State of Alaska Epidemiology Bulletin

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Hospitalizations due to Unintentional Carbon Monoxide Poisoning — Alaska, 1993–2010

Background

In 2007, there were 2,302 confirmed hospitalizations for carbon monoxide (CO) poisoning nationally (rate: 0.8 per 100,000 population).[1] A colorless and odorless gas, CO is produced during fossil fuel combustion. When inhaled, CO binds tightly to hemoglobin in red blood cells, preventing oxygen binding and transfer in the body. CO poisoning can cause headache, nausea, dizziness, confusion, and death. This *Bulletin* describes the epidemiology of hospitalizations due to CO poisoning in Alaska from 1993–2010.

Methods

Alaska unintentional CO poisoning hospitalization data from 1993–2010 were obtained from the Alaska Trauma Registry (ATR) using ICD-9 code 986 ("toxic effect of CO"). Rates were calculated using the National Center for Health Statistics Bridged Race Vintage 2010 Postcensal Population estimates, and adjusted to the 2010 U.S. population for comparison.

Results

During 1993–2010, 149 persons were hospitalized due to CO poisoning. The median number of cases was seven (range: 0–25) per year. Case counts were highest during the winter months (76, 51%), followed by fall (44, 30%) spring (11, 7%), and summer (10, 7%; seasonality information was not available for eight cases). The median age of hospitalized patients was 39 years; 99 (66%) were male, and 104 (70%) were White. The statewide crude and age-adjusted rates for CO poisoning hospitalizations were 1.17 and 1.22 cases per 100,000 persons, respectively. Rates by region were highest in the Southeast and Gulf Coast (Table). Rates by sex, age, and race were highest among males aged 20–49 years (Figure) and Blacks (Table).

Of the 149 hospitalizations,

- exposures by sex among males and females, respectively, were domestic motor vehicle exhaust (27, 27%; 8, 16%), domestic heating sources (18, 18%; 9, 18%), other domestic source (26, 26%; 25, 50%), occupational (11, 11%; 1, 2%), and other/unknown (17, 17%; 7, 14%);
- exposures by region for Anchorage/Mat-Su, Gulf Coast, Interior, and Southeast, respectively, were domestic motor vehicle exhaust (20, 28%; 4, 15%; 6, 20%; 2, 20%), domestic heating sources (13, 18%; 6, 23%; 5, 17%; 1, 10%), other domestic source (23, 32%; 10, 39%; 11, 37%; 2, 20%), occupational (4, 6%; 3, 12%; 2, 7%; 1, 10%), and other/unknown (11, 16%; 3, 12%; 6, 20%; 4, 40%);
- eight (5%) were suspected or proven to have had an alcohol-related CO exposure, and five (3%) were suspected or proven to have had an illicit drug-related CO exposure;
- 122 (82%) were discharged to home, 19 (13%) were transferred to another hospital, and 4 (3%) died;
- 16 (11%) received care in an intensive care unit;
- the median duration of hospital stay was 1 day (range: 1–18); the median documented hospitalization cost was $1,463 (maximum: $33,359) per patient; and the total hospitalization cost for all patients was $424,445.

Discussion

Alaska ATR hospitalization data from 1993–2010 indicate that unintentional CO poisoning hospitalization rates were highest among males aged 20–49 years and persons living in the Southeast and Gulf Coast regions. The higher burden of CO poisoning hospitalization among males was driven primarily by more toxic exposures from domestic motor vehicle exhaust and occupational settings. Reasons for the disproportionate geographical representation of CO poisoning hospitalizations are unclear, but might be due to differences in motor vehicle exhaust (e.g., motor boats),[2] home heating/ventilation, occupational, and/or other exposures. Unintentional CO poisoning hospitalizations occurred mainly in the fall and winter seasons, which are associated with longer stays indoors and more frequent use of CO-generating items such as heaters.

CO exposure prevention involves proper installation and maintenance of fuel-burning appliances at home and in the workplace, the routine use of CO detectors, proper and adequate ventilation, and public education. An important limitation of this report is the potential for ATR data misclassification due to insufficient clinical and circumstantial (e.g., presence of CO detector) information.

Figure. Unintentional CO Poisoning Hospitalization Rates, by Sex and Age — Alaska, 1993–2010

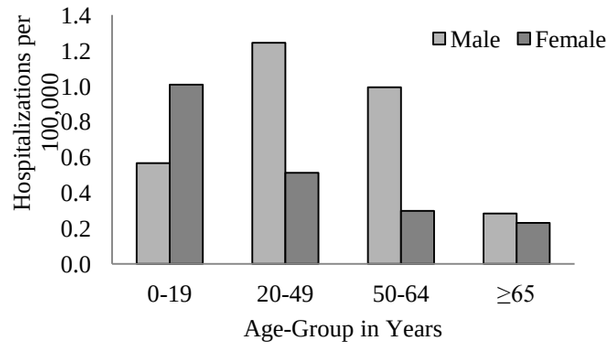

Table. Unintentional CO Poisoning Hospitalization Rates by Region and Race — Alaska, 1993–2010

Region	Rate (n)*		Race†	Rate (n)*
Anchorage/ Mat-Su	1.8 (71)		White	2.0 (104)
Gulf Coast	3.9 (26)		Black	2.8 (9)
Interior	1.8 (29)		A/PI	1.6 (7)
Northern	----		AI/AN	1.1 (14)
Southeast	4.0 (10)		Hispanic	1.6 (6)
Southwest	----			

**Crude rates per 100,000 persons; case counts do not total 149 because "unknowns" were excluded*
†A/PI = Asian/Pacific Islander; AI/AN = American Indian/Alaska Native
----Rates were not calculated for regions with <5 cases

Recommendations

1. Health care providers should encourage their patients to use CO detectors in the home and to have heating systems (e.g., gas, oil, or coal burning appliances) serviced by a qualified technician annually. Other informational materials are available online at: http://www.cdc.gov/co/
2. Emergency preparedness personnel should educate the public about CO risk factors, including operating CO-generating motors, generators, stoves, or grills indoors or near open doors/windows.
3. Employers should strictly follow federal regulations and guidelines for the workplace that involve CO monitoring, exposure, and risk management. Information is available at: http://www.dec.alaska.gov/air/anpms/co/cohome.htm

References

1. Iqbal S, Law HZ, Clower JH, Yip JH, Elixhauser A. Hospital burden of unintentional carbon monoxide poisoning in the United States, 2007. *Am J Emerg Med* 2012;30:657-64.
2. Alaska Section of Epidemiology *Bulletin*. "Carbon Monoxide: Stay Aware-Stay Alive." No. 31, August 10, 1993. Available at: http://www.epi.alaska.gov/bulletins/docs/b1993_31.htm

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