

Green or Orange Anesthetic Practice: Choice or Obligation?

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Introduction

Environmental sustainability is a state in which the demands placed on the environment can be met without reducing its capacity to allow all people to live well, now and in the future. Evidence is strong that we are exceeding and eroding the earth's carrying capacity, that there are limits to growth on a finite planet. Leading thinkers suggest that to stand any chance of achieving environmental sustainability, businesses need to move from a sense of right-to-exploit the natural environment to a worldview of mutual interdependence and radical eco-innovation [1]. "Cradle to Cradle, C2C" model is sustainable and considerate of life and future generations and is a noble target [2], however, it might prove elusive in medical service, at least currently.

The three R's-reduce, reuse and recycle - all help to cut down on the amount of waste we throw away. The most effective way to reduce waste is to not create it in the first place. This is followed by reuse of same materials. Recycling is the process of converting waste materials into new materials and objects. We cannot stop medical waste production entirely because of our inability to neutralize contaminating load of bacteria, viruses, radioactive materials, and chemotherapeutic agents in an eco-friendly way so far. Fate of waste, which is neither reused nor recycled, is either landfill or incineration at a very high damaging cost to environment.

The task to measure total medical waste added to Earth is daunting on one hand and on the other hand, its necessity is questionable. It is reasonable to assume that medical service is fulfilled through certain means which fate must be classified in advance. They could be reduced, reused, recycled or wasted, depending on potential hazard they might add after their first use. We introduce few ideas away from simplistic approach of sorting out waste into black and orange bags, and sharps boxes in induction room and theatres.

Preoperatively, few medications are given orally at no waste, namely paracetamol, antiemetics, tranexamic acid, antibiotics or B-blockers. Care is observed as fasting state may preclude such practice under certain conditions. If this to be adopted, green way is to be followed, even if it necessitates that patient bring their own mugs to the day ward sharing their green responsibility. Tablets are distributed in very small reusable and recyclable paper envelopes. With rough estimation in case of paracetamol, this may reduce spending with many thousand pounds every week taking in consideration that cost ratio of 1000mg paracetamol iv to oral is nearly 70 to one [3]. Meanwhile, patients received the same medicine with comparable effect in even a safer way [4].

Monitoring patients represents majorly the area of reuse. Pulse oximeter and blood pressure cuffs visit all our patients without any concern as we keep reusing them indefinitely until they wear off. ECG monitor is different where electrode leads are reusable, while conducting discs or dots are not. Doubling disc radius increases circle area by 4 times, while

not adding any benefit for conduction of heart electricity. Hence, we suggest using smallest possible discs that maintain the conducting gel while sticking to skin around it as neonatal discs, for all patients to reduce waste. Breathing circuits and capnometry, are fitted with a filter that allows definite multiple reuses. Airway management waste and reusable materials could be revisited in a similar way to sort out what is reusable and what is not.

Patients' blood is the main potential source of contamination posing contact risk. Cleaning spilt blood increases waste exponentially. Hence, blood spillage and loss during anaesthetic procedures should be either eliminated or minimized. IV cannulation is to be conducted as meticulously bloodless as possible as it could be. Training of new anesthetists ought to include such technique that guarantees this result. Cannula connection to iv fluid is safer to be done immediately following successful cannulation, in a bloodless and orderly fashion. The anesthetists apply index finger pressure on tip of the cannula while withdrawing and disposing needle into contaminated sharps container immediately. However, we should be looking a new design of strictly bloodless cannula.

Finally, iv fluid set is attached to cannula. Often pressure application is applied wrongly, with blood spillage as result. We propose having cannula dressing with another sticky strip which is color-coded and equal in length to distance from cannula's hub to its tip, to be applied following cannulation for definite marking of the pressure spot. The practice of capping the cannula in induction room for later connection of iv fluids in theatre must stop. Blood spillage is more likely then, as it is usually done at last moment and under pressure. Even if iv fluids are not needed, small iv extension for injection is connected. In case of failed cannulation attempt, put a swab at puncture site, apply maintained pressure while withdrawing the unsuccessful cannula and finally a small adhesive is placed. If pressure is applied for 5 long minutes, nothing more could be needed. Otherwise, 2 by 2 double-layered swabs would reduce waste more than the too large 4 by 4 swabs. Attaching iv fluid for each patient is just a way of imprudent wasting of resources. A balanced decision between need of iv fluids versus waste production, is a valuable approach.

Pharmaceutical industry should share responsibility in reducing waste, while motivated, persuaded or pressurized by anesthetists. Drug packaging is not a matter of routine, profit or propaganda, especially when it comes to hospitals as big, guaranteed consumers. For the same drug, different volumes of consumption should be supplied by different packages accordingly. The onus is on the producer to state nature of packaging and why not biodegradable if not so. If recyclable, which container it goes to at the end. Wrapping some ampoules contradict reducing waste, especially it is not needed and may hamper immediate access. Wasted unread drug brochures contained in packages destined for hospital use by professional specialists are very silly portrayal of legal obligation on the side of producing companies. However, a QR

(quick response) codes tagged on the package, could provide easy access to drug information through any smartphone and seriously realize this legal responsibility.

Drug ampoules that break with difficulties, increase injury risk and bleeding with potential increase in materials usage and waste production. Shatterproof ampoules should be guaranteed. Besides, wrapping drug ampoules separately is unnecessary and unaffordable luxury, that ought to stop. Routine emergency drugs that are prepared each list are seldom used and end up as waste, but paradoxically needed if preparation is omitted, are better supplied as prefilled syringes that can be used any time for any case. Inter-patient contamination is not allowed, but this doesn't preclude dividing ampoules or vials contents among patients on the surgical list ahead of start. So, a 60ml- or 100ml vial of propofol could be divided into three or five induction doses instead of breaking three or five ampoules with less waste produced.

We conducted a very limited observation of material used in a morning list of 5 short cases. We found that mean weight values of non-contaminated, sharps and non-sharps are 90g/case and 160g/case respectively. While total value of contaminated, sharps and non-sharps together is 15g. There is unexplained tendency to send all sharps for incineration, which is unfair. This is a big destructive load on Earth resulting from all surgical operations performed. We still believe that this could be reduced by simple measures like using same withdrawal needles through the whole list as there is no contact with patients.

Recovering patients may be the least of all in producing waste, however prescribing O₂ and face mask to patients non-selectively may not prove so. Reassessment of the notion of prophylactic O₂ is mandatory. Research is needed regarding lowest safest SpO₂ after emerging from anesthesia, as little is accrued while raising SpO₂ from 94% to 100% except being away from shoulder of O₂ dissociation curve [5]. Airway patency and deep breathing exercise should be emphasized rather than increasing FiO₂ while recovering patients.

For sustainability management to be transpired, green bundle of measurements should find its way into training programs of new anesthetists that include curriculum green anesthesia section, examination topics, credits and prizes for the greenest. It is worth trying to have anesthesia department green lead who can forward all these plans. "Zero waste" [6] as a goal is humans' hope to continue living on inhabitable Earth. Embracing the Three Rs, is basic preliminary step of this achievement. Wisdom ingrained in anesthesia makes anesthetists leaders on the green road for human future on Earth.

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