



A Reference Guide for Completing the Death Certificate for Drug Toxicity Deaths

Introduction

Death certificates provide critical information used by public health officials to detect trends in mortality overall and by cause. State and national mortality statistics based on death certificate data are often used to help determine which medical conditions receive research and prevention funding; set public health goals; and measure population health status at the local, state, and national levels. Because statistical data derived from death certificates are only as accurate as the information provided, it is important that all persons involved in death registration strive for completeness and accuracy in reporting the circumstances and causes contributing to the death. Detailed and specific information on cause and manner of death allows for greater accuracy in determining the underlying and contributory causes of death.

Instructions for medical examiners, coroners, and other medical certifiers on how to complete the death certificate can play an important role in improving the quality of mortality data. Several documents provide general information on how to complete a death certificate (1,2). This Reference Guide focuses on completing the death certificate for a particular category of deaths—deaths due to acute toxicity involving drugs. Acute drug toxicity deaths are sometimes referred to as overdose or poisoning deaths (3). Although there are other types of deaths that may involve drugs, such as deaths from disease caused by chronic drug use, deaths from existing disease or other condition(s) exacerbated by drug use, deaths from anaphylaxis or adverse effects of drugs, and traumatic deaths in which the decedent was intoxicated (see [Appendix I](#)). These are not the focus of this Reference Guide.

This guide includes:

- Detailed instructions for completing the death certificate for a drug toxicity death
- Scenarios describing different types of drug toxicity deaths and example death certificates ([Appendix II](#))
- Resources and websites with additional information ([Appendix III](#))

By following the instructions provided in this Reference Guide, certifiers will help ensure that their findings reported on death certificates are appropriately conveyed to others who use death certificate information for standardized statistical reporting and public health promotion.

Completing the Death Certificate for Drug Toxicity Deaths

Deaths in which drug toxicity is suspected to be involved should be referred to the local medical examiner or coroner because these deaths generally fall under their jurisdiction. In most cases, the medicolegal death investigation office will assume jurisdiction of the case, conduct a medicolegal death investigation, and determine the cause and manner of death.

The accuracy of the death certification is dependent on a thorough investigation of the death. Determining the cause and manner of death, and in particular, the degree of drug involvement in a death, can be difficult. This Reference Guide does not provide guidance on investigating and determining cause and manner of drug involved deaths, but such information can be found in other training materials and resource documents (3–7).

This section provides instructions for completing the death certificate for drug toxicity deaths. For general instructions on death certification, consult references such as the *Medical Examiners' and Coroners' Handbook on Death Registration and Fetal Death Reporting* (1) and *Cause of Death and the Death Certificate: Important Information for Physicians, Coroners, Medical Examiners, and the Public* (2).

Timeliness of death registration

A death certificate should be completed and submitted to the state vital statistics registrar as soon as possible after a death occurs, and within the time limits specified by the jurisdiction. In the case of a drug toxicity death, the initial certification of the fact of death might occur before the toxicology results are available. In this instance, the death certificate should be completed with as much detail as possible and then amended as soon as additional information becomes available. See the section, “Certificates pending further investigation,” for more guidance on amending certificates.

The medical section of the U.S. Standard Certificate of Death

The medical certifier's primary responsibility in death registration is to complete the medical portion of the death certificate. The U.S. Standard Certificate of Death (Figure) and all state death certificates have several sections where cause of death and other information are reported, including Part I: the chain of events—diseases, injuries, or complications—that directly caused the death; Part II: other significant diseases, conditions, or injuries that contributed to the death but did not result in the underlying cause of death given in Part I; and “How Injury Occurred”: a description of how the injury occurred.

Proper completion of the medical section of the death certificate is vital for conveying accurate information about the underlying and contributing causes of death. A complete and accurate cause-of-death section for a drug toxicity death should list the drugs that caused or contributed to the death, if known. In addition, the words used to describe the causes of death, as well as where on the death certificate the information is reported (i.e., Part I, Part II, and How Injury Occurred), are very important. The words that are used and where they are written influence how others understand the information provided by the medical certifier on the cause and manner of death, and ultimately influence the selection of the underlying and contributing cause-of-death codes used for standardized statistical reporting (see Appendix IV).

When completing the death certificate, the medical certifier should identify the drugs that contributed to the death, if known. The information reported on the death certificate should reflect the certifier's best medical opinion about the substances that caused the death. The drugs mentioned should not necessarily be an exhaustive list of all the substances detected by toxicology testing. Toxicology testing may identify the presence of multiple drugs; however, only those drugs present in concentrations considered sufficient to have caused or contributed to the death, given the health of the decedent and the circumstances surrounding the death, should be listed on the death certificate.

Completing Part I

As with any death, the cause-of-death information should reflect the certifier's best medical opinion of the disease, injury, poisoning, or other condition that led to the death. These conditions should be reported as precisely as possible in Part I of the death certificate, with the most recent condition listed on line a., and the initiating condition on the lowest-used line (line b., c., or d.). For clarity, report only one condition per line and avoid using abbreviations or acronyms. In most cases, information that is more specific is preferable; however, do not include information in the cause-of-death statements that might identify the person(s) (decedent or others) involved (e.g., names, addresses).

Part I should contain all the information related to the causal chain leading to death. In general, the information in each section of the death certificate (i.e., Part I, Part II, and How Injury Occurred) is considered independently. Therefore, it is important to specify the drug(s) that were involved in the causal chain in Part I, rather than use a generic description (e.g., drug overdose) and name the drug (e.g., heroin) in another section. Because the information reported in Part I reflects the causal chain directly leading to death, the information reported in Part I is more influential in assigning the underlying cause-of-death code(s) for statistical reporting than information recorded in Part II or the section describing how the injury occurred (see Appendix IV).

When completing Part I for drug toxicity deaths:

- Include the name(s) of the specific drug(s) that have been determined to have caused the drug toxicity death, if the specific drug(s) are known.
- Report the drug on the same line (i.e., line a., b., c., or d.) as the term used to describe the cause of death (e.g., toxicity, poisoning).
- If there is not enough space on the line to list all the drugs involved, use the connector word “and” at the end of the line and continue to the next line.
- Avoid using vague phrases such as “drug overdose,” “multiple drug toxicity,” or “polypharmacy” without including the specific drug(s) involved. While these phrases identify the death as having some aspect of drug involvement, the detailed information on the specific drug(s) is still needed.
- If information is only available about the drug class (e.g., opiate) and not the specific drug (e.g., hydrocodone), list the drug class. An example of when this might occur is when the decedent survived for a time in the hospital prior to death from drug toxicity, and there was no *antemortem* sample available for testing and the hospital urine screen only identified a class of drug. However, if information on the specific drug is known (e.g., from the scene investigation), naming the specific drug is preferable.
- Use generic drug names rather than brand or trade names. A list of websites for determining the generic names for brand name drugs is provided in Appendix III.
- Name the parent drug rather than a metabolite (breakdown product) of the parent drug. For example, if, based on the investigation, the drug involved is determined to be heroin, it is preferable to list heroin rather than morphine and 6-acetylmorphine (8,9). The parent drug is of primary interest for public health surveillance and prevention.
- Note that as with other causes of death, the use of the term “probable” is acceptable in death certificate reporting (1,9). For example, if morphine and 6-acetylmorphine are identified

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as causing a drug toxicity death, it is acceptable to report “probable heroin toxicity” (1,9).

- Avoid using acronyms (e.g., write 6-acetylmorphine, not 6-AM or 6-MAM).
- Use appropriate terms to describe the causes of the death. Terms such as “toxicity,” “toxic effect,” “toxic reaction,” “poisoning,” and “overdose” describe an acute event in which the manner of death is likely to be accident, suicide, homicide, or the intent could not be determined. These terms should be used when describing a drug toxicity death.
- Consider carefully the meaning of terms such as “use,” “abuse,” “addiction,” “dependence,” “habit,” and “misuse” because they do not indicate an acute event, but rather suggest a chronic condition or behavior. These terms should not be used to indicate drug toxicity.
- Consider carefully the meaning of terms such as “ingested,” “took,” and “used” because they do not indicate a cause of death, but rather the action that led to the cause of death. The use of terms describing a behavior or action could result in the death being tabulated among natural causes of death rather than non-natural causes (i.e., deaths for which the manner of death is likely to be accident, suicide, homicide, or the intent could not be determined).

Completing Part II

All other important events or conditions that were present at the time of death and contributed to the death but were not part of the causal sequence reported in Part I should be recorded in Part II. These conditions might have predisposed the person to death, but were neither necessary nor sufficient to cause the death. For example, obstructive sleep apnea might contribute to death from an opioid overdose without being in the causal chain leading to death. Report only the conditions that contributed to the death. Do not report conditions that did not contribute to the death.

As in Part I, use appropriate terms to describe the contributing condition. This section can also be used to record a history or evidence of drug use, abuse, or misuse (e.g., intravenous drug abuse, prescription medication abuse, methadone treatment, detox admissions or treatment) if it contributed to the death.

Completing “How Injury Occurred” section

For injury and poisoning deaths, including drug toxicity deaths, a clear and concise statement explaining the circumstances surrounding the injury or external cause of death should be reported in the “Describe How Injury Occurred” box. The amount of detail provided in this box will depend on the circumstances and information known about the death. Depending on the circumstances and cause determinations, some of these items could be reported in Part I or Part II.

If known, these details on drug toxicity deaths can be useful for public health purposes:

- Route of administration of the drug; for example, oral ingestion, intravenous injection, snorted, huffed, smoked, transdermal, or transmucosal
- Source of the drug; for example, drug prescribed to decedent, illicit street use, or diverted from another person’s prescription
- Type of drug formulation; for example, immediate, long-acting, or extended release

Completing “Manner of Death” section

Death certificates include a check box for reporting manner of death. The check box generally includes options such as “Natural,” “Accident,” “Suicide,” “Homicide,” “Could not be determined,” and “Pending Investigation.” Because drug toxicity deaths are non-natural, the manner of death options for drug toxicity deaths in most jurisdictions are accident (i.e., unintentional), suicide, homicide, and could not be determined. In general, if a non-natural condition is reported in Part I or Part II, the manner of death will be a selection other than “Natural” (2).

The National Association of Medical Examiners guide on determining manner of death (7) makes the following distinctions between the various manners of death:

- Natural—The death is due to a disease, chronic condition, the aging process, or some combination thereof.
- Accident—This manner is used when there is little or no evidence that the injury or poisoning occurred with intent to harm or cause death (i.e., the fatal outcome was unintentional).
- Suicide—Death from injury or poisoning that occurs because of a self-inflicted act intended to harm or cause the death of oneself.
- Homicide—Death from an injury or poisoning that occurs due to a volitional act committed by another person to cause fear, harm, or death. Intent to cause death is a common element, but is not required for classification as homicide.
- Could not be determined—This category is intended solely for deaths in which, after thorough investigation, it is impossible to establish the manner of death with reasonable certainty. It is used when the information pointing to one manner of death is no more compelling than one or more other competing manners of death when all available information is considered (i.e., when the medical examiner or coroner cannot decide which manner—accident, suicide, or homicide—best describes the manner of death). This category should not be used for cases pending further investigation.

A National Association of Medical Examiners position paper (3) states, “The best classification for manner of death in deaths due

to the misuse or abuse of opioids without any apparent intent of self-harm is ‘accident.’”

Certificates pending further investigation

Death certificates should only be submitted with cause and manner “Pending Investigation” when the determination of cause or manner of death depends on further investigation, and when there is a reasonable expectation that the information gathered, such as results from an autopsy, toxicology analysis, other laboratory or diagnostic procedure, or further investigation, might significantly change the determination of the cause or manner of death. In many cases, suspected drug toxicity deaths will meet these criteria as toxicological analysis will not be completed within the time frame allotted for registration by the jurisdiction. If there is not a reasonable expectation that the determination of cause or manner of death will change based on additional findings, cause and manner should be reported on the basis of the facts available and the certification made according to the best judgment of the certifier.

Most, if not all, vital registration systems make provisions for certification of deaths in which the cause or manner cannot be determined immediately (i.e., pending investigation). Local laws and regulations vary, but in general, the certifier should complete the death certificate insofar as possible with the information available and submit the certificate to the vital registrar within the time limits specified by law or regulation.

Completing “Place of Injury” section

In general, this field is used to indicate the type of place where the injury occurred. Enter the general type of place (e.g., the decedent’s home, a restaurant, vacant lot, park or recreation area, construction site, office building, jail, institution), not a specific address or named location that might be identifiable.

The place where the injury occurred may be the same as or different from the place where the person was found unresponsive or dead. With drug toxicity deaths, the place where the decedent ingested, injected, or otherwise took the drug, if known, should be considered the place of injury. If this location is not known, but the place where the decedent was found unresponsive or dead is known, enter that location in the “Place of Injury” field. Indicate that this is the place the decedent was found unresponsive or dead, if space allows. In the absence of any information, report “unknown” for place of injury.

Conclusion

Death certificates play an important role in understanding mortality due to drug toxicity. Medical examiners, coroners, and other certifiers are responsible for the completeness, accuracy, and specificity of the information provided on death certificates, which affects the quality and utility of the statistics compiled from these data.

Accuracy of the information on the death certificate is dependent on a thorough investigation of the death, as well as the appropriate reporting of that information on the death certificate. Drug toxicity deaths may be complicated, and the relationship between the existing diseases or the sequence in which diseases or injuries occurred is not always clear. After completing a thorough medical and death scene investigation, the medical examiner or coroner is in the best position to determine the cause of death.

For this reason, cause-of-death certifiers are in a unique and important position to provide critical and actionable information that can be used at the local, state, and national levels to understand the causes of drug toxicity deaths; to identify the demographic groups and geographic regions at increased risk; and to plan, implement, and assess relevant prevention efforts.

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Appendix I. Drug Involved Deaths Other Than Drug Toxicity

This Reference Guide focuses on acute events (i.e., sudden deaths) involving drug toxicity. There are other causes of deaths involving drugs that are not due to acute toxicity. When certifying these deaths, it is important to include the role that a drug or medication played in causing or contributing to the sequence of events that resulted in the death. The guidance for including the specific drug(s) involved applies to these causes of death as well.

Causes of death involving drugs that are not due to acute toxicity include:

- Death from disease caused by chronic drug use; for example:
 - Hepatic cirrhosis resulting from hepatitis C infection due to intravenous drug abuse
 - Cardiomyopathy resulting from doxorubicin treatment for a carcinoma or sarcoma
- Death from existing disease or other condition exacerbated by drug use; for example:
 - Opioid drugs cause respiratory depression as one of their effects. The use of an opioid drug in the setting of emphysema or hypertensive heart disease can lead to death by further compromising the ability to breathe and causing extra work for the heart.
 - Cocaine and methamphetamine constrict blood vessels, so the presence of these drugs worsens the condition of a person who already has plaque narrowing the coronary arteries.
- Death from adverse effects of drugs; for example:
 - Anaphylaxis from penicillin or cephalosporin used to treat an infection
 - Aplastic anemia from phenytoin treatment for epilepsy control
- Traumatic deaths in which the decedent was intoxicated; for example:
 - Death due to injuries sustained in a motor vehicle collision in which the deceased driver had an intoxicating concentration of ethanol, methamphetamine, oxycodone, or other substance(s) that the certifier considered contributed to the driver's impairment, leading to the collision and death

Appendix II. Scenarios and Example Certificates for Deaths Involving Drug Toxicity

This section includes example death certificates for both common, as well as challenging, scenarios where drug toxicity caused or contributed to the death. These scenarios are in no way exhaustive of all possible events or possible drug combinations. The brief descriptions provided in the scenarios focus on the drug involvement in the death and do not describe all the findings that would be available from an investigation. Additionally, the descriptions are not meant to provide guidance on how to determine the cause and manner of death. Rather, the purpose of the scenarios and example certificates is to provide guidance on how to convey information about the cause and manner of death, once the certifier has determined that drug toxicity is involved.

For simplicity, the focus of the example death certificates is the boxes addressing Part I, Part II, how the injury occurred, and place of injury; however, the entire death certificate should be completed in real circumstances.

Scenario I: Single drug toxicity

A 37-year-old male with a history of methamphetamine use emerged from a bathroom looking pale, then collapsed and died. Female at scene reported she did not know whether the decedent had used any methamphetamine that day. Decedent had two syringes in a pocket of his pants, and one syringe contained some blood. No needle mark was visible on body. Toxicological analysis of peripheral blood detected methamphetamine, a stimulant that can result in dysrhythmia leading to sudden death, at a high concentration (1.4 mg/L).

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined that the cause of death was methamphetamine toxicity.

Comment: Methamphetamine toxicity was reported as the cause of death on line a. of Part I. The history of drug use, probable intravenous drug use, and drug paraphernalia (syringes) are described in the “How Injury Occurred” box.

Scenario I

<p>CAUSE OF DEATH (See instructions and examples)</p> <p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) →</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>			<p>Approximate interval: Onset to death</p>
<p>Methamphetamine toxicity</p> <p>a. _____ Due to (or as a consequence of): _____</p> <p>b. _____ Due to (or as a consequence of): _____</p> <p>c. _____ Due to (or as a consequence of): _____</p> <p>d. _____</p>			
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Apartment of acquaintance</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>			
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Reported history of methamphetamine use, probable intravenous injection, had syringes in pocket</p>		<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

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Scenario II: Report the parent drug not the metabolites

32-year-old male with history of heroin use was released from a treatment facility 3 days prior to death. He was found deceased at home in his bathroom. On counter were two small baggies containing white powder, a spoon that also contained white powder in the bowl, a lighter, and a syringe. Toxicological analysis of peripheral blood detected 6-acetylmorphine at a concentration of 0.034 mg/L, morphine at a concentration of 1.489 mg/L, and codeine at a concentration of 0.076 mg/L. 6-acetylmorphine, morphine, and codeine are all metabolites of heroin. The detection of these substances (with the blood concentration of morphine greater than the blood concentration of codeine and 6-acetylmorphine) and the scene findings are indicative of heroin toxicity (8,9).

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined that the cause of death was heroin toxicity.

Comment: Heroin toxicity was reported on line a. of Part I of the death certificate. Naming the parent drug is preferable to naming its metabolites (breakdown products) because the certifier is best able to determine the involvement of the parent drug. If only the metabolites of heroin (i.e., morphine and codeine) are included on the certificate (even in the presence of 6-acetylmorphine), a person reviewing the certificate might likely infer that this death involved pharmaceutical morphine and codeine instead of drug overdose involving heroin.

Some certifiers may be uncomfortable implying that heroin is the parent drug that produced the metabolites 6-acetylmorphine and morphine, and was the source of codeine detected in the toxicological analysis. However, the references cited provide explicit guidance and principles to follow to make this determination (8,9). As with any death, a thorough investigation and consultation with a forensic pathologist or toxicologist is advised.

Scenario II

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)</p> <p style="text-align: center;">Heroin toxicity</p> <p>a. _____ Due to (or as a consequence of):</p> <p>b. _____ Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____ Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>				
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
			<p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p style="text-align: center;">Decedent's home</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Probable intravenous drug injection, found in bathroom with baggies of white powder, spoon, lighter, and syringe</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

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Scenario III: Mixed drug toxicity in which not every substance that was found caused or contributed to the death

22-year-old male reportedly fell and hit head day before death but never lost consciousness. He was found dead in bed with one white pill on nightstand. Toxicological analysis of peripheral blood detected hydrocodone at a concentration of 0.15 mg/L, oxycodone at 0.06 mg/L, alprazolam at 0.02 mg/L, acetaminophen at 5 mg/L, and nicotine was present at a concentration of 14 mcg/L.

Acetaminophen is often paired with hydrocodone in pharmaceutical preparations. The determination was made that the acetaminophen did not cause or contribute to the acute

toxicity leading to death. Nicotine was also determined not to contribute to the acute toxicity.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined that the cause of death was hydrocodone, oxycodone, and alprazolam toxicity.

Comment: Hydrocodone, oxycodone, and alprazolam toxicity were reported as the causes of death on line a. of Part I. Although toxicological analysis detected multiple substances, only those determined to have caused or contributed to the death should be reported. Because acetaminophen and nicotine were determined not to contribute to the acute drug toxicity, neither was listed on the death certificate.

Scenario III

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) -----></p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>				
<p>a. Hydrocodone, oxycodone, and alprazolam toxicity</p> <p>Due to (or as a consequence of):</p>				
<p>b. _____</p> <p>Due to (or as a consequence of):</p>				
<p>c. _____</p> <p>Due to (or as a consequence of):</p>				
<p>d. _____</p> <p>Due to (or as a consequence of):</p>				
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
			<p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Decedent's home</p>		<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Probable oral ingestion of multiple pharmaceutical opioid and sedative pills</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

Vital Statistics Reporting Guidance

Scenario IV: Mixed opioid toxicity with many drugs contributing

56-year-old male with history of heroin use found dead on couch. Spoon, syringe cap, and plastic bag with white powder were in kitchen, but no syringe was found. A friend said decedent had gone to the kitchen, then came out confused. Decedent laid on couch and fell asleep before he began snoring loudly, then stopped breathing. Toxicological analysis of peripheral blood detected 6-acetylmorphine at a concentration of 0.004 mg/L, morphine at a concentration of 0.189 mg/L, codeine at a concentration of 0.023 mg/L, fentanyl at a concentration of 0.035 mg/L, and amitriptyline at a concentration of 0.18 mg/L.

The detection of 6-acetylmorphine, morphine, and codeine (with the blood concentration of morphine greater than the blood concentration of codeine) is indicative of heroin use and intoxication. The blood concentration of fentanyl was also elevated. The history of acting intoxicated and snoring loudly is consistent with an opioid overdose.

The amitriptyline concentration is within the therapeutic range. Amitriptyline toxicity leads to cardiac dysrhythmia and sudden death. Because the progression of this case (intoxication, decreasing consciousness, irregular breathing, and deep coma) was not consistent with sudden cardiac death, the pathologist concluded that amitriptyline did not play a role. The same case with a different history (e.g., sudden collapse) may lead to a different interpretation of the contribution of amitriptyline.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined that cause of death was toxic effects of heroin and fentanyl.

Comment: The toxic effects of heroin and fentanyl were reported as the cause of death on line a. of Part I. As described, a different interpretation of the contribution of amitriptyline is possible with a slightly different scenario. In these instances, the certifier may choose to include amitriptyline in the list of drugs, or otherwise indicate that another drug was involved, using a more lengthy statement such as, “Combined toxic effect of multiple drugs including heroin and fentanyl.”

Scenario IV

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p>				
<p>IMMEDIATE CAUSE (Final disease or condition resulting in death) -----></p>	<p>Toxic effects of heroin and fentanyl</p>			
<p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>	a.	Due to (or as a consequence of):		
	b.	Due to (or as a consequence of):		
	c.	Due to (or as a consequence of):		
	d.	Due to (or as a consequence of):		
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>				<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
				<p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Decedent's home</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Probable intravenous injection, spoon, syringe cap, and white powder in baggy near body</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

Vital Statistics Reporting Guidance

Scenario V. Overdose with too many substances to list on one line of the certificate

32-year-old male with history of drug use found dead in bed at a homeless shelter. Shelter clients said that the decedent was very sleepy the night before, but that they did not see him use any drugs. Autopsy showed a depressed scar over a vein in the left antecubital fossa. Toxicological analysis detected cocaine (trace), fentanyl (0.07 mg/L), acetyl fentanyl (0.004 mg/L), methoxy acetyl fentanyl (0.04 mg/L), alprazolam (0.11 mg/L), sertraline (0.014 mg/L), and caffeine (present, not quantified).

The circumstances and autopsy findings clearly indicate that this death was due to the toxic effect of some combination of drugs, but not every substance on the toxicology report necessarily played a role in causing the death. Cocaine has the potential to cause death at any concentration, so cocaine was included in the list of substances causing death (10). In addition, in this instance, it was reasoned that the decedent's somnolence was most consistent with the opioid fentanyl and its analogs, and so the fentanyl drugs were included. Alprazolam can interact with opioid drugs, so it was determined to be in the causal pathway leading to the death.

Sertraline is present at a therapeutic concentration and is not known to interact with opioid drugs (11), so sertraline was determined to play an insignificant role in causing this death. Restricting the decedent's access to caffeine probably would not have kept him from dying. Because sertraline and caffeine were determined to play an insignificant role, they were not included on the death certificate.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined that the cause of death was the combined toxic effects of multiple drugs including cocaine, fentanyl, acetyl fentanyl, methoxy acetyl fentanyl, and alprazolam.

Comment: The combined toxic effect of multiple drugs including cocaine, fentanyl, acetyl fentanyl, methoxy acetyl fentanyl, and alprazolam was reported in Part I. In this example, there were too many substances to report on a single line of the death certificate. When more than one line is needed, the certifier should continue the list of drugs on the next line with a connector (i.e., and) at the end of the previous line.

Scenario V

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition resulting in death) ----->	a. Combined toxic effects of multiple drugs including cocaine, and Due to (or as a consequence of):			
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. fentanyl, acetyl fentanyl, and Due to (or as a consequence of):			
	c. methoxy acetyl fentanyl, and alprazolam Due to (or as a consequence of):			
	d. _____			
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined		
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Homeless shelter		41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No
42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____				
43. DESCRIBE HOW INJURY OCCURRED: Probable intravenous injection			44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)	

Vital Statistics Reporting Guidance

Scenario VI: Stimulant in the presence of cardiomegaly

41-year-old female found dead on floor at noon after she went to bed at 5:00 a.m. Police say crack cocaine was in next room. Mother of decedent said that the decedent had hypertension, but did not abuse drugs. A pipe was found on the floor beside the decedent. Heart mass was 530 grams. Toxicological analysis of peripheral blood detected cocaine at a concentration of 0.14 mg/L.

Cocaine has a short half-life, so the decedent had used cocaine fairly recently, which is consistent with the crack pipe on the floor beside the decedent. One effect of cocaine is to increase blood pressure. On average, individuals who use cocaine have heavier hearts than individuals who do not use cocaine. Cocaine can also cause dysrhythmia, particularly in the setting of an abnormally large heart, as found in this case.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined the cause of death to be cocaine toxicity, with hypertensive heart disease included as a significant contributing factor.

Comment: Cocaine toxicity was reported on line a. of Part I of the death certificate. The hypertensive heart disease was a significant contributing condition and was reported in Part II. It is not an uncommon scenario for preexisting chronic conditions (e.g., hypertensive heart disease) to be exacerbated by drug toxicity. In such cases, subtle differences in the findings from the autopsy and investigation may result in different determinations of whether drug toxicity was the underlying cause, part of the causal chain, or a contributing condition. Once determined, the certifier should report in Part I the diseases, injuries, and complications and conditions that were part of the causal sequence leading to death, with the underlying cause on the lowest-used line of Part I, and report in Part II the diseases, injuries, and complications and conditions that were significant contributing conditions.

Scenario VI

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) -----></p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>				
<p>a. Cocaine toxicity Due to (or as a consequence of): _____</p> <p>b. _____ Due to (or as a consequence of): _____</p> <p>c. _____ Due to (or as a consequence of): _____</p> <p>d. _____</p>				
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p> <p>Hypertensive heart disease</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p style="text-align: center;">Home</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Probable smoking of crack cocaine</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

Vital Statistics Reporting Guidance

Scenario VII: Significant health condition with drug toxicity contributing to death

Decedent was a 57-year-old male smoker with a history of chronic obstructive pulmonary disease requiring supplemental oxygen, with back pain that began 5 years prior to death after a fall at work. The decedent took oxycodone to treat his back pain. His family reported that he was in his usual state of health when they left to go shopping. They found him dead on the couch when they returned an hour later. Autopsy showed grossly evident emphysema. Toxicological analysis of peripheral blood detected oxycodone at a concentration of 0.094 mg/L and hydrocodone at a concentration of 0.06 mg/L. The decedent was not prescribed hydrocodone.

The underlying cause of death was determined to be debilitating emphysema, which is reported in Part I. Opioid drugs depress the normal function of the central nervous system, including the drive to continue breathing. Although oxycodone and hydrocodone (opioids) are present at slightly elevated levels, this decedent had little respiratory reserve, so even slight impairment by opioids would contribute to death. In this instance, the oxycodone and hydrocodone were determined to have contributed significantly to the death. The decedent was a

smoker, which also contributed significantly to the development of emphysema.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined the underlying cause of death to be emphysema, with oxycodone and hydrocodone toxicity and smoking included as significant contributing factors.

Comment: Emphysema was reported on line a. of Part I. Oxycodone and hydrocodone toxicity as well as smoking were reported in Part II. By stating the natural disease in Part I, the certifier is indicating that it played the most important role in causing the death. The mention of the drug toxicity in Part II requires that the injury-related items be completed. Even though the underlying cause of death is a natural disease, the manner of death may be certified as accidental because of the contributing role of drug toxicity. In general, if a non-natural condition is reported in Part I or Part II, the manner of death should be a selection other than natural (2). For more discussion and example certificates when the disease and injury seem inseparable, see *Cause of Death and the Death Certificate: Important Information for Physicians, Coroners, Medical Examiners, and the Public* (2).

Scenario VII

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. Emphysema Due to (or as a consequence of): _____			
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. _____ Due to (or as a consequence of): _____			
	c. _____ Due to (or as a consequence of): _____			
	d. _____ Due to (or as a consequence of): _____			
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Oxycodone and hydrocodone toxicity, smoking			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Home		41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No
42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____				
43. DESCRIBE HOW INJURY OCCURRED: Decedent was prescribed oxycodone for back pain, had no prescription for hydrocodone			44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)	

Vital Statistics Reporting Guidance

Scenario VIII: Huffing

38-year-old female with history of huffing and excessive ethanol use was found dead on her den floor. An aerosol spray can was found on the floor between the body and a couch. Four more similar spray cans were found nearby in a plastic bag, and beer cans were found in trash can. Toxicological analysis of peripheral blood detected difluoroethane at a concentration of 24 mg/L and ethanol at a concentration of 0.08 g/dL.

Halogenated hydrocarbons such as difluoroethane can cause heart dysrhythmias that lead to death. The ethanol concentration is high enough to make a person legally intoxicated if driving a

motor vehicle, but this concentration is not high enough to cause death by alcohol poisoning so was not reported as a cause of death on the death certificate.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined the cause of death to be difluoroethane toxicity.

Comment: Difluoroethane toxicity was reported as the cause of death on line a. of Part I. Because alcohol was not determined to have contributed to the death, it was not listed on the death certificate.

Scenario VIII

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition resulting in death) ----->	a. Difluoroethane toxicity Due to (or as a consequence of): _____			_____ _____ _____ _____
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. _____ Due to (or as a consequence of): _____			
	c. _____ Due to (or as a consequence of): _____			
	d. _____ Due to (or as a consequence of): _____			
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Decedent's home		41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No
42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____				
43. DESCRIBE HOW INJURY OCCURRED: Inhalation of aerosol spray, found dead with spray can in hand and four more cans in trash bin nearby			44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)	

Vital Statistics Reporting Guidance

Scenario IX: Intentional medication overdose

38-year-old male complained of chest pain, and was taken to hospital by family. He developed liver failure and died. Autopsy showed yellow discoloration and necrosis of liver. Toxicological analysis of peripheral blood obtained on hospital admission detected acetaminophen at 75 mg/L. The family reports that he was depressed because he had lost his job, and his girlfriend left him in the same week. He had told his family that he could not take these blows, but they never thought that he would harm himself. Suicide note was found.

From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined the death to be due to liver failure resulting from liver necrosis caused by acetaminophen toxicity. The manner of death was determined to be suicide.

Comment: Liver failure was the immediate cause of death so it was reported on line a. of Part I. The liver failure was due to liver necrosis, so it was reported on line b. The underlying cause was acetaminophen toxicity, which was reported on the lowest-used line in Part I (in this case, line c.).

Scenario IX

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a.	Liver failure	Due to (or as a consequence of):	
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b.	Liver necrosis	Due to (or as a consequence of):	
	c.	Acetaminophen toxicity	Due to (or as a consequence of):	
	d.			
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input checked="" type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Unknown		41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No
42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____				
43. DESCRIBE HOW INJURY OCCURRED: Decedent took excess acetaminophen, details of ingestion unknown			44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)	

Vital Statistics Reporting Guidance

Scenario X: Delayed death with no admission blood available

31-year-old female admitted to hospital for suspected overdose. Admission screen was positive for cocaine metabolites and opioids. After brain death a week later, the family granted permission for organ harvest. After organ harvest, the hospital released body to crematory. The medical examiner or coroner office took jurisdiction of the case when contacted for permission to cremate. No admission blood remained at hospital.

From the findings, the medical certifier determined the underlying cause of death to be opioid and cocaine toxicity with an immediate cause of anoxic brain damage.

Comment: The anoxic brain damage was the immediate cause of death and was reported on line a. of Part I of the death certificate. As the underlying cause of death, opioid and cocaine toxicity was reported on the lowest-used line of Part I (line b. in this case). Although it is important to provide the most specific information possible, without blood from the time of admission to test and with no information from the death scene about the type of opioid involved, it was only possible to list the drug classes found by the hospital admission screen.

Providing the information about the lack of admission blood on the death certificate indicates that it was not possible to be more specific about the particular drugs involved.

Scenario X

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. Anoxic brain damage Due to (or as a consequence of):			
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. Opioid and cocaine toxicity Due to (or as a consequence of):			
	c. _____ Due to (or as a consequence of):			
	d. _____ Due to (or as a consequence of):			
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I				33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No
				34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Unknown		41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No
42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____				
43. DESCRIBE HOW INJURY OCCURRED: Admitted to hospital for suspected overdose, delayed death, no admission blood to test				44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)

Appendix III. Resources for Additional Information

1. National Center for Health Statistics. Medical examiners' and coroners' handbook on death registration and fetal death reporting. Available from: https://www.cdc.gov/nchs/data/misc/hb_me.pdf.
2. National Center for Health Statistics. Writing cause-of-death statements. Available from: https://www.cdc.gov/nchs/nvss/writing_cod_statements.htm.
3. Council of State and Territorial Epidemiologists. Recommendations and lessons learned for improved reporting of drug overdose deaths on death certificates. Available from: https://c.ymcdn.com/sites/www.cste.org/resource/resmgr/PDFs/PDFs2/4_25_2016_FINAL-Drug_Overdos.pdf.
4. National Center for Health Statistics. Instructions for classifying the multiple causes of death, ICD–10, 2017. Part 2b. Examples for poisoning deaths can be found in Appendix H. Available from: https://www.cdc.gov/nchs/nvss/instruction_manuals.htm.
5. Food and Drug Administration. Substance registration system—Unique ingredient identifier. Available from: <https://fdasis.nlm.nih.gov/srs/>.
6. Drug Enforcement Administration's Special Testing and Research Laboratory. Scientific Working Group for the Analysis of Seized Drugs monographs. Available from: <http://www.swgdrug.org/monographs.htm>.

Appendix IV. Processing and Coding Cause-of-death Information From Death Certificates

Electronic files for statistical reporting and analysis are generated through a multistep process involving the funeral director, medical certifier, the state vital statistics registrar's office, and the National Center for Health Statistics (NCHS).

Typically, the process begins with the creation of the record by the funeral director. The funeral director is primarily responsible for completing the demographic portion of the death certificate with the assistance of an informant, usually a family member or friend. The medical certifier is primarily responsible for the completion of the medical portion of the death certificate. The medical portion of the death certificate includes a description of the immediate, underlying, and contributing causes of death, as captured in the certifier's own words.

Certifiers submit the completed cause-of-death statements in the appropriate format to the vital statistics registrar's office. Through a cooperative agreement between the jurisdictions and NCHS, the vital statistics registrar's office then shares some of the death certificate information with NCHS. This information includes variables such as demographic characteristics of the decedent, the manner of death, and the literal text from the certifier on the cause(s) of death and how the injury occurred. NCHS uses software and trained nosologists to code the causes of death from the information provided on the death certificate. Causes of death are coded using the *International Classification of Diseases, 10th Revision* (ICD-10), a classification system maintained by the World Health Organization (WHO). As a member of WHO, the United States has agreed to use this international classification scheme to assist with the analysis and comparability of mortality data worldwide.

The assignment of ICD-10 codes is based on rules determined by WHO. These rules take into account the level of detail provided, the words that are used to describe the circumstances leading to death, and where the information is recorded on the death certificate (i.e., Part I, Part II, or How Injury Occurred). The use of standard processes to assign the ICD-10 codes minimizes subjectivity and limits jurisdiction-to-jurisdiction variation in assigning the ICD-10 codes. From this coding process, one underlying cause and multiple contributory causes of death are determined.

Deaths with an underlying cause-of-death code indicating toxicity by drugs, medicaments, or biological substances are considered drug toxicity deaths. The ICD-10 underlying-cause codes for drug toxicity deaths by intent include X40-X44 (Unintentional), X60-X64 (Suicide), X85 (Assault), and Y10-Y14 (Undetermined intent). The specific drug(s) involved in the death are identified using the ICD-10 multiple cause-of-death codes T36-T50.

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