Mortality Medical Data System Processing Injury Data

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Thank you for inviting me to attend your meetings related to Injury Statistics. This presentation focuses on how injury information reported on a death certificate is assigned an ICD code through use of the software developed by NCHS.

During this time, I plan to:

1. Provide a description of a medical entity
2. Explain how the system assigns an entity reference number to this entity
3. Explain how ICD codes are assigned based upon entity reference numbers.

Please feel free to ask questions during my presentation. As a preview, I will review the acronyms used in our systems.

MICAR

MICAR is an acronym for Mortality Medical Indexing, Classification and Retrieval.

MICAR actually consists of 3 separate systems: 2 for data entry and 1 processing

PC-MICAR Data Entry:

Requires a trained data entry operator enters the causes of death reported on the death certificate in standardized medical terminology. In addition to entering the terms, PC-MICAR requires that the user indicate the position of the condition on the record. Training for MICAR data entry requires approximately 1 - 2 months.

SUPERMICAR Data Entry:

SuperMICAR is an enhanced version of PC-MICAR. The main purpose of this improved version of MICAR is to allow data entry operators to enter the cause of death information as it is literally reported. With essentially no translation or standardization of the input required, training is minimal. Such a literal entry system is essential to the development of an electronic death certificate system.

MICAR200:

This part of the system is the multiple cause rules application program. It automates our 2b instruction manual. MICAR validates each entry, assigns a tentative ICD code, applies any coding rules that relate one entry to another, and then produces the appropriate set of ICD codes for input to ACME.
ACME:

ACME is an acronym for Automated Classification of Medical Entities and has been in use for over 30 years. Its primary purpose is to assign the underlying cause of death when presented with a set of multiple cause codes as input.

TRANSAX:

TRANSAX, stands for TRANSlation of Axis. This program translates or converts the multiple cause of death data that were prepared as input to the ACME system into a form better suited for analysis.

This afternoon’s discussion focuses on how the input to the ACME system is generated. Tomorrow there will be another discussion concerning how the multiple cause data can be used in analyzing injury data.

A medical entity is a word or set of words that describe a cause of death. It may be a disease, a disease process, abnormality, disorder, symptom, complications, injury, poisoning, or a mode of dying (e.g., respiratory arrest). For the purposes of MICAR data entry, it is important to consider entities as being divided into three groups: Diseases, injuries or adverse reactions cause by some external force, and description of external force causing the injury. These are refereed to as diseases, injuries, and external cause.

All disease and injuries acceptable to MICAR are stored in a large data base referred to as the MICAR Dictionary or Big Book of Deaths (the file extension BBD - for those familiar with our software). The MICAR dictionary has approximately 100,000 unique entries.

- 78% are diseases (of these 59% are neoplasms)
- 6% are injuries
- 6% are surgeries

Standardized MICAR nomenclature requires that each entity be created in the following order:

1. Acute or Chronic (includes subacute)
2. Adjectives - entered in the order reported on the certificate
3. Site - body site
4. Lead term

Typically, both diseases and injuries are reported as either one word (e.g., emphysema, burns) or a multiple words (cardiac arrest, open wound) that are adjacent to each other. With a fairly short and easy to understand set of rules and some training in medical terminology and anatomy, each medical entity can be translated into MICAR nomenclature.

The "lead term" is not necessarily a single word. The MICAR instruction manual contain a complete list of alternate lead terms. This list is predominately used with injuries. Alternate
lead terms make data entry easier and faster. For example, the following are considered to be lead terms:

- blunt force injury
- bullet wound
- crushing injuries
- incised stab wound
- puncture wound

Each entity is assigned an Entity Reference Number in the MICAR dictionary. This number is a 6-digit number. There is no relationship between entity reference numbers and ICD codes. The number are totally independent.

In general, all entities have unique entity reference number. Terms may be entered using either the adjectival form or the noun form of the site. These are considered to be synonymous.

<table>
<thead>
<tr>
<th>Entity Reference Number</th>
<th>Entity Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABDOMEN TRAUMA</td>
<td>095709</td>
</tr>
<tr>
<td>ABDOMINAL TRAUMA</td>
<td>095709</td>
</tr>
</tbody>
</table>

However, the Latin and English form of a words are not synonymous.

<table>
<thead>
<tr>
<th>Entity Reference Number</th>
<th>Entity Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>RENAL CANCER</td>
<td>035234</td>
</tr>
<tr>
<td>KIDNEY CANCER</td>
<td>035142</td>
</tr>
</tbody>
</table>

With injuries, there are many more synonymous terms that are assigned the same ERN. The dictionary equates BLUNT TRAUMA, BLUNT FORCE and BLUNT IMPACT. For example, ERN 099135 is assigned to:

- BLUNT IMPACT HEAD INJURY
- BLUNT HEAD INJURY
- HEAD BLUNT INJURY
- HEAD BLUNT IMPACT
- BLUNT FORCE HEAD INJURY
- HEAD BLUNT FORCE INJURY
- HEAD IMPACT INJURY
- BLUNT FORCE IMPACT HEAD INJURY
- IMPACT HEAD INJURY

We have automated the creation of correct MICAR nomenclatures for diseases and injuries in SuperMICAR. All of the above terms are assigned the ERN 099135 by SuperMICAR with the "formal" definition of the entries: BLUNT FORCE TRAUMATIC HEAD INJURY.

Many adjectives (such as massive or extensive) reported with diseases or injuries are frequently considered to be insignificant by the classification. For example, if EXTENSIVE HEAD INJURY is entered into MICAR, the system will assign ERN 095133 for HEAD
INJURY. These adjectives do not appear in the MICAR dictionary; however, the PC-MICAR user is instructed to enter the words in correct MICAR order. The system is designed to drop a maximum of three words while trying to match a term in the dictionary.

Unfortunately, the same adjectives may affect the code assignments for a specific group of diseases or injuries. The system is aware of these limitations and will not drop certain words if the resulting term is assigned an ICD code indicating an injury. The following terms are not dropped when the resulting term is an injury:

   BOTH, BILATERAL, MULTIPLE, UPPER, LOWER, and terms indicating a late effect code: OLD, REMOTE, HEALED.

External Causes (e.g., accidents, falls, fires) are often reported in a set of words or phrases not adjacent to one another. With external causes, the rearrangement is more difficult than with disease or injuries. The information need to form a single entity is frequently scattered and even repeated in several locations of the medical certification. Moreover, information extraneous to classification is frequently reported and easily confounded with relevant information. Because of the difficulty of interpreting external causes, a system of programmed instructions have been designed to combine the relevant information together to form a medical entity. This set of instruction are referred to as "prompts".

I have chosen one of the easier external prompts to show as an illustration:

   Ia   Gunshot wound to the head

   How injury occurred: decedent shot himself while cleaning a hunting rifle

Accidents involving firearm, require 2 pieces of information:

   1. The type weapon and
   2. The circumstances

The correct external cause prompt for this entry is: I1502.

   I: Firearms
   15: Rifle
   02: while cleaning, handling or playing with gun

This prompt is considered to be an entity and is assigned ERN 900239.

Automating the coding of the external causes is our most important challenge. The ICD-10 version of SuperMICAR does not code any external causes. We were not satisfied with the current processing so we removed it completely. We expect to implement the external cause processor within the year. Once that is accomplished, SuperMICAR should be able to code at levels equivalent to PC-MICAR with the bonus that the operator can become proficient in a few days as opposed to a few weeks.
Tentative ICD Code:

Each entity in the dictionary including the external cause prompts are assigned an ICD code. The dictionary provides space for a maximum of 3 ICD codes per entity. The majority of disease and external cause entities only have one ICD code assigned. In rare circumstances, a disease may have 2 ICD codes. However, injuries always have a minimum of 2 ICD codes. The first code is the injury code (referred to as the N-code); the second code is an assumed external cause code (referred to as the E-code). (All three ICD positions are used with entities indicating a surgery and some injuries).

LUNG STAB WOUND  
Other injuries of lung  
Assault by a sharp object  
S273  X99

LUNG KNIFE STAB WOUND  
Contact with knife, sword, or dagger  
S273  W26

LEG FRACTURE  
Fracture of femur, part unspecified  
Exposure to unspecified factor  
S729  X59

In ICD-9, the default E-code for fracture was FALL,  
I1502  W33

At this stage of processing, all entities, diseases, injuries, and external causes, has been assigned an entity reference number with a "default" ICD code. Any record on which one or more terms could not be assigned an entity reference number is set aside for manual coding. Records which have an ERN assigned to all term are processed through the rules application program. The ICD code from the dictionary may or may not be the best code assignment for each record. Moreover, the record may have multiple injuries; therefore, multiple external cause codes.

MICAR200 is the rules application program. This program uses the entity reference numbers to assign the most appropriate ICD code. This program automates are 2b instruction manual.

This is what I call:  
Diseases that are Injuries  
Injuries that are diseases  
Sequella of injuries

CONDITIONS QUALIFIED AS TRAUMATIC

In ICD-10, some conditions have both a non-traumatic and traumatic code. Consider these conditions to be traumatic and code as traumatic when they are qualified as "traumatic" or they are reported as due to or with injury NOS, trauma NOS, any specified injury (injuries) or an external cause. Do not apply this instruction when the condition is reported due to a non-traumatic condition.
This rule is applied:

1. The word TRAUMATIC cannot be deleted if the resulting term is a disease. If a given term is not in the MICAR dictionary, the record will be rejected for manual review.

2. If an ERN indicating an injury is reported on a lower line, the ERN on the upper line will be converted to traumatic is the ICD provides a separate code.

Example of MICAR Decision Table

<table>
<thead>
<tr>
<th>TRA14</th>
<th>000099</th>
<th>J129</th>
<th>PNEUMONIA</th>
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<tbody>
<tr>
<td></td>
<td>097177</td>
<td>T798</td>
<td>X59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TRAUMATIC PNEUMONIA</td>
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</tbody>
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<tr>
<td>ia</td>
<td>Pneumonia</td>
<td>000099</td>
<td>J189</td>
</tr>
<tr>
<td>b</td>
<td>Hip Fracture</td>
<td>094920</td>
<td>S720 X59</td>
</tr>
</tbody>
</table>

Using the TRAUMATIC Tables, MICAR will convert the entry on line a to ERN 097177 - TRAUMATIC PNEUMONIA with ICD codes T798 X59

**INTENT OF CERTIFIER**

In order to arrive at the most appropriate code for a given diagnostic entity, it is sometimes necessary to take other recorded information and the order in which the entries are reported into account because the coding of information taken out of context may not convey the meaning intended by the certifier. However, do not apply provisions in ICD-10 for linking two or more diagnostic terms to form a composite diagnosis classifiable to a single ICD-10 code. The objective is to code each diagnostic entity in accordance with the intent of the certifier without combining separate codable entities.

If fracture (of any site) is reported due to specified disease, including M800 - M839, the fracture is considered to be pathological.

<table>
<thead>
<tr>
<th>IC112</th>
<th>094920</th>
<th>S720 X59</th>
<th>HIP FRACTURE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>090096</td>
<td>M844</td>
<td>PATHOLOGICAL HIP FRACTURE</td>
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</tbody>
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<tr>
<td>b</td>
<td>Hip Fracture</td>
<td>094920</td>
<td>S720 X59</td>
</tr>
<tr>
<td>c</td>
<td>Osteoporosis</td>
<td>090094</td>
<td>M819</td>
</tr>
</tbody>
</table>

Using the Intent of Certifier table, the entry in line b is converted ERN 090096 - PATHOLOGICAL HIP FRACTURE with ICD code M844. In addition, the traumatic table entry used above is not longer applicable since the hip fracture is no longer considered to be an injury.
RELATING AND MODIFYING

"Injury" due to disease conditions

Consider "injury," "hematoma," "laceration," (or other condition that is usually but not always traumatic in origin) of a specified organ to be qualified as nontraumatic when it is indicated to be due to or reported on the same line with a disease that could result in damage to the organ, provided there is no statement on the death certificate that indicates the condition was traumatic. If there is provision in the Classification for coding the condition that is considered to be qualified as nontraumatic as such, code accordingly. Otherwise, code to the category that has been provided for "Other" conditions of the organ (usually .8).

ID102 095915 S268 X59 HEART LACERATION
400119 I518 NONTRAUMATIC HEART LACERATION

Ia Laceration heart 095195 S268 X59
b Myocardial infarction 000092 I219

Using the Injury Due to Disease table, the entry in line a is converted ERN 400119 - NONTRAUMATIC HEART LACERATION with ICD code I518.

LATE EFFECTS:

When there is evidence that death resulted from residual effects rather than the active phase of conditions for which the classification provides a Sequela code, code the appropriate Sequela category. Code specified residual effects separately. Apply the following interpretations to the Sequela categories.

LEF01 095074 S065 X59 SUBDURAL HEMATOMA
214456 T905 Y86 LATE EFFECTS SUBDURAL HEMATOMA

Ia Subdural Hematoma 1 year 095074 S065 X59
b Fall 900127 W19

Using the Late Effects table, the entry in line a is converted ERN 214456 - LATE EFFECT SUBDURAL HEMATOMA with ICD codes T905 Y86. In addition the external cause, FALL, is marked to be converted to LATE EFFECT code since it caused a condition with a duration of 1 year.

FINAL ICD INPUT TO ACME

After the MICAR decision tables have been applied, the final step is to write the ICD codes as input to ACME. With diseases, this is an easy process. The ERN’s are converted to ICD codes
and move to the ACME input format which includes provisions for indicating the location of
the entity on the certification.

Ia  Pneumonia  000099  J189
b  Hip Fracture  094920  S720  X59
c  Osteoporosis  090094  M819

J189/M844/M819

However, each injury has been assigned an external cause code in addition to the injury code.
Therefore, it is necessary to determine which e-code should be used and where this e-code
should be placed.

Injuries and external cause entities are assigned a weight or importance factor:

E-code are generated through use of the prompts. These entities are the strongest
conditions. The inclusion of an E-code overrides all other external cause
codes.

N/E Code:  Certain one-term entities state or imply cause (external code) and effect
(nature of injury code).

E.G.: bite, cut, drowning, stab, sunstroke

These entities are the second strongest and will cause all other external
cause code to be eliminated.

N-Codes:  These are the weakest codes in terms of retaining the assumed external
cause code. As note above, any other class of external cause codes will
be retained before we keep an assumed e-code.

If there is more than 1 n-code, there is a rather complicated list of rules
to determine which assumed e-code will be retained.

Ia  Pneumonia  T798  X59
b  Hip Fracture  S720  X59
c  Cerebral Vascular Disease  I679

T798/S720*I679 &X59

I will close my presentation with some general comments related to injuries and the ICD-10
code structure

ICD-10  T00 - T07
Injuries involving multiple body regions
In general MICAR codes individual components of all reported injuries

If Open Wounds of head and neck

MICAR will code: Head Injury S099
                 Neck Injury S199

  T0101 Open wounds involving head with neck will not be used.

However, we have discussed applying the codes for multiple regions in the TRANSAX processing.

In addition, we do not consider the plural form of injury nor the plural form of the site to indicate multiple. When the injury is stated as multiple, bilateral, both, the entity will be coded as multiple.

  Fractured Hips S720 not T025

This was done for QC purposes - handwritten certificates, difficulty in reading.

Probably not a popular decision.

MICAR Dictionary - needs to be reviewed. The first step in generating the ICD-10 system was to convert the dictionary from ICD-9 code to ICD-10 codes. We were not consistent in our interpretation of the 4th digits 8 and 9. All injury codes will be reviewed before our 2000 system is released

  Injury
    - head S09.9
    -- specified NEC S09.8

This concludes my presentation. If you would like to see the automated systems, I have them installed on my laptop.

We are now open for questions and/or comments.
Mortality Medical Data System
Processing Injury Information

Donna Glenn
NCHS RTP

Description of Medical Entity
Assignment of Entity Reference Number
Assignment of ICD codes

MICAR
- Mortality Medical
- Indexing
- Classification
- And
- Retrieval

MICAR Components
- Data Entry Software
  - PC-MICAR Data Entry
  - SuperMICAR Data Entry
- MICAR200

ACME
- Automated
- Classification of
- Medical
- Entities

TRANSAX
- TRANSlation of
- AXis
Medical Entity

- Disease
- Injury
- External Cause

MICAR Dictionary or the Big Book of Death (BBD)

- @ 100,000 unique entities
- 78% Diseases
  - 59% Neoplasms
- 6% Injuries
- 6% Surgeries

Standardized MICAR Nomenclature

1. Acute\Chronic
2. Adjective(s)
3. Site
4. Lead Term

Alternate Lead Terms

- Blunt Force Injury
- Bullet wound
- Crushing injuries
- Incised stab wound
- Puncture wound

Entity Reference Number

- Synonymous
  - Abdomen Cancer 042659
  - Abdominal Cancer 042659

- Not Synonymous
  - Renal Cancer 035234
  - Kidney Cancer 035142

Synonymous Injury terms

- Blunt trauma
- Blunt Force
- Blunt Impact
ERN 099135

- BLUNT IMPACT HEAD INJURY
- BLUNT HEAD INJURY
- BLUNT HEAD IMPACT
- BLUNT FORCE HEAD INJURY
- BLUNT FORCE IMPACT HEAD INJURY
- IMPACT HEAD INJURY

Drop Words

- Massive
- Extensive
- Poorly Controlled
- Advanced Effects
- Approximately
- Terminal Stage
- Irreversible
- Controlled

Cannot be Dropped With Injury

- Both
- Bilateral
- Multiple
- Upper
- Lower
- Terms indicating Late effects
  - old, remote, healed, etc.

Death Certification

- Ia Gunshot wound to the head

- How Injury Occurred:
  - decedent shot himself while cleaning a hunting rifle

External Cause Prompts

- Firearms
  - Type of Weapon
    - 05 Pistol
    - 10 Shotgun
    - 15 Rifle
  - Circumstances
    - 01 Playing Russian Roulette
    - 02 While cleaning, handling, playing with gun

MICAR Dictionary

- 099189 Lung Stab Wound S273 X99
- 099188 Lung Knife Wound S273 W26
- 094971 Leg Fracture S729 X59
- 11502 (prompt) W33
MICAR200:

Rules Application Program

- Disease that are Injuries
- Injuries that are Diseases
- Sequella of Injuries (and External Causes)

Qualifying Conditions as Traumatic

- Reported as traumatic
- Reported DUE TO or with an injury or external cause

Medical Certification

<p>| | |</p>
<table>
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<tr>
<td>a</td>
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<td>Hip Fracture 094920 S720 X59</td>
</tr>
<tr>
<td>a</td>
<td>Traumatic Pneumonia 097177 T798 X59</td>
</tr>
<tr>
<td>b</td>
<td>Hip Fracture 094920 S720 X59</td>
</tr>
</tbody>
</table>

Intent of Certifier

- Using other information and the order in which entries are reported to convey the meaning intended by the certifier
- Fractures reported due to specified disease imply a pathological fracture

MICAR Decision Table

Table: TRA14

Input: 000099 J129 Pneumonia
Result: 097177 T798 X59 Traumatic Pneumonia
MICAR Decision Table

Table: IC112

Input: 094290 S720 X59
Hip Fracture
Result: 090096 M844
Pathological Hip Fracture

Medical Certification

Ia Pneumonia 000099 J189
b Hip Fracture 094920 S720 X59
c Osteoporosis 090094 M819

Ia Pneumonia 000009 J189
b Path. Hip Fracture 090096 M844
c Osteoporosis 090094 M819

Relating and Modifying

Injury Due to disease condition

Consider injury, hematoma, laceration - non traumatic if reported due to a disease that could result in damage to the organ

MICAR Decision Table

Table: ID102

Input: 095915 S268 X59
Subdural Hematoma
Result: 400119 I518
Nontraumatic Heart Laceration

Medical Certification

Ia Nontraumatic Heart Laceration 400119 I518
b Myocardial Infarction 000092 I219

Late Effects

Death resulted from residual effects rather than active phase
Classification provides a Sequela code
Code residual Effects separately
### MICAR Decision Table

**Table:** LEF01  
**Input:** 095074 S065 X59  
**Result:** 214456  
**Subdural Hematoma**

### Medical Certification

- **Ia** Subdural Hematoma 1 year  
  095074 S065 X59  
- **b** Fall 900127 W19  
- **Ia** Late Effect Subdural Hematoma 214456 T905 Y86  
- **b** Fall 900127 W19

Set flag to convert E-code to Late Effects

### Final ICD: Input to ACME

- **Ia** Pneumonia J189  
- **b** Hip Fracture M844  
- **c** Osteoporosis M819  
- **II** Cerebral Vascular Disease I679  

J189/M844/M819*I679

### Classification of Injuries

- **E-Code Prompt**
- **N/E Code Imply Cause (E-code) and Effect (N-code)**
- **N-Codes Assumed Cause**

### Final ICD: Input to ACME

- **Ia** Pneumonia T798 X59  
- **b** Hip Fracture S720 X59  
- **II** Cerebral Vascular Disease I679  

T798/S720*I679 &X59

### ICD-10: T00 - T07

**Injuries Involving Multiple Body Regions**

- **T01.0** Open wounds involving head with neck  
- **S09.9** Head Injury  
- **S11.9** Neck Injury