Understanding Mortality Statistics: The Importance of Cause-of-Death Certification and Coding

Robert N. Anderson, PhD
Arialdi M. Miniño, MPH
Mortality Statistics Branch
Division of Vital Statistics

Centers for Disease Control and Prevention
National Center for Health Statistics
Cause of death certification

- Physicians
  - Deaths due to natural causes
- Medical examiners/coroners
  - Injury deaths
  - Deaths occurring under suspicious circumstances
  - Sudden, unattended deaths
Evaluating Cause of Death Statistics

Accuracy of diagnosis vs Accuracy of certification
Standard format for reporting cause of death

Part I. Diseases, injuries, or complications that caused the death

Immediate cause

a. ________________________________

Due to (or as a consequence of)

Approximate interval between onset and death

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. ________________________________

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

______________________________
Standard format for reporting cause of death

Part I. Diseases, injuries, or complications that caused the death

Approximate interval between onset and death

Immediate cause

a. ____________________________________________ ____________
   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. ____________________________________________ ____________

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Standard format for reporting cause of death

Part I. Diseases, injuries, or complications that caused the death

Approximate interval between onset and death

Immediate cause

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. ________________________________ ________

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Underlying Cause of Death

• The disease that initiated the train of morbid events leading directly to death
or...

• The circumstances of the accident or violence that produced the fatal injury
Standard format for reporting cause of death

Part I. Diseases, injuries, or complications that caused the death

Immediate cause

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) ________

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
General Instructions

• Events and conditions should be logically linked in terms of time, etiology and pathology

• Underlying cause should be on the last used line in Part I

• One cause on each line in Part I
General Approach

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Condition which directly preceded death**
   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. **Antecedent condition**
   Due to (or as a consequence of)

c. **Underlying cause**
   Due to (or as a consequence of)

d. ____________________________

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
A 60-year-old male with a long history of chronic alcoholism developed cirrhosis. Terminally, the patient had hepatic encephalopathy, which dominated the clinical picture, but there was also some gastrointestinal bleeding (varices) and pneumonia, which complicated clinical management and were also thought to have contributed to death.
Immediate cause of death – Part I, line (a)

• The disease or complication which directly preceded death
• There must always be an entry on line I(a)
• Avoid writing “cardiac arrest” or “cardiopulmonary arrest”
Example 1 – Immediate cause

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Hepatic encephalopathy**
   Due to (or as a consequence of)  
   Approximate interval between onset and death 15 days

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)  

b.

| d. ____________________________ |  
| ____________________________ |  
| ____________________________ |  
| ____________________________ |  

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Antecedent causes – Part I, lines (b), (c) and (d)

• Reported conditions should be in a logical sequence in terms of time, etiology and/or pathology

• Terminate the sequence with the underlying cause of death – leave unused lines blank
Example 1 – Antecedent causes

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Hepatic encephalopathy
   Due to (or as a consequence of)

b. Cirrhosis of liver
   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.

c. 
   Due to (or as a consequence of)

d. 

Approximate interval between onset and death

15 days

5 years

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Example 1 – Antecedent causes

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Hepatic encephalopathy
   Due to (or as a consequence of)
   15 days

b. Cirrhosis of liver
   Due to (or as a consequence of)
   5 years

c. Chronic alcoholism
   Due to (or as a consequence of)
   years

d. ________________________________
   ________________________________

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Other significant conditions – Part II

• Other important diseases or conditions that were present at the time of death and that may have contributed to death, but were not directly related to the underlying cause of death should be reported in Part II.
Example 1 – Other significant conditions

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Hepatic encephalopathy**
   Due to (or as a consequence of)
   [15 days]

b. **Cirrhosis of liver**
   Due to (or as a consequence of)
   [5 years]

c. **Chronic alcoholism**
   Due to (or as a consequence of)

d. [ ]

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

**Bleeding esophageal varices, pneumonia**
Example 2

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Acute renal failure
   Due to (or as a consequence of)  
   Approximate interval between onset and death: 5 days

b. Hyperosmolar nonketotic coma
   Due to (or as a consequence of)  
   Approximate interval between onset and death: 8 days

c. Diabetes mellitus, non-insulin dependent
   Due to (or as a consequence of)  
   Approximate interval between onset and death: 15 years

d. __________________________

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
A 80-year-old male with congestive heart failure is hospitalized with leg pain and edema and is subsequently diagnosed with deep venous thrombosis. Death occurred as the result of a pulmonary embolism. The patient had a history of poorly-controlled hypertension, prostate cancer and a previous myocardial infarction.
Example 3

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Pulmonary embolism**
   Due to (or as a consequence of)
   30 min

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. **Acute iliofemoral deep venous thrombosis**
   Due to (or as a consequence of)
   5 days

c. ?
   Due to (or as a consequence of)

d. 
   

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Example 3a

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Pulmonary embolism**
   Due to (or as a consequence of)
   
   **Approximate interval between onset and death:**
   30 min

b. **Acute iliofemoral deep venous thrombosis**
   Due to (or as a consequence of)
   
   5 days

c. **Congestive heart failure**
   Due to (or as a consequence of)
   
   4 yrs

d. **Hypertension**
   
   years

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

**Poorly differentiated adenocarcinoma of the prostate, old myocardial infarction**
Example 3b

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause
a. **Pulmonary embolism**
   Due to (or as a consequence of)
   30 min

b. **Acute iliofemoral deep venous thrombosis**
   Due to (or as a consequence of)
   5 days

c. **Congestive heart failure**
   Due to (or as a consequence of)
   4 years

d. **Old myocardial infarction**
   10 years

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Poorly differentiated adenocarcinoma of the prostate, hypertension
Example 3c

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Pulmonary embolism
   Due to (or as a consequence of)
   30 min

b. Acute iliofemoral deep venous thrombosis
   Due to (or as a consequence of)
   5 days

c. Poorly differentiated adenocarcinoma of the prostate
   Due to (or as a consequence of)
   years

d. __________________

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Congestive heart failure, old myocardial infarction, hypertension
Example 4

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Metabolic derangement
   Due to (or as a consequence of)
   Approximate interval between onset and death 2 days

b. Diabetic ketoacidosis (new onset diabetes)
   Due to (or as a consequence of)
   2 days

c. Probable pancreatitis
   Due to (or as a consequence of)
   2 wk

d. Possibly due to hypertriglyceridemia from low carbohydrate diet - speculative
   4 wk

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Hypertension
# General Approach for Injury

**Part I.** Diseases, injuries, or complications that caused the death.

<table>
<thead>
<tr>
<th>Immediate cause</th>
<th>a. <strong>Fatal derangement</strong> Due to (or as a consequence of)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b. <strong>Bodily trauma</strong> Due to (or as a consequence of)</td>
</tr>
<tr>
<td></td>
<td>c. <strong>Injury event</strong> Due to (or as a consequence of)</td>
</tr>
<tr>
<td></td>
<td>d. <strong>Injury event</strong> Due to (or as a consequence of)</td>
</tr>
</tbody>
</table>

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.

**Part II.** Enter other **significant conditions contributing to death** but not resulting in the underlying cause given in Part I.

Approximate interval between onset and death.
Describe how injury occurred

- Ran over by farm tractor
- Deceased was experiencing dizziness from new medication. Apparently fell, struck head, suffocated face down in carpet.
- Decedent was eating and a piece of meat became lodged in throat
- Victim was overcome by carbon monoxide poison, which was produced by a portable generator
- Assaulted with a baseball bat and knife resulting in fatal injuries to head
Example 5

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Left intrathoracic hemorrhage**
   
   Due to (or as a consequence of)
   
   20 min

b. **Transection of left subclavian vein**
   
   Due to (or as a consequence of)
   
   20 min

c. **Stab wound of left shoulder**
   
   Due to (or as a consequence of)
   
   20 min

d. ____________________________
   
   ____________________________

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Example 6

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Methicillin-resistant staph aureus sepsis
   Due to (or as a consequence of)
   Approximate interval between onset and death: 2 days

b. MRSA pneumonia
   Due to (or as a consequence of)
   5 days

c. Cutaneous burn wound infection
   Due to (or as a consequence of)
   10 days

d. 3rd degree thermal burns
   Due to (or as a consequence of)
   14 days

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Example 7

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause  a. **Asphyxia**

Due to (or as a consequence of)  
unknown

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. **Drowning**

Due to (or as a consequence of)  
unknown

c.  

Due to (or as a consequence of)  

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

**Alcohol intoxication at 0.31 grams percent**
Some Common Problems

- Mechanisms or modes of dying
  - Cardiac or respiratory arrest
  - Cardiopulmonary arrest
  - Asystole
- Reporting symptoms, ill-defined conditions or lab findings
- Lack of specificity
Some common problems (cont.)

• Multiple conditions on one line

• Incorrect causal sequences

• Reporting terminal conditions (e.g., heart failure, renal failure, septicemia, pneumonia, pulmonary embolism, prematurity, etc.) that have more than one possible cause as the underlying cause
Example (bad) 8

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. Cardiac/pulmonary arrest, advance dementia
   Due to (or as a consequence of) 

b. Diphtheria, aortic stenosis, CVA, CAD
   Due to (or as a consequence of) 

c. Pacemaker
   Due to (or as a consequence of) 

d. _______________________________ 
   _______________________________

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Approximate interval between onset and death
Example (bad) 9

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Cardiac arrhythmia -> standstill**
   
   Due to (or as a consequence of)
   
   Immediate

b. **Tacky-brady mostly brady, syndrome**
   
   Due to (or as a consequence of)
   
   Years

c. **Arteriosclerotic vascular disease with**
   
   Due to (or as a consequence of)
   
   Years

d. **Chronic atrial fibrillation**

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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

**Hypothyroidism**
Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Respiratory failure/ARDS**
   Due to (or as a consequence of)

b. **Septic shock**
   Due to (or as a consequence of)

c. __________
   Due to (or as a consequence of)

d. __________
   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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

**Immunodeficiency**
Example (bad) 11

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause  a. **Acute myocardial infarction**

   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. **Coronary arteriosclerosis**

   Due to (or as a consequence of)

   c. **Diabetes mellitus type II**

   Due to (or as a consequence of)

   d. **Hypertension, essential**

Approximate interval between onset and death

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

   **High cholesterol, Hypercholesterolemia**
Example (bad) 12

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause
   a. **End stage COPD**
       Due to (or as a consequence of)

   b. **Hx CAD**
       Due to (or as a consequence of)

   c. **Anemia**
       Due to (or as a consequence of)

   d. **Elevated BUN**

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

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.

Approximate interval between onset and death
**Example (bad) 13**

<table>
<thead>
<tr>
<th>Immediate cause</th>
<th></th>
<th>Approximate interval between onset and death</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cardiopulmonary arrest</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Due to (or as a consequence of)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Inanition</td>
<td>2 mos</td>
<td></td>
</tr>
<tr>
<td>Due to (or as a consequence of)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Multisystem failure</td>
<td>2 mos</td>
<td></td>
</tr>
<tr>
<td>Due to (or as a consequence of)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part I. Diseases, injuries, or complications that caused the death.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Congestive heart failure, renal failure
Example (bad) 14

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Cardiogenic shock**
   Due to (or as a consequence of)
   
   Approximate interval between onset and death
   12 hours

b. **COPD**
   Due to (or as a consequence of)

   Years

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.

c. **Mania**
   Due to (or as a consequence of)

   Years

d. **Lithium toxicity**
   Due to (or as a consequence of)

   5 days

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Example (bad) 15

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause  
a. Complications of left hip FX  
   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 significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Approximate interval between onset and death
Example (bad) 16

Part I. Diseases, injuries, or complications that caused the death.

Approximate interval between onset and death

Immediate cause

a. Polypharmacy
   Due to (or as a consequence of)

b. Cardiomegaly with left ventricular hypertrophy
   Due to (or as a consequence of)

c. Pul Ed
   Due to (or as a consequence of)

d. Remote FX of cervical vertebrae column
   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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
Example (bad?) 17

Part I. Diseases, injuries, or complications that caused the death.

Immediate cause

a. **Gunshot wound, self-inflicted to head**
   Due to (or as a consequence of)

b. **Terminal cancer of the lungs**
   Due to (or as a consequence of)

c. ________________________________
   Due to (or as a consequence of)

d. ________________________________
   Due to (or as a consequence of)

Sequently 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.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.
How extensive are the problems?

- Mechanisms or modes of dying and ill-defined conditions as the underlying cause - 2%
- Reporting terminal conditions that have more than one possible cause as the underlying cause - 11%
- Multiple conditions per line (Part I) – 10%
- Incorrect causal sequences - 25%
Medical Examiners' and Coroners' Handbook on Death Registration and Fetal Death Reporting

2003 Revision

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics
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- http://www.cdc.gov/nchs/about/major/dvs/hanbk.htm
- http://www.thename.org/
http://www.cdc.gov/nchs/deaths.htm

Robert N. Anderson
301-458-4073
RNNAnderson@cdc.gov