Implementing the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) Injury Diagnosis Matrix, Using NCHS SAS Formats

Background

Due to the number and complexity of ICD-10-CM injury codes, it would be challenging and inefficient to use SAS "IF-THEN" statements to assign diagnosis codes to cells in the injury diagnosis matrix. Instead, predefined SAS format libraries are provided to reflect the different pieces of information captured in the ICD-10-CM codes. One format file assigns a description of the injury, a second format file assigns the body region of the injury and a third format file assigns the nature-of-injury classification. After injury cases are identified by an analyst, these formats can be used to classify injuries within the injury diagnosis matrix. Excel spreadsheets are also provided to convey this information for reference purposes and use outside of SAS. The SAS formats are created by the National Center for Health Statistics (NCHS) based on the information contained within the spreadsheets. Both the Excel spreadsheets and the SAS formats contain the same information and may be used together.

The Excel spreadsheets and SAS formats will be updated yearly to reflect injury-related code changes introduced by the ICD-10-CM Coordination and Maintenance Committee. Generally, any changes made to the ICD-10-CM go into effect at the beginning of the federal fiscal year, or October 1st. Codes that have since been deleted by the Coordination and Maintenance Committee will be left in both the Excel spreadsheets and the SAS formats. This means that analysts may use the same formats and spreadsheets for multiple years of data – eliminating the need to match specific years of data with specific formats and spreadsheets. Importantly, multiple years of data should be analyzed with the same (most current) formats and spreadsheets for consistent code categorization, and to mitigate any changes made to the injury diagnosis matrix. The files available, and a summary of their contents, are outlined below.

File Name	File Description
011224 2023 revisions to 2016 Proposed ICD10CM Inj Dx Matrix.xlsx	Spreadsheets with the full list of injury diagnosis codes and associated descriptions, the nature of injury, and body region, as of October 1, 2023
Differences_10V10CMMatrix.csv	A list of ICD-10-CM codes that are in a different body-region-by-nature-of-injury cell than the ICD-10 parent code.
Tech_Notes_Table_I_Relocation_of_codes_12282020.csv	Changes in the location of ICD-10-CM injury diagnosis codes in the 2020 final ICD-10-CM injury diagnosis matrix, as of October 1, 2020
Tech_Notes_Table_II_Addition_of_codes_12282020.csv	Injury diagnosis codes added to the 2016 proposed ICD-10-CM injury diagnosis matrix to create the 2020 final ICD-10-CM injury diagnosis matrix, as of October 1, 2020
Descript_fmt32b.sas7bcat	SAS format (32-bit) file that provides injury code descriptions
Nature_Lvl_fmt32B.sas7bcat	SAS format (32-bit) file that provides nature-of-injury information
Body_Lvl_fmt32B.sas7bcat	SAS format (32-bit) file that provides injury code body-region information
Descript_fmt64b.sas7bcat	SAS format (64-bit) file that provides injury code descriptions
Nature_Lvl_fmt64B.sas7bcat	SAS format (64-bit) file that provides nature-of-injury information
Body_Lvl_fmt64B.sas7bcat	SAS format (64-bit) file that provides injury code body-region information

Use of the SAS Formats

The formats are intended for use with cleaned administrative medical data, and after cases have been selected as injuries for classification within the matrix. The formats are designed for the first six

characters of the ICD-10-CM code. Codes should be left justified, without decimals or spaces, and all letters should be upper case. The direct output of the nature-of-injury and body region variable formats, as well as the possible matrix classifications, are shown in Tables 1 and 2.

Once the data are prepared and the formats are applied, the nature of the injury and body region can be reported to cross tabulate cells of the matrix. The formats can be hard coded into the dataset, removing the need to reference them with each data import. Additionally, the formats include a numbering schema that allows for substringing to create numeric fields for the different nature-of-injury and body region levels. These formats can be cross tabulated to create the full injury diagnosis matrix.

Body Region Formats
There are three levels of body region that are summarized into the format $Bodyf contained in the Body_Lvl_fmt32B.sas7bcat/ Body_Lvl_fmt64B.sas7bcat SAS format file. These levels are represented numerically in the first 8 positions of the applied format and described in the subsequent format text. Each level is coded to a two-digit number that is separated by a decimal and unique to each value in that level. These can be substringed off the applied format to get a numeric coding scheme if needed. For cases where a more granular level of body region does not exist, the value '00' is reported. In the following format text, each level is separated by a semicolon (i.e. [level one; level two; level three]).

The first level is indicated in the first two digits of the format (positions one and two of the format), the second level is indicated in the second two digits (positions four and five), and the third level is the last two digits (positions seven and eight). An example format and the full numeric coding schema is outlined below.

Example: Applied Body Region Format (Format=$Bodyf.):
Querying a case with the injury code S70.00X (contusion of unspecified hip) would result in the following format assignment: 04.10.24.EXTREMITIES; LOWER EXTREMITY; HIP This output summarizes the three classification levels.

Level 1	Level 2	Level 3
04 = Extremities	10 = Lower Extremity	24 = Hip

Table 1. Numeric Coding Schema for Body Region

Level 1	Level 2	Level 3
01 = Head and neck	00 = Not applicable (blank)	00 = Not applicable (blank)
02 = Spine and back	01 = Traumatic brain injury	01 = Face
03 = Torso	02 = Other head, face and neck	02 = Eye
04 = Extremities	03 = Spinal cord (SCI)	03 = Other head
05 = Unclassifiable by body region	04 = Vertebral column (VCI)	04 = Neck
06 = Unspecified	05 = Chest (Thorax)	05 = Other head and neck
	06 = Abdomen	06 = Cervical SCI
	07 = Pelvis	07 = Thoracic SCI
	08 = Other trunk	08 = Lumbar SCI
	09 = Upper extremity	09 = Sacral or coccygeal SCI
	10 = Lower extremity	10 = Cervical VCI
	11 = Multiple body regions	11 = Thoracic VCI
	12 = Systemwide	12 = Lumbar VCI
		13 = Sacral or coccygeal VCI
		14 = External genitalia
		15 = Pelvic organs
		16 = Lower back and pelvis
		17 = Pelvic girdle
		18 = Buttock
		19 = Other
		20 = Shoulder and upper arm
		21 = Forearm and elbow
		22 = Wrist, hand, and fingers
		23 = Arm, not further specified
		24 = Hip
		25 = Upper leg and thigh
		26 = Knee
		27 = Lower leg and ankle
		28 = Foot and toes
		29 = Ankle and foot
		30 = Other, multiple, and unspecified

Nature-of-Injury Formats

There are two levels describing the nature of injury that are summarized into the format $Naturef contained in the Nature_Lvl_fmt32B.sas7bcat/ Nature_Lvl_fmt64B.sas7bcat SAS format file. These levels are represented numerically in the first five positions of the applied format and described in the subsequent format text. Each level is coded to a two-digit number that is separated by a decimal and unique to each value in that level. These can be substringed off the applied format to get a numeric coding scheme if needed. For cases where a more granular level does not exist to describe the nature-of-injury, the value '00' is used. In the following format text, each level is separated by a semicolon (i.e. [level one; level two]).

The first level is indicated in the first two digits of the format (positions one and two of the format) and the second level is indicated in the second two digits (positions four and five). An example format and the full numeric coding schema is outlined below.

Example: Applied Nature-of-injury Format (Format=$Naturef.):

Querying a case with the injury code T22.011 (burn of unspecified degree of right forearm) would result in the following format assignment:

09.01.BURNS AND CORROSIONS; BURNS

This output summarizes the two classification levels.

Level 1	Level 2
09 = Burns and Corrosions	01 = Burns

Table 2. Numeric Coding Schema For Nature-of-injury

Level 1	Level 2
01 = Fracture	00 = Not applicable (blank)
02 = Dislocation	01 = Burns
03 = Internal organ injury	02 = Corrosions
04 = Open wound	03 = Sprains and strains
05 = Amputation	04 = Injury to nerves
06 = Blood Vessel	05 = Injury to muscles and tendons
07 = Superficial injury or contusion	06 = Other injury
08 = Crushing	
09 = Burns and corrosions	
10 = Effect of foreign body entering orifice	
11 = Other effects of external causes	
12 = Poisoning	
13 = Toxic effects	
14 = Other specified injury	
15 = Unspecified injury	

Sample SAS Code
This sample code assumes that:
- the operating system is a 32-bit system (for a 64-bit system please use the provided formats that end in ('_FMT64B');
- a working dataset named 'ICD10_Injury_Clean' already exists;
- that a field with a valid injury code named 'Injury_Code' has been created and that this field contains an injury diagnosis code that is ready for classification within the matrix;
- that the selected injury diagnosis code in the 'Injury_Code' field meets the conditions described in the above document (left justified, with no spaces/decimals, all letters upper case, and with only the first six digits).

Step 1: Import Formats

```
** Create a library for the SAS format files, and place the files in that folder;
Libname Myfmtlib "Z:\ ICD10CM Formats (file path) ";

** Read in the SAS format files for injury description, nature-of-injury, and body region;
Options Fmtsearch=( Myfmtlib.Descript _fmt32B, Myfmtlib.Body_Lvl_fmt32B,
Myfmtlib.Nature_Lvl_fmt32B);  Run;
```

Step 2: Apply the formats

```
Data ICD10_Injury_Classified_Cases;
        Set ICD10_Injury_Clean;

            Nature=PUT((Injury_Code), $NatureF.);      ** Apply format for the nature-of-injury;
            Body_Reg=PUT((Injury_Code), $BodyF.);      ** Apply format for the body region;
            Descript=PUT((Injury_Code), $DESCF.);      ** Apply format for a description of the code;

Run;
```

Step 3 (*Optional*): Creating numeric variables for nature-of-injury and body region

```
Data ICD10_Injury_Classified_Cases1;
        Set ICD10_Injury_Classified_Cases;

            Nature_Level_1= Input(Substr(Nature,1,2),2.0);    **Nature of injury Level 1  (Numeric);
            Nature_Level_2= Input(Substr(Nature,4,2),2.0);    **Nature of injury Level 2  (Numeric);

            Body_Level_1= Input(Substr(Body_Reg,1,2),2.0);     **Body Region Level 1 (Numeric);
            Body_Level_2= Input(Substr(Body_Reg,4,2),2.0);     **Body Region Level 2 (Numeric);
            Body_Level_3= Input(Substr(Body_Reg,7,2),2.0);     **Body Region Level 3 (Numeric);

Run;
```

Table 3. Full Format by Body Region Level

Body Region Level 1	Body Region Level 2	Body Region Level 3	Format ($Bodyf.)
Head and neck	Traumatic brain injury	…	01.01.00. HEAD AND NECK; TRAUMATIC BRAIN INJURY
	Other head, face and neck	Face	01.02.01.HEAD AND NECK; OTHER HEAD, FACE AND NECK; FACE
		Eye	01.02.02.HEAD AND NECK; OTHER HEAD, FACE AND NECK; EYE
		Other head	01.02.03.HEAD AND NECK; OTHER HEAD, FACE AND NECK; OTHER HEAD
		Neck	01.02.04.HEAD AND NECK; OTHER HEAD, FACE AND NECK; NECK
		Other head and neck	01.02.05.HEAD AND NECK; OTHER HEAD, FACE AND NECK; HEAD AND NECK, OTHER HEAD AND NECK
Spine and back	Spinal cord (SCI)	Cervical SCI	02.03.06.SPINE AND BACK; SPINAL CORD (SCI); CERVICAL SCI
		Thoracic SCI	02.03.07.SPINE AND BACK; SPINAL CORD (SCI); THORACIC SCI
		Lumbar SCI	02.03.08.SPINE AND BACK; SPINAL CORD (SCI); LUMBAR SCI
		Sacral or coccygeal SCI	02.03.09.SPINE AND BACK; SPINAL CORD (SCI); SACRAL OR COCCYGEAL SCI
	Vertebral column (VCI)	Cervical VCI	02.04.10.SPINE AND BACK; VERTEBRAL COLUMN (VCI); CERVICAL VCI
		Thoracic VCI	02.04.11.SPINE AND BACK; VERTEBRAL COLUMN (VCI); THORACIC VCI
		Lumbar VCI	02.04.12.SPINE AND BACK; VERTEBRAL COLUMN (VCI); LUMBAR VCI
		Sacral or coccygeal VCI	02.04.13.SPINE AND BACK; SVERTEBRAL COLUMN (VCI); SACRAL OR COCCYGEAL VCI
Torso	Chest (Thorax)	…	03.05.00.TORSO; CHEST (THORAX)
	Abdomen	…	03.06.00.TORSO; ABDOMEN
	Pelvis	External genitalia	03.07.14.TORSO; PELVIS; EXTERNAL GENITALIA
		Pelvic organs	03.07.15.TORSO; PELVIS; PELVIC ORGANS
		Lower back and pelvis	03.07.16.TORSO; PELVIS; LOWER BACK AND PELVIS
		Pelvic girdle	03.07.17.TORSO; PELVIS; PELVIC GIRDLE
		Buttock	03.07.18.TORSO; PELVIS; BUTTOCK
		Other	03.07.19.TORSO; PELVIS; OTHER
	Other trunk	…	03.08.00.TORSO; OTHER TRUNK

Body Region Level 1	Body Region Level 2	Body Region Level 3	Format ($Bodyf.)
Extremities	Upper extremity	Shoulder and upper arm	04.09.20.EXTREMITIES; UPPER EXTREMITY; SHOULDER AND UPPER ARM
		Forearm and elbow	04.09.21.EXTREMITIES; UPPER EXTREMITY; FOREARM AND ELBOW
		Wrist, hand, and fingers	04.09.22.EXTREMITIES; UPPER EXTREMITY; WRIST, HAND, AND FINGERS
		Arm, not further specified	04.09.23.EXTREMITIES; UPPER EXTREMITY; ARM, NOT FURTHER SPECIFIED
	Lower extremity	Hip	04.10.24.EXTREMITIES; LOWER EXTREMITY; HIP
		Upper leg and thigh	04.10.25.EXTREMITIES; LOWER EXTREMITY; UPPER LEG AND THIGH
		Knee	04.10.26.EXTREMITIES; LOWER EXTREMITY; KNEE
		Lower leg and ankle	04.10.27.EXTREMITIES; LOWER EXTREMITY; LOWER LEG AND ANKLE
		Foot and toes	04.10.28.EXTREMITIES; LOWER EXTREMITY; FOOT AND TOES
		Ankle and foot	04.10.29.EXTREMITIES; LOWER EXTREMITY; ANKLE AND FOOT
		Other, multiple, and unspecified	04.10.30.EXTREMITIES; LOWER EXTREMITY; OTHER, MULTIPLE, AND UNSPECIFIED
Unclassifiable by body region	Multiple body regions	…	05.11.00.UNCLASSIFIABLE BY BODY REGION; MULTIPLE BODY REGIONS
	Systemwide	…	05.12.00.UNCLASSIFIABLE BY BODY REGION; SYSTEMWIDE
Unspecified	…	…	06.00.00.UNSPECIFIED

'…' indicates that there is no categorization for this level.

Table 4. Full Format by Nature-of-injury Level

Nature-of-Injury Level 1	Nature-of-Injury Level 2	Format ($Naturef.)
Fracture	…	01.00.FRACTURE
Dislocation	…	02.00.DISLOCATION
Internal organ injury	…	03.00.INTERNAL ORGAN INJURY
Open wound	…	04.00.OPEN WOUND
Amputation	…	05.00.AMPUTATION
Blood Vessel	…	06.00.BLOOD VESSEL
Superficial injury or contusion	…	07.00.SUPERFICIAL INJURY OR CONTUSION
Crushing	…	08.00.CRUSHING
Burns and corrosions	Burns	09.01.BURNS AND CORROSIONS; BURNS
	Corrosions	09.02.BURNS AND CORROSIONS; CORROSIONS
Effect of foreign body entering orifice	…	10.00.EFFECT OF FOREIGN BODY ENTERING ORIFICE
Other effects of external causes	…	11.00.OTHER EFFECTS OF EXTERNAL CAUSES
Poisoning	…	12.00.POISONING
Toxic effects	…	13.00.TOXIC EFFECTS
Other specified injury	Sprains and strains	14.03.OTHER SPECIFIED INJURY; SPRAINS AND STRAINS
	Injury to nerves	14.04.OTHER SPECIFIED INJURY; INJURY TO NERVES
	Injury to muscles and tendons	14.05.OTHER SPECIFIED INJURY; INJURY TO MUSCLES AND TENDONS
	Other injury	14.06.OTHER SPECIFIED INJURY; OTHER INJURY
Unspecified injury	…	15.00.UNSPECIFIED INJURY

'…' indicates that there is no categorization for this level.

Resource Updates and Changes

Date	Update/Change
11-01-2021	Files have been updated to reflect changes to the ICD-10-CM for federal fiscal year 2022. This includes the addition of U07.0 and R45.88 from outside the injury chapters. For a full listing of changes, see the '112021 2021 revisions to 2016 Proposed ICD10CM Inj Dx Matrix document'. The BodyF formats were lengthened to correct for a truncation issue. NatureF formats were corrected to include a semicolon in-between classification levels.
11-01-2022	Files have been updated to reflect changes to the ICD-10-CM for federal fiscal year 2022.
05-03-2023	Files have been updated to reflect changes to the ICD-10-CM for federal fiscal year 2023.
01-19-2024	Files have been updated to reflect changes to the ICD-10-CM for federal fiscal year 2024.