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.

ABDOMEN TRAUMA	095709
ABDOMINAL TRAUMA	095709

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

RENAL CANCER	035234
KIDNEY CANCER	035142

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	S273	X99
Other injuries of lung		
Assault by a sharp object		
LUNG KNIFE STAB WOUND	S273	W26
Contact with knife, sword, or dagger		
LEG FRACTURE	S729	X59
Fracture of femur, part unspecified		
Exposure to unspecified factor		
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 <u>due to</u> 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

TRA14	000099	J129		PNEUMONIA	
	097177	T798	X59	TRAUMATIC PNEUMONIA	
	Ia.	Pneumonia		000099	J189
	b	Hip Fracture		094920	S720 X59

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.

IC112	094920	S720 X59	HIP FRACTURE	
	090096	M844	PATHOLOGICAL HIP FRACTURE	
Ia	Pneumonia	000099	J189	
b	Hip Fracture	094920	S720	X59
c	Osteoporosis	090094	M819	

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 <u>residual effects</u> rather than the active phase of conditions for which the classification provides a Sequela code, code the appropriate Sequela category. Code specified residual <u>effects</u> 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 state as multiple, bilateral, both, the entity will be codes 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 out 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

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❧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
꙰I   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

꙰I1502   (prompt)   W33

MICAR200:

Rules Application Program

MICAR200

☞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

MICAR Decision Table

Table: TRA14

Input: 000099 J129
         Pneumonia
Result: 097177 T798 X59
         Traumatic Pneumonia

Medical Certification

| Ia | Pneumonia | 000099 | J189 |
| b | Hip Fracture | 094920 | S720 X59 |

| Ia | Traumatic Pneumonia | 097177 | T798 X59 |
| b | Hip Fracture | 094920 | S720 X59 |

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: 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 | Laceration Heart 095195 | S268 X59 |
| b | Myocardial Infarction 000092 | I219 |

| 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
          Subdural Hematoma
Result: 214456
          Late Effects 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

ICD-10:   T00 - T07
Injuries Involving Multiple Body
Regions

Multiple Hip Fractures   T025
Fracture Both Hips   T025

Fractured Hips   S720

MICAR Dictionary: Problems

ICD Index Entry

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

For 2000 system, review all codes for
injuries

Mortality Medical Data System
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The End