Achieving Ecological Sustainability in Anesthesiology

Believe it or not, damages from health-sector pollution are on the same order of magnitude as lives lost each year from preventable medical errors. Therefore, striving to keep patients safe should include efforts to protect public health.

"Ironically, the health sector is one of the worst polluting industries," said Jodi Sherman, MD, assistant professor of anesthesiology at Yale School of Medicine, in New Haven, Conn. "You cannot have healthy people on a sick planet."

The Nociception Level Index

Monitor Detects Patients' Pain During Surgery

Israeli researchers have devised a multivariable index that appears to accurately reflect patients' experience of pain during surgery.

"The primary significance of our findings is that we have proved that it is possible to accurately and objectively assess patients' nociceptive state—or "pain"—based on an algorithmic combination of multiple physiological parameters, creating the Nol, [nociception level] index," Ruth Edry, MD, told Anesthesiology News. Results of a trial of the Nol index were reported in Anesthesiology (2016;125:193-203).

"We were able to identify—in anesthetized, non-communicating, surgical patients—a patient's response to noxious stimuli and the effect of analgesic administration, as well as grade the patient's response to noxious stimuli of varied levels and distinguish different doses of analgesia during a similar noxious stimulus."

Dr. Edry is the lead author of this study and senior physian anesthesiologist at Rambam Medical Center in Haifa.

Use of Enhanced Recovery Pathways in Ambulatory Settings Markedly Successful

CHICAGO—Although enhanced recovery pathways are beginning to gain a foothold in the inpatient arena, their place in the ambulatory setting is only now evolving, particularly for cancer patients. Research shows, however, that procedure-specific enhanced recovery pathways can be successfully implemented in outpatient centers, with marked success in terms of reduction in lengths of stay and increased patient satisfaction.
Anesthesiology Sustainability Checklist

By the ASA Environmental Task Force
www.asahq.org/resources/sustainability

Reduce Inhaled Anesthetic Atmospheric Waste

☐ Utilize low fresh gas flows
☐ Avoid high impact inhaled anesthetics: Desflurane, Nitrous Oxide
☐ Consider intravenous or regional techniques
☐ Invest in WAG trapping for volatile only or WAG destroying (all inhaled anesthetics, including Nitrous Oxide) technology for the Anesthesia Machine

Reduce IV Pharmaceutical Waste

☐ Use prefilled syringes
☐ Use appropriate sized vials for an individual patient
☐ Dispose of unused medications and vials according to regulations (and not exceeding)

Reduce Anesthesia Equipment Waste

☐ Only open equipment intended for immediate use
☐ Consider purchase of reusable or reprocessed equipment over disposable
☐ Reprocess or recycle suitable disposable equipment
☐ Adjust stock levels to minimize discarding expired items
☐ Reformulate prefabricated kits to eliminate unnecessary items
☐ Reformulate anesthesia supply cart to eliminate unnecessary items
☐ Donate expired or unused open equipment

Solid Waste Segregation

☐ Segregate waste according to type (pharmaceutical, solid, biohazard, etc.)

Supply department: Possible devices, IV bags, safety, and then rest.

To further reduce "only use what stuff is expired or expired items and carts to remove unique.

Several printed routines are routine manuals. "Vial may not be needed this year." According to a drug store being said. As a result, to prefilled syringes third party vendors. Although this

Focus of ASA Task Force

Strategies advocated by the American Society of Anesthesiologists (ASA)’s Environmental Task Force to reduce pollution have been collected and listed in the ASA’s Anesthesia Sustainability Checklist (see sidebar).

For inhaled anesthetic gas management, strategies include avoiding the use of high impact inhaled anesthetics desflurane and nitrous oxide. "Instead, administer either sevoflurane or isoflurane when possible," said Dr. Sherman, who serves as co-chair of the task force.

Making a habit of using low fresh gas flows, and using noninhalated intravenous and regional techniques when clinically feasible, will also reduce inhaled anesthetic atmospheric waste. Technology for waste anesthetic capture/degasification is an important opportunity to further reduce emissions.

"It is not just what we throw away that matters," Dr. Sherman said. "It is also the resources that go into the manufacturing, transportation and the use of supplies—in other words, the entire life cycle of a product. So reducing waste overall is a critically important strategy."

Surprisingly, the most damaging phase of inhaled anesthetics is the disposal process. "These drugs are essentially blown off of hospital rooftops and into the air, as there are no regulations controlling their outdoor emissions," Dr. Sherman said.

Fortunately, there is commercially available technology to capture volatile anesthetics and to destroy nitrous oxide. "The question then becomes, should we all be adopting this technology?" Dr. Sherman said.

Anesthesiologists can become environmentally responsible by championing conservation of resources. "This includes reducing waste and using more reusable devices when safe to do so, or reprocessing those devices," Dr. Sherman said. "Essentially, instead of using in-house central sterilization and
supply departments, third-party vendors take the disposable devices, clean and test them to guarantee their safety, and then resell them at a discounted price."

"To further reduce anesthesia equipment waste, 'only open up stuff that you need,'" Dr. Sherman said. Adhering to stock levels to minimize the number of expired items and reusing anesthesia supply carts to remove unnecessary items are also helpful.

Several printed articles demonstrate that anesthesiologists routinely discard 30% to 70% of intravenous drugs. "Vial sizes are frequently much larger than needed for an individual patient, so many of our drugs are being disposed of unused," Dr. Sherman said. As a result, some institutions have changed to prefilled syringes, which are provided by either a third-party vendor or an in-house pharmacy.

"Although this strategy has not been broadly adopted because it requires cost shifting, a comprehensive cost analysis has been lacking," Dr. Sherman said. "Prefilled syringes are safer, though, and have been advocated for by the Anesthesia Patient Safety Foundation (APSF) since 2010."

Solid waste segregation is another key metric for sustainability. "We have many different waste streams in the OR. The more hazardous the waste is, the more expensive and more polluting it is to treat, so taking the time to properly separate trash actually does matter," said Dr. Sherman, who is the environmental compliance officer for Yale's Department of Anesthesiology.

"These drugs are essentially blown off of hospital rooftops and into the air, as there are no regulations controlling their outdoor emissions."

—Jodi Sherman, MD

Another targeted area is linens. Reusable surgical linens have been shown to produce less pollution. Regardless of whether linens are reusable or disposable, "we need to minimize their use—for example, the number of cotton blanket turnovers on a single patient in their perioperative stay," Dr. Sherman said. "There is no evidence that a patient's heat is conserved more by having a blanket fresh out of the warms versus neat, and frequent changers are costly and energy- and water-intensive."

In addition, replacing old electronics such as monitors with the latest models is "not necessarily useful," Dr. Sherman said. When disposing of old equipment or negotiating new equipment contracts, specify the services of a certified sustainable electronic recycling vendor.

Anesthesiologists can step up to the plate in many ways, including starting or joining a sustainability committee at the department, hospital or community level. They also can become active in medical device procurement committees and add environmental preferable purchasing concerns to decision making.

"Moreover, you can get involved on a higher administrative level, or give talks at your own facility," Dr. Sherman said.

This past summer, Yale's Department of Anesthesiology launched a free smartphone app called Yale Gasting Greener, which provides a calculator to help educate clinicians about the environmental impact of inflating anesthetics. The app also offers an optional research data collection tool. "By sharing inflated anesthetic procurement volume data, a user can receive a free, personalized benchmark report on the inflating anesthetic carbon footprint performance of her facility," Dr. Sherman said.

The ASA Environmental Task Force will be commissioning a special series of articles in Anesthesia Technology News in the coming months, for a more in-depth discussion of why and how to make anesthesia practices more sustainable.

**Suggested Reading**


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**One Circuit per Day**

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