Evaluating a Novel Carbon Monoxide (CO) Monitoring Framework in Long-Term Care Facilities (LTCFs)

BC Centre for Disease Control
An agency of the Provincial Health Services Authority

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CO in Long-term Care Facilities

- The **need to better understand and manage CO exposures in LTCFs** arose from a 2010 incident where staff and residents were exposed to CO in a long-term care facility in Saskatchewan.
- The incident required the evacuation of one wing of the facility and contributed to three deaths. In response, the Saskatoon Health Region and the province of Saskatchewan have taken steps to ensure that such events are prevented. This included the **development and implementation of a CO monitoring and reporting framework to manage CO exposures in long-term care facilities.**

CO detectors do not alarm at low levels
- designed to prevent CO poisoning (high level exposure)
- not designed to prevent sub-acute exposures

Residents at LTCFs may have health conditions (heart, respiratory) which make them more susceptible to the effects of low-level CO exposure (10-25 ppm)

CO Exposure	Symptoms	CO alarm triggers
Mild (e.g., 35 ppm, 6 to 8 hrs)	Headache, nausea, fatigue (flu-like, but no fever, multiple people may be affected)	70 ppm, 60 to 240 minutes
Medium (e.g., 200 ppm, 2 to 3 hrs)	Headache, irritability, drowsiness, dizziness	150 ppm, 10 to 50 minutes
High to dangerous (e.g., 400 ppm+, 20 min+)	Unconsciousness, convulsions, death if continued exposure	400 ppm, 4 to 15 minutes

CO Monitoring and Response Framework

Education
- Educate staff about CO health effects, sources, and importance of monitoring
- Train staff on CO monitoring and response protocols

Monitoring
- Develop protocols for CO monitoring
- Install CO detectors at locations near CO sources
- Monitor CO levels daily
- Identify elevated CO levels (>10 ppm)

Prevention and Mitigation
- Develop resources related to identification and maintenance of CO sources
- Perform routine maintenance on combustion appliances
- Respond to elevated CO levels

Evaluation Objectives

- Document intended and actual implementation of Saskatoon Health Region's CO monitoring program
- Identify considerations for improving or maintaining the CO monitoring program
- Gauge the extent to which the CO monitoring program will allow achieving its intended outcomes of increased safety

"The program has had a huge impact on placing greater priority on preventative maintenance. This is seen to be a significant benefit."

"The positive focus has been that maintenance staff are visible throughout the building and are interacting with other disciplines routinely."

"It is 'one more thing to do' for staff. Although no "hard" costs are apparent with the exception of purchasing the detectors. Confidence in the reliability of the detectors is very low."

Evaluation Components

- Adequacy of human and technical resources
- Totality of implementation
- Production of complete and reliable monitoring information
- Early outcomes – changes concerning real and possible exceedances

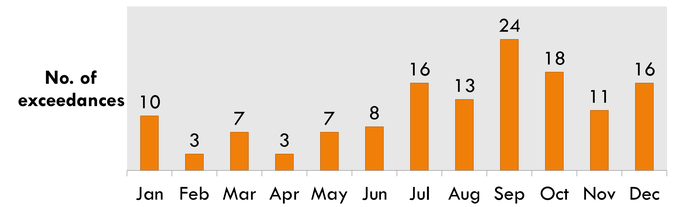
Methodology

- **Review of policy documents**
- **Review of monitoring records** (June 2013 to January 2015)
- **Interviews** of staff and managers (10 LTCFs)
- **Direct facility audits**

Findings

Reported levels	Time to monitor	No. of detectors
10 to 195 ppm	10 to 80 min/day	6 to 24 per facility

Number of reported exceedances by month, 8 LTCFs, June 2013 - January 2015 (N=136)



Conclusions

As currently available CO detectors do not provide notification of low-level CO exposure, monitoring either by manual processes or through automated notification to a responsible person would be required to mitigate sub-acute and acute CO exposures associated with adverse health effects.

Where effectively implemented, the CO monitoring program is having a positive effect, not only on the technical capacity to detect and respond to CO exceedances but also on the overall awareness and vigilance about its threat.

Although components of the program have generally been implemented, the pattern of incomplete readings, especially on weekends and holidays, shows that there are challenges to maintain complete coverage of monitoring tasks.

Technical deficiencies with CO detectors may undermine the confidence and perceived utility of the program.