Maryland Hospitals for a Healthy Environment

Compilation of Case Studies

November 2008

Blue Wrap Recycling Pilot Project

Mercury Audits

Auditing Neonatal Intensive Care Units for Preventable Risks

Reusable Sharps Container Program Assessment

MD H2E

Hospitals for a Healthy Environment

MARYLAND

Acknowledgements

Maryland Hospitals for a Healthy Environment would like to thank the following organizations for their contribution to the success of the case studies presented:

- Maryland Department of the Environment (MDE)
- Clean Production Action / Health Care Without Harm
- cdm eCycling
- Antos Environmental

MD H2E extends its gratitude to each of the hospital participants for taking part in the opportunity to learn more about what each can do to make sound environmental changes in their hospital.

We would also like to thank all MD H2E staff, especially Linda Lindquist, Denise Choiniere, and Nicole Killion, for their hard work on the success of the case studies.

Printed on 100% recycled content paper.

November 2008

Maryland Hospitals for a Healthy Environment
University of Maryland School of Nursing
655 West Lombard Street, Room 665
Baltimore, MD 21201
410.706.2107
www.mdh2e.org

Case Studies

MD H2E

Hospitals for a Healthy Environment

MARYLAND

Blue Wrap Recycling Pilot Project at Harbor Hospital in Baltimore, Maryland

Introduction

Hospitals in the United States generate an average of seven tons of waste per day, including infectious, solid, and hazardous waste. Included in that amount is the waste generated by surgical services or operating rooms (OR)[1]. Approximately 19% of the waste generated by surgical services is blue wrap – made of polypropylene or #5 plastic – the material used to maintain the sterility of medical and surgical instruments until opened. Blue wrap is a strong material, resistant to tearing and moisture, making it an effective barrier to contamination. Many hospitals are transitioning to reusable metal containers in which instruments are placed and then autoclaved before use. In the interim, most facilities are using large amounts of blue wrap. Recycling blue wrap offers cost savings, waste reduction, as well as environmental health benefits[2].

Reduction in total waste generated by a hospital translates into lower disposal fees. For example, Legacy Good Samaritan Hospital in Oregon has been recycling blue wrap since the late 1980s. In 2005, Legacy Good Samaritan Hospital recycled 65 tons of blue wrap, and saved approximately $230,000 in solid waste disposal fees. In addition to avoided solid waste fees, hospitals can earn a modest profit by selling #5 plastic to a local buyer. Legacy Good Samaritan Hospital earns, on average, $7800 a year by selling its blue wrap to local plastics recyclers[3].

Blue wrap is not a biodegradable product and will persist in the environment. When blue wrap is diverted from the waste stream, it can be sold as a raw material for use in the production of other plastic products. This reduces the need for newly extracted raw materials and reduces energy needs as well as the potential air, ground and water pollution produced during extraction and production[2].

Blue Wrap Recycling Pilot

Maryland Hospitals for a Healthy Environment (MD H2E), in collaboration with cdm eCycling, initiated a pilot project for Maryland hospitals to collect and recycle blue wrap. Harbor Hospital in Baltimore, Maryland was the first hospital to participate in the program. This case study summarizes Harbor Hospital's experiences. The three organizations that participated in the pilot project are:

- **Maryland Hospitals for a Healthy Environment (MD H2E)** — a grant-funded initiative that promotes environmental sustainability in healthcare throughout Maryland. MD H2E professionals provide assistance to health care facilities on preventing pollution; reducing the generation of hazardous, solid, and infectious waste; eliminating mercury; purchasing more environmentally preferable products and services; increasing recycling; and implementing other practices that improve environmental performance.
- **Harbor Hospital** — a 203-bed facility located in Baltimore, Maryland, operating within the MedStar Health system. Harbor Hospital has eleven OR suites and three endoscopic/ gastrointestinal rooms. Harbor Hospital has created a Green Team to assess and implement environmental programs, and is currently finalizing its efforts to virtually eliminate mercury from the facility.
- **cdm eCycling** — a recycler located in Baltimore, Maryland whose mission is to help clients prevent their retired electronic equipment from entering the national waste stream by providing innovative programs to reuse and recycle eWaste in a responsible manner. cdm also works with MD H2E to identify recycling markets for other usable waste products.

MD H2E and Harbor Hospital identified three goals for the blue wrap recycling pilot project: (1) to reduce the tonnage of waste by capturing at least 50% of the blue wrap destined for disposal; (2) to determine potential savings created by recycling blue wrap; and (3) to contribute to employee satisfaction and pride that their workplace is making an effort to fight global warming.

Blue Wrap Recycling Project Summary

Harbor Hospital collected sterile blue wrap in eleven OR suites and three endoscopic/GI rooms from May 2007 to December 2007. cdm eCycling collected the blue wrap once a month free of charge for a period of six months. The total weight collected over the course of the pilot was 1,666 pounds. Staff was educated about the blue wrap recycling via in-services, posted signs and fliers, and a number of electronic communications. Management and charge nurses were the "champions" who took responsibility to educate staff and act as resources for questions and concerns.

During this period, Harbor Hospital diverted nearly 75% of its blue wrap from the waste stream. Under a long-term contract with Curtis Bay Energy, Harbor Hospital pays 19 cents per pound to dispose of its regulated medical and solid waste. The avoided cost for disposal translates to a modest $320 savings. cdm eCycling will identify a local market for polypropylene as it collects additional material from other pilot participants. Due to its low market value, high volume and low weight, it is inefficient to ship #5 plastics long distances.

The flow of blue wrap material through Harbor Hospital is outlined below:

- Nurses collect blue wrap in the operating room before the patient enters the room and place the recyclable material in clear bags from the procedure-based distribution kits. Reuse of these bags negated the need to purchase bags for the recycling effort and proved to be another source of cost savings.
- OR staff nurses move full bags of blue wrap from the OR to labeled carts in the hallway.
- Daily, environmental services (EVS) personnel transfer the clear bags with blue wrap from the labeled carts in the hallway to a laundry bin and cart them to pallet-sized gaylord boxes in a large closet on a back dock.
- cdm eCycling collects, on average, three Gaylord boxes of blue wrap each month from the hospital.
- cdm eCycling transports the gaylord boxes to its warehouse in Baltimore for weighing and storage.
- Pending collection of sufficient volume of blue wrap, cdm eCycling will identify an appropriate market for the material.

The team of staff from the three organizations involved in this pilot project learned many lessons during the course of events:

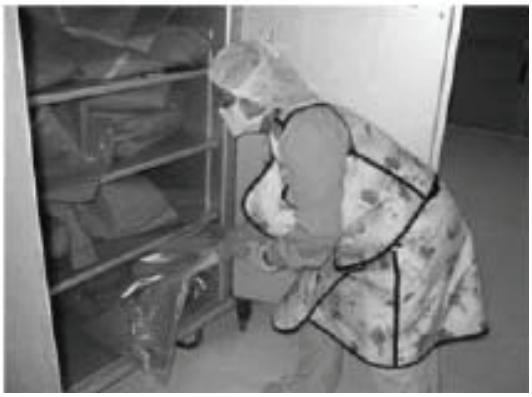
- A hospital **team approach** is vital to the success of the program. Infection control, environmental services, central sterile, nurses, and management are all a crucial part of the planning and execution of the program and should be involved at the onset of the project with roles and responsibilities clearly defined.
- **Staff education** is important especially for contract workers who are not a part of the permanent hospital staff.
- Simple **labeling and proper signage** regarding placement of blue wrap is imperative.
- **Collection container size** must be large enough to hold the amount of blue wrap

waste generated yet still fit in the allotted space in the room. **Placement of containers** matter too. Harbor Hospital found it was better to place the containers away from staff such as anesthesia and surgeons who dispose of many sharps throughout the course of a procedure and could accidentally dispose of sharps in the most accessible but wrong container.

- Visually inspect **storage areas** on a regular basis to ensure access remains available.
- Ongoing **communication** with MD H2E and the recycler can assist in troubleshooting.
- **Including saline and sterile water bottles** increased the volume of recycled material, improved the efficiency of the program, and diverted more items from the waste stream.
- Hospital employees were enthusiastic about the blue wrap recycling program which resulted in **fewer complaints** about overflowing trash containers.
- cdm eCycling employees began using metal mesh gloves for sorting as a **precautionary measure** against accidental exposures and injuries.

Conclusion

Blue wrap, a commonly used and disposed of operating room product, is non-biodegradable and persists in the environment. By setting up a recycling program, hospitals are able to divert waste from the waste stream and save money. To reduce its environmental footprint, Harbor Hospital undertook a blue wrap recycling pilot program with assistance from Maryland Hospitals for a Healthy Environment and in conjunction with cdm eCycling. The blue wrap recycling pilot project was successful in accomplishing the three original objectives. Harbor Hospital was able to (1) divert 75% of its blue wrap from the waste stream; (2) realize potential savings created by recycling blue wrap; and (3) experience increased employee satisfaction. Hospitals considering a blue wrap recycle program can use the lessons learned by Harbor Hospital during the pilot project to help guide their own program.



Contacts

Joan D. Plisko, Ph.D.
MD H2E Technical Director
(410) 706-2107
plisko@son.umaryland.edu

MaryAnn Earle, RN, BSN, CNOR
Perioperative Nursing Director
Harbor Hospital
(443) 745-0787
maryann.earl@medstar.net
www.harborhospital.org

Bob Donald
Co-Founder of CDM eCycling
410-525-1400
bob@cdm4recyle.com
www.cdm4recycle.com

References

1 Waste Reduction. Why Focus on Waste? Practice Greenhealth. cms.h2e-online.org/ee/waste-reduction

2 Reusable Totes, Blue Wrap Recycling and Composting. Environmental Best Practices for Health Care Facilities. (2002). Environmental Protection Agency Region 9 Pollution Prevention Program. www.epa.gov/region09/waste/projects/hospital/totes.pdf

3 Gaskill, M. (2006) Going Green– RNs Tackle Hospital Waste. *Nurse Week* April 24, 2006. www.h2e-online.org/docs/*nurseweek42406.pdf*

Introduction

Mercury is a potent neurotoxin that can affect the brain, spinal cord, kidneys and liver. According to the U.S. Centers for Disease Control and Prevention, up to one in 10 women in the U.S. already carry enough mercury in their blood to pose a threat of neurological damage to their fetus[1]. Affected children show diminished intelligence, impaired hearing and poor coordination[2]. The health care sector is a large producer of mercury air emissions due to (1) their contribution to medical waste incinerators; and (2) the considerable amount of energy consumed originating from coal fired power plants (a mercury generating process)[3]. In addition to mercury air emissions, hospitals contribute four to five percent (4-5%) of the total wastewater mercury load in some communities[4].

In healthcare, sphygmomanometers (i.e., blood pressure devices) and gastroenterology instruments (e.g., esophageal dilators) typically account for eighty to ninety percent (80% to 90%) of the mercury in a health care facility. Mercury can also be found in thermometers, repair kits (for sphygmomanometers, barometers, and switches), staining solutions and laboratory re-agents, tissue fixatives, thermostats, batteries, manometers on medical equipment, fluorescent and high intensity lamps, and cleaning solutions[5]. Fortunately, there are safe, cost-effective, non-mercury alternatives for all of these.

Mercury is regulated under the Resource Conservation Recovery Act (RCRA), which requires all hazardous waste handlers to have specially trained staff and equipment on hand in case of a spill or release. Additionally, these facilities must meet special storage, handling, disposal, waste tracking, and reporting requirements[6]. Failure to meet any of these requirements can result in fines up to $25,000 per day. Eliminating or reducing mercury use lowers compliance costs, and minimizes the potential for expensive spill cleanups and worker exposure to mercury.

Mercury Spills Are Costly:
Broken Sphygmomanometer
December 2006

Replace employee shoes	$ 32.99
County Emergency Department	$ 2,297.50
Environmental Clean Up Company	$14,519.91
Repair/Paint Company	$ 1,136.75
Employee Physician Visit	$ 70.00
Total	**$18,057.15**

More than 4,000 health care facilities in the U.S. have pledged to become mercury free and eight hospitals in Maryland have received national recognition for virtually eliminating mercury from their facility[1].

Mercury Audit Project

Maryland Hospitals for a Healthy Environment (MD H2E), with assistance from Antos Environmental, conducted mercury audits at three Maryland hospitals during the winter 2007 to spring 2008. The Mercury Audit Project was funded through a grant from the Maryland Department of the Environment (MDE). Prior to the onsite audits, MD H2E sent each hospital a list of common locations known in a healthcare facility to contain mercury. This case study summarizes the mercury audits conducted at the three hospitals.

Audits were conducted by a team that in-

cluded a combination of MD H2E, Antos Environmental and hospital employees.

- **Maryland Hospitals for a Healthy Environment** — A grant-funded initiative that promotes environmental sustainability in healthcare throughout Maryland. MD H2E professionals provide assistance to health care facilities on preventing pollution; reducing the generation of hazardous, solid, and infectious waste; eliminating mercury; purchasing more environmentally preferable products and services; increasing recycling; and implementing other practices that improve environmental performance.
- **Antos Environmental** — A company dedicated to environmental efforts within health care and industry since 1989. The company helps hospitals perform waste assessments, implement recycling programs and decrease waste volumes; thereby saving the hospital money from disposal fees.
- **Hospital Participants** — Participating in the audit project were two private Baltimore-based mid-size acute care hospitals and one state psychiatric hospital. All three hospitals are participants of the MD H2E initiative.

Mercury Audit Summary

Staff knowledge regarding mercury containing devices ranged from general to excellent on the three health care campuses. All three facilities are accredited by The Joint Commission and have hazardous materials and waste management plans. Hospital 1 has made great strides to reduce mercury in the clinical areas and is working with its physicians to switch to non-mercury esophageal dilators. Mercury found at Hospital 2 is mostly in sphygmomanometers. Hospital 2 currently has measures in place to safely remove these devices from the hospital with plans in the new budget to replace these devices with non-mercury alternatives. Considerably less mercury was found at Hospital 3, the psychiatric hospital, and most of it was within the facilities domain.

During the course of the audits, many departments within each facility were examined for mercury containing devices. Typically, clinical devices such as sphygmomanometers and gastroenterology instruments account for eighty to ninety percent (80% to 90%) of the mercury in a health care facility. While these items can be eliminated from a facility, items such as mercury containing fluorescent bulbs cannot be eliminated but rather can be responsibly recycled. Below is a summary, by department, of the mercury found in the three hospitals.

Mercury sphygmomanometer

Clinical Areas: In Hospital 1 there were 23 mercury-containing esophageal dilators. Esophageal dilators can contain anywhere from 0.13 to 1.77 pounds of mercury. All thermometers but one were digital and all sphygmomanometers were aneroid in Hospital 1. In Hospital 2, the audit found 184 mercury-containing sphygmomanometers, each with over 113 grams of mercury, located throughout the patient care areas. Additionally, in the dental clinic there were dental mercury amalgams, which are collected and sent out for recycling. There were no mercury-containing clinical devices in Hospital 3.

Esophageal dilator

Facilities: All three hospitals use low mercury fluorescent bulbs. A typical 4-foot-long low mercury bulb contains approximately 3.5 mg of mercury, which is less than the EPA limit for mercury, compared to 12 mg in con-

ventional 4-foot-long fluorescent bulbs. Hospital 1 is recycling the bulbs, Hospital 3 is collecting them for eventual recycling, and Hospital 2 is planning on implementing a recycling program in the near future. All three hospitals use high intensity lamps in their parking lots. There was a variety of pressure control, light switches, thermostats, and fire alarm box switches that may contain mercury at all three facilities. All three facilities intend to replace them with mercury-free alternatives. Hospitals 1 and 2 are recycling alkaline, nickel cadmium, and lead acid batteries, while Hospital 3 is recycling wet cell batteries.

Laboratory: In Hospital 1, the onsite laboratory uses Grams Iodine which contains mercury. The onsite laboratory of Hospital 2 uses non-mercury fixatives and stains; however the histology laboratory did contain three 10-12 inch mercury-containing testing thermometers. Hospital 3 has an onsite laboratory that is a specimen collection site only; all laboratory tests are conducted by an offsite contractor.

Pharmacy: Hospital 1 has no mercury containing pharmaceuticals. The other two hospitals indicated the only mercury-containing pharmaceutical used is the influenza vaccine.

Education and Training: Hospital 1 provides employee annual e-learning that includes hazardous materials in general and mercury in particular. Hospital 2 provides annual training to Environmental Services personnel, and as a result of this assessment, will expand this training to Facility and Maintenance personnel as well. As a result of the audit, Hospital 3 is now planning to conduct training for identification and proper handling of mercury containing devices.

Mercury Spills: The two acute care Hospitals have mercury spill clean up kits with a 24-hour trained spill response team available. There are also contracts in place for emergency large-spill clean-up.

Next Steps to Mercury Elimination

While the amount and location of mercury varied from hospital to hospital, the next steps in creating an overall facility mercury management system are similar. As such, the following are recommended next steps for the three hospitals, although specifics of each step will vary.

1. **Develop a Mercury Management Policy** indicating overall hospital commitment to eliminating mercury from the hospital setting.
2. **Develop a Purchasing Policy** that indicates mercury-containing products will not be purchased by the hospital unless special permission is given.
3. **Prepare a budget for the removal and disposal of the mercury containing devices** found in the physical assessment and for the **procurement of non-mercuric alternatives**.
4. **Develop and implement training** for identification and awareness of mercury, handling precautions, and proper disposal of mercury-containing devices and material.
5. **Partner with the physician base** who drives the use of mercury based medical equipment at the acute care hospitals to switch to mercury-free alternatives.
6. **Continue to expand recycling efforts** particularly the clinical devices, fluorescent bulbs, and batteries.
7. **Publish success stories** to hospital employees and to the community to let people know that the hospital is a good neighbor!

Follow-Up

MD H2E conducted follow-up interviews with representatives of the three hospitals ap-

proximately six months after the audits were conducted. The results are highlighted below.

Hospital 1 has been successful in switching to mercury-free esophageal dilators and properly recycled the mercury containing dilators. Hospital 1 has replaced the one mercury thermometer in the Blood Bank and no longer uses the Gram Iodine in the lab. Hospital 1 is within a larger hospital system which is working on a corporate mercury management plan and mercury purchasing plan.

Hospital 2 has started recycling fluorescent bulbs and replaced the three mercury thermometers in the lab. A mercury management plan and purchasing policy are planned for the next fiscal year. The bulk of mercury at Hospital 2 is from the sphygmomanometers. These have not been replaced but will be in the next two years when the hospital opens at a new location, and the old location decommissioned. Personnel at Hospital 2 have been successful in educating physicians on mercury-free alternatives.

Hospital 3 has plans to replace, instead of repair, all pressure control, light switches, thermostats and fire alarm boxes switches with mercury alternatives when needed. Hospital 3 is in the planning phase of establishing policies for the following: (1) training for awareness of mercury containing devices and materials within facilities and maintenance; (2) purchasing to incorporate in the screening of products and vendors for the identification of mercury; (3) developing a contract with a waste disposal company for the disposal of all mercury waste including fluorescent bulbs; and (4) developing a policy and process for collection and disposal of all batteries. Hospital 3 is also in the process of identifying a vendor to recycle their fluorescent bulbs.

Conclusion

The health care sector is a large contributor to mercury emissions and mercury load in air and in waste water due to continued use and improper disposal of mercury and mercury containing devices. In an effort to gain insight as to what hospitals are currently doing to reduce their mercury load, MD H2E with assistance from Antos Environmental conducted mercury audits at three area hospitals. The audits showed that safe, cost-effective, non-mercury alternatives are available; however mercury and mercury containing devices are still prevalent in health care settings. The audits demonstrated that hospital staff was knowledgeable about mercury and mercury containing devices and were taking steps to eliminate these from their hospitals. The seven actions outlined in the *Next Steps to Mercury Elimination* is a good starting point for any health care facility starting to address elimination and disposal of mercury and mercury containing devices in their facility.

Contacts

Joan D. Plisko, Ph.D.
MD H2E Technical Director
(410) 706-2107
plisko@son.umaryland.edu

Amy Piser
Antos Environmental
(518) 325-5410
www.antosenvironmental.com

References

1 Health Care Without Harm www.hcwh.org/us/mercury/issue

2 Environmental Protection Agency www.epa.gov/mercury/effects

3 Mercury Study Report to Congress (1997) Environmental Protection Agency www.epa.gov/ttn/caaa/t3/reports/volume2.pdf

4 Health Care Without Harm www.noharm.org/library/docs/Going_Green_The_Mercury_Problem_-_Fast_Facts.pdf

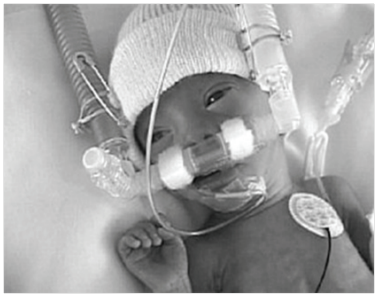
5 Health Care Without Harm www.noharm.org/details.cfm?ID=582&type=document

6 Practice Greenhealth cms.h2e-online.org/ee/hazmat/hazmatconcern/mercury

Auditing Neonatal Intensive Care Units for Preventable Risks

Introduction

Polyvinyl chloride (PVC) is the most common plastic used in hospital products. Dioxin, a potent human carcinogen and endocrine disruptor, is formed during the production of PVC-containing products and during the incineration of disposed PVC products. Di-2-ethylhexyl phthalate (DEHP) is a plasticizer used to make PVC-containing products soft and flexible[1]. DEHP can leach out of PVC-containing devices into contained liquids such as IV fluids and enteral feeding products. DEHP is a known developmental and reproductive toxicant[2].



In July 2002, the United States Food and Drug Administration issued a Public Health Notification on PVC Devices Containing the Plasticizer DEHP. The FDA recommends to[2]:

1. Use alternatives to DEHP-containing products when exposures are excessive;
2. Use alternatives to DEHP when high risk procedures are performed on male neonates, pregnant women carrying male fetuses, and peripubertal males;
3. Reformulate products to decrease/ eliminate DEHP exposure; and
4. Label DEHP-containing products.

In a 2002 risk assessment, the National Toxicology Program (NTP) found there was 'serious concern' that intensive exposure to DEHP may cause adverse effects in male neonates[3].

To minimize the potential negative effects of exposure to DEHP, a growing number of hospitals are undertaking efforts to reduce PVC and DEHP use in their facilities, specifically in the neonatal intensive care unit (NICU) where the most vulnerable populations reside. DEHP-containing products commonly used in the NICU include respiratory therapy products, blood bags, IV bags and tubing, catheters, enteral feeding devices, and suction devices.[2]

NICU Audit Project

With funding from the Maryland Department of the Environment (MDE), Maryland Hospitals for a Healthy Environment (MD H2E) audited NICUs at three Maryland hospitals to identify products containing DEHP and develop a plan for hospital NICUs to transition to DEHP-free products. In conjunction with Clean Production Action/Health Care Without Harm, MD H2E audited the hospitals in October 2007. This report summarizes the findings of that project.

- **Maryland Hospitals for a Healthy Environment —** A grant-funded initiative that promotes environmental sustainability in healthcare throughout Maryland. MD H2E professionals provide assistance to health care facilities on preventing pollution; reducing the generation of hazardous, solid, and infectious waste; eliminating mercury; purchasing more environmentally preferable products and services; increasing recycling; and implementing other practices that improve environmental performance.
- **Clean Production Action/Health Care Without Harm —** Clean Production Action's mission is to design and deliver strategic solutions for green chemicals, sustainable materials, and environmentally preferable products. Health Care Without Harm is a coalition of organizations working to transform the health

care sector so it is no longer a source of harm to people and the environment.

- **Hospital Participants —** Participating in the NICU audit project were three private Baltimore-based mid-to-large size acute care hospitals. All three hospitals are participants of the MD H2E initiative.

The objectives of the audit were to: (1) assess the presence of DEHP-containing products in select Maryland NICUs; (2) identify DEHP-free alternative products; and (3) develop a plan for hospitals to transition to DEHP-free products.

NICU Audit Results

Maryland Hospitals for a Healthy Environment assessed 106 products across the three participating hospitals. Of those 42 (40%) were labeled with material content information relating to DEHP. MD H2E was able to identify material content for 39 additional unlabeled products, leaving 25 products as undetermined material content. The 81 products of determined material content were then assessed for DEHP content.

Table 1. NICU products containing DEHP

Products	% containing DEHP	% containing DEHP LABLED as such
IV	45%	20%
Feeding	25%	0%
Respiratory	42%	16%
Suction	100%	33%
GI/GU	None	Not applicable
All Products	40%	16%

Of the 81 products assessed 33 contained DEHP; however it was found that only 13 were labeled as containing DEHP. Table 1 lists the percentage of products containing DEHP and the percentage DEHP-containing products that are labeled as such.

Purchasing Priorities for DEHP-Free Products

There are now safe and effective alternatives available for most DEHP-containing medical products and a growing number of hospitals are undertaking efforts to reduce DEHP use in their facilities. A key barrier to purchasing DEHP-free products is the identification of which products to target for priority replacement. Many medical product labels do not disclose the material content of the device, making it difficult to determine which devices contain PVC and DEHP.

DEHP leaches in the highest concentrations when heat is applied, agitation occurs or when coming into contact with high lipid formulations.

Each of the NICUs audited use products containing DEHP. Some products are of higher concern due to the higher risk potential for exposure to vulnerable populations. Since DEHP leaches in the highest concentrations when heat is applied, agitation occurs or when coming into contact with high lipid formulations, products that are used in this scenario or for extended periods of time are often identified as higher risk. [2]

<u>High Priority Products:</u> Of highest priority for elimination is any DEHP-containing product that holds or conveys blood, breast milk, or nutritional formulas, which includes:

- Blood bags and tubing. Any tubing used to convey blood should be DEHP-free and ideally PVC-free.
- Feeding tubes and bags. Any plastic in contact with nutritional formulas should be DEHP-free.
- Breast pumps. Any plastic in contact with breast milk should be DEHP free.

Moderate Priority Products: These products lead to direct patient exposure to DEHP, but exposure levels will be less than products holding/conveying blood, breast milk or nutritional formulas. DEHP-free alternatives are widely available for these products, which include:

- IV bags, tubing, and administration sets
- Catheters
- Suction tubing
- Respiratory products, including masks and nasal cannula

Minimal Risk: There is no direct patient exposure to DEHP, however, the product contains PVC and the ultimate goal is to eliminate the use of all PVC-containing products.

No Risk: This product does not contain PVC or DEHP.

Moving Forward

While the audit results provided each facility with important information on DEHP-containing products, it is the responsibility of the facility to use this information to make changes in purchasing practices. To accomplish this, MD H2E recommended several steps in moving forward outlined below. As soon as possible it is imperative that each facility identify alternatives to the high and moderate priority products. Given the vulnerability of premature babies and infants in general to DEHP exposure, NICUs should strive to eliminate all products containing DEHP.

1. **Determine DEHP content in all "undetermined" products.** The audit provides a list of medical products known to contain DEHP. The audit also demonstrates that a number of products used in the NICU are not labeled for their DEHP content. The only way to ascertain whether a product contains these materials is by directly contacting the vendor.

- **Notification:** Send a formal letter to all vendors stating that the facility is concerned about the use of PVC and DEHP in medical devices. The letter should state that the facility intends to ask for clarification of material content for all disposable medical products—specifically PVC and DEHP content—and those vendors should be prepared to respond to this inquiry.
- **Disclosure/Information Request:** Send an inquiry to all vendors asking for disclosure of PVC and DEHP content in all disposable medical products covered by facility-vendor or GPO-facility-vendor contract.
- **Preferred Product:** Tell vendors that your hospital is moving toward a safer environment and would prefer to purchase products that are PVC and DEHP-free, and that your hospital is looking for PVC and DEHP-free alternatives for all items used in the NICU.

2. **Work with vendors and group purchasing organizations (GPOs) to request DEHP-free formulations.** Ask vendors for DEHP-free alternatives to DEHP-containing products and ask about plans for introducing DEHP-free products. If a product contains DEHP and no alternative is available, inquire to the company's plans to introduce a DEHP-free alternative. Manufacturers including Hospira, Baxter, B. Braun, Kendall/Tyco, Kimberly-Clark, Cardinal Health, Medex Inc./ Smith Medical offer PVC and DEHP-free alternatives.

3. **Educate staff and health professionals about DEHP-free and PVC products and associated health risks.** Many clinicians, including NICU managers, nurses and physicians, may be unaware of the concerns around the use of PVC and DEHP-containing medical products. A key step is to engage clinical staff in a meaningful dialogue about concerns with these products. Add DEHP-free criteria to value analysis or product evaluation processes.

4. **Work with purchasing team to identify and demand DEHP-free products.** Pur-

chasing staff have a mandate to identify the lowest price point for a product category. It is critical that clinical staff emphasize the requirement to purchase DEHP-free devices, as some of these products may be more expensive. Purchasing staff will need to set up a process to determine DEHP-free alternatives and negotiate for more favorable price terms. Collaboration with the facility's group purchasing organization (GPO) is strategic.

5. **Develop DEHP-free purchasing policy for the NICU.** Work with your purchasing department and corporate contract department to establish a policy requiring all products purchased for the NICU be DEHP-free.

Follow-Up

MD H2E conducted follow-up interview with representatives of the three hospitals approximately on year after the audits were conducted. Results are highlighted below.

Hospital 1 reported that it has replaced almost all of the high priority items that were identified during the audit. The manager prioritized items by how frequently they were used. Because there was a filter that was used daily with NICU patients the manager set about to replace this item first. Currently she has not been able to find DEHP-free blood warming tubing, but because this item is only used once every two years, it has been a low priority for her. The manager also discovered that her hospital wide system purchasing group already had many DEHP-free items available that she had not previously been made aware. This made it possible to replace some DEHP items almost immediately. The manager also took DEHP products that were not used off the shelves.

The NICU manager of Hospital 2 presented the audit information at a Quality Risk and Safety meeting and subsequently received approval to replace DEHP items. She believes the NICU is currently 90% DEHP-free. All new equipment purchased has been DEHP-free. They have been unable to replace a PVC mask, which the audit was unable to determine if it contains DEHP. Staff nurses have been engaged on this issue and were part of the team looking for new equipment.

Hospital 3 is continuing to pursue the issue of purchasing DEHP-free products with management.

Conclusion

Nurse Managers in the three NICUs have a high level of knowledge about DEHP in products and the health effects associated with its use. The products used in the various NICUs were diverse in terms of produce manufacturer, and there were few products used universally by all participating hospitals. The audit demonstrated that 64 (60%) products audited were unlabeled (i.e. the material content was unknown to the hospital). The three Maryland area hospitals are interested in incorporating DEHP-free requirements into purchasing contracts, and will continue to work to make it a requirement of purchasing contracts.

Contact

Joan D. Plisko, Ph.D.
MD H2E Technical Director
(410) 706-2107
plisko@son.umaryland.edu

Denise Choiniere, RN
MD H2E Nursing Coordinator
(410) 706-2352
dchoiniere@umm.edu

References

1 Health Care Without Harm www.hcwh.org/us/pvcDehp/issue

2 Food and Drug Administration Health Notification: PVC Devices Containing Plasticizer DEHP www.fda.gov/cdrh/safety/dehp.html

3 National Toxicology Program Center for the Evaluation of Risk to Human Reproduction Meeting Summary Oct. 14, 2005 cerhr.niehs.nih.gov/chemicals/dehpDEHPMtgSumm101405.pdf

Reusable Sharps Container Program Assessment

MD H2E
Hospitals for a Healthy Environment
MARYLAND

Introduction

Health care workers routinely use and dispose of needles, otherwise known as sharps, for administering medications, testing blood glucoses, medical procedures, and other activities. In the United States, the Center for Disease Control (CDC) estimates that over 800,000 accidental needle stick injuries occur each year among health care workers costing health care facilities thousands of dollars in treatments[1]. Used sharps and sharps containers are expensive to dispose of as they are considered medical waste in Maryland and across the country. In Maryland the average cost of medical waste disposal is between 19 and 30 cents a pound. To minimize disposal costs, reduce employee needle stick injuries, increase staff satisfaction and increase environmental benefits, hospitals around the country are implementing programs that utilize reusable sharps containers.

Reusable sharps containers, which are often made from polypropylene grade # 5 plastic, function like disposable sharps containers except they are collected on a regular basis by either a hospital employee or an outside vendor, replaced and reused, instead of being disposed of after one use. Reusable sharps containers are designed with increased engineering controls to decrease needle stick injuries. The collected containers are shipped or taken to an off-site facility, mechanically emptied, disinfected, and returned to the health care facility for reuse – on average of 500 times. This process dramatically reduces a hospital's waste volume and associated disposal fees.

The Occupational Safety and Health Administration (OSHA) and the Food and Drug Administration (FDA) have approved the use of reusable sharps containers for health care facilities. Under the FDA 510K clearance and OSHA Bloodborne Pathogen Standard, requirements include that the containers are[2]:

- Closable, puncture resistant, and leak proof;
- Appropriately labeled and color-coded;
- Designed with an opening that is large enough to accommodate disposal of an entire blood collection assembly (i.e., blood tube holder and needle);
- Easily accessible to the immediate area where sharps are used; and
- Easily portable if employees travel from one location to another.

Reusable Sharps Container Program Assessment

- **Maryland Hospitals for a Healthy Environment (MD H2E) —** a grant-funded initiative that promotes environmental sustainability in healthcare throughout Maryland. MD H2E professionals provide assistance to health care facilities on preventing pollution; reducing the generation of hazardous, solid, and infectious waste; eliminating mercury; purchasing more environmentally preferable products and services; increasing recycling; and implementing other practices that improve environmental performance. For this case study, MD H2E interviewed three hospitals in Maryland about their reusable sharps containers program[4].
- **Holy Cross Hospital (HC) —** a 450-bed hospital with specialized expertise in surgery, neuroscience, cancer, women and infants' services, and senior care is located in Silver Spring. For managing reusable sharps containers, HC contracted with a major sharps disposal company from 2001 until 2007. In 2007 HC switched to another sharps disposal company.

- **Western Maryland Health System (WMHS) —** a hospital in rural Cumberland with 200 physicians, eight specialty centers and several different campuses. WMHS has been working with a third sharps disposal company since June 2006 for managing reusable sharps containers.
- **University of Maryland Medical Center (UMMC) —** a large, urban hospital with over 700 beds. This Baltimore-based teaching hospital treats over 60,000 patients per year. UMMC started a reusable sharps container pilot program in October 2007 with a major sharps management company. The contract was subsequently taken over in 2008 by a local disposal company.

Project Summary

This assessment reviewed several aspects of reusable sharps container programs at each facility. First, MD H2E staff interviewed each hospital about their decision to switch to reusable sharps containers and what factors contributed to that decision. Second, each hospital detailed the process it took to implement reusable sharps containers including who they worked with to determine need, which staff were key in each step, and what happens to the containers at the collection facility. Lastly, hospitals indicated if they had provided any additional staff education regarding the switch to reusable sharps containers.

The decision to use reusable sharps containers: The facility manager at each of the three hospitals initiated the switch from disposable sharps containers to reusable sharps containers. Working in concert with infection control, nursing, purchasing, administration, and materials management, the teams cited cost savings, service improvement and environmental benefits as the motivations behind the switch. HC and UMMC sent out a request for proposals (RFPs) while WMHS was approached by the vendor that it was already using for managing regulated medial waste[3]. The monies to implement the reusable sharps containers programs came out of the Housekeeping budgets for both HC and WMHS. Since UMMC is conducting a pilot of the reusable sharps containers, there is no fee at this time.

Establishing a contract for reusable sharps containers?

Be sure to ask your vendor these questions:

How often are containers picked up?

- Make sure this is adequate and have a back up plan for servicing full containers between pickups.

Are the sharps containers opaque or see thru?

- Facilities report that see-thru boxes help them recognize and respond proactively to full boxes between pickup.

How will the vendor service rooms that are in use when they come to pick up sharps containers?

- Some facilities reported overflowing boxes because their recycler bypasses occupied rooms. With your vendor, plan for servicing occupied rooms.

The process: Prior to placing reusable sharps containers at WMHS and UMMC, the sharps collection companies conducted audits to determine the volume of reusable sharps containers needed. At HC, housekeeping staff tracked sharps volume for several months to determine the amounts needed. The hospitals each purchased the sharps containers and the vendors picked up the used containers on a predetermined schedule (typically two to three times per week). At UMMC and HC the vendor removes the used sharps container unit by unit and replaces it with an empty container. At WMHS, nursing or housekeeping staff lock the full sharps container, place them in the soiled utility room, and get an empty sharps container from the clean utility room. The used sharps containers are stored within a larger locked container which housekeeping

transfers to a locked room for pick up by the vendor. All vendors leave extra containers in high volume areas and with housekeeping at UMMC and HC in case containers need to be changed out between pick-ups.

Each vendor takes the used sharps containers back to their respective facility, mechanically empties and disinfects them. Vendors then inspect the "clean" containers and return them to the hospitals for reuse. Infection Control personnel at all three hospitals were included in the process and each hospital sent representatives to visit the vendor facility prior to implementing the program.

Benefits

The three hospitals identified many benefits of switching to reusable sharps containers including cost savings, a decrease in needle stick injuries, environmental savings, decreased labor need for new system, and increased satisfaction among staff.

- **Cost savings:** Hospitals achieved costs savings in two ways: lower overall waste disposal fees and reduced costs for new reusable sharps containers. In less than two years, WMHS achieved a 47% cost savings of over $75,000 due to lower disposal fees and new container pricing. UMMC estimates that it would save $46,000 in container costs and over $11,000 in disposal fees annually if it were to implement the program hospital wide. Also if UMMC contracts for their change out service, UMMC would save an additional $20,000 per year in labor costs. HC switched to reusable sharps containers even though the new contract was more expensive than the previous one; management felt that it was worth it because the new containers were safer.
- **Decrease in needle stick injuries:** WMHS reported that needle stick injuries decreased by 50% since the inception of the reusable sharps containers; there were four needle stick injuries in the two years preceding the program, and two in the two years since the program has been in place. The average cost to treat a needle stick injury at WMHS is $400-$600, including initial evaluation, initial and follow-up lab studies, and nursing time. The cost would increase if the staff person needs medical treatment due to an acquired infection from the needle stick. According to a staff survey done by UMMC, 79% of the survey respondents felt the reusable sharps container program provided for a safer environment for patients and staff.
- **Environmental savings:** UMMC estimates that it will remove 63,000 pounds (31.5 tons) of plastic from the waste stream per year by using reusable sharps containers. WMHS has diverted 34 tons of plastic from the landfill since it started using reusable sharps containers in 2006.
- **Staff education**: As part of the contracts, all three vendors provided in-services to the hospital units that were utilizing reusable sharps containers. Additional training was administered to housekeeping staff separately. UMMC also sent out an email and posted fliers and HC posted fliers at the nursing stations.
- **Decreased labor:** UMMC and HC report that using the turn key service has freed up more time for housekeeping to perform other duties. A turn key service contract specifies that the vendor will pick up containers on the staff units and replace them on a regular schedule. WMHS, who

does not use a turn key service, reports that using reusable sharps containers has decreased work for nurses but in some instances increased work for housekeeping.

- **Increased staff satisfaction:** Employee satisfaction is very high with the reusable sharps containers at all three hospitals. Complaints regarding overflowing sharps containers have been reduced. While it took Holy Cross' EVS team some time to adjust to the new system, they are now satisfied with the changes. UMMC conducted a survey of staff on units where the reusable sharps containers were piloted. Sixty-five percent (65%) of the staff surveyed felt that the reusable sharps turn key service was more efficient than the previous system in place. Eighty-one percent (81%) felt that the reusable sharps containers were simple to operate. Sixty percent (60%) liked the new reusable sharps program and felt that it should be instituted on a permanent basis in the hospital.

Conclusion

All three hospitals are very satisfied with their reusable sharps containers program. There were decreased needle stick injuries, increased employee satisfaction, and two of the three programs experienced cost savings. Reusable sharps containers are a successful component of the hospitals' sustainability initiatives and contributed substantially to diverting waste from the waste stream. Because of the successful pilot, UMMC plans on switching the entire hospital to reusable sharps containers within the year.

Contacts

Joan D. Plisko, Ph.D.
MD H2E Technical Director
(410) 706-2107
plisko@son.umaryland.edu

Harold Polk
Process Coordinator Facilities
Safety and Environmental Health
University of Maryland Medical Center
(410) 328-6491
hpolk@umm.edu

Jim Dixon
Director Housekeeping/Patient Transport
Western Maryland Health System
(301) 723-4089
jdixon@WMHS.com

Peter McCaffrey
Director of Environmental Services
Holy Cross Hospital
(301) 754-7086
mccafp@holycrosshealth.org

References

1 Selecting and Evaluating, and Using Sharps Disposal Containers (Publication No. 97-111). (1998) National Institute for Occupational Safety and Health (NIOSH). www.cdc.gov/niosh/sharps1.html. This document detail performance criteria (functionality, accessibility, visibility, and accommodation), regulatory standards, strategies for selecting and using reusable sharps containers, formulas for determining proper placement height, evaluation survey, and recommended readings. You may also call (800) 232-4636 to get a copy of the document.

2 www.preimierinc.com/quality-safety/tools-services/safety/topics/needlestick/reusable.jsp

3 While each hospital used a different vendor for purchasing and processing the reusable sharps containers, this study focused on the hospitals only. Information about specific vendors may be derived by contacting the hospital representatives noted at the conclusion of this study.

MD H2E

Hospitals for a Healthy Environment

MARYLAND

MD H2E Advisory Board

Anna Gilmore Hall
Health Care Without Harm

Philip Howard
Lifebridge Health

Laura Armstrong
Maryland Department of the Environment

Frank Monius
Maryland Hospital Association

Maryland Nurses Association

Frank Weinberg
MedStar Health

Kathryn Hall, RN MS

Leonard Taylor
University of Maryland Medical System

Lisa Rowen, DNSc, RN
University of Maryland Medical Center

Virginia Thompson
US EPA Region 3

Maryland H2E Staff

Barbara Sattler, RN, DrPH, FAAN
Program Director

Joan D. Plisko, PhD
Technical Director

Louise Mitchell, PT
Sustainable Foods Coordinator

Nursing Outreach
Denise Choiniere, RN BSN
Nicole Killion, RN BSN
Linda Lindquist, RN BSN

Who is MD H2E?

MD H2E is a technical assistant and networking initiative that promotes environmental sustainability in health care. Participants include hospitals, clinics, nursing homes, research laboratories, and other ancillary health care providers in Maryland.

MD H2E professionals provide assistance to health care facilities with preventing pollution; reducing the generation of solid, hazardous, and special medical waste; eliminating mercury; recycling; and implementing other programs such as environmentally preferable purchasing, green building, integrated pest management and sustainable food practices.

Why Join MD H2E?

- To improve patient and employee health and safety by reducing occupational exposures.
- To keep current on Maryland specific regulations and compliance issues.
- To identify and implement cost-saving programs that improve the bottom-line.
- To receive public recognition for creating a healthier environment.

Benefits of MD H2E

- Receive ongoing technical support to identify and implement hospital specific programs
- Participate in site-specific, non-regulatory pilot projects and audits for mercury and other hazardous materials.
- Network with peers through participation in MD H2E focus groups.
- Attend specialized workshops on a variety of subjects as regulated medical waste, sustainable foods, and asthmagens.

Current MD H2E Projects

When choosing the best way to minimize your facility's environmental footprint, MD H2E can help assist you. We provide site specific technical assistance to address a wide variety of environmental issues. Samples of our current projects include:

- Green team development
- Environmentally preferable purchasing
- Waste minimization and segregation
- Mercury elimination
- Elimination of PVC/DEHP
- Green cleaning
- Healthier, local, sustainable foods
- Composting
- Integrated pest management
- Blue wrap recycling
- Battery and fluorescent bulb recycling
- Pharmaceutical waste management
- Reusable sharps containers

Contact

Joan Plisko
Technical Director
410-706-2107
plikso@son.umaryland.edu

To learn more about how your hospital can become a MD H2E participant or take advantage of opportunities to minimize your facility's environmental footprint.

Maryland Hospitals for a Healthy Environment initiative is sponsored by:

MD H2E
Hospitals for a Healthy Environment
MARYLAND