Fighting global warming: it's time to reduce waste!

As was underlined during the last United Nations climate change conference (Conference of the Parties, COP 24), global warming is a major concern for humanity. The goal defined during the Paris Agreement of 2015 was to keep the increase in global average temperature to well below 2°C above pre-industrial levels. This goal might be reached by bringing greenhouse gas emissions to zero within the second half of the 21st century. Such an effort presupposes a profound change to our way of life and energetic application of transitional policies to reduce dependence on fossil fuels. Of note, healthcare (mainly related to hospitals) contributes to global warming, with the total carbon footprint ranging from 3–10% of the total national carbon dioxide equivalent emissions.[1–3] Improving the energy efficiency of buildings, reducing car use by health facilities, rationalizing the choice of inhaled anesthetics and avoiding nitrous oxide and unnecessarily high fresh gas flow rates may all contribute to reducing the greenhouse gas emissions associated with healthcare.[4–6] Minimizing medical waste might also be effective in reducing the environmental impact of our activity.

In our maternity ward, we aimed to assess the carbon footprint related to the insertion of an epidural catheter for labor pain relief. In fact, the insertion of an epidural catheter implies the use of prepared epidural analgesia sets (compresses, trays, cups), epidural kits (needle, catheter, filter) and ancillary devices (fields, surgical gown and gloves), some elements of which are rarely used and, therefore, quasi-systematically discarded. An independent observer recorded all the devices that were used or not (and discarded) during the insertion of an epidural catheter by 10 senior and resident anesthesiologists. Each of these medical devices and its packaging were weighed using high-precision scales. The materials used in the composition of the devices were provided by the manufacturers we contacted. The carbon footprint of each used/unused medical device was then calculated using the methodology available on the French Environment and Energy Management Agency website, accessed on December 2, 2018. This calculation takes into account the carbon dioxide emission related to the extraction and the production of each constituent material of the medical device. We also added to this calculation the carbon emissions related to the destruction of healthcare waste, based on estimates provided by the French Environment and Energy Management Agency. The overall carbon emissions thus estimated were expressed in equivalent kg CO_2 ($kgCO_2e$) and equivalent ton CO_2 (tCO_2e).

We found that the overall carbon emission related to the insertion of each epidural catheter ranged from 1.3 to 1.8 $kgCO_2e$. Knowing that approximately 4200 deliveries per year occur under epidural analgesia in our maternity unit, we estimated that the carbon footprint of the insertion of epidural catheters may range from 5.2–7.2 tCO_2e per year. This is equivalent to the carbon dioxide emissions released per passenger during four to five flights between Paris and New York. With regards to the unused devices that were discarded by all the anesthesiologists during the insertion of the epidural catheters, their carbon footprint was 1.2–1.7 tCO_2e per year, which is equivalent to the carbon dioxide emissions emitted by one car driver whilst performing five journeys between Paris and Berlin.

These results are certainly an underestimate since the carbon footprint calculations did not take into account carbon emissions related to the production of the medical devices themselves, especially the energy consumed in assembling the materials, as this was not included in the calculation. In addition, we did not include the carbon dioxide emissions related to the transportation of the materials and medical devices or to the production of soap and antiseptic solution. Nevertheless, these results illustrate how our medical activity impacts the overall emission of carbon dioxide and that non-binding and easy-to-achieve strategies could be proposed to reduce the carbon footprint related to healthcare. Our research led our team to propose new epidural sets and kits to limit waste. Unnecessary trays, cups, compresses and fields were removed, leading to an estimated reduction in the overall carbon emission related to the insertion of epidural catheters by approximately one ton per year. We believe these results should encourage every surgical, interventional radiology and anesthetic team to re-assess the sets they use every day in order to easily contribute to minimizing carbon emissions related to their activity. As stated by Pencheon et al.[5] with regard to health sector leadership in mitigating climate change "There is a special responsibility and opportunity for the health sector to lead by example".

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Safety net or hole in the cheese?

Non-Luer neuraxial connectors are a hot topic at the moment. The ISO 80369-6 has been ratified and NRFit spinal needles are now widely available. The Association of Anaesthetists have produced a Frequently Asked Questions (FAQ) information sheet.[1] However, the fact still remains that one can draw up whatever drug one wishes into an NRFit syringe and administer it through an NRFit spinal needle. The new non-Luer connectors have given us an engineered solution to the problem of connecting a Luer syringe containing a drug intended for intravenous administration to a neuraxial administration device (spinal needles only at present; epidural catheters to follow in the future). Yet latent errors still exist in the system: firstly, we need to draw up the drug intended for neuraxial administration from a drug ampoule or fluid bag and errors can occur at this point. A second issue relates to the old but ongoing problem of drug labelling and off-label use of drugs intended for the neuraxial route. Drug ampoules or bags containing fluid intended for epidural administration clearly state on them that the drug is 'for epidural use only'. The glass ampoules that we use for the preparation of our spinal anaesthetic mixture often do not. In our institution we use 0.5% bupivacaine 5 mg/mL (Marcain Heavy, AstraZeneca) plus fentanyl 50 μg/mL, 2 mL (Martindale Pharma) and morphine 1 mg/mL, 10 mL (Torbay Pharmaceuticals). The local anaesthetic ampoule states that the drug is 'for intrathecal injection only'. The opioids are not licensed for neuraxial administration and therefore contain no reference to administration via that route: rather the fentanyl ampoule states 'for IV or IM injection' and the morphine ampoule states 'for IV use'.

There are surprisingly few preparations of morphine that are licensed in the UK and one needs to consider the complexities of the pharmaceutical industry to understand this predicament. A drug can be *suitable* for many things but may only be *licensed* for a single application. Obtaining a licence for a drug is an expensive business: The UK Medicine and Healthcare products Regulatory Agency states it will cost £92,753[2]. If a licensed drug exists, hospital pharmacies are obliged to purchase that drug, even though they may be able to produce the drug more cheaply themselves. Changing the licence of a drug is also expensive, perhaps prohibitively so. The fee is £25,643.

Have we reached a point where we should be lobbying health regulators to supply us with drugs licensed for the neuraxial route? The fee of 'only' £25,000 is small when one considers the cost of a neuraxial drug error. Having identified the issue of still being able to draw up any drug one wishes to administer via our NRFit syringe, surely we need more precise ampoule labels to reduce the chance of an error?

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