

Background and industry description

Kansas Hospitals for a Healthier Environment, or KH2E, is a program hosted by the Pollution Prevention Institute, or PPI, and funded by the EPA, Region 7. KH2E works to reduce environmental and public health impacts of toxic chemicals in hospitals, specifically the high priority TSCA chemicals. The project began in 2019, but field work was paused for about 18 months due to COVID. It resumed 2021 and was completed in 2022. It worked for two of the three years (2019 and 2022) with a main partner, Ascension St. Francis as well as the Ascension system sustainability leadership. Nationally, Ascension is the largest non-profit healthcare provider in the United States and the largest Catholic healthcare provider in the world with 178 facilities in 19 states. Their Wichita property, Ascension St. Francis campus, is the largest hospital in Kansas with more than 500 beds. In 2021, KH2E program worked with multiple small rural hospitals. All three years, PPI utilized trained interns to do TSCA assessment field work.

In 2019, the first year of the project, an intern worked exclusively with the Ascension St. Francis location in Wichita, Kansas. The trained intern completed a detailed chemical inventory, identifying and ranking TSCA-containing products across the hospital as well as safer alternatives for the high priority TSCA products. Ascension St. Francis is the largest hospital in Kansas with more than 500 beds. In 2020, adjustments were made to continue the work throughout the pandemic, working virtually with a Toxics Team made up of Ascension facility partners from across the country. The focus of the Toxics Team work was to learn from what was done in 2020 in Kansas, and replicate toxics identification and removal in other Ascension facilities. In 2021, PPI expanded its approach and worked with six different Kansas hospitals ranging in size from 13 to 199 beds. Using lessons learned from 2019 project and 2020 Toxics Team work, chemical inventories and safer alternative were identified for each of the six small hospitals. In 2022, a PPI intern worked with Ascension St. Francis hospital again, to follow-up on the 2019 chemical inventory and to complete an assessment of the facility's ice machine refrigerants to identify refrigerant type and look for leaks.

Incentives to change

Hospitals are responsible for the health of their patients, often the most vulnerable populations. Removing harmful and toxic chemicals can improve patient safety, and as this sector continues to grow, taking these steps now to reduce toxics and pollution at the source will reduce environmental health impacts, protecting public health. This program worked to reduce environmental and human health impacts of high-priority toxic chemicals in hospitals. The primary goal of the project was to identify chemicals included in The Toxic Substance Control Act, or TSCA, which is a federal regulation that gives the EPA authority to require reporting, recordkeeping, and in some cases, restrictions related to chemical substances and/or mixtures. In recent years the EPA began the process of evaluating risk associated with TSCA-priority chemicals and in some cases, these evaluations have resulted in restricting the use of highly toxic chemicals. Awareness and knowledge of TSCA will allow hospitals to reduce toxic exposure to patients, worker and the communities they serve.

Ascension St. Francis and PPI have a history of working together for nearly two-decades, and there is a mutual goal of extending these improvements in source reduction and toxics' reduction across the entire Ascension network of more than 178 facilities in 19 states nationwide.

Additionally, smaller rural hospitals have an interest in reducing toxics or stockpiles of old unused chemicals at their facilities. PPI has a 20-year relationship with the rural hospitals that make up the Kansas Healthcare Engineers Association or KHEA, a state association that frequently features PPI project work at their bi-annual conferences and in their newsletters.



¹ www.epa.gov/laws-regulations/summary-toxic-substances-control-act

PROJECTS

PPI's KH2E project included reviewing four priority product categories for high-priority TSCA chemicals. The majority of effort was dedicated to category one, assessing TSCA chemical inventories. Work in each of these categories is detailed in this section.

TSCA chemicals, including mercury

The healthcare sector, like other industry sectors, have a history of using a number of highly-toxic chemicals and processes that can be harmful to workers and the communities hospitals care for. TSCA 2014 Work Plan chemicals were the focus for this project and specific targets included elemental mercury, and halogenated solvents and refrigerant. Most of these chemicals are known neuro-toxins that impact the brain of developing fetuses, as well as the nervous systems, kidneys, livers, and hearts of adults. In the environment they can be persistent, bioaccumulative, and toxic, or PBT. In addition to being a public health threat, mercury spills due to poor storage or handling, costs thousands to clean up.

During 2019, the intern created a spreadsheet for Ascension Via Christi reviewing the hospital's chemical inventory. More than 800 products were analyzed, including 80 products containing 2014 TSCA Work Plan chemicals. Eight of the most toxic products were evaluated more closely for pollution prevention or P2 potential. Out of these eight products, four were recommended for removal or replacement: Saf-Sol 20/20, SSD II (an industrial degreaser), Nikal (a solder that containing nickel), and Xylene (a solvent used in tissue processing). This totaled 2,072 lbs of TSCA chemical reduction annually, 1.22 tons of HAPS, 1.01 tons of VOCs, 10.85 MTCO_{2e} due to methylene chloride and carbon tetrachloride, and a cost savings of \$457.

In addition to the inventory work, PPI also met with the Ascension advisory board, called the "Toxics Team," made up of environmental professionals from across the Ascension national network. As COVID-19 slowed the project field work, these professionals met regularly and began to look at their Grainger-supplied chemical orders to target elimination of four chlorinated solvents including Methylene Chloride, Trichloroethylene (TCE), Tetrachloroethylene (PERC) and Carbon tetrachloride.

In 2021, chemical inventories from six hospitals were examined for TSCA 2014 Work Plan chemicals. This was done by comparing CAS numbers of chemicals to the list of high-priority TSCA chemicals and then identifying safer alternatives. More than 400 chemicals were analyzed and more than 130 TSCA-containing products were identified. Ten high-priority TSCA chemicals were analyzed further for source-reduction potential. Looking for these ten chemicals, the intern identified 92 products, including elemental mercury, spray paints and thinners, enamels and primers, adhesives and sealants, lubricants, and flux. All identified products were either recommended for replacement with safer alternatives or disposal if the product was too dangerous to be used up for its intended purpose. The recommendations from the six hospital inventories totaled 541 lbs. of TSCA chemical reduction, 0.01 tons of HAPs, 0.08 tons of VOCs, 0.87 MTCO_{2e} due to methylene chloride, and a cost savings of \$524.

In 2022, at Ascension Via Christi St. Francis hospital, a follow-up chemical inventory analysis and a refrigerant gas inventory on ice machines were performed. The goal of the follow-up chemical inventory analysis was to determine how many of the 2019 recommendations were implemented. The methodology included comparing the 2022 chemical inventory to the 2019 list of recommended-removal products. Out of the four products recommended for removal in 2019, three have been eliminated. The fourth product, Xylene, used in tissue processing equipment in the lab, required better alternatives be developed in the future to justify replacement according to Ascension staff. The main barrier to replacement was due to the costs of about \$140,000 to replace the machine. Unfortunately, the machine is specifically designed to use Xylene and could not be retrofitted to use a safer alternative. The goal of the refrigerant gas inventory was two-fold, first to identify any leaks for immediate repair and second to document the type of refrigerant used and identify which machines could use refrigerants that have a reduce climate impact. Sixty-five machines were inspected for leaks and inventoried, the majority of which used R404A refrigerant. It was recommended to replace the ice machines currently using R404A with R134a, a refrigerant that is less toxic to the climate and less expensive. Refrigerants manufactures specification indicate these replacements would reduce the global warming potential (GWP) by 2492 at a cost saving in gas of \$85. Using the EPA's P2 greenhouse gas calculator, the 68.19 lbs. of refrigerant gas would represent a GHG reduction of 188.2 MTCO_{2e} per year.



² www.kha-net.org/AlliedOrganizations/KHEA/

³ www.epa.gov/assessing-and-managing-chemicals-under-tsca/tsca-work-plan-chemical-assessments-2014-update

PROJECTS, CONTINUED

In the summary table below, recommendations across all hospitals, are broken down by commonly identified, high-priority TSCA chemicals, listed in alphabetical order with the corresponding quantities.

Medical devices containing DEHP and PVC

Historically, hospitals have used patient-care medical devices that contain DEHP or PVC. This project targeted the elimination of these chemicals from breast pumps, internal nutrition tubing, IV tubing, urology catheters, exam gloves, umbilical vessel catheters and nasogastric tubes. DEHP is a reproductive toxicant that the FDA has documented as leading to male infertility. It is also tied to the creation of dioxin and other hazardous chemicals.

In the first year, at Ascension Via Christi, it was recommended to develop a safe and compliant plastics purchasing policy, and to avoid purchasing any new plastics containing PVC and DEHP.

In late 2022, the Ascension Toxics Team reported their first nation-wide success related to this category of toxic reduction. Under a "Safer Chemicals" initiative, contract renewals with suppliers now include requirements that will green their supply chain. One of the first products evaluated for DEHP was surgical gloves and the group is now moving forward to evaluate their breast pumps and enteral feeding tubes. Although impacted by a pandemic, after three years of work with the Toxics Team, they have been able to gain momentum and begin the process of TSCA source-reduction through their purchasing contracts. Unfortunately, the team was not able to provide quantified data at this time.

Cleaners

Hospitals are cleaned thoroughly to protect the health of patients. Carpet, bathroom, window, floor care, and all-purpose are some examples of the cleaners normally used. Many of these chemicals may be able to be replaced with safer and less toxic alternatives. This can be achieved by identifying labeling such as the safer choice label and by using tools such as the Safer Chemical Ingredients List. If ignored, the usage of these chemicals can cause asthma and cancer in individuals with chronic exposure.

In 2019, cleaners used by environmental services, or EVS, were included in the chemical inventory completed at Ascension St. Francis. No cleaners with TSCA-containing chemicals were identified. It was also noted that EVS at Ascension follows the Healthier Hospitals Initiative Safer Chemicals Challenge for Green Cleaning.

In 2021, when the intern worked with six various Kansas hospitals, cleaners were investigated for high-priority TSCA chemicals. Again, no cleaners were found to contain TSCA-containing chemicals.



Toxic interiors and landscapes

This category of TSCA chemicals targeted the identification and elimination of potential per- and polyfluoroalkyl substances, or PFAS, and TSCA chemicals found in interiors and furnishings at hospitals. due to their. PFAS are widely-used due to their flame and water-resistant properties. Some studies have linked these long lasting chemicals to harmful health effects in humans and animals . Specifically, cancer, birth defects, infertility, asthma and chemical sensitivities. In addition to PFAS, this project also sought to reduce or eliminate formaldehydes and antimicrobials in interiors as well as landscaping chemicals, including ice melt.

PPI met with the Ascension sustainability director and Toxics Team member in 2019 and 2020 to review this category of toxics and products. As part of the review of this category, Ascension had begun to develop a plan to phase out toxic laden furnishing as new furnishings were purchased. In 2018 and 2019, working with their vendor, an assessment of the type of furnishings and quantities that were healthy hospital compliant, no more than 30% of annual purchases contain PFAS or PVC. Ascension has been successfully implementing this purchasing policy, slowing reducing the interiors and furniture that contains PFAS and PVC .

⁴ practicegreenhealth.org/healthierhospitals

⁵ www.epa.gov/pfas/pfas-explained

RESULTS

Recommendations totaling 2,613 lbs. of TSCA chemicals were identified for replacement or removal. At the time of this report 366 lbs. of TSCA chemicals were removed, including 15 pounds of elemental mercury, 22 pounds of tetrachloroethylene and 9 pounds of trichloroethylene. This equates to the prevention of 10.92 MTCO₂e, 0.02 tons HAPs, 0.06 tons VOCs, and a savings of \$414.

The following projects have been recommended and implemented:

RESULTS				
TSCA Chemical Identified	Annual Estimated Environmental Impact (lbs.)	GHG Reductions (MTCO ₂ e)	Estimated cost savings (\$/year)	Implemented (lbs.)
antimony	0.75	—	\$981	0.00
benzene	0.69	—		0.00
butyl benzyl phthalate	0.75	—		0.00
carbon tetrachloride	13.75	10.85		13.75
elemental mercury	15.00	—		15.00
ethylbenzene	92.44	—		19.81
long-chain chlorinated paraffins	10.50	—		7.00
methylene chloride	32.47	0.13		18.39
naphthalene	6.44	—		2.25
nickel	1.50	—		1.50
octamethylcyclotetrasiloxane	11.36	—		8.00
quartz	79.22	—		24.50
tetrachloroethylene	21.57	—		21.57
trichloroethylene	11.26	—		9.26
xylene	2,315.03	—		224.56
R404A (not TSCA) replacement with R134A	68.19	108 (2492 GWP)	\$85	0
Total	Recommended: 2612.73 lbs. TSCA chemicals, 1.24 tons HAPs, 1.09 tons VOCs, 2492 less GWP in refrigerant	118.93 MTCO₂e Recommended and 10.92 implemented¹	\$1,066 Recommended \$414 implemented*	Implemented: 366 lbs. of TSCA chemical reduction, .02 tons HAPs .06 tons VOCs

*This estimated cost savings does not include the price of an approximately \$140,000 new tissue processor that allows for the usage of xylene to be discontinued.

¹EPA P2 GHG Calculator with Cost, Apr. 7, 2016