

13-EH-01

Committee: Environmental Health

Title: Public Health Reporting and National Notification for Carbon Monoxide Poisoning

I. Statement of the Problem:

Carbon monoxide (CO) is a colorless, odorless, nonirritating gas that is produced through the incomplete combustion of hydrocarbons. Sources of CO include combustion devices (e.g., boilers and furnaces), motor-vehicle exhaust, generators and other gasoline or diesel-powered engines, gas space heaters, woodstoves, gas stoves, fireplaces, tobacco smoke, and various occupational exposures. CO poisoning is a leading cause of unintentional poisoning deaths in the United States. Unintentional, non-fire related CO poisoning is responsible for approximately 450 deaths and 21,000 emergency department (ED) visits each year.¹⁻²

II. Background and Justification:

CSTE adopted the *Surveillance Case Definition for Acute Carbon Monoxide Poisoning* in 1998 (position statement EH-1), and the *Updates to 1998 Case Definition for Acute Carbon Monoxide Poisoning Surveillance* in 2007 (position statement EH-03).

This position statement describes methods for inclusion of CO poisoning in standard public health reporting, based on use of CO exposure and CO poisoning case data available from Poison Control Centers as the core case-ascertainment source, and case notification to CDC by means of the on-going American Association of Poison Control Centers (AAPCC) National Poison Data System (NPDS).³ The position statement describes four tiers of surveillance activities, which can vary depending upon the resources available: PCC only; case-finding using multiple data sources, including PCC; case-finding using multiple data sources with matching and record linkage; and, case-finding using multiple data sources with individual case investigation. The position statement further describes selected case-ascertainment data sources. CDC has described these methods as follows: "Surveillance and analysis of data from NPDS and secondary sources might provide a more comprehensive description of the burden of CO exposure in the United States and assist in the development of interventions better targeted to high-risk populations."³

Establishing surveillance for carbon monoxide poisoning based on case information from Poison Control Centers has special value in the disaster setting, both for rapid assessment (situational awareness),⁴ and for retrospective analyses.⁵⁻⁷

III. Statement of the desired action(s) to be taken:

1. Utilize standard sources (e.g. reporting*) for case ascertainment for Carbon Monoxide Poisoning. Surveillance for Carbon Monoxide Poisoning should use the following recommended sources of data to the extent of coverage presented in Table III.

Table III. Recommended sources of data and extent of coverage for ascertainment of cases of Carbon Monoxide Poisoning.

Source of data for case ascertainment	Coverage	
	Population-wide	Sentinel sites
Clinician reporting	X	
Laboratory reporting	X	

Reporting by other entities (e.g., hospitals, veterinarians, pharmacies, poison centers, hyperbaric facilities)	X	
Death certificates	X	
Hospital discharge or outpatient records	X	
Extracts from electronic medical records	X	
Telephone survey		
School-based survey		
Other _____		

2. Utilize standardized criteria for case identification and classification (Sections VI and VII) for Carbon Monoxide Poisoning and add this condition to the *Nationally Notifiable Condition List*.

- 2a. Immediately notifiable, extremely urgent (within 4 hours)
- 2b. Immediately notifiable, urgent (within 24 hours)
- 2c. Routinely notifiable

CSTE recommends that all States and Territories enact laws (statue or rule/regulation as appropriate) to make this disease or condition reportable in their jurisdiction. Jurisdictions (e.g. States and Territories) conducting surveillance (according to these methods) should submit case notifications** to CDC by means of the American Association of Poison Control Centers (AAPCC) National Poison Data System, as described below.

3. CDC should publish data on Carbon Monoxide Poisoning as appropriate in *MMWR* and other venues (see Section IX).

CSTE recommends that all jurisdictions (e.g. States or Territories) with legal authority to conduct public health surveillance follow the recommended methods as outlined above.

Terminology:

* Reporting: process of a healthcare provider or other entity submitting a report (case information) of a condition under public health surveillance TO local or state public health

**Notification: process of a local or state public health authority submitting a report (case information) of a condition on the Nationally Notifiable Condition List TO CDC.

IV. Goals of Surveillance

Public health surveillance data systems for Carbon Monoxide poisoning operate for multiple purposes:

- Immediate response, to block the occurrence of further cases
- Planning and evaluation of prevention programs
 - Estimation of the magnitude of the problem and tracking of trends over time
 - Identification of high-risk areas and population sub-groups
 - Assessment of the effectiveness of preventive policies and practices, such as legal requirements for installation of CO alarms in residences
- Investigation of novel exposure pathways and previously unknown determinants

Public health jurisdictions vary in their CO poisoning prevention program practices. Although very few use surveillance data for immediate response, the New York City Department of Health & Mental Hygiene is a good example of a “best practice” at the local level: calls to the Poison Center can result in rapid dispatch

of a municipal fire department vehicle. Best practices in most jurisdictions focus on program evaluation and planning. When resources are available to conduct thorough case investigations, compile a de-duplicated database from cases ascertained from multiple sources, and analyze, interpret and disseminate the resultant information (the Maine Center for Disease Control & Prevention is a good example of this “best practice”),⁸ then public health practitioners and their partners can focus preventive policies and program activities on the known exposure pathways and other determinants.

Experience gained from investigations of CO poisoning outbreaks (such as those related to post-storm power outages) has shown both the limitations of secondary data analysis and the challenges of attempting to establish ad-hoc case-ascertainment methods based upon reporting. The establishment and maintenance of data systems based on reporting of CO poisoning, which are useful for routine surveillance of the sporadic cases, finds particular value during an outbreak.

V. Methods for Surveillance: Surveillance for Carbon Monoxide Poisoning should use the recommended sources of data and the extent of coverage listed in Table III.

Every jurisdiction in the US has a Poison Control Center (PCC) staffed by specialists who assess calls for information regarding exposures to toxic substances and calls for assistance regarding illnesses where a toxic substance is suspected of being the cause, and dispense medical advice under the authority and control of a Medical Director.⁹ When state law or rule requires reporting of carbon monoxide poisoning by clinicians, PCCs are generally required to report. Language in the reporting rule should preferably refer to PCCs explicitly.

Reporting of carbon monoxide poisoning by PCCs constitutes the core case-finding method. Surveillance systems vary, and are described here as operating in four hierarchical tiers, each inclusive of the one which is less comprehensive:

1. PCC only
2. Multi-source case-finding (includes PCC)
3. Multi-source case-finding with matching, for linkage and de-duplication
4. Multi-source case-finding with matching and case-investigation

When resources are available, surveillance activities operating at tier 4 have the greatest effectiveness.

Multi-source case-finding includes CO poisoning case ascertainment from laboratory reporting of carboxyhemoglobin (COHb) test results, case-based reporting from hospitals, case-based reporting from Medical Examiners and Coroners (ME/C), automated reporting from electronic medical records, and review of death certificates and administrative records (such as workers compensation).

Each source used for CO poisoning case ascertainment has different characteristics: it may have good sensitivity/completeness (few false negatives); it may have good positive predictive value (few false positives); it may have good timeliness; it may include many unique cases (not found in other data sources); and/or it may have high information value (including facts about the route of exposure or other contributing factors which are less reliable in other sources). No single data source possesses all of these characteristics.¹⁰

Poison Control Center data have high information value and contain many unique cases. Cases where health effects from CO exposure exist and CO exposure is well documented (such as by air monitoring equipment), but the affected individual does not seek medical care, may not be found in other data sources. Calls to PCC can have very good timeliness; rapid dispatch of a municipal fire department vehicle in New York City as a consequence of a call to the PCC is an illustrative example. Every 3-5 minutes, PCCs send electronic case information to the American Association of Poison Control Centers (AAPCC) for the National Poison Data System (NPDS). Anomaly alert analysis is conducted by NPDS every hour; toxicosurveillance staff confirm clusters found this way with the originating PCC; and, alerts can be issued. Surveillance staff in the CDC National Center for Environmental Health have full access to

NPDS data,¹¹⁻¹² and staff in state and territorial health agencies can be enabled similarly. The sensitivity of PCC reporting is moderate: many of the most severe cases are missed, such as out-of-hospital deaths, as well as those who go directly to hospital ED. Limitations of PCC data include: state and ZIP code of the caller is often used as a surrogate measure for the patient's residence, which may not accurately represent the patient's actual residence; and, personal identifiers may be incomplete.

Laboratory reporting of carboxyhemoglobin (COHb) test results has high information value for clinical aspects, but low information value for details of exposure. It also contains few unique cases, and because COHb differs in smokers compared to non-smokers, it also has a low PPV due to high COHb values in heavy smokers.¹³ Pulse co-oximetry provides a non-invasive option to obtain COHb results quickly. However, the reliability of results obtained from pulse co-oximetry is imperfect.¹⁴

Case-based reporting from Medical Examiners and Coroners (ME/C) has good sensitivity for the most severe cases (out-of-hospital deaths may be uniquely found here), and good PPV. Details from death investigations can provide excellent information value about exposure pathways and other contributing factors. ME/C data often has low timeliness.

Case-based reporting from hospitals has good PPV. Sensitivity for detecting diagnosed cases and timeliness of reports is dependent on compliance with reporting requirements. Information value for details of exposure is variable. Other limitations include: under-diagnosis, due to the non-specific profile of CO poisoning symptoms;¹⁵ federal hospitals may not report; and, resident hospitalizations in out-of-state hospitals may not be included, due to the lack of non-resident data exchange between states.

Automated reporting of reportable conditions from electronic medical records is an unproven method for CO poisoning case ascertainment with a high potential for great utility in the future. The potential for automated reporting from clinical record systems, such as in hospital EDs, to reduce the problem of timeliness and completeness is especially promising. Automated "syndromic surveillance" data systems, which can rely on the patient's presenting chief complaint at the ED, have been successfully used for timely case-finding (such as in Florida); in contrast, where syndromic surveillance data systems rely upon coded ED discharge diagnosis, improvement in completeness of case-finding is likely, but timeliness is decreased.

Retrospective review of death certificates and administrative records, such as workers compensation records, obviously has low timeliness, but may have high sensitivity. Information about work-related exposure pathways, for example, may be best found in this manner. Limitations include non-specific underlying cause of death codes in ICD-10.¹⁶

When case ascertainment utilizing multiple data sources is operating, case counting without de-duplication (Tier 2) results in a need to present case data separately for each data source in tables and charts in published surveillance reports. When case ascertainment utilizing multiple data sources is combined with matching, for linkage and de-duplication (Tier 3), the surveillance data system is able to calculate more accurate counts and rates of morbidity and mortality. Published surveillance reports can include Venn diagrams to depict case-finding overlap.¹⁷ An impediment to accurate matching is the lack of complete personal identifiers in PCC data, as noted above, although matching can be done using other fields.¹⁷ When case ascertainment utilizing multiple data sources and matching is combined with case investigation (Tier 4), the drawback of incomplete personal identifiers in PCC data is minimized. More importantly, case investigation data can provide critical detail needed for case classification, as well as details on exposure routes and contributing factors needed for policy development and prevention program planning, such as for immediate intervention for prevention in the disaster setting.

VI. Criteria for case identification:

A. Narrative: A description of suggested criteria for case ascertainment of carbon monoxide poisoning

Reporting refers to the process of healthcare providers or institutions (e.g. clinicians, clinical laboratories, hospitals, Poison Control Centers) submitting basic information to governmental public health agencies about cases of carbon monoxide poisoning that meet certain reporting requirements or criteria. Cases of carbon monoxide poisoning may also be ascertained by the secondary analysis of administrative data.

Clinical Presentation Criteria:

- A person with signs or symptoms consistent with a diagnosis of carbon monoxide poisoning. There is no unique list of CO poisoning symptoms: the condition presents with a non-specific profile.¹⁵ Typical symptoms include, but are not limited to, headache, dizziness, fatigue/weakness, nausea/vomiting, confusion, shortness of breath, chest pain, and loss of consciousness.
- A person whose poison control center report indicates an exposure to carbon monoxide (Call type = exposure, Substance = carbon monoxide) with minor, moderate, or major health effects (Medical outcome = minor, moderate, major, death)

Laboratory Criteria:

- A person with a carboxyhemoglobin (COHb) level of $\geq 5.0\%$ as measured by a blood sample or pulse CO-oximetry

Criteria for case-finding in administrative data:

- A person whose death certificate has any mention of 'Toxic effect of carbon monoxide' (ICD-10 T58) or carbon monoxide exposure as a cause of illness (ICD-10 X47 or X67 or Y17)
- A person whose healthcare record contains: a diagnosis of toxic effect of carbon monoxide (ICD-9-CM code 986, ICD-10-CM code T58.x); or exposure to carbon monoxide as a result of motor vehicle exhaust gas (E868.2), incomplete combustion of other domestic fuels (E868.3), other source (E868.8), unspecified carbon monoxide (E868.9), poisoning by carbon monoxide that is undetermined whether accidentally or purposefully inflicted (motor-vehicle exhaust, 982.0; other CO, E982.1), suicide and self-inflicted poisoning as a result of motor vehicle gas (E952.0), or other carbon monoxide (E952.1)
- A person whose poison control center report indicates an exposure to carbon monoxide (Call type code = exposure, Substance code = carbon monoxide) with minor, moderate, or major health effects (Medical outcome code = minor, moderate, major, death)

B. Table of criteria for case ascertainment of carbon monoxide poisoning

Table VI-B. Table of criteria to determine whether a case should be reported to public health authorities; includes criteria for case-finding from administrative data.

Criterion	Reports	Poison Center Records**	Death Certificates*	Hospital Discharge or Outpatient Records*
<i>Clinical Evidence</i>				
Signs or symptoms consistent with CO poisoning, which include, but are not limited to, headache, dizziness, fatigue/weakness, nausea/vomiting, confusion, shortness of breath, chest pain, and loss of consciousness	S	S		
Toxic effect of CO listed as contributing cause of death (ICD-10 code T58), or ICD-10 code for an etiologic mechanism which includes CO exposure (X47, X67, Y17) is listed anywhere in the record			S	
Healthcare record containing: a coded diagnosis of toxic effect of carbon monoxide (ICD-9-CM 986, ICD-10-CM code T58.x), or ICD-9-CM cause of injury code E868.2, E868.3, E868.8, E868.9, E982.0, E982.1, E952.0, E952.1.				S
Report of poisoning due to CO exposure with minor, moderate or major health effects.		S		
<i>Laboratory Evidence</i>				
Carboxyhemoglobin (COHb) >= 5% as measured by a blood sample	S			
Carboxyhemoglobin (COHb) >= 5% as measured by Pulse CO-oximeter	S			

* As administrative or secondary data source

** Criterion is used either to direct reporting, or as administrative or secondary data source

Each alternative disease or condition subtype is listed in a separate column. Each criterion (symptom, sign, lab result, immunization status, occupation, travel history, etc.) is listed in a separate row. Meeting the criteria listed under any single column of this table is sufficient to identify a case for reporting.

S = This criterion alone is Sufficient to report a case.

N = All "N" criteria in the same column are Necessary to report a case.

O = At least one of these "O" (Optional) criteria in each category (e.g., clinical evidence and laboratory evidence) in the same column—in conjunction with all "N" criteria in the same column—is required to report a case.

C. Disease-specific data elements

The American Association of Poison Control Centers (AAPCC) National Poison Data System (NPDS) contains adequate data elements for surveillance of carbon monoxide poisoning. Although CDC staff cannot access information in the call notes at this time, that information is available to staff in state and local health agencies. AAPCC is currently in process of redeveloping the NPDS application, which will allow for addition of new fields. New fields are adopted after review and approval from the AAPCC Board. Suggestions include fields for route of exposure ("CO source"), CO alarm presence and alerting, and carboxyhemoglobin value when available.

VII. Case Definition for Case Classification

A. Narrative: Description of criteria to determine how a case should be classified.

Confirmed:

Reporting Systems: Clinicians, Medical Examiners/Coroners, Laboratories, Hyperbaric Chambers, Poison Centers:

- (C1) A carboxyhemoglobin level, as measured by a blood sample, of > 5% in non-smokers¹³
- OR-
- (C2) A carboxyhemoglobin level, as measured by a blood sample of > 10% in smokers or for whom smoking status is unknown.¹³
- OR-
- (C3) In the absence of laboratory confirmation of an elevated COHb level, signs or symptoms consistent with acute carbon monoxide poisoning AND a positive environmental exposure* consistent with CO poisoning.¹⁸
- OR-
- (C4) A PCC report (status = closed) with “exposure” recorded as the type of call, when the exposure substance was carbon monoxide, AND a minor, moderate or major medical effect or death was reported AND a positive environmental exposure* consistent with CO poisoning was indicated in the case notes.¹⁸

Administrative Data (in the absence of case investigation):

- (C5) ICD-9-CM Coded Data: (1) A medical care record for CO poisoning in which the Nature of Injury code N-986 "Toxic effect of CO" is listed anywhere in the record, OR; (2) a medical care record in which an External Cause of Injury code (E-code), indicating exposure to carbon monoxide (exclusively) is listed anywhere in the record, i.e., E868.3, E868.8, E868.9, E952.1, or E982.1. [Note: ICD codes are listed in Appendix 1]
- OR-
- (C6) ICD-10 Coded Data: A mortality record in which T58, Toxic Effect of Carbon Monoxide, is listed anywhere in the record
- OR-
- (C7) ICD-10-CM coded data: A medical care record for CO poisoning in which T58, Toxic Effect of Carbon Monoxide, is listed anywhere in the record

Probable Case:

Reporting Systems: Clinicians, Medical Examiners/Coroners, Laboratories, Hyperbaric Chambers, Poison Centers:

- (P1) A carboxyhemoglobin level, as measured by a blood sample, that is 9% ≤ COHb ≤ 10% in smokers or for those whom smoking status is unknown.
- OR-
- (P2) A carboxyhemoglobin level, as measured by a pulse co-oximeter of > 10%.
- OR-
- (P3) Loss of consciousness or death without alternative explanation AND exposure to a source of CO.

-OR-

- (P4) In the absence of environmental monitoring,** a report of a patient with signs or symptoms consistent with acute CO poisoning AND concurrent environmental exposure* as that of a confirmed CO poisoning case.

-OR-

- (P5) A PCC report (status= closed) with “exposure” recorded as the type of call, when the exposure substance was carbon monoxide, AND a moderate or major medical outcome or death was reported.

Administrative Data (in the absence of case investigation):

- (P6) ICD-9-CM Coded Data: A medical care record in which an E-code indicating acute carbon monoxide poisoning inferred from motor vehicle exhaust gas exposure is listed anywhere in the record, i.e., E868.2, E952.0, or E982.0. [Note: ICD codes are listed in Appendix 1]

-OR-

- (P7) Poison Control Center (PCC) Data: A record of a case (status= closed) with “exposure” recorded as the type of call, when the exposure substance was carbon monoxide, AND a moderate or major medical outcome or death was reported.

-OR-

- (P8) Workers’ Compensation (WC) Data: A record of a workers compensation paid claim where CO poisoning is listed.

Suspected Case:

Reporting Systems: Clinicians, Medical Examiners/Coroners, Laboratories, Hyperbaric Chambers, Poison Centers:

- (S1) A carboxyhemoglobin (COHb) level, as measured by a pulse co-oximeter, of equal to or greater than 9% and less than or equal to 10%.

-OR-

- (S2) In the absence of laboratory confirmation of an elevated COHb, a report of a patient with non-specific symptoms (headache, dizziness, and/or fatigue/weakness) AND environmental monitoring** consistent with an exposure to CO.

-OR-

- (S3) A report of a patient with an environmental exposure* consistent with CO poisoning.¹⁸

-OR-

- (S4) In the absence of laboratory confirmation of an elevated COHb, a report of a patient with non-specific symptoms (headache, dizziness, and/or fatigue/weakness) AND exposure to a source of CO.

Administrative Data (in the absence of case investigation):

- (S5) ICD-9-CM Coded Data: In the absence of an N-986 code: (1) a medical care record in which an E-code that mentions CO exposure as a cause of illness is listed anywhere in the record (E818.0-.9, E825.0-.9, E844.0-.9, E867, E868.0, E868.1, E890.2, E891.2), or (2) a medical care record in which an E-Code where carbon monoxide exposure is plausible is listed (N987, E838.0-.9, E869.9, E951.0, E951.1, E951.8, E952.9, E958.1,

E962.2, E962.9, E968.0, E972, E978, E979.3, E981.0, E981.1, E981.8, E988.1). [Note: ICD codes are listed in Appendix 1]

- OR -

- (S6) ICD-10 Coded Data: In the absence of T58 code, a mortality record in which a code that mentions CO exposure as a cause of illness, is listed anywhere in the record (X47, X67, Y17).

-OR-

- (S7) Poison Control Center (PCC) Data: A record of a case with “exposure” recorded as the type of call, when the exposure substance was carbon monoxide, AND a minor medical outcome was reported.

-OR-

- (S8) Worker’s Compensation (WC) Data: A record of a workers compensation submitted claim where CO poisoning is listed.

Terminology:

* Environmental exposure: Environmental exposure consistent with CO poisoning is defined as having a quantified indoor air concentration measurement of CO, and a known duration of exposure which is consistent with CO poisoning. For example, an exposure to 100 ppm of CO for approximately 100 minutes, to achieve a COHb level of at least 5.0%.¹⁸

** Environmental monitoring: Environmental monitoring evidence is defined as documentation of a CO detector that alarmed, or documentation of an unquantified elevated level of CO (e.g., fire department notation).

Criteria to distinguish a new case of this disease or condition from reports or notifications which should not be enumerated as a new case for surveillance

A case should be categorized as a new (incident) case when there is either:

- New exposure to CO from different exposure source
- Repeated exposure as defined by having the same exposure source as previous occurrence where the criteria used to designate a case has been resolved prior to repeat exposure

A case is categorized as a prevalent case when there are multiple reports for the same episode, such as when there are multiple COHb lab test results or when a patient receives multiple hyperbaric treatments following a single poisoning event.



B. Classification Tables

Table VII-B. Criteria for defining a case of CO Poisoning.

Criterion	Confirmed							Probable								Suspect							
	C1	C2	C3	C4	C5	C6	C7	P1	P2	P3	P4	P5	P6	P7	P8	S1	S2	S3	S4	S5	S6	S7	S8
<i>Clinical Evidence</i>																							
Headache			O								O						O		O				
Dizziness			O								O						O		O				
Fatigue or weakness			O								O						O		O				
Nausea/vomiting			O								O												
Confusion			O								O												
Shortness of breath			O								O												
Chest pain			O								O												
Loss of consciousness or death without alternative explanation			O							N	O												
Death certificate lists toxic effect of carbon monoxide as contributing to death (ICD-10 T58)						N															A		
Death certificate lists CO exposure as contributing cause (ICD-10 X47, X67, Y17)																					N		
PCC record (status=closed) designated as CO exposure				N								N		N								N	

VIII. Period of Surveillance:

On-going.

IX. Data sharing/release and print criteria:

Notification of cases to CDC is recommended via the American Association of Poison Control Center's (AAPCC) National Poison Data System (NPDS).

There are no plans for the re-release of case data as the data are owned by AAPCC. Requests for case data should be directed to AAPCC.

CDC plans to conduct standard periodic analysis of NPDS data and may conduct ad-hoc analyses as a part of disaster response activities. Aggregate case data will be incorporated into presentations, the CDC website, or publications such as MMWR. CDC may share results of ad-hoc analyses conducted after disasters if requested by the impacted states.

X. References

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XI. Coordination

Agencies for Response:

- (1) CDC
Tom Frieden
Director
1600 Clifton Rd
Atlanta, GA 30333
(404) 639-7000
txf2@cdc.gov

Agencies for Information: (Complete contact information must be provided for acceptance to review.)

- (1) American Association of Poison Control Centers
Debbie Carr
Executive Director
515 King St., Suite 510
Alexandria, VA 22314
(703) 894-1858
info@aapcc.org



XII. Submitting Author:

- (1) Steven C. Macdonald
Surveillance Epidemiologist
Washington State Department of Health, Division of Environmental Public Health
PO Box 47846
Olympia WA 98504-7846
(360) 236-3183
steven.macdonald@doh.wa.gov

Co-Author: (Complete contact information must be provided for acceptance to review.)

- (1) Active Member Associate Member

Kathy Decker
Epidemiologist
Maine CDC Environmental & Occupational Health Program
University of Southern Maine, Applied Medical Sciences
286 Water Street, 3rd Floor
State House Station 11
Augusta, ME 04333
(207) 287-3218
Kathy.L.Decker@maine.gov

- (2) Active Member Associate Member

Leslie Walleigh
Public Health Physician and Program Manager
Maine Center for Disease Control and Prevention
286 Water Street, 3rd Floor
State House Station 11
Augusta, ME 04333
(207) 287-3222
Leslie.Walleigh@maine.gov

**Additional Authors listed in Appendix 2.*

Appendix 1: ICD codes

ICD-9-CM Diagnosis Code and Injury Cause E-Codes Explicitly Involving or Inclusive of Carbon Monoxide (CO) Poisoning		Type	Classification
N986	Toxic effect of carbon monoxide	Explicit	Confirmed
E868.3	Accidental poisoning by carbon monoxide from incomplete combustion of other domestic fuels	Explicit	Confirmed
E868.8	Accidental poisoning by carbon monoxide from other sources	Explicit	Confirmed
E868.9	Accidental poisoning by carbon monoxide from an unspecified source	Explicit	Confirmed
E952.1	Self-inflicted poisoning by other carbon monoxide source	Explicit	Confirmed
E982.1	Undetermined cause of poisoning by other carbon monoxide source	Explicit	Confirmed
E868.2	Accidental poisoning by motor vehicle exhaust gas not elsewhere classifiable	Explicit	Probable
E952.0	Self-inflicted poisoning by motor vehicle exhaust gas	Explicit	Probable
E982.0	Undetermined cause of poisoning by motor vehicle exhaust gas	Explicit	Probable
E818.x	Other noncollision motor vehicle traffic accident, including accidental poisoning from exhaust gas	Inclusive	Suspected
E825.x	Other motor vehicle nontraffic accident of other and unspecified nature, including accidental poisoning from CO	Inclusive	Suspected
E844.x	Other specified air transport accidents, including poisoning by CO while in transit	Inclusive	Suspected
E867	Accidental poisoning by gas distributed by pipeline, or CO from combustion of such gas	Inclusive	Suspected
E868.0	Accidental poisoning by liquefied petroleum gas in mobile containers, or CO from combustion of such gas	Inclusive	Suspected
E868.1	Accidental poisoning by other/unspecified utility gas, or CO from combustion of such gas	Inclusive	Suspected
E890.2	Other smoke and fumes from conflagration in a private dwelling, including CO	Inclusive	Suspected
E891.2	Other smoke and fumes from conflagration in other building, including CO	Inclusive	Suspected



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E838.x	Other and unspecified water transport accident, including accidental poisoning by bases or fumes on ship	Inclusive, unmentioned	Suspected
E951.0	Self-inflicted poisoning by gases in domestic use, pipeline	Inclusive, unmentioned	Suspected
E951.1	Self-inflicted poisoning by gases in domestic use, LPG (mobile)	Inclusive, unmentioned	Suspected
E951.8	Self-inflicted poisoning by gases in domestic use, other utility gas	Inclusive, unmentioned	Suspected
E958.1	Self-inflicted injury by burns, fire	Inclusive, unmentioned	Suspected
E962.2	Homicidal assault by poisoning from other gases and vapors	Inclusive, unmentioned	Suspected
E962.9	Homicidal assault by poisoning, unspecified	Inclusive, unmentioned	Suspected
E968.0	Homicidal assault by fire	Inclusive, unmentioned	Suspected
E981.0	Poisoning by gases in domestic use, undetermined intent, pipeline	Inclusive, unmentioned	Suspected
E981.1	Poisoning by gases in domestic use, undetermined intent, LPG (mobile)	Inclusive, unmentioned	Suspected
E981.8	Poisoning by gases in domestic use, undetermined intent, other utility gas	Inclusive, unmentioned	Suspected
E988.1	Undetermined cause of injury by fire, burns	Inclusive, unmentioned	Suspected
N987	Toxic effect of other gases, fumes or vapors	Inclusive, unmentioned	Suspected
E869.9	Accidental poisoning by other gases or vapors, unspecified	Inclusive, unmentioned	Suspected
E952.9	Self-inflicted poisoning by other gases or vapors, unspecified	Inclusive, unmentioned	Suspected
E979.3	Terrorism involving fires, including asphyxia	Inclusive, unmentioned	Suspected
E972, E978	Legal intervention or execution including asphyxiation by gas	Inclusive, unmentioned	Suspected

Legend: The table above is a supplement to Table VII, and should not be used independently of Table VII.



ICD-10-CM Codes Explicitly Involving or Inclusive of Carbon Monoxide (CO) Poisoning		Type	Classification
T58.x	Toxic effect of carbon monoxide from all sources	Explicit	Confirmed

Legend: The table above is a supplement to Table VII, and should not be used independently of Table VII.

ICD-10 Cause of Death Codes Explicitly Involving or Inclusive of Carbon Monoxide (CO) Poisoning		Type	Classification
T58.x	Toxic effect of carbon monoxide from all sources	Explicit	Confirmed
X47.x	Accidental poisoning by other gases and vapors, including CO	Inclusive	Suspected
X67.x	Intentional self-poisoning by and exposure to other gases and vapors, including CO	Inclusive	Suspected
Y17.x	Poisoning by and exposure to other gases and vapors, of undetermined intent	Inclusive	Suspected

Legend: The table above is a supplement to Table VII, and should not be used independently of Table VII.

Appendix 2. Additional authors

Prakash Mulay
 Chemical Surveillance Coordinator
 Bureau of Epidemiology
 Florida Department of Health
 Tallahassee, FL 32399
 (850) 245-4444
Prakash_Mulay@doh.state.fl.us (CSTE Active Member)

Katherine Wheeler
 Epidemiologist
 Bureau of Environmental Surveillance and Policy
 NYC Department of Health & Mental Hygiene
 New York NY 10007
KWheeler@DutchessNY.gov (CSTE Active Member)