

Final Report

**Grant Project Number X-97583701-0**  
Funding period April 2002 to June 2004

**Demonstrating Pollution Prevention (P2)  
at Healthcare Facilities Using  
Hospitals for a Healthy Environment (H2E) Products**

Submitted to:  
U.S. EPA Region 5

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## EXECUTIVE SUMMARY

Hospitals for a Healthy Environment (H2E) developed out of a Memorandum of Understanding between the U.S. Environmental Protection Agency (EPA) and American Hospital Association (AHA). Its goals are for hospitals to eliminate mercury from the waste stream by 2005, reduce waste generated by the facility to meet the H2E total waste volume reduction of 50 percent by 2010 and minimize persistent, bioaccumulative toxic (PBT) chemicals.

The H2E initiative has useful tools and provides good publicity to encourage pollution prevention in the healthcare sector. The Minnesota Technical Assistance Program (MnTAP) worked with H2E to develop some of its products, including the *Chemical and Solid Waste Minimization Plans*. MnTAP pursued this grant as an opportunity to use H2E tools to demonstrate the effectiveness of pollution prevention at healthcare facilities from April 2002 to June 2004.

As a result of MnTAP's work through this project, at least 34 Minnesota healthcare facilities (22 percent of Minnesota hospitals) are engaged in documented pollution prevention efforts at some level. Thirteen facilities have signed on as H2E Partners and 29 have either eliminated 75 percent of their mercury or are working toward that goal. These facilities have eliminated 394 pounds of mercury, 751 gallons of hazardous chemicals and 250,000 pounds of solid waste. They saved \$152,600. This number does not fully reflect savings due to decreased spill clean-up costs, hazardous waste disposal, decreased liability or compliance costs. Additional reductions and savings are expected.

MnTAP identified at least five facilities that are pollution prevention leaders in Minnesota. These facilities have been exemplary in their pollution prevention efforts and have been willing to share their success with other businesses.

A number of outreach efforts and communication techniques were used to reach the healthcare audiences. Working through the University of Minnesota's Academic Health Center and the healthcare trade associations proved most effective.

## INTRODUCTION

Healthcare's primary mission is to provide quality care and provide for the health of the community. While working to accomplish this mission, hospitals produce on average 6,600 tons of waste a day. Healthcare waste is the fourth largest contributor of mercury to the environment and a significant contributor of dioxins.

The cost of waste for healthcare facilities is substantial. Estimated solid waste cost per hospital bed is \$425 per year for hauling alone. Hospitals incur additional costs for handling, storage, insurance, regulatory management and training. Solid waste costs five cents a pound on average. Hazardous waste costs at least 25 times that. Regulated medical waste costs five times as much as solid waste for hauling. As mercury becomes more regulated, the costs to comply with waste regulations will also increase.

Most healthcare institutions engaging in a pollution prevention initiative will save an average of 55 percent in waste hauling costs alone. Other benefits include reduced labor and compliance costs, reduced insurance liability, and improved occupational and community health.

In 1998, Hospitals for a Healthy Environment developed out of a Memorandum of Understanding between the U.S. Environmental Protection Agency (EPA) and American Hospital Association (AHA). Its goals are for hospitals to eliminate mercury from the waste stream by 2005, reduce waste generated by the facility to meet the H2E total waste volume reduction of 50 percent by 2010 and minimize persistent, bioaccumulative toxic (PBT) chemicals. Hospitals and other healthcare facilities that join H2E as Partners receive public recognition for participating and are eligible for awards for their achievements.

The H2E initiative has useful tools and provides good publicity to encourage pollution prevention in the healthcare sector. MnTAP represented state and local government and assistance programs on the Environmental Leadership Council of H2E and chaired two workgroups that compiled the documents that are used nationally, including the *Chemical and Solid Waste Minimization Plans*.

MnTAP undertook this grant as an opportunity to use H2E tools to demonstrate the effectiveness of pollution prevention at healthcare facilities. This report summarizes the work from the grant, April 2002 to June 2004, and documents results. It provides information on how H2E tools were used to facilitate pollution prevention at Minnesota's 141 hospitals and 19 health systems. It outlines the strategies used and how information was transferred to other assistance providers.

## HEALTHCARE LEADERS

Through this project, MnTAP identified that Minnesota has at least five facilities that could be classified as pollution prevention leaders. These facilities have been exemplary in their pollution prevention efforts. They have shared their successes with other businesses through a technology diffusion demonstration tour, presentations at Healthcare Environmental Awareness and Resource Reduction (HEARRT) meetings and H2E workshops, and articles in MnTAP and trade publications. These institutions include: Fairview Health Services, Hennepin County Medical Center, New Ulm Medical Center, Park Nicollet Health Services and Ridgeview Medical Center. Table 1 summarizes the impact of the pollution prevention efforts of these leader facilities. Most of these leader facilities have won H2E awards (see the section H2E Commitment).

**Table 1. Pollution Prevention at the Leading Minnesota Healthcare Facilities**

<b>Institution</b>	<b>PBT Reduced</b>	<b>Solid/Hazardous Waste Reduced</b>	<b>Cost Savings (annual)</b>	<b>Current Initiatives</b>
Fairview Health Services, Minneapolis		24,000 lb solid waste	\$23,000	Mercury elimination
Hennepin County Medical Center, Minneapolis	190 lb mercury		\$31,550	Microfiber mops, hazardous waste management and reduction
New Ulm Medical Center, New Ulm	76 lb mercury		NA	Paper reduction
Park Nicollet Health Services, St. Louis Park	121 lb mercury	348 gal/yr formalin reduction	(mercury) \$33,500 <u>5,000</u> \$38,500	Hazardous waste management and reduction
Ridgeview Medical Center, Waconia	6.2 lb mercury	207 gal solvents 20 gal ethylene oxide 88 gal phenolic disinfectant 225,882 lb solid waste	\$ 3,600 6,812 2,045 <u>11,858</u> \$24,315	Paper reduction, hazardous waste management and reduction
<b>Total</b>	393 lb mercury	663 gal hazardous chemicals 253,000 lb solid waste	\$117,365	

NA is not available.

**Fairview Health Services** had a MnTAP intern in 2002 to investigate ways to reduce packaging waste volume and toxicity of waste materials. The intern recommended implementing environmentally preferable purchasing (EPP), reusable sharps containers, resource management, and eliminating hazardous chemicals and mercury.

**Hennepin County Medical Center (HCMC)** attended the MnTAP sponsored technology demonstration site (p.10) and received a Lead by Example Incentive Fund grant from the county to facilitate its pollution prevention programs, primarily looking at changing its disinfection cleaners and methods. Hennepin County has champions in its safety director and one of its safety technicians.

**New Ulm Medical Center** has champions in both the facilities manager and one of its physicians. The support of this physician was key in helping to gain the buy-in of the medical staff for changing to mercury-free medical devices. MnTAP facilitated a waste reduction team at New Ulm for three meetings. This relationship continues as the hospital engages in other waste reduction projects. This hospital was motivated to protect community health as part of its mission.

**Park Nicollet Health Services** had a MnTAP intern in 2000 to evaluate eliminating mercury-containing devices in its one hospital and 25 clinics. Results from this project were published in the spring 2002 MnTAP *Source* newsletter article "Getting Credit for Eliminating Mercury" <[mntap.umn.edu/source/17-2/Mercury.htm](http://mntap.umn.edu/source/17-2/Mercury.htm)>. Information from the project was used to develop the fact sheet *Mercury in Healthcare Lab Reagents* <[mntap.umn.edu/health/92-Mercury.htm](http://mntap.umn.edu/health/92-Mercury.htm)>.

**Ridgeview Medical Center (RMC)** was the recipient of a Minnesota Office of Environmental Assistance (MOEA) grant in 2001 (\$50,000) that assisted them with facility-wide training on sustainability and pollution prevention. RMC worked with Sustainability Associates to become a model sustainable hospital, the first of its kind in the nation. It used sustainability education and the Natural Step, along with an eco-audit, train the trainer, sustainability action planning and implementation. MnTAP provided the pollution prevention training to RMC's managers. RMC's chief executive officer (CEO) and the facility manager were both champions within the facility. As part of RMC's efforts towards sustainability, it added another staff position, a guest services manager who is also a champion. RMC became the technology demonstration site (p. 5). RMC's CEO presented at a conference for healthcare administrators and directors. Its facilities manager presented at HEARRT (p.7). MnTAP promoted both of these activities. MnTAP also helped RMC submit its application that won it a 2003 Governor's Award for Excellence in Waste and Pollution Prevention. Also, this hospital was motivated to protect community health as part of its mission.

Several other Minnesota healthcare facilities have made a commitment to pollution prevention and undertaken pollution prevention initiatives. But, they may not have accomplished enough to be considered leaders. They have not documented results or shared the results of their successes.

## **H2E Commitment**

### **Partners for Change**

H2E Partners for Change are healthcare facilities that make a commitment to work toward eliminating mercury from the waste stream by 2005, reducing waste generated by the facility to meet the H2E total waste volume reduction of 50 percent by 2010 and minimizing PBT chemicals. They pledge to implement programs and policies that will protect the environment, improve worker safety, reduce pollution and advance community health. They commit to work with the H2E program to assess their facility's waste and environmental programs and set annual goals and action plans.

Three of the five leading healthcare facilities are signed on as H2E Partners for Change. Two of these were recruited during this grant. Although Fairview Health Services and Park Nicollet Health Services have both undertaken pollution prevention initiatives, the champions within these facilities were unable to commit their full facilities at this time. MnTAP has provided assistance to all of the H2E Partner facilities.

Hennepin County Medical Center and Ridgeview Medical Center each won H2E's Partners for Change Award. This award is given annually to facilities that have made significant progress toward reducing waste, preventing pollution and eliminating mercury. They had to go beyond meeting self-identified H2E goals for the previous year.

### **Making Medicine Mercury Free (MMMMF)**

H2E Making Medicine Mercury Free award winners have virtually eliminated mercury and developed policies to sustain the elimination. Three of the five leading healthcare facilities have earned MMMF award. Park Nicollet Health Services will qualify for the mercury award in 2004 and Fairview Health Services, which has 26 separate facilities, will likely be applying for the award on a facility-by-facility basis. All of the Minnesota award winners are listed in Table 2.

**Table 2. Minnesota Healthcare Facilities and H2E**

<b>Institution</b>	<b>Partner for Change Pledge</b>	<b>Partner for Change Award</b>	<b>MMMF Award</b>	<b>Leading Facility</b>
Austin Medical Center-Mayo Health System, Austin*	X			
Duluth Clinic Health System, Duluth	X			
Fairview Health Services, Minneapolis				X
First Care Medical Services, Fosston	X		X	
Hennepin County Medical Center, Minneapolis*	X	X	X	X
Mercy Hospital & Healthcare Center, Moose Lake	X			
New Ulm Medical Center, New Ulm*	X		X	X
Northfield Hospital and Skilled Nursing Facility, Northfield*	X			
Park Nicollet Health Services, St. Louis Park				X
Parker Hughes Institute, Roseville*	X		X	
Redwood Area Hospital, Redwood Falls*	X			
Ridgeview Medical Center, Waconia	X	X	X	X
St. Joseph's Medical Center, Brainerd	X			
St. Luke's Hospital & Regional Trauma Center, Duluth	X			
St. Mary's Medical Center, Duluth	X			

An asterisk (\*) indicates that the facility became an H2E Partner during this grant period.

## TECHNOLOGY DEMONSTRATION SITE

MnTAP set up a healthcare technology demonstration site to showcase what a facility has done to eliminate priority chemicals. This effort included a tour, a case study and presentations. The technology demonstration and tour "Practicing Hospitals for a Healthy Environment" was held April 17, 2003, at Ridgeview Medical Center.

Four pollution prevention technologies were demonstrated:

1. **Formalin distillation.** Formalin is used as a fixative to prepare tissue samples for observation under a microscope. Formalin is a mixture of 37 percent formaldehyde and 10 to 15 percent methanol in water. Low to moderate exposure to formaldehyde can irritate the eyes, nose, mouth, throat and skin, and cause headaches. Formaldehyde is carcinogenic, and toxic or fatal to humans at high concentrations. Distillation allows the formalin to be recovered for reuse, reducing the quantity of chemical necessary to be kept on site.
2. **Ethylene oxide (EtO) elimination.** EtO is used as a gas for sterilization. It is both flammable and highly reactive. Acute exposures to EtO gas may result in respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath and cyanosis. Chronic exposure has been associated with the occurrence of cancer, reproductive effects, mutagenic changes, neurotoxicity and sensitization.<sup>1</sup> Ridgeview used hydrogen peroxide as a substitute.

<sup>1</sup> Occupational Safety and Health Administration (OSHA), Safety and Health Topics: Ethylene Oxide, <http://www.osha.gov/SLTC/ethyleneoxide/>, viewed 6/17/04.

3. **Glutaraldehyde substitution.** Glutaraldehyde is a toxic chemical that is used as a cold sterilant for heat-sensitive medical, surgical and dental equipment. Contact with glutaraldehyde liquid and vapor can severely irritate the eyes, and at higher concentrations burns the skin. Breathing glutaraldehyde can irritate the nose, throat and respiratory tract, causing coughing and wheezing, nausea, headaches, drowsiness, nosebleeds and dizziness<sup>2</sup>. Ridgeview switched to using Cidex® OPA ortho-phthalaldehyde.
4. **Mercury-free sphygmomanometers.** Mercury is a neurotoxin and PBT element. Traditional blood pressure cuffs contain mercury in its gauge. The new equipment uses electronic instrumentation instead of mercury.

Twenty-five people representing eight hospitals attended the event. MnTAP conducted follow-up with the attendees to offer further assistance and track implementation. Three of the facilities implemented at least one of the demonstrated technologies. Table 3 shows the results of the technology demonstration.

**Table 3. Implementation after Technology Demonstration Site**

<b>Institution</b>	<b>Technology Implemented</b>	<b>Waste Reduced</b>	<b>Cost Savings</b>
Park Nicollet Health Services, St. Louis Park	Formalin recycling	348 gal/yr	\$5,000/yr
Hendricks Hospital, Hendricks	Glutaraldehyde substitution	48 gal/yr	NA
Johnson Memorial Health Services, Dawson	Glutaraldehyde substitution Thermometer exchange	40 gal/yr 500 g mercury	NA
<b>Total</b>		436 gal/yr 500 g mercury	\$5,000/yr

NA is not available.

At both Hendricks Hospital and Johnson Memorial Health Services, employee health was the impetus for eliminating the use of glutaraldehyde. The director of nursing and the operating room (OR) nurse championed these efforts, respectively.

A MnTAP case study about the RMC facility was printed in Joint Commission for the Accreditation of Healthcare Organizations' July 2002 newsletter *Environment of Care*. Information summarizing Ridgeview's pollution prevention efforts is available on the MOEA Web site at <[www.moea.state.mn.us/p2/govaward03.cfm](http://www.moea.state.mn.us/p2/govaward03.cfm)>.

<sup>2</sup> Occupational Safety and Health Administration (OSHA), Hospital eTool - HealthCare Wide Hazards Module Glutaraldehyde, <http://www.osha.gov/SLTC/etools/hospital/hazards/glutaraldehyde/glut.html>, viewed 6/17/04.

## PARTNERS

Working with partners was critical to the success of this project, particularly the University of Minnesota's Academic Health Center and the American Hospital Association. These two groups are well known and respected within the healthcare community. MnTAP used a variety of approaches to leverage association partners during this project.

**American Society of Healthcare Engineers (ASHE) and American Society of Healthcare Environmental Services (ASHES).** These groups are part of AHA. Both assisted this project by providing membership information for mailings and invitations to H2E-related events. Formal relationships with these two associations have been slow to develop. MnTAP has not been able to identify an environmental champion at these organizations. As a result, the local Minnesota associations of ASHES and ASHE are not fully supporting and promoting H2E.

**Healthcare Environmental Awareness and Resource Reduction Team (HEARRT).** HEARRT is a partnership between the MOEA and MnTAP. It has quarterly meetings to provide a forum for exchange of information between healthcare facilities. It has 96 healthcare staff members on its mailing list. Nineteen facilities on the HEARRT mailing list are actively implementing pollution prevention. This group was used as a conduit for information on H2E. During this grant, MnTAP gave a presentation on infectious waste reduction to HEARRT.

**Hospitals for a Healthy Environment (H2E).** MnTAP is regularly in touch with staff of H2E. All of the resources developed by MnTAP through this project were distributed through the H2E listserv. H2E's has publicized its goals through the listserv, AHA efforts, trade journals and other publications. This has motivated the healthcare sector to engage in pollution prevention, especially mercury elimination. When asked about the impetus for mercury elimination, healthcare staff frequently cites the EPA "ban" on mercury. Although a ban does not exist, the idea has reached healthcare engineers, environmental services and safety staff that eliminating mercury is the thing to do.

**Joint Commission for the Accreditation of Healthcare Organizations (JCAHO).** JCAHO evaluates and accredits nearly 16,000 healthcare organizations and programs in the United States. An independent, not-for-profit organization, JCAHO is the nation's predominant standards-setting and accrediting body in healthcare. The Joint Commission requires healthcare facilities to meet performance standards in specific areas. The standards are set to achieve maximum performance for activities affecting the quality of care at the facility. To meet standards, healthcare facilities must develop performance improvement (PI) initiatives. These initiatives help the facility continuously improve and remain competitive. Pollution prevention activities can be used as PI initiatives.

The Joint Commission published a pollution prevention case study article in its *Environment of Care* newsletter. Subsequent to MnTAP's development of the guidance document, *Meeting JCAHO Standards with Pollution Prevention*, MnTAP is now working collaboratively with JCAHO and H2E to develop pollution prevention related tools to assist JCAHO surveyors.

**Metropolitan county hazardous waste regulators.** The Solid Waste Management Coordinating Board (SWMCB) coordinates waste activities for six of the Twin Cities metropolitan counties. MnTAP has been talking with SWMCB members about H2E and fostering their awareness of hazardous waste in healthcare. Since 2002, SWMCB's hazardous waste regulatory staff has been working to improve regulatory oversight of healthcare facilities. MnTAP has been an active partner in this effort, using H2E's *Chemical Minimization Plan* to further the regulators' understanding of where hazardous waste is generated within healthcare facilities and highlighting pollution prevention opportunities. MnTAP presented a healthcare pollution prevention training to SWMCB and others as part of the training day of



the 2004 Minnesota Waste Conference. During May and June 2004 SWMCB regulatory staff were inspecting Twin Cities hospitals.

Coincident to the SWMCB effort, the Minnesota Pollution Control Agency is piloting multi-media inspections at hospitals that include a pollution prevention component. These inspections have resulted in increased interest by the hospitals in pollution prevention and waste reduction. MnTAP has received a number of requests for more information. Regulation of hazardous waste will continue to be a driver for the healthcare industry to pursue the goals of H2E.

**Minnesota Hospital Association (MHA).** MnTAP repeatedly tried to involve this trade association to support H2E and leverage the group to reach its members. At first its support was limited. MHA periodically attended HEARRT meetings and offered its name as support for H2E events. It published notice of the H2E workshops in its newsletter. In June 2003 and May 2004, it published notice of the recipients of H2E's Making Medicine Mercury Free award upon request. MHA began formally partnering with MnTAP to support H2E in June 2004. The hospital association is now considering joining H2E as a Champion and has agreed to have regular articles about H2E facilities and programs in its newsletter. Increased interest appears to be due to the firm foundation that has been laid and new MHA staff members with more time to devote to H2E and to champion environmental improvements. Increased visibility of environmental initiatives and their benefits through MHA's newsletter *Newsline* can only improve activity in the sector.

**Minnesota Office of Environmental Assistance (MOEA).** This state agency is MnTAP's primary funding source. It facilitates the quarterly HEARRT meetings and was one of the sponsors for the H2E workshops.

**University of Minnesota.** MnTAP worked with the communications director for the Academic Health Center to have a letter signed by Frank Cerra, senior vice president for health sciences, sent to hospital administrators advocating H2E. Cerra is well known and well regarded among hospital leaders. The letters resulted in six contacts to MnTAP. Half of those facilities went on to request site visits and/or engage in pollution prevention efforts.

## **HEALTHCARE TECHNICAL ASSISTANCE**

MnTAP worked with the recruited healthcare facilities for over two years by conducting technical assistance including site visits, team facilitation, student interns and financial assistance to help them implement PBT and other chemical reduction measures. MnTAP worked to get healthcare facilities committed to becoming H2E Partners for Change and to using the tools of H2E.

**Telephone calls and emails.** MnTAP received 546 requests for information or other assistance related to healthcare during this grant. Infectious waste reduction, mercury elimination and chemical risk reduction were the most common areas of concern.

**Site visits.** MnTAP conducted 24 site visits during this grant. Infectious waste reduction, mercury elimination and chemical risk reduction were the most common areas of concern.

**Teams.** New Ulm Medical Center, one of the leading healthcare facilities, requested that MnTAP help facilitate a waste reduction team. MnTAP assisted New Ulm's safety committee over two years, attending meetings every six to nine months to provide tools and information for their pollution prevention efforts and tips to keep their projects on track. The team's first initiative was mercury elimination. The team is currently working on solid waste reduction through paper minimization.

**Interns.** MnTAP sponsored two healthcare intern projects in 2002. The intern at HealthEast, St. Paul, looked for ways for the hospital and clinics to reduce operating room and laboratory infectious waste (Table 4). She also looked at developing a segregation system for reusable items and evaluated how needleless technology can reduce infectious waste volume. As a result HealthEast's St. Joseph's Hospital's surgical services has purchased a suction canister system that mechanically drains the canisters. St. Joseph's Hospital implemented this system because it minimizes staff exposure to potentially infectious agents and eliminates staff time spent pouring canisters. St. Joseph's will save \$15,021 annually in labor costs with the suction canister system.

**Table 4. HealthEast Intern Recommendations**

<b>Waste Reduction Option</b>	<b>Infectious Waste Reduced</b>	<b>Raw Material Saved</b>	<b>Cost Savings (annual)</b>	<b>Status</b>
Replace all OR suction canisters, Environ-Mate	10,941 lb	10,941 lb	\$75,500	Recommended with remodeling or construction project
Alternative to suction canisters, Steris SafeCycle	3,337 lb	3,337 lb	\$24,610	Partially implemented
Education and infectious waste policy revision	44,000 lb	---	\$11,180	Implemented
Reusable sharps containers	15,368 lb	15,368 lb	\$8,170	Recommended
Reduction of lab sample volumes	7,025 lb	3,898 lb	\$6,890	Partially implemented
Reducing use of disposables	General Waste: 24,500 lb	23,723 lb	\$25,550	Recommended (future): sterile processing aspect currently not feasible
Environmental policy addition H2E goal: 33% Reduction in solid waste by 2005 50% reduction by 2010	General Waste: 664,000 lb (332 tons)  1,008,000 lb (504 tons)		\$21,400  \$32,420	Recommended
<b>Total</b>	<b>1,777,272 lb</b>	<b>57,267 lb</b>	<b>\$205,720</b>	

Fairview Health Services, Bloomington, one of the leading healthcare facilities, had a MnTAP intern to investigate ways to reduce packaging waste volume and toxicity of waste materials. Fairview reduced 12 tons of plastic waste and saved \$23,000 annually by implementing reusable containers for infectious waste "sharps." Fairview also signed a resource management contract with their waste management company. Resource management compensates waste contractors based on performance in achieving the organization's waste reduction goals rather than the volume of waste disposed. As a result, resource management aligns waste contractor incentives with the facility's goals as both explore innovative approaches that foster cost-effective resource efficiency through prevention, recycling and recovery.<sup>3</sup> MnTAP has been unable to follow the progress of this initiative due to staff changes including losing Fairview's champion.

<sup>3</sup> U.S. Environmental Protection Agency: Waste Wise, Resource Management, <http://www.epa.gov/epaoswer/non-hw/reduce/wstewise/wrr/rm.htm>, viewed 6/18/04.

Redwood Area Hospitals was recruited for an intern project for summer 2004. The hospital wants to reduce its volume of solid waste and waste that results in the emission of PBTs. The intern's work will be completed at the end of August 2004. MnTAP will follow up with the facility for two years to track implementation of pollution prevention suggestions.

**Financial assistance.** As previously mentioned, Hennepin County Medical Center, one of the leading healthcare facilities, received a grant to facilitate its pollution prevention programs. MnTAP articles in trade journals provided information to HCMC's environmental services staff. HCMC has applied for grant funds to do formalin reclamation. The technology demonstration site supplied information to make this change.

## **OUTREACH AND RESOURCE DEVELOPMENT**

MnTAP along with MOEA planned and presented workshops describing H2E and opportunities for pollution prevention using H2E tools. All Minnesota hospitals received invitations to the five H2E workshops provided around the state in 2001 and 2003. The 2003 H2E workshops had 60 attendees, representing 16 different healthcare facilities.

MnTAP mailings to all Minnesota hospitals included invitations to the technology demonstration site, success stories from MnTAP's newsletter *Source* and the guidance document *Meeting JCAHO Standards with Pollution Prevention*. Notices to recruit intern projects were posted in the *Source* and advertised at HEARRT meetings.

MnTAP developed several resources for the healthcare sector. All resources were distributed via the HEARRT email list and the H2E listserv. Many were included in various mailings to healthcare facilities. They were also used to provide direct technical assistance to clients. All materials published by MnTAP were posted on its Web site.

As a result of receiving the *Meeting JCAHO Standards with Pollution Prevention*, H2E became interested in expanding the use of the information. The guidance document identifies pollution prevention activities that can serve as performance improvement initiatives to achieve JCAHO standards and meet environmental, health and safety rules and regulations, and H2E goals. The resource is designed to assist the healthcare sector achieve environmental improvements as part of JCAHO accreditation.

Subsequently, H2E received an Innovative Working Group grant from the U.S. EPA to establish an innovative collaborative partnership with multiple healthcare and regulatory organizations to work with JCAHO to affect significant environmental performance and compliance improvements in the healthcare sector. MnTAP is working on this project in a consultative role.

The continued education on the overlap between pollution prevention and performance improvement (PI) under JCAHO should facilitate improved pollution prevention implementation. Because JCAHO PI standards require benchmarking of quality initiatives, data collection by healthcare facilities should improve.

The fact sheet *Mercury in Healthcare Lab Reagents*, in particular, resulted in a number of calls for more information and assistance. Hospitals working on hazardous waste issues appreciate how this piece helps them with evaluating reagents. The *Reducing Suction Canister Waste* fact sheet was developed using the information gained through the intern project at HealthEast. Since then, HealthEast purchased and installed a suction canister system.

## Resources

### Articles

- "15 Seconds of Fame—Kicking the Canister," *Source* spring 2003, <http://mntap.umn.edu/source/18-2/canister.htm>
- "Clean care," *Health Facilities Management*, March 2004  
[http://www.hospitalconnect.com/hfmmagazine/jsp/articledisplay.jsp?dcrpath=AHA/PubsNewsArticleGen/data/0403HFM\\_DEPT\\_Envir\\_Services&domain=HFMMAGAZINE](http://www.hospitalconnect.com/hfmmagazine/jsp/articledisplay.jsp?dcrpath=AHA/PubsNewsArticleGen/data/0403HFM_DEPT_Envir_Services&domain=HFMMAGAZINE)
- "Getting Credit for Eliminating Mercury," *Source* spring 2002, <http://mntap.umn.edu/source/17-2/Mercury.htm>

### Fact sheets and reference materials

- *Formalin Recovery in Healthcare Labs*, <http://mntap.umn.edu/health/20-Formalin.htm>
- *Meeting JCAHO Standards with Pollution Prevention*, <http://mntap.umn.edu/health/jcaho.htm>
- *Mercury in Healthcare Lab Reagents*, <http://mntap.umn.edu/health/92-Mercury.htm>
- *Mercury in Labs and Pharmacies*, <http://mntap.umn.edu/health/10a-mercclabs.htm>
- *Mercury in Patient Care Areas*, <http://mntap.umn.edu/health/10c-mercpatient.htm>
- *Mercury in Nonclinical Healthcare Areas*, <http://mntap.umn.edu/health/10a-mercnonclinic.htm>
- *Reducing Suction Canister Waste*, <http://mntap.umn.edu/health/91-Canister.htm>

### Web site

- MnTAP's healthcare Web page is kept up to date with the latest resources and links to relevant information, <http://mntap.umn.edu/health/index.htm>

## REGIONAL INFORMATION DISSEMINATION

Sharing pollution prevention expertise from MnTAP and H2E has benefited the healthcare sector in other states in the region. Sharing provides other Region 5 states with resources that they may not have had adequate access to due to lack of staff funding or background. MnTAP transferred the results of the grant work through conference calls, presentations, printed case studies and Web sites.

Region 5 EPA staff convened quarterly conference calls for the six state pollution prevention technical assistance programs (TAPs), Indiana, Illinois, Michigan, Minnesota, Ohio and Wisconsin. These calls helped MnTAP share strategies for working with healthcare institutions. H2E staff also participated in the calls, providing direct links to the H2E program for Region 5 TAPs. The calls were useful forums not only for MnTAP to share ideas and information but also to learn from other programs. Connecting with other regional programs provided MnTAP insight into what other states and healthcare facilities were doing, providing the opportunity to discuss healthcare issues and resolutions to problems. Stories of each other's successes are useful in encouraging similar accomplishments. The quarterly conference calls will continue.

MnTAP provided expertise at workshops in four of the six Region 5 states. Generally the assistance provided was in the form of presentations. The topics chosen were areas of need as suggested by the other states. They varied from mercury elimination to an overview of H2E to JCAHO performance improvement standards. Michigan used the opportunity to train its retired engineer program staff to improve their healthcare assessments. MnTAP was able to provide firsthand information to Wisconsin healthcare facilities regarding mercury elimination. Ohio was not interested in participating. Indiana was not able to participate due to lack of staff.

Results of the infectious waste reduction intern project at the HealthEast hospitals, St. John's and St. Joseph's, were provided at H2E and Healthcare Without Harm's Clean Med Conference in April 2004.

Presentations at the Great Lakes Region Pollution Prevention Roundtable (GLRPPR) and National Pollution Prevention Roundtable (NPPR) conferences were forestalled due to budget and staff constraints.

All fact sheets created during the funding period were posted on the MnTAP Web site, highlighted in emails sent to the H2E listserv and linked from the H2E Web site. The New Hampshire Department of Environmental Services revised the MnTAP fact sheet *Suction Canister Waste Reduction* (May 2003) to create a Web resource for New Hampshire. It should be posted on its Web site in summer 2004. The California Department of Health Services used the same fact sheet to develop its infectious waste reduction resources.

Due to industry intricacy, information sharing between Region 5 states or other regions can be helpful. Greater success with P2 can be achieved with each state having at least one dedicated staff professional that can work with the healthcare industry on H2E or other pollution prevention initiatives.

## DISCUSSION

Healthcare facilities are numerous and complex, particularly hospitals. Like a university campus, they are comparable to small cities. Hospitals are composed of many divisions with diverse functions. Examples include patient rooms with needs similar to residential buildings, laboratories preparing chemistries and operating rooms with infectious waste and extreme cleaning needs. This complexity leads to complex waste streams, from wastewater to infectious, hazardous, radioactive and solid wastes.

Because hospitals are such large facilities that have many diverse functions, MnTAP identified several different target audiences within healthcare facilities. Table 5 outlines the breakdown of the "miniature cities" and how the different hospital divisions and job functions can impact pollution prevention.

**Table 5. Wastes Within Hospitals**

<b>Hospital Divisions / Job Functions</b>	<b>General Waste Issues Related to JCAHO Standards</b>	<b>Specific Waste or Role in Pollution Prevention</b>
Administration	Solid waste, integrated pest management, EPP	Top management support, valuing community health as part of the facility's mission statement
Environmental services/ guest services/ housekeeping	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, integrated pest management, pharmaceutical management, patient safety, EPP	Cleaning, disinfectants, waste management, recycling
Facilities management/ grounds supervisor/ plant operations	Mercury, solid waste, hazardous chemical spills and exposure, ignitable chemicals, integrated pest management, patient safety, EPP	Mercury-containing chemicals and equipment, pesticides, facility maintenance such as painting and boiler operations
Food service	Mercury, solid waste, hazardous chemical spills and exposure, ignitable chemicals, integrated pest management, patient safety, EPP	Solid waste, composting, feeding food waste to livestock, disinfectants, cleaning chemicals
Laboratory staff	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, patient safety, EPP	Formalin recovery, mercury-containing chemicals and equipment, disinfectants, solvents, infectious waste reduction
Materials management	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure,	Purchasing, packaging waste, waste hauling, all contracts

<b>Hospital Divisions / Job Functions</b>	<b>General Waste Issues Related to JCAHO Standards</b>	<b>Specific Waste or Role in Pollution Prevention</b>
	ignitable chemicals, integrated pest management, pharmaceutical management, patient safety, EPP	
Nursing staff, general	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, pharmaceutical management, patient safety	Mercury-containing chemicals and equipment, mercury spill clean up, disinfectants
OR nurses and technicians	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, pharmaceutical management, patient safety	Exposure to suction canister waste, sterilants (i.e. ethylene oxide and glutaraldehyde), disinfectants, packaging waste
Pharmacy staff	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, pharmaceutical management, patient safety, EPP	Pharmaceuticals: mercury, chemotherapeutic agents
Physicians	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, pharmaceutical management, patient safety	Decision-making authority over equipment, processes and procedures using sterilants, pharmaceuticals, infectious waste
Risk management	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, integrated pest management, pharmaceutical management, patient safety, EPP	Employee and patient exposure, general liability
Safety and environmental	Mercury, solid waste, infectious waste, hazardous chemical spills and exposure, ignitable chemicals, integrated pest management, pharmaceutical management, patient safety, EPP	All areas

Because of their complexity, hospitals need to have the H2E message sent through a variety of venues to reach staff at many levels throughout the facilities, from the CEO to the maintenance staff. Because of all the competing demands on healthcare, H2E messages need constant reinforcement. A variety of strategies, numerous contacts and several technical assistance tools are needed to initiate pollution prevention in this industry. During this project, a number of outreach efforts and communications techniques were used to reach the healthcare audiences. Working through the University's Academic Health Center (AHC) and the healthcare trade associations proved most effective. Communications that went to facilities directly from MnTAP yielded marginal response, unless an organization was very familiar with MnTAP.

Administrative, upper management or board level support is needed for full-fledged adoption. This layer of the organization is difficult to reach and requires persistence and connections on the part of the technical assistance provider.

Hospital safety staff can be key contacts for pollution prevention because they understand waste issues and are focused on safety. They also focus on the whole facility. Since the terrorist attacks of September 11, 2001, hospitals have had to develop plans to respond to terrorist attacks especially bioterrorism. Safety staff are pulled into this process, making it difficult for them to spend time looking at pollution

prevention. Also, JCAHO has stepped up its review in the area of emergency preparedness, as well. In the future, MnTAP will try to leverage hospital administrators to support outreach efforts.

## **Motivators**

The main motivators for hospitals to look into pollution prevention have been concerns about occupational health and patient health, as impacted by being at the hospital, and cost.

Although protecting and maintaining community health is nearly always part of a healthcare facility's mission statement, hospitals may not be motivated to focus on this aspect of their mission. Ridgeview Medical Center and New Ulm Medical Center both embraced this aspect of their missions to help drive their pollution prevention work. This may be one characteristic that helps identify leading facilities.

Business models do not consider environmental and public health costs. Many CEOs lack an understanding of the costs and benefits of pollution prevention. Looking at hospitals from a broad perspective, CEOs generally do not link their own facility's waste to human health, although this is key to healthcare's mission.

## **Leveraging Leaders**

Having support from leaders in the healthcare industry, such as the University's AHC and Ridgeview Medical Center, help lend validity to pollution prevention. They help others to begin considering pollution prevention as one of the many priorities for a healthcare facility. Drawing upon the successes of healthcare environmental leaders provides access into other healthcare organizations and assists with moving the H2E initiative into the executive realm. Presentations and discussions at various executive level meetings lead by RMC's CEO have encouraged other healthcare facilities to investigate H2E. Leading facilities can also be used as demonstration sites to show off technologies in action. This gives other healthcare professionals the opportunity to see the technologies and ask questions of their peers. The work of the leading facilities can be recorded in case studies and shared with facilities that are unable to attend the demonstrations.

## **Benefit of Partnerships**

Partnering with associations was critical to getting the word out about pollution prevention, H2E tools, MnTAP resources and upcoming events. Trade associations are especially valuable because they are regular ongoing trusted channels for communication. Technical assistance providers can tap into those communication venues to more broadly and more frequently get the message out. Trade associations lend credibility to the messages. To gain the full support of an association for H2E, it needs to have a champion within the organization. As MnTAP discovered with MHA, when an association staff person finds H2E to be important then H2E's importance can grow within the organization and gain greater support. This will result in dissemination of information to members. Now that MHA is supporting H2E, MnTAP sees a great deal of potential in working with them to increase the knowledge and implementation of pollution prevention.

## **Challenges from a Trade Association**

The Vinyl Institute, part of the American Chemistry Council, took issue with information being presented at the five H2E workshops about vinyl being linked to dioxin, a PBT. The healthcare industry generates a significantly larger percentage of plastic and vinyl in its waste stream than do other industries. As an organochlorine, vinyl is linked to dioxin formation when incinerated after disposal. In Minnesota, a significant portion of the waste stream is incinerated. Dioxins are also produced when vinyl is manufactured. MnTAP had to spend many hours responding to the questions of the Vinyl Institute. This included time during the workshops, impacting other attendees. The Vinyl Institute challenged the discussion of vinyl and dioxins. As a result of its discussions with the MOEA and the Minnesota Chamber of Commerce, the terms "vinyl" and "PVC" were not to be used or written at the H2E

workshops. The term "organochlorines" was acceptable; however, the audience was not familiar with the term and defining its context was banned.

## **Benefits of Assistance**

**Technology demonstration** sites are a good way to help people understand a technology or process change, making it easier for them to see how it may fit in their own healthcare facility. At a technology demonstration, attendees have the opportunity to see the alternative idea in action. They have the opportunity to ask questions of their peers who are using it. In the case of the formalin distillation equipment, people could see the amount of space the equipment took in a small lab and could see how easy the process was to run. Both of those qualities are more difficult to convey on paper than to understand upon seeing it.

**Student interns** help healthcare facilities overcome the barrier of not having a staff person to commit to a pollution prevention project. Interns are also a valuable way to gather data on a process change. Developing case studies can be challenging because many facilities lack documentation. They may not track the volume of waste managed and disposed from a specific department or from a specific process. Tracking takes time and may not have value to the organization itself if it begins tracking after a change has been made.

Frequently, healthcare facilities report undertaking various environmental improvement projects, but benchmarking is not done. From the perspective of a technical assistance provider, hands on technical assistance such as site visits and intern projects continue to be the best way to collect data. This requires a time commitment by technical assistance programs. Technical assistance programs understand that the more involved their assistance the more likely a client is to adopt a pollution prevention change. Technical assistance staff has to spend a significant amount of time working with any one client in order to motivate them to make a change. This holds true for the healthcare industry.

**Grants** can provide capital for pollution prevention equipment or provide support for outside training or detailed services of a consultant. Hennepin County Medical Center has used their grant funding to purchase dispensing equipment for less toxic chemicals to be used in almost all of their cleaning applications. Ridgeview Medical Center used their grant funding to educate management staff on sustainability and to do an extensive "eco-audit."

## **PBTs**

The most prevalent and easily eliminated PBT in healthcare is mercury. Mercury waste from healthcare facilities comes from a variety of sources including lab reagents, thermometers and blood pressure gauges. Although lab reagents are the most likely source of mercury in wastewater from healthcare facilities, they are also the most difficult to eliminate. Thermometer and equipment changes are easier.

Dioxin, another PBT strongly associated with healthcare, is not as easily addressed as mercury. Medical waste incinerators have historically been significant contributors of dioxin to the environment. Vinyl products are used in many healthcare applications from intravenous and blood bags to patient identification bands to shower curtains. Vinyl is an organochlorine. Its presence in high concentrations in incinerated healthcare waste provides feedstock for dioxin formation. Recent changes to medical waste incinerator rules have closed many incinerators diminishing their dioxin contributions to the environment. Autoclaving and other non-incineration technologies are now often used to treat infectious waste. However, much vinyl-containing medical waste is still incinerated and has potential for dioxin formation. As discussed previously, the vinyl industry has posed substantial barriers to disseminating information about dioxin-related concerns associated with vinyl. Substitutes for non-vinyl products are not as widely available and are more expensive than vinyl.



## **Progress of Non-leaders**

Many of the “non-leader” hospitals appear to be engaged in pollution prevention activities at some level. Generally they are separated from the leader hospitals because they do not track their efforts. While they may report “eliminating mercury” or “reducing waste,” the non-leader facilities frequently cannot substantiate these changes and have not done benchmarking.

H2E Partners are supposed to track and report progress and accomplishments to H2E on an annual basis. However, when MnTAP asked for information about changes, volumes reduced and cost savings, this documentation was not available from most H2E Partners. Not being able to track changes impedes accurate reporting.

## **Time and Money**

"No time" and "no money" for looking into pollution prevention opportunities are heard in every industry, including healthcare. Priority issues in healthcare that may take precedence over pollution prevention include lack of staff, especially in nursing; lack of money; security concerns and legislation, such as the Health Insurance Portability and Accountability Act (HIPPA) and others that affect Medicare/Medicaid reimbursement.

Financial constraints have hospitals squeezing budgets. While cost can be a motivation to implement pollution prevention, money for capital expenses can be hard to justify for a hospital department. This may be especially true in the case of mercury-containing equipment. If the equipment is working well and the replacement adds no medical benefit, such as greater accuracy, the cost to replace equipment to eliminate risk may not seem worth the expense. In some cases, the expense of spill management can be the cost driver for pollution prevention.

Running on tight budgets can result in tight staffing. Staffing can also be tight because of the lack of supply of qualified professionals, as in nursing. This limits the time that healthcare staff spends identifying pollution prevention opportunities and researching options. Technical assistance staff can help with those needs, but healthcare staff still need to evaluate their own operations, review the resources provided, complete a cost analysis and present it to management. In the case of an operating room nurse, that all has to happen in between room preparation and patient operations.

## **Regional Information Sharing**

The conference calls were useful forums for MnTAP to share ideas and information, and to learn from other programs. Connecting with other regional programs provided MnTAP insight into what other states and healthcare facilities were doing, providing the opportunity to discuss healthcare issues and resolutions to problems. Stories of each other's successes are useful in encouraging similar accomplishments. Staff from other Region 5 states, Region 5 EPA and MnTAP found the sharing beneficial and plan for the calls and information exchange to continue.

## CONCLUSION

This two-year project achieved its objective of demonstrating pollution prevention at healthcare facilities using the products of Hospitals for a Healthy Environment. MnTAP successfully promoted and helped hospitals implement pollution prevention practices and technologies as a means to reduce healthcare waste and costs.

For facility-wide change to take place in healthcare, the focus needs to be on having prominent leadership support and instituting cultural change.

As H2E works with JCAHO to integrate PI standards and pollution prevention in the future, greater implementation of pollution prevention should take place. Data collection by healthcare facilities should become more common, increasing the frequency of benchmarking.

Next steps will involve continued assistance with interested and active facilities as well as assisting other hospitals who can benefit from implementation of pollution preventing technologies, reduced costs, better use of raw materials, improved employee health and reduced impact on the environment.

Developing new and maintaining current relationships with partners will continue. Partnering is especially beneficial in this complex industry. Multiple partners help reach the numerous levels and trades present in healthcare. Trade associations, local and state governments and universities can provide links to healthcare professionals, sources of information and act as communication vehicles.

Increased regulatory scrutiny and growing interest by JCAHO in using pollution prevention in PI standards will serve as motivators for hospitals to consider using pollution prevention to meet H2E goals. Throughout the project, regular and ongoing outreach kept H2E exposure high with hospitals. The workshops and technology demonstration day were successful in bringing hospitals together to discuss technologies that increase efficiency, reduce waste and save money. The project generated awareness of new technologies for healthcare facilities to implement. More importantly, several facilities adopted pollution preventing technologies and many more are working on future changes.