals and materials;
- manage ordering products to maximise efficiency and reduce the number of deliveries;
- buy equipment that is the best value over time;
- value equipment and consumables that are reusable or recyclable; and,
- reduce consumption where possible.

Introduction

Sustainable procurement in dentistry means choosing products and suppliers in such a way as to minimise environmental impacts without compromising patient safety. In the UK, NHS dental procurement has been shown to account for 18% of the carbon footprint of dentistry.[1] Sustainable procurement can lead to lower operational costs because of reduced waste and increased efficiency. Other benefits to the practice include enhanced patient recognition, as patients are increasingly environmentally aware. Dental suppliers will benefit from selling safer products and can use this more sustainable approach to promote their business.

Sustainable procurement in dentistry should be viewed as a practice-level initiative that links into a broader regional/national health system strategy to reduce greenhouse gas (GHG) emissions (50% reductions required for the Irish public sector by 2030).[2] Embedding dental procurement within these frameworks ensures consistency with the wider EU Green Deal and national decarbonisation targets.[3]

Procurement decisions can be evaluated in different ways. The four pillars of sustainability are social, human (including healthcare), environmental, and economic. These factors must prosper in a balanced way for a sustainable future. To that end, the triple bottom line theory is a sustainability framework used in business that measures a business's success across three parameters: its social impact (people); its environmental impact (planet); and, its financial performance (profit). This guides the procurer to pre-assess purchases not only for monetary value but to minimise carbon and waste, to ensure ethical labour practices in supply chains, protect staff and patient health by reducing chemical exposure, and deliver best value when life cycle costs (LCCs) are considered. The reader may have seen a recent paper by one of the authors demonstrating that manufacturing toothbrushes locally, or at least within Europe, has more positive social outcomes across several levels; this also applies to other procurement products.[4]

Actions for the practitioner

Avoid waste: order less and order less frequently

Ordering supplies less frequently will reduce the pollution associated with

delivery. Good stock control is very important to avoid waste, and reduce costs, for example, rotating consumables to ensure that older products are in front of newer ones.

The authors are aware of progress by the Irish dental supply companies to electrify their fleets and significantly reduce their transport emissions.[5] In the absence of electrified transport, where practical, practices and suppliers should consolidate shipments to minimise transport-related emissions.

Dental team members should **Rethink** the products they buy and try to avoid disposable or single-use items. **Reduce** orders as much as is practical. **Reuse** products that can be reused. **Recycle** products as appropriate. Consider having a system or a designated person who oversees stock management. Doing an annual audit can identify the most used products and analyse their sustainability. By design, the ideal product would be:[6]

- safe to use on patients and fit for purpose;
- manufactured without fossil fuels;
- manufactured with renewable energy;
- supplied with minimum, reusable packaging;

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- broken down into environmentally harmless elements;
- simple in design, and easy to clean and reuse or recycle;
- transported in the most environmentally acceptable way; and,
- inexpensive.

Supplier and manufacturer decisions are influenced by a combination of market demand, regulatory requirements, cost structures, and reputational considerations, rather than simple market forces alone.[7] Evidence from sustainable healthcare supply chains shows that clear procurement signals from clinicians and institutions, together with policy incentives, standards (e.g., ISO 14001, NHS Evergreen, EU Green Public Procurement), and transparency requirements, can act as major facilitators of change.[8,9,10] Conversely, fragmented demand, lack of product labelling, and uncertainty about clinical acceptability often remain key barriers to supplier innovation.[1] Collaboration between dental professionals, procurement leads, and suppliers is therefore essential to shift the market toward lower-carbon, ethically sourced products.

Suppliers should be encouraged to reuse packaging by collecting it for reuse. It would be more efficient to only have one monthly delivery, with used packaging collected by the supplier for reuse; if it cannot be reused it can be recycled. Ideally, suppliers should be committed to ISO 14001 or other international standards reflecting sustainability. Ideal packaging[8] would conserve as many natural resources as possible and be reusable, and production would be low energy.

The dental team should discuss sustainability with their supplier and request more sustainable delivery and products where possible. Suppliers should be encouraged to advertise their environmentally acceptable products and highlight these products in their catalogues and advertising.

Plastics

Plastic pollution is a major crisis worldwide and plastic products should be avoided or reduced where possible.[11,12] Ideally, materials for order should be grown rather than fossil fuel based. Grown products such as bioplastics should be grown on non-arable land, where possible, to preserve land for food production.[12]

Plastics are not inert materials. To achieve flexibility, colour, durability, and flame resistance, they contain a wide range of chemical additives, including plasticisers (e.g., phthalates), flame retardants (polybrominated diphenyl ethers [PBDEs], tetrabromobisphenol A [TBBPA]), stabilisers (lead, cadmium, bisphenol A), and antioxidants (butylated hydroxytoluene [BHT], butylated hydroxyanisole [BHA]).[13] These substances are not chemically bound to the polymer and can migrate, leach, or volatilise throughout the product's life cycle during manufacture, use, or disposal.[14] Human exposure occurs through skin contact, inhalation of microplastic particles, and especially, ingestion via food packaging as additives transfer into food and beverages.[15] Several of these compounds act as endocrine disruptors (e.g., BPA, phthalates), neurotoxicants (e.g., PBDEs, lead stabilisers), or carcinogens (e.g., vinyl chloride monomers).[16] Microplastics can also absorb and carry persistent organic pollutants (POPs) like dioxins and polychlorinated biphenyls (PCBs), amplifying their bioavailability once ingested or inhaled.[17] As a result, plastics contribute not only to environmental contamination, but also to chronic low-level chemical exposure in humans, particularly through consumer and healthcare products that come into contact with the body or food.[18]

Cleaning products

Cleaning contractors and cleaners should be required to only use safe chemical cleaning solutions that readily break down to environmentally safe components. A study of domestic cleaners showed a reduction in lung function potentially linked to the inhalation of toxic substances.[19]

The dental team should avoid using chlorine and other polluting products.[11] There are safer alternative cleaning agents on the market, and these should be the cleaning products of choice. If your supplier does not stock these products, it should be encouraged to stock safe products. Alternatively, purchase them from companies that do.

Further research and education are required to ensure that dental professionals can accurately identify which cleaning and disinfection products are safe and environmentally responsible to use. In Ireland, the use and management of all chemical agents in the workplace are governed by the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001-2021, which require employers to identify hazardous substances, assess exposure risks, and implement control measures to protect staff and patients. Compliance with these regulations should form the foundation of sustainable chemical procurement and use within dental settings.[20]

Equipment

Single-use equipment should be avoided unless there is a very strong reason for its use. Some items are single use for infection control reasons. Disposable kits have a higher environmental impact in many areas, including the minerals and metals used, resulting in greater damage to the environment including freshwater use and climate effects.[21] Switching from single-use to reusable exam kits can reduce climate impacts by approximately one-third.[21]

Avoid plastic disposable single-use suction tips and air/water syringe tips. These should be replaced by steel products ideally, or reusable and autoclavable plastic suction tips. Recycling plastic consumables, such as suction tips and plastic barriers, should take place where appropriate.

Dental equipment can be energy intensive. Always check the efficiency of equipment as advised by the manufacturer. Buy energy-efficient autoclaves, washer-disinfectors, suction units and compressors.

Procurers should think beyond the purchase price of any equipment they buy. Looking at the whole LCC helps to compare products by looking at the total cost over their entire lifetime, not just the price on the invoice. This includes the energy needed to run the equipment, the cost and frequency of maintenance or consumables, and the final disposal or recycling cost. For example, a cheaper autoclave that uses more electricity and water may cost far more to operate over ten years than a higher-efficiency model. A simple way to apply LCC is to ask three questions before purchase:

1. What will it cost to run and service each year?
2. How long will it last before replacement?
3. Can parts be repaired or recycled at end of life?

Example:

Consider a practice deciding between two suction systems:
System A costs €3,000, uses 1.2kWh of electricity per hour, and typically lasts for seven years.
System B costs €4,000, uses only 0.6kWh per hour, and lasts for 10 years.
System A seems cheaper. However, with ten years of daily use, the energy savings from System B (at a price of €0.35/kWh) would amount to €1.36 a day and the longer lifespan means that its total annual purchase cost (€400 compared with €423 per year) is also lower.

Even without complex spreadsheets, thinking in terms of costs over time, not just the purchase price, enables dentists to choose equipment that is financially and environmentally sustainable, aligning with the principle of 'best value over time' rather than lowest upfront cost.[1]

PPE

Use biodegradable personal protective equipment (PPE) materials, for example, polylactic acid (PLA) masks and gowns, as these have a lower environmental cost. PLA masks, manufactured from plant-derived polymers such as corn starch, are available as biodegradable alternatives to conventional polypropylene (PP) surgical masks.[1] Although visually similar, they can be distinguished through several physical and labelling characteristics. PLA masks typically exhibit a slightly stiffer and glossier texture, often with a sweet or starchy odour, whereas PP masks feel softer and more elastic.

On the packaging, they are labelled as "bioplastic", "plant-based", or "compostable", and commonly certified under EN 13432, ASTM D6400/D6868, or compost standards.[22,23] Unlike PP masks marked with the recycling code PP-5, PLA masks usually carry compostability logos and instruct users not to recycle them in conventional plastic streams.[6] However, it is important to note that most commercial 'eco' masks are hybrid designs in which only the external or filter layers are PLA, while ear loops or nose wires remain synthetic, limiting full biodegradability.

Under current HSE guidance, used masks from treatment areas should continue to be managed as healthcare risk waste, regardless of whether they are polylactic or polypropylene based. Only unsoiled PLA masks used in non-clinical areas (e.g., reception staff, waiting rooms) may be directed to industrial composting streams, but only where certified as EN 13432 and accepted by the waste provider.[24]

Preferably, reusable gowns and visors should be considered. Non-sterile gloves are adequate for most dental procedures. Reusable silicone gloves can be used for non-critical procedures. Gowns and aprons should be washable. Cotton or other plant- or animal-based fabrics are favoured compared to the fossil fuel-based fabrics such as polypropylene or polyester, as these shed particles of plastic during washing. Reusable gowns may potentially reduce GHG emissions, energy consumption and solid waste generation.

Office supplies

Practices should aim to be paperless if possible. Social media and other online tools can be used to communicate with patients. Paper used in the practice should be good quality recycled paper. Purchase any necessary stationery in bulk. Office and waiting room furniture should be environmentally sustainable and should not contain plastic components. Wooden furniture should be from a sustainable source and not made from tropical hardwood.

Household items such as tea and coffee should come from a sustainable source and preferably be organic. Fairtrade, Rainforest Alliance and other certified brands are easily attained.

Dental laboratory

The use of digital intraoral scanning and local laboratory partnerships significantly reduces the environmental footprint associated with dental laboratory work. Digital workflows eliminate the need for physical impressions, plaster casts and disinfection chemicals, while also reducing transport requirements and emissions.[1] When work must be sent to external laboratories, selecting local or national providers instead of overseas facilities avoids the disproportionate carbon impact of air freight (0.9kg CO_2e per tonne), which can be up to 10 times higher per kilogram of cargo than ground transport (0.080–0.120kg CO_2e per tonne).[25] Laboratories that operate under ISO 14001 (environmental management) or ISO 9001 (quality management) standards should be prioritised.[6]

Challenges and solutions

Despite repeated warnings, governments and industries are not sufficiently meeting the challenges of sustainable development. Barriers include concerns about profitability, vested interests within the fossil fuel industry, and widespread disinterest or disinformation.[26]

Yet, meaningful progress depends not only on systemic change but also on the actions of individuals and sectors willing to take responsibility. Within dentistry, Irish practices face specific obstacles to sustainable procurement, including potentially higher upfront costs, limited product options, and stringent infection control requirements. Over time, growing demand and regulatory pressures are likely to reduce these costs. Practices can help accelerate progress by sourcing greener alternatives, engaging with suppliers, and appointing sustainability leads to co-ordinate training and promote environmentally responsible practices. Reusable items that can be safely decontaminated should be prioritised, and disposable products should be made from sustainable materials. Continued collaboration between professional organisations, suppliers, and practitioners is essential to share knowledge, strengthen sustainability policies, and embed best practice across the dental supply chain.

Take home messages:

- procurement practices can reduce environmental damage in a sustainable way;
- working with suppliers and manufacturers on more environmentally friendly approaches will help us to move towards a more sustainable future; and,
- practitioners should embed the concept of rethink, reduce, reuse and recycle in practice procurement policies.

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