Iris - Automated coding system for causes of death

Iris User Reference Manual V5.8.1S1

Iris Version 5.8.1-Y2021S2 with MUSE 2.9

26 April 2021

Iris Institute

iris-institute@bfarm.de

www.iris-institute.org

List of contents

1. Introduction

Before installing and using the software, the user should read the manual carefully.

1.1 About Iris

Iris is an automatic system for coding multiple causes of death and for the selection of the underlying cause of death. It can be used in batch or interactively. The aim of Iris is twofold:

- To provide a system in which the language-dependent aspects are separated from the software itself. Moreover, the language-dependent parts are stored in database tables and can easily be modified.
- To improve international comparability. Iris is based on the international death certificate form provided by WHO (*World Health Organisation*) in Volume 2 of ICD-10-WHO and the causes of death are coded according to the ICD-10 rules. Updates to ICD-10 are included according to the WHO timelines.

Through **version 4** the Iris software uses components of the *Mortality Medical Data System* (MMDS) of the U.S. National Center for Health Statistics (NCHS).

Since **version 5** the Iris software uses the Multicausal and Unicausal Selection Engine (MUSE). MUSE operates based on internationally agreed decision tables which are based on the most recent version of ICD-10-WHO.

You will find a list of revised terms in the manual and software regarding Iris version 4 and version 5 at *Appendix 7: List of revised terms in the manual and software*.

Iris can be used in two modes. In the Code entry mode, the user enters ICD-10 codes corresponding to the conditions reported on the death certificates. Iris then selects the underlying cause. In this mode Iris is ready for use as soon as it is installed. In the Text entry mode, the user enters the causes of death in free text, as they are reported on the death certificate. For text entry coding, you need a dictionary that translates text into ICD-10 codes. The advantage of including a dictionary is that once a decision has been made on which ICD-10 code to use for a specific diagnostic expression, the expression will be coded in the same way each time it occurs on a death certificate.

Iris also provides means for language standardisation, which very much reduces the size of the dictionary.

Please note that an example of dictionary in English is provided, when you install Iris. The diagnostic texts and ICD codes are not up-to-date. You can create your own dictionary and standardisations in your language or you ask other countries if there is a dictionary available in your language.

1.2 Rights of third parties

The Iris software uses ICD-10 codes and titles of WHO (World Health Organisation). It is not allowed to extract the ICD-10 codes and titles from Iris and duplicate or distribute them separately. All rights of the ICD-10 are at the World Health Organisation (WHO). If you would like to use the ICD-10 separately from Iris please contact the WHO for the conclusion of a license agreement. An online form is available at http://www.who.int/about/licensing/classifications/en/index.html.

1.3 About Iris Institute

Iris has been developed through an international cooperation and soon the necessity appeared to set an official structure for the Iris effort. In this context, the Iris Institute was created for the deployment, maintenance and development of the Iris software. Moreover the increasing international interest in the Iris software has made it necessary to provide an institutional foundation to secure the supply and support of the Iris software. Consequently the cooperating partners from France, Italy, Hungary and Sweden approached the DIMDI (German Institute of Medical Documentation and Information) with the request to establish the Iris Institute. Since DIMDI (German Institute of Medical Documentation and Information) and BfArM (Federal Institute for Drugs and Medical Devices) have been merged, the secretariat of the Iris Institute is hosted by BfArM from 26 May 2020 onwards. Currently the following institutions have joined the cooperation and are involved in the development of Iris:

- *Centre d'épidémiologie sur les causes médicales de décès (Inserm-CépiDc)*, France
- *Federal Statistical Office (Destatis)*, *Federal Institute for Drugs and Medical Devices (BfArM)*, Germany

- *Hungarian Central Statistical Office (KSH)*, Hungary
- *Italian National Institute of Statistics (Istat)*, Italy
- *National Center for Health Statistics (NCHS)*, USA
- *Office for National Statistics (ONS)*, England and Wales
- *Statistics Netherlands (CBS)*, Netherlands

The Iris Institute is an international cooperation of the above mentioned institutions. Sweden was involved in for more than twenty years in the development of Iris and was part of the Iris Core Group until the end of 2016.

1.4 How can I give feedback?

When you notice an error at the decision tables:

- Check with Volume 2 of ICD-10-WHO
- Check with the official WHO updates and emergency codes for COVID-19
- If you think ICD-10-WHO should be corrected, then the problem should be reported to the Mortality Reference Group (MRG) or discussed in the Mortality Forum (more about the WHO-FIC Committees and Reference Groups and Mortality Forum).
  <u>Please note</u> that there are no further updates for ICD-10 by WHO. The last URC (Update and Revision Committee for ICD-10) update was for 2019. Also the Table Group is suspended since October 2018.
- If the error is a wrong ICD-10-WHO application, then report to the *Iris Institute*

In the case you find a bug in the Iris software, Iris manual or Iris Tables then report this error to the *Iris Institute*.

1.5 How can I get updates and information about Iris?

You could subscribe to the newsletter **"Iris News"** which is free of costs. So you will get all relevant information and updates about Iris in the future.

Iris News
Downloads Iris
FAQ
Iris Users

Events and Trainings

Iris and ICD-11

1.6 International decision tables

Iris/MUSE uses international agreed decision tables (DT). Updates were done after discussion by the Mortality Reference Group (MRG) and by the Table Group (TG). The users should not modify these table entries. Since 2011, these tables have been maintained by the Iris Institute according to the annual WHO official updates of the ICD-10. The current decision tables derive from those developed by the NCHS (National Center for Health Statistics) for the selection of the underlying cause of death used by ACME (Automated Classification of Medical Entities).

1.7 Standardized file names

The Iris Institute standardized the file names, which are released at the Iris website. You will find below some examples for which files we standardized the names:

- Database of certificate:

    o Iris-Certificates-V4.5-Y2015S1.mdb
    o Iris-Certificates-V5.1-Y2015S1.mdb

- Database of Iris Tables:

    o Iris-Tables-V4.5-Y2015S1.mdb
    o Iris-Tables-V5.1-Y2015S1.mdb

- Iris user reference manual:

    o Iris-User-Reference-Manual-V4.5S1.pdf
    o Iris-User-Reference-Manual-V5.1S1.pdf

- Translation of interface:

    o User-Interface-English-V4.5S1.properties
    o User-Interface-English-V5.1S1.properties

- Iris Software:

    o Iris-V5.4.0-Y2017S1.zip

- o Iris-V5.4.1-Y2017S2.zip

- MUSE files:

  - o specV2017SR10-Muse.csv.DES; specV2017SR10-Codes.csv
  - o specV2017SR20-Muse.csv.DES; specV2017SR20-Codes.csv

Table 1 Description of abbreviation in file names

Abbreviation	Description	Example
V	"Version" of Iris or coding year	Iris-User-Reference-Manual-**V4.3**S1.docx
Y	"Year" of coding	Iris-Tables-V4.5-**Y2014**S4.mdb
S or **SR**	"Sub version" (if we release more than one version)	Tables-Y2015**S2**.zip

1.8 About this manual

Here an overview about the content at this manual:

- Chapter 1: Introduction – Some general information

- Chapter 2. Installation guide – Explains how to install Iris

- Chapter 3. How to use Iris – Overview of the most important functions in Iris

- Chapter 4. Menus and tools – Details about the use of each function in Iris

- Chapter 5. MUSE in Iris – Describes MUSE module and files used by Iris/MUSE

- Chapter 6. Databases – Provides details on each table in the two Iris databases

- Chapter 7. Standardisation in Iris – Explains how to use text standardisation, e.g. to reduce the size of the dictionary

- Chapter 8. User´s Table Maintenance – Describes the table work by the users

- Chapter 9. Previous Iris versions – Contains list of Iris versions and the differences between the various versions

- Appendix – Here you will find lists for e.g. "Iris Hot Keys", "Created Codes", "Connected Codes for neoplasms" and a "List of abbreviations"

Some important comments or information are marked with "Please note" at this manual.

1.9 Note about changes from Iris version 4 to version 5

In 2016 two main innovations took place with an impact on Iris coding: the introduction of the 2016 updates of ICD-10 instructions (Volume 2) and the replacement of MICAR (Mortality Medical Indexing, Classification, and Retrieval) and ACME (Automated Classification of Medical Entities) by MUSE (multicausal and unicausal selection engine) in Iris version 5. MICAR and ACME, the previous engine used in Iris version 4 for coding and selecting the underlying cause of death (UCOD) was developed by National Center for Health Statistics (NCHS).

These changes implied some adjustments in the decision tables used by Iris for coding, which belong to

- Multicausal decision tables (MCDT) used in Iris from version 5 and
- Unicausal decision tables for the selection of the underlying cause also referred to as "decision tables" (DT), derived from ACME tables and used in version 4.

Both multicausal and unicausal tables are included in a single file used by MUSE (specMuse file - specVxxxxSRxx-Muse.csv.DES). The multicausal table has been developed ex novo for MUSE, while some changes, especially the introduction of new rules, where necessary for decision tables.

You will find more information about the new version and new rules in this Iris manual. Chapter 5 (MUSE in Iris) and chapter 8.2 (Developing and maintained the dictionary) include the information about the MUSE module, MUSE flags and connected codes. The changes for the "Iris Tables" database are in chapter 6 (Databases). You will find information about the MUSE settings at chapter 4.5.10.6 (Coding Tab).

Furthermore you will find more information at the file "Information about the coding rule types for mortality coding with Iris" at *Downloads Iris*.

Please note: The decision tables for Iris version 4 in 2017 was the final update for Iris version 4. The structure of the unicausal tables has changed a little bit: SENMC rule is replaced by IDMC and SENDC rule is replaced by IDDC in Iris version 5. IDMC is a new rule and it cannot be handled by MMDS (Mortality Medical Data System). We also deleted all obsolete codes in the unicausal tables. Therefore the TABA and

TABB would not work in the right way and it is not possible to produce MMDS tables for these technical reasons.

In addition, the ICD-10 updates for 2016 and 2019 involve some algorithm changes which are implemented in MUSE, but not in MMDS. So the new tables and the new rules for selection of the underlying cause will be not applied in MMDS.

1.10 Current Iris version

The current Iris version includes following software packages and tables for the coding year 2021:

- Iris Version 5.8.1-Y2021S2 (with MUSE 2.9) – released May 2021
- specV2021SRxx-Muse.csv.DES
- specV2021SRxx-Codes.csv
- Iris-Tables-V5.8-Y2021Sx.mdb
- Iris-Certificates-V5.8-Y2021Sx.mdb
- Injury_rank-Y2021Sx.csv
- Reasonid-Y2021Sx.csv

Please check the Iris website (*Downloads Iris*) whether updates are available for the software and tables.

Please note:

1) The file "specV2019SR10-Muse.csv.DES" (or more recent versions) does not work in Iris version 5.5.0 (or previous Iris versions). Additionally, the logic of some new "condition" were not implemented in the MUSE logic and also the algorithm for Step M1 and Step M2 has changed with the updates of WHO for 2019.

2) The Iris Institute can provide updates during the year only for the most recent Iris version. Therefore, please use the most recent version of Iris, otherwise it could be that we cannot provide any updates.

3) Iris version 5.8.0 (or previous version) does not know that U12.9 is an external cause code and it is not possible to add a main injury code to U12.9. These issues are solved with Iris version 5.8.1 (or more recent versions).

2.   Installation guide

This chapter includes important information about the requirements and installation of the Iris software.

2.1 Requirements

You could use Iris with these requirements:

- Microsoft Windows Vista, Windows 7, Windows 8, Windows 8.1 and Windows 10 [Iris does no longer run under Windows XP. Windows 7, Windows Vista and Windows XP are no longer supported by Microsoft, so it involves a lot of security threats.]
- Microsoft .Net Framework (from 4.5.2)
- Microsoft Access 2003 or later, if no other database manager is available [MS Office 2003, 2007 and 2010 are no longer supported by Microsoft. It is not possible to use "Apache OpenOffice" database.]
- or a robust relational database server *Oracle, MSSQL, PostgreSQL* or *MySQL* directly
- or any through OLEDB, parameters described on *www.connectionstrings.com* (see also chapter *4.5.10.4 Certificate Database Tab*)

Iris is independent of your browser and you can use Iris in a server environment for multiple users.

The '.Net Framework' is a component that allows Microsoft programs written for '.Net Framework' to work with Windows. Before you first install Iris, '.Net Framework' should be already installed.

If you do not have a favourite database manager, use Access which is the default for Iris. The settings of the Access database used to store death certificates must allow system objects to be read. The default "Iris Certificates" database installed with Iris has the parameters correctly set for system objects to be read, but if you want to create your own Access certificate database, adjust the settings as follows:

Access – MS Office 2003

- Open Access

- In the Tools menu, select the Options item: the Option window is opened. Select the Display tab and check the System Objects box. Close the Option window.
- In the Tools menu, select the Security item and then the Access authorisation item: the Access authorisation window is opened. In the Object name list box, select MSsyObjects line and click on Read structure and Read data check boxes in the Authorisation group.
- In the Tools menu, select Options Item: the Option window is opened. Select the Display tab and uncheck the System Objects box. Close the Option window.

Access – MS Office 2007

- Open Access
- Click on the Microsoft Office button in the left upper part of the window and select the Access options button at the bottom right of this menu.
- Select the "Navigation options" button and check the Display System Objects box. Close the Option window.
- In the Tools menu, select the Security item and then the Access authorisation item: the Access authorisation window is opened. In the Object name list box, select MSysObjects line and click on Read structure and Read data check boxes in the Authorisation group.
- Again click on the Microsoft Office button in the left upper part of the window, select the Access options button at the bottom right of this menu.
- Select the "Options de navigation" button and uncheck the Display System Objects box. Close the Option window.

Note that in some computer environments you will need administrator's privileges to change these settings. Apart from modifying the databases, MS Access is not needed on the computer that will run Iris.

If you would need to reinstall Iris, first save your "Iris Certificate" database and "Iris Tables" databases to a separate folder. Then uninstall Iris using "Add or Remove Programs" in the Control Panel. Install the new version as if it was a first installation.

Then start Iris, open the Tools menu, go to the Options item and specify the names of the folders where you saved your "Iris Certificate" and "Iris Tables" databases.

Iris can be run from an application server: install Iris on the server, share the Iris folder (allow everybody to read and run the files) and create a shortcut of 'Iris.exe' on client computers. The Options of each client are kept on the client computer. Your personal configuration files can be found at:

- "C:\Users\xxxxxx\AppData\Local\Iris_Core_Group\yyyyyy"

Where \xxxxxx is your user name and \yyyyyy are folders corresponding to the different versions of Iris. The file at this folder is named "user.config". Note that the folder 'AppData' is hidden by default.

With some security configurations the folders under "C:\Program Files" are write-protected. Therefore, the Iris databases must be placed in a folder that is not write-protected, for example under "Documents". (You can ask your IT department for the write permission or use another folder where you have these permissions). Also take care of this is the installation procedure.

Please note:

Don´t use the folder "Program files (x86)" for the installation, you should move to another location/folder.

Your screen should support a resolution of "1024 x 768" or higher. If the resolution is lower, parts of the screen (Iris interface) will not display properly, even if it looks like the screen is big enough for the Iris interface.

Your display should be attuned to 100% (Standard), otherwise parts of the screen (Iris interface) will not displayed properly.

2.2 Installation

Since Iris version 5 there is no need to install MMDS (Mortality Medical Data System). MMDS is replaced by MUSE (Multicausal and Unicausal Selection Engine). MUSE is integrated in the Iris software.

If '.Net Framework' is not present on your computer it's necessary to install '.Net Framework' first. On some computers this may take several minutes.

2.2.1 Installation of Iris with Windows installer

Unzip the installation files and place them in a separate folder. Open the installation folder and click on the "IrisInstallation.msi" program. Then follow the instructions of the Iris setup wizard.

During the installation, you may change the default installation folder and the rights to use Iris on the computer.
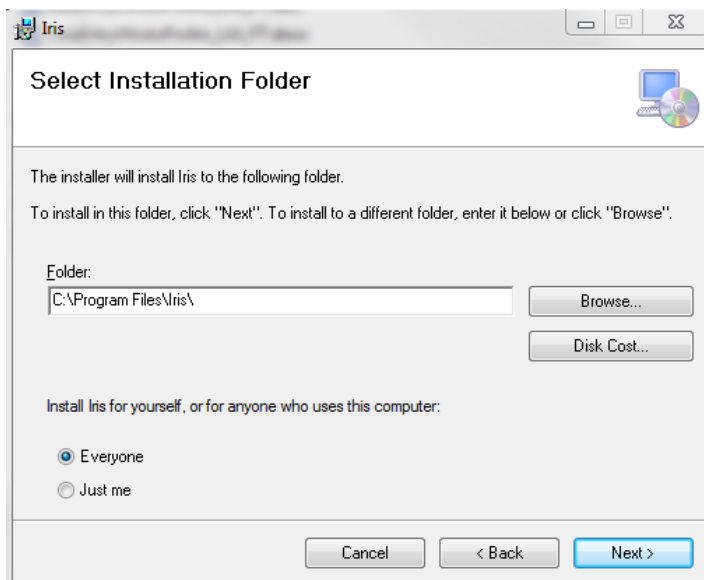
Figure 1 Selection of installation folder with Windows 7

By default the installation wizard places Iris in the "C:\Program Files (x86)" folder [Windows 7 or higher], but you should change to another location/folder. By default, the installation wizard makes Iris available to everyone using the computer. This setting can be changed, so that Iris will be available to the user performing the installation only.

There is no registry update done by Iris. It just installs files at the specified location and creates shortcuts. The installation wizard also places an Iris icon on the desktop. Double-click this icon to start Iris.

At the end of the installation, by default "Iris Certificate" and "Iris Tables" databases are available in the installation folder. You can move these databases to another

location on your computer, or you can migrate them to a database server on your network.

When you have installed a new version of Iris and that an older version was used, Iris will ask at first whether you want to keep your settings or not:
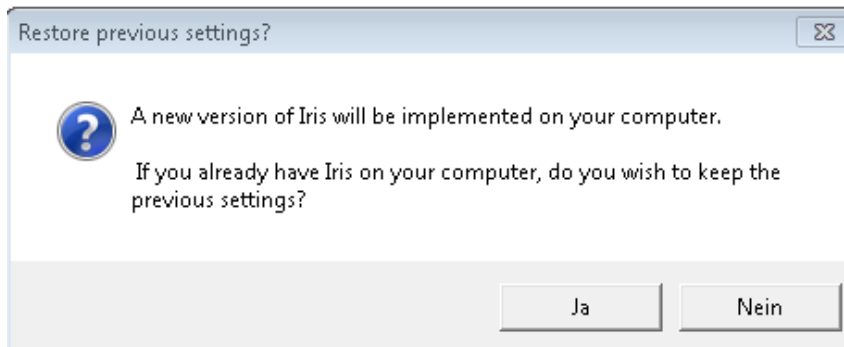
Figure 2 Question about previous settings

During the first start Iris will show the window below:
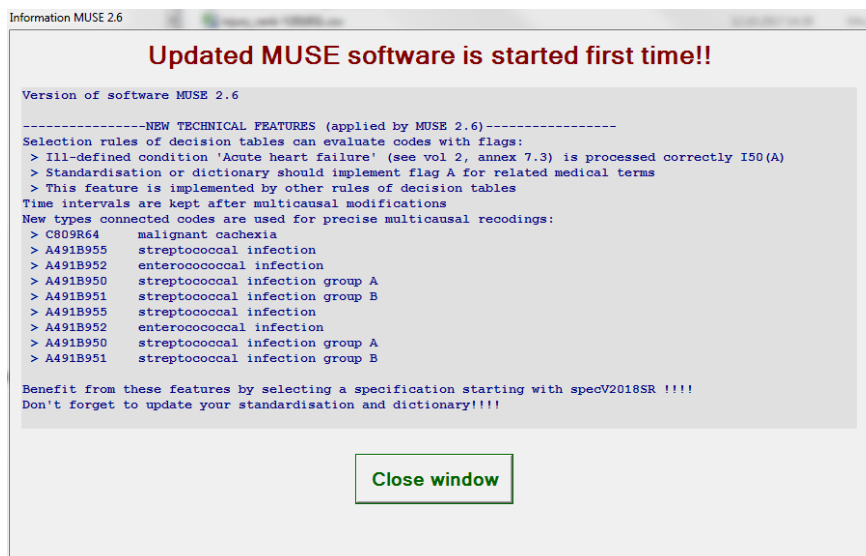
Figure 3 MUSE window starts first time (content of screen could be different for each version)

Then Iris will ask you which specification table you want to use. The last one contains the latest decision tables and multicausal tables. Please select a spec file and continue by clicking on "Load selected specification".
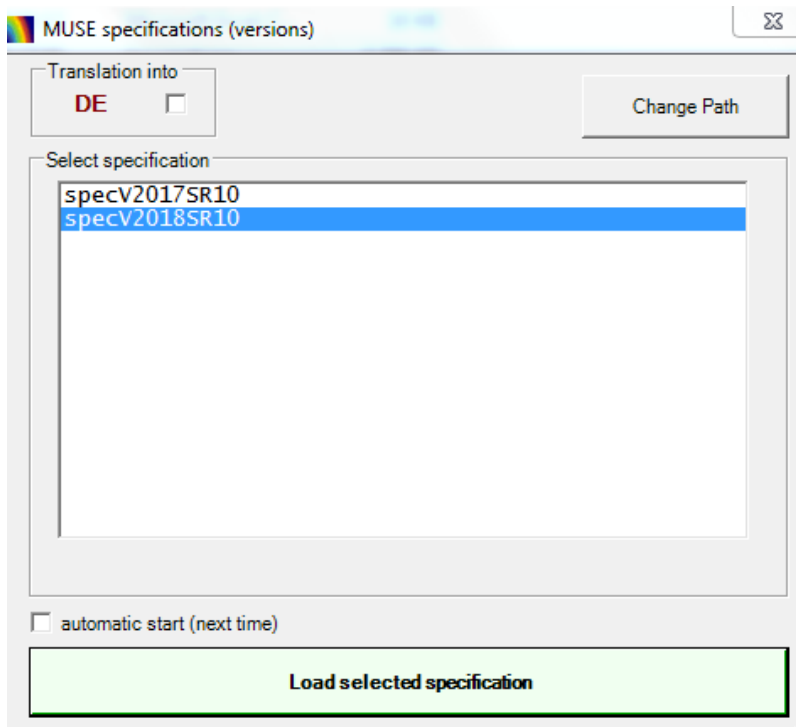
Figure 4 Screenshot of MUSE specification window

After the selection Iris will load the specification files:

Figure 5 MUSE loads specification files

Before opening a work lot, carefully read the Options chapter (see chapter
4.5.10 Options) and select the correct paths for log files, "Iris Certificate" and "Iris
Tables" databases, as well as the correct parameters for you database manager if it
is not Microsoft Access. This is an important step otherwise Iris will not work correctly.

2.2.2 Use of Iris without an installation package

When you have never been installed Iris on the computer before and you do not use the Iris installation package (but rather the unpacked files), then you will get the following message after starting Iris (by clicking on "Iris.exe"):
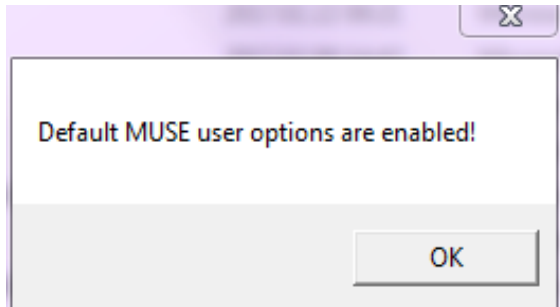
Figure 6 Screenshot of message

You can ignore this message (by clicking on "OK") and MUSE will add the "MuseConfiguration" folder ("C:\Users\xxxxxx\MuseConfiguration") with the needed configuration files (see also chapter *5.7 Configuration of MUSE*).

Then Iris will ask at first whether you want to keep your settings or not:
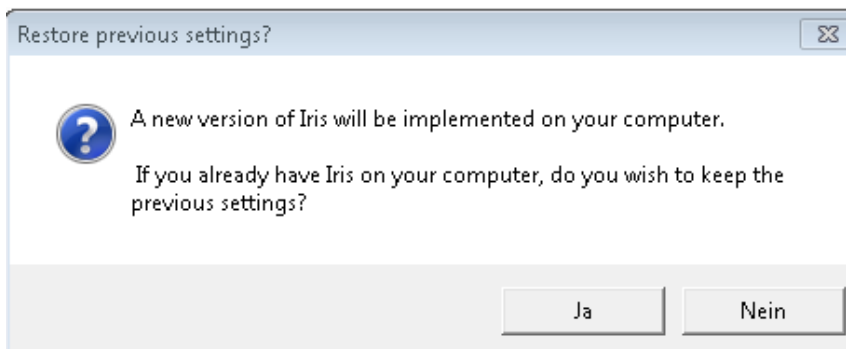
Figure 7 Question about previous settings

By default "Iris Certificate" and "Iris Tables" databases are available in the provided folder. You can move these databases to another location on your computer, or you can migrate them to a database server on your network.

Information MUSE 2.6

Updated MUSE software is started first time!!

Version of software MUSE 2.6

----------------NEW TECHNICAL FEATURES (applied by MUSE 2.6)----------------
Selection rules of decision tables can evaluate codes with flags:
 > Ill-defined condition 'Acute heart failure' (see vol 2, annex 7.3) is processed correctly I50(A)
 > Standardisation or dictionary should implement flag A for related medical terms
 > This feature is implemented by other rules of decision tables
Time intervals are kept after multicausal modifications
New types connected codes are used for precise multicausal recodings:
 > C809R64   malignant cachexia
 > A491B955   streptococcal infection
 > A491B952   enterococcoccal infection
 > A491B950   streptococcal infection group A
 > A491B951   streptococcal infection group B
 > A491B955   streptococcal infection
 > A491B952   enterococcoccal infection
 > A491B950   streptococcal infection group A
 > A491B951   streptococcal infection group B

Benefit from these features by selecting a specification starting with specV2018SR !!!!
Don't forget to update your standardisation and dictionary!!!!

Close window

Figure 8 MUSE window starts first time

Then Iris will ask you which specification table you want. The last one contains the latest decision tables and multicausal tables. Please select a spec file and continue by clicking on "Load selected specification".

MUSE specifications (versions)

Translation into
DE ☐   Change Path

Select specification
specV2017SR10
specV2018SR10

☐ automatic start (next time)

Load selected specification
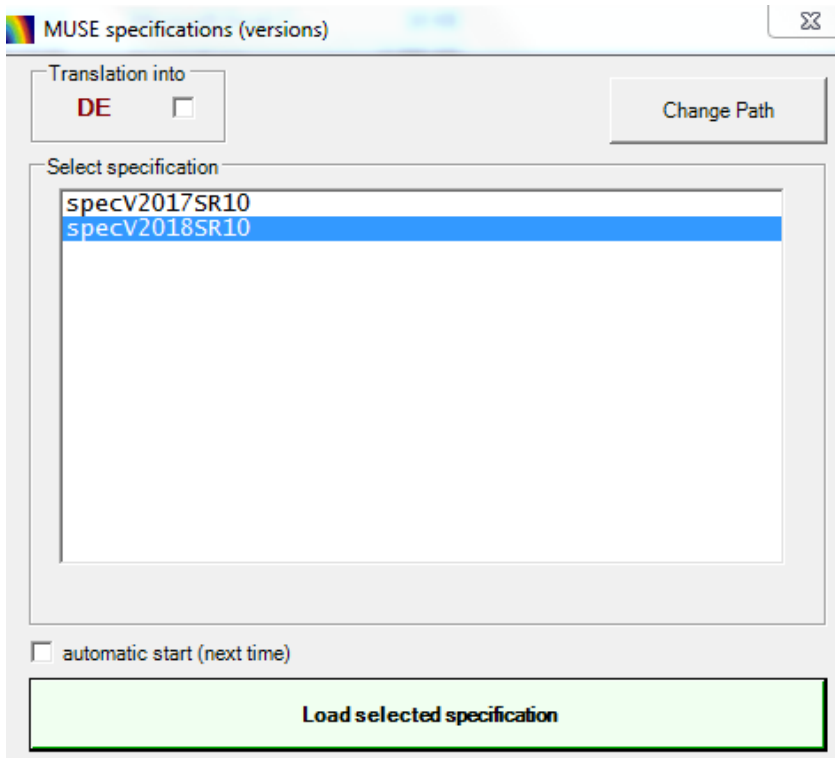
Figure 9 Screenshot of MUSE specification window

After the selection Iris will load the specification files:

```
MUSE 2.6 Initialization

MUSE SPECIFICATION specV2018SR10 is loaded..
 > Path      C:\Users\heuserfriedrich\Downloads\V5.5.0\SPEC\specV2018SR10
 > User entries : 138
 > Codes        : 16395
```

Figure 10 MUSE loads specification files

Before opening a work lot, carefully read the Options chapter (see chapter *4.5.10 Options*) and select the correct paths for log files, "Iris Certificate" and "Iris Tables" databases, as well as the correct parameters for you database manager if it is not Microsoft Access. <u>This is an important step otherwise Iris will not work correctly.</u>

2.2.3 Change of default path for MUSE configuration file

The MUSE configuration is default stored in option file 'MuseUserOptions.xml' located in subdirectory 'MuseConfiguration' of the user path (C:\Users\YourName\MuseConfiguration).

In case you have any restrictions not to use the user path, you can change the settings for MUSE. The option file 'MuseUserOptions.xml' will be loaded from the specified path if windows environment variable `MUSE_CONFIG_PATH` is set. To change the default memory location follow this instruction.

Klick on the Windows logo at the taskbar:

Figure 11 Windows Logo

Search for 'Environment variable' at the search field:
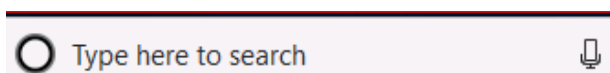
Figure 12 Windows search box

Open 'Environment variable'; and select "New…" at user variable:
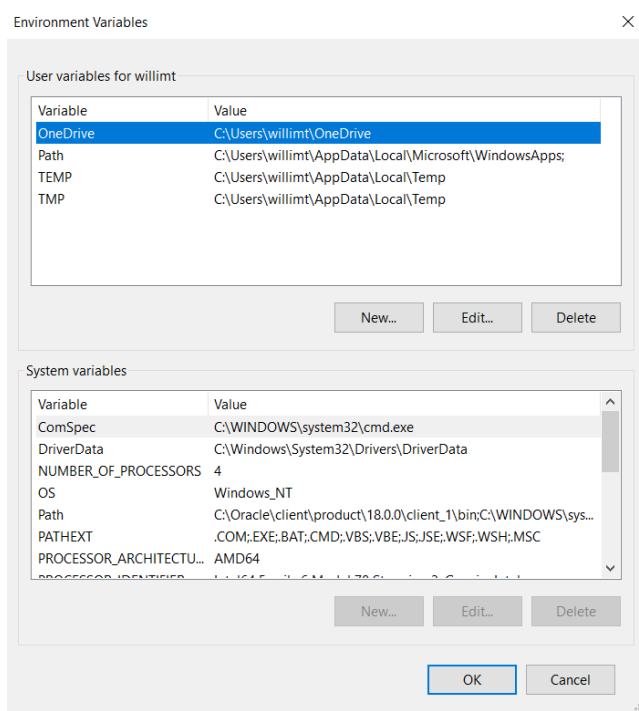
Figure 13 Environment Variable window

Create new user variable; add `MUSE_CONFIG_PATH` to the first line; and your specific path (drive/folder) to the second line:
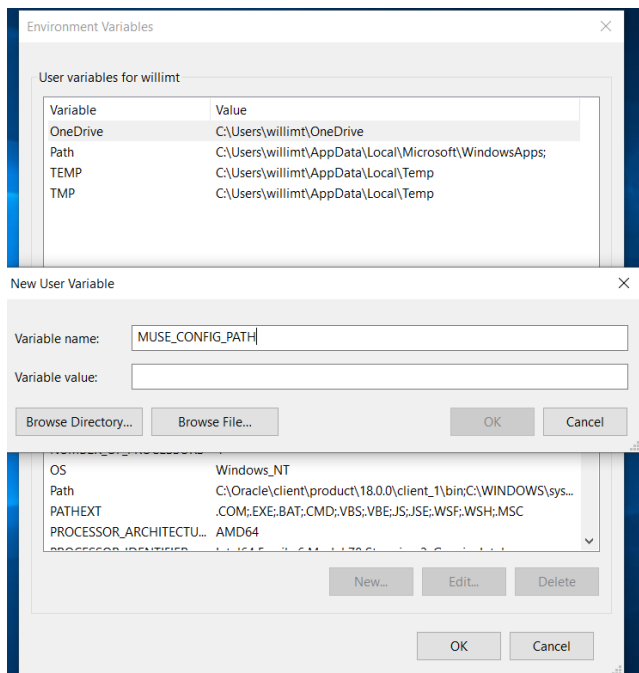
Figure 14 Create new user variable
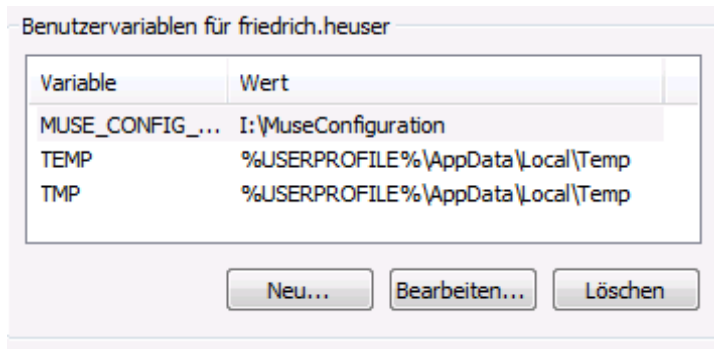
Figure 15 New user variable is added

You can check your changes (MUSE settings) on the environment variables in Iris [via Tools, Options, Coding tab, MUSE settings]:
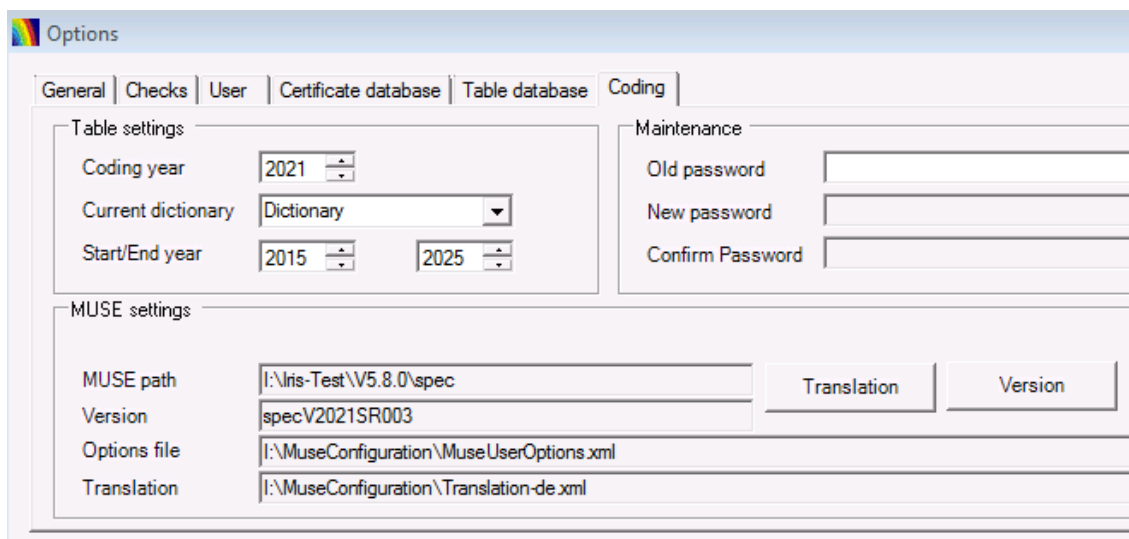
Figure 16 Options, Coding tab, MUSE settings

3. How to use Iris

This chapter gives a short but complete description of Iris. For more detailed explanations of each feature, please refer to chapter 4. (Menus and tools).

Iris can be used in different modes. You can use Iris for data entry without access to the coding functions, for data entry with access to the coding functions, or for coding without full access to the data entry functions.

The Data entry mode is the most restricted mode and can be used for data capture by staffs that are not medical coders. For coding, several modes are available. In Code entry mode, the user enters ICD-10-WHO codes corresponding to the conditions reported on the death certificates. Iris then selects the underlying cause. In this mode Iris is ready for use as soon as it is installed. In Text entry mode, the user enters the causes of death in free text, as they are reported on the death certificate. For text entry coding, you need a dictionary that gives a correspondence between text and ICD-10-WHO code. It is a long work to build this dictionary, however it increases considerably the usefulness of the system and the data quality. Once a decision has been made on which ICD-10-WHO code to use for a specific diagnostic expression, the expression will be coded in the same way on each occurrence, at least for the duration of the ICD-10-WHO revision – or until the code is changed in the Iris dictionary. Iris also provides means for language standardisation, which reduces very much the size of the dictionary. Please note that an example of dictionary in English is provided, when you install Iris. The diagnostic texts and ICD codes are not up-to-date. From Iris version 4.4.1 a combination of data entry and coding mode is available. These modes are intended for settings where medical coders also enter the death certificate data.

Chapter 3.1 describes the Iris interface and the main functions of menus and tools.

Chapter 3.2 explains how to prepare database tables containing death certificates, "work lots".

Chapter 3.3 deals with the Code entry mode. In this mode you enter ICD-10-WHO codes for the diagnoses mentioned on the death certificate and Iris will select the underlying cause of death.

Chapter 3.4 describes the Text entry mode. In this mode you enter diagnostic terms as reported on the death certificate. Iris then matches the terms to a dictionary and assigns ICD-10-WHO codes. However, you will have to provide Iris with a dictionary that gives the correspondence between a diagnostic term (for instance "Acute myocardial infarction") and the appropriate ICD-10-WHO code (in this case I219).

Chapter 3.5 describes how to specify time intervals connected to the diagnoses. This works in the same way for both modes.

Chapter 3.6 deals with the data entry.

Chapter 3.7 describes how to translate the interface and messages in any language.
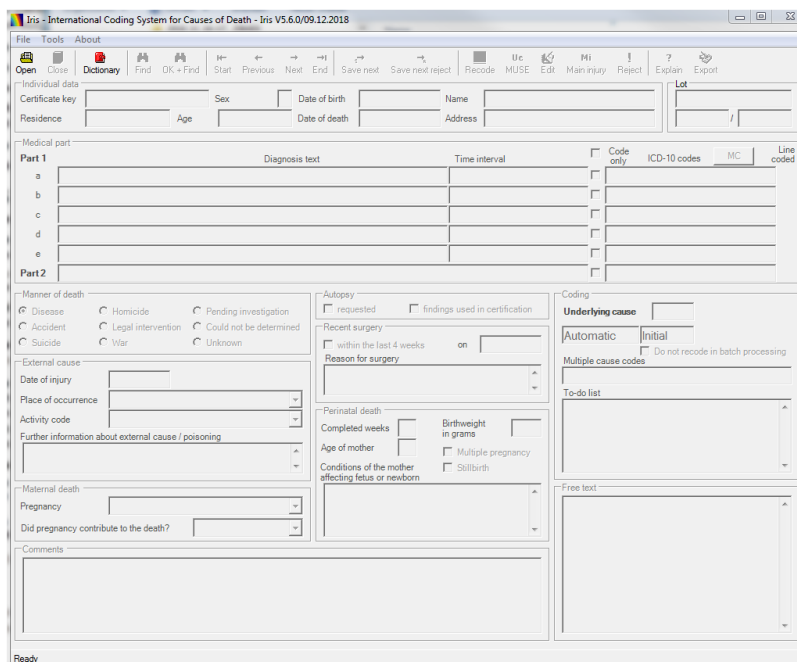
Chapter 3.8 describes how to translate the label name.

Chapter 3.9 describes the use of Iris by command line.

Chapter 3.10 describes the access of two users' access to the same certificate.

3.1 Interface

The upper part of the window below includes a menu and a toolbar. The toolbar contains menu items that are frequently used, and you can access them with a single click:

Figure 17 Main interface of Iris

Through the File menu you can open and close lots, and exit Iris. You can also launch batch processing and display scanned images of the death certificates, if available (see chapter *4.1 File menu* for a complete description).

To open a lot, select the menu item "Open" or click on the tool "Open" just below the File menu. The following window will appear:

Figure 18 Open lot

This window offers various options, which are described in more detail in chapter *4.1.1 Open*. At present, just click on the arrow to the right of the drop list "Choose or Input a lot". This displays the work lots available in the "Iris Certificates" database. If you have not already created work lots of death certificates (see chapter *3.2 Lot*

preparation), at least a lot called "Test" is available. Select this lot and click OK to open it. The main window now looks like this:
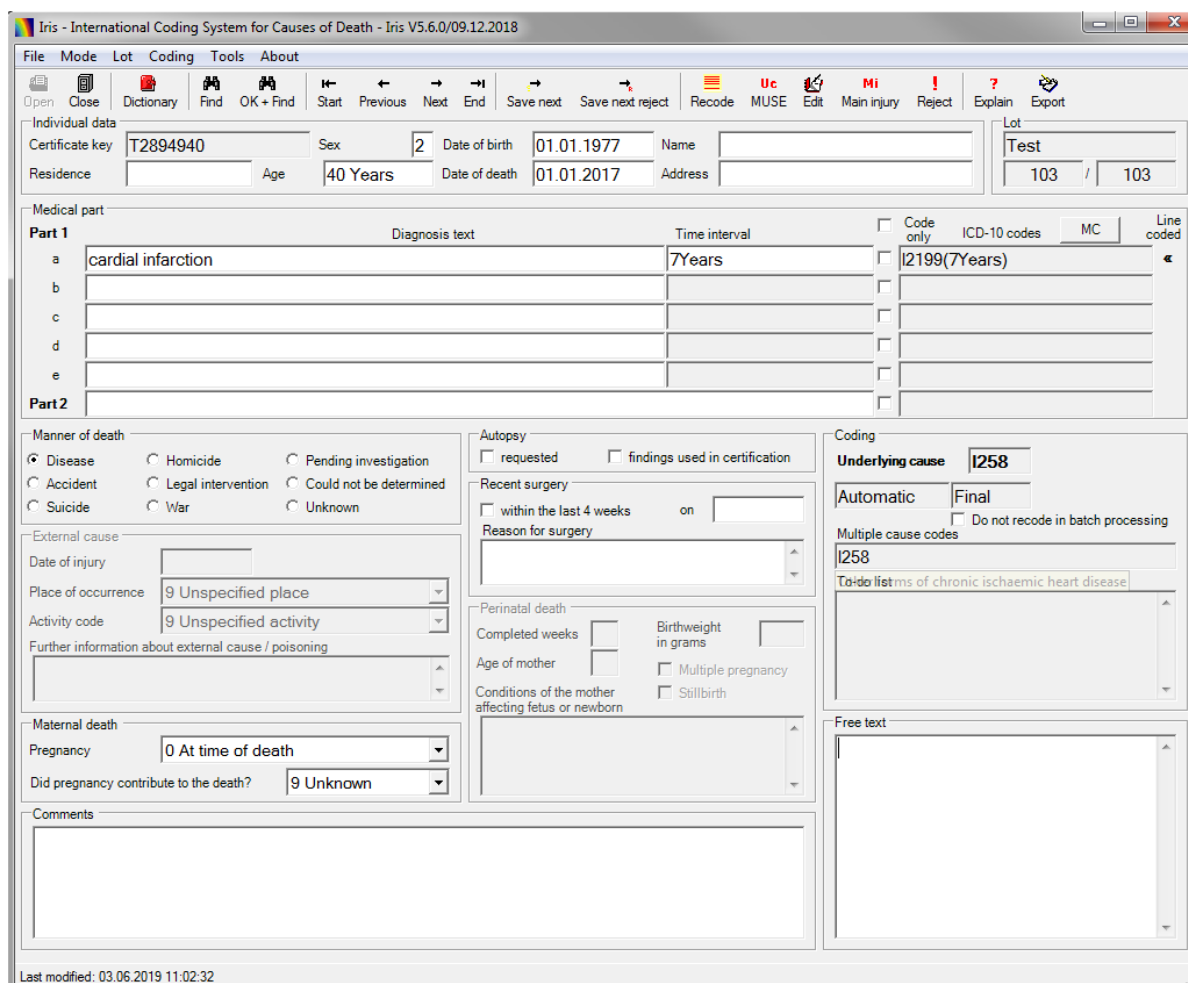
Figure 19 Main interface of Iris with open lot

The menus "Mode", "Lot" and "Coding" have been added to the menu bar.

The Mode menu defines the entry mode: text or code. It also allows too tell Iris whether there are 4 or 5 lines in Part 1, Maternal and/or perinatal additional data. Eventually, this menu specifies the display and the application of standardisation1 related options.

The Lot menu contains commands for navigating from one record to another, finding specific records and saving modifications.

Through the Coding menu you can recode the medical part, select the underlying cause or edit the underlying cause, specify the main injury, force a reject, display

explanations on the coding, delete all causes of death or restore the original wording if you have modified or deleted a cause-of-death entry.

Finally, the Tools menu contains functions for browsing or editing the dictionary and the standardisation tables. Through the Tools menu you also have access to the Options feature, which allows you to define the default features of Iris.

The toolbar under the menus gives you quick access to the most frequently used items of the menu. The menus and tools items are explained in the chapter 4. Menus and Tools.

The main window has several groups of items.

The Individual data block, on the top left of the window, includes by default read only text boxes that display important background data. In 'Data entry interface' mode they can be modified.

Certificate key, date of birth, date of death and sex (1 = male; 2 = female; 3 and others values = unknown) must be provided when the work lot is prepared (see chapter *3.2 Lot preparation*). Age is computed from dates of birth and death if they are available:

Figure 20 Individual data of the main interface

If not, age can be supplied directly through the 'Age' field of the certificate table.

The Lot block, at the upper right of the window, gives the lot name, the rank of the certificate in the lot (Certificate number) and the total number of death certificates in the lot:

Figure 21 Lot numbers of the main interface

Under these two blocks is the Medical part:

Figure 22 Medical part of the main interface

These text boxes reproduce the WHO international format of the death certificate. Diagnosis texts (in Text entry mode) or codes (in Code entry mode) and time intervals should be entered here. Text boxes with grey background are read only zones and cannot be modified. In Text entry mode, diagnosis text boxes are available for text entry while code boxes cannot be modified. On the contrary, in Code entry mode only the ICD-10-WHO code boxes are available for code entry. You can move from Text entry mode to Code entry mode and vice versa by clicking the tick boxes in the "Code only" column. A default mode can be set in the Options (see chapter *4.5.10 Options*).

If you click the button "MC" above the ICD-10-WHO codes column (see figure above), Iris opens an editing box for the multiple causes. The codes are arranged in a grid with one line each lines 1a–1e in Part 1 and one line for Part 2. Each line can have a maximum of eight codes. You can edit the codes, assign ampersands if required and also re-select the underlying cause (to reselect the UC, click Recode in the browser box).

To the right under the Medical part group is the Coding block:

Figure 23 Coding block of the main interface

Iris displays the selected underlying cause code. Iris also shows the status of the record after the selection procedure. If Iris, for some reason, could not select an underlying cause, or if the selected underlying cause is tentative and needs verification, the word "Reject" appears below the underlying cause box. Remaining coding problems and other reasons why a record has been rejected displayed in the To-do list box. If the underlying cause has been edited interactively, the coding status is stated as "Manual", if not the box reads "Automatic".

The check box "Do not recode in batch processing" allows you to flag this record so that it will not be modified when recoding the lot in batch (see chapter *4.1.3 Batch processing*).

At the bottom of the coding block are shown, the ICD-10-WHO codes Iris used to select the underlying cause of death. These codes also form the basis of the multiple cause output from the Iris system.

The "Manner of Death" block on the left under the Medical part group specifies if the death is a disease death, an accident, a suicide, a homicide, of undetermined intent, etc. If the Manner of Death (MoD) is unknown, there are alternatives for "Pending investigation" or "Not filled in". Generally, the Manner of Death information should be taken from the death certificates when the work lot is prepared, but it can be changed manually.

The remaining blocks (described below) contain additional information on the death and are optional. If you want to use this information and to store the data, the corresponding fields must exist in the "Ident" tables (see chapter *3.2 Lot preparation*).

For deaths due to injuries or poisoning, the External cause block displays the date an injury occurred, and codes for the place of occurrence and the activity at the time of the injury. A larger box can be used to display free text about how the external cause or poisoning occurred.

The Autopsy block has two tick boxes; one if an autopsy requested; the other if results of the autopsy are used in certification.

The Recent surgery block shows whether a surgery has been performed within the last 4 weeks and, if so, the date of surgery and the reason why.

The Perinatal death block shows additional information on perinatal deaths (completed weeks of pregnancy; birthweight; age of mother; complication of the mother who affected fetus or newborn; tick boxes for multiple pregnancy and stillbirth).

The Maternal death block shows information about pregnancy and complication with pregnancy. The drop boxes are available only for female decedents.

Finally, the fields in the Comments and Free text areas can be used as desired by the coder. In the Comment text box the coder may write a short comment on the current death record (field type "Memo" with more than 255 characters). The free text field can be used to store or forward larger chunks of text, for example internet citations concerning a specific cause of death. It can also be used to display additional information reported by the physician on the death certificate.

3.2 Lot preparation

Before coding with Iris, you must prepare work lots containing death certificates. The work lots are stored in the "Iris Certificates" database. By default, it is a Microsoft Access database located in the Iris folder. The default location can be changed in the Options (see chapter *4.5.10 Options*). Also, you may choose another database management system than Access [It is not possible to use an "Apache OpenOffice" database]. *Oracle, MSSQL, PostgreSQL* and *MySQL* server have direct support in Iris but almost any database can be used by choosing the OLEDB option. In later case, to provide the appropriate connection parameters it is advisable to visit *www.connectionstrings.com* web page and check the given database related information. The Certificates database may be located anywhere on your computer or on a network. If you prefer to store the database somewhere else than in the Iris folder, then change the "Iris Certificates" database settings in the Options item under the Tools menu.

A work lot consists of two tables: an "Ident" table and a "MedCod" table:

- the "Ident" table contains all the individual data except the causes of death;
- the "MedCod" table contains the medical causes of death.

Decide on a name for the work lot (e.g. "Lot1"). This name will be used to open the work lot in Iris. Next, create a "Lot1Ident" table and a "Lot1MedCod" table. To do so, copy the tables "aaaReferenceIdent" and "aaaReferenceMedCod" included in the Certificates database and change their name into "Lot1Ident" and "Lot1MedCod" (or whatever name you have chosen). Make sure that the work lot name is followed by the strings "Ident" and "MedCod".

The last step is to feed the "Ident" table with records. The following fields must contain data: CertificateKey, Sex and DateBirth, DateDeath or Age if the dates are not presented. Regarding the age expression it's important to use the correct format. If units are translated in the translation file then these must be used (see chapter *6.2.1 Identification table (Ident)*).

The valid sex values in Iris are:

- 1 = male
- 2 = female
- 3 until 8 = unknown
- 9 = missing data

The 'CertificateKey' is a primary key and can be up to 30 characters long. Also, the field 'MannerOfDeath' must be set to "0", the field Status to "Initial", the field Reject to "No", and the field 'Coding' to "Automatic". The "MedCod" table can be empty and the diagnostic terms or ICD-10-WHO codes will be added by Iris later during the interactive coding.

It is then possible to open the work lot in Iris. Launch Iris, select Open in the "File" menu (or enter Ctrl + O, or just click on the Open tool). You will be prompted to choose one of the work lot names that now appear in the list box:
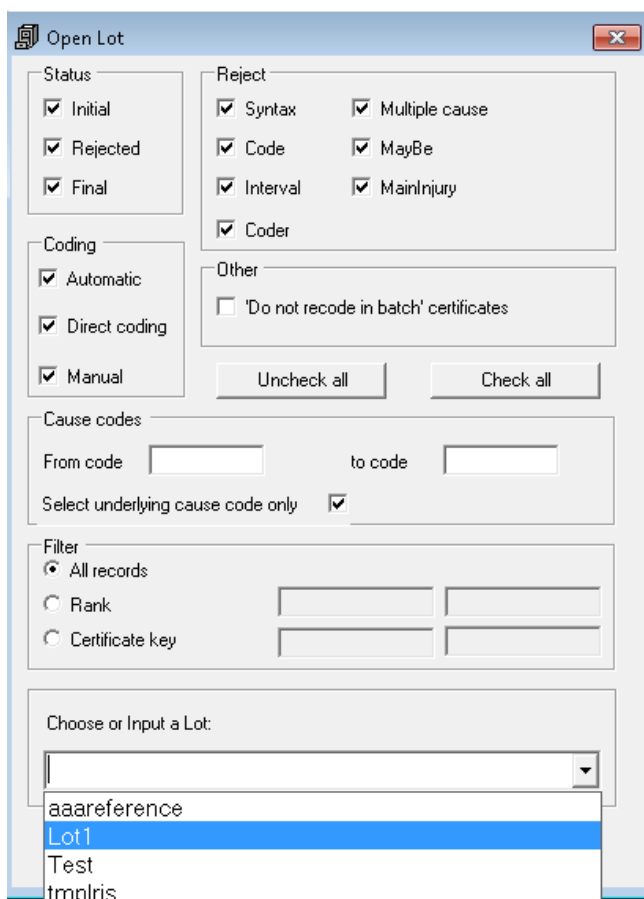
Figure 24 Open lot

Select Lot1 (or the name you have chosen) and the first record is displayed in the window. Alternatively, you may type the work lot name in the box. In that case, remember to leave out the suffixes "Ident" or "MedCod" when you key in the name.

The Iris Certificates database contains a small work lot called Test that you can open and use for testing.

3.3 Code entry mode

As mentioned above Iris can be used in two modes: Code Entry mode or Text Entry mode. When using Iris in Code Entry mode you will not enter diagnosis text expressions, but instead you will enter ICD-10-WHO codes corresponding to the text expressions directly. This mode will be particularly useful if a dictionary in your language is not yet available. First create a work lot (see *previous chapter*). Make sure that Code Entry mode is selected by default: In the Tool menu, select the Option item. Then tick the "Code only as default" check box in the Mode menu block:
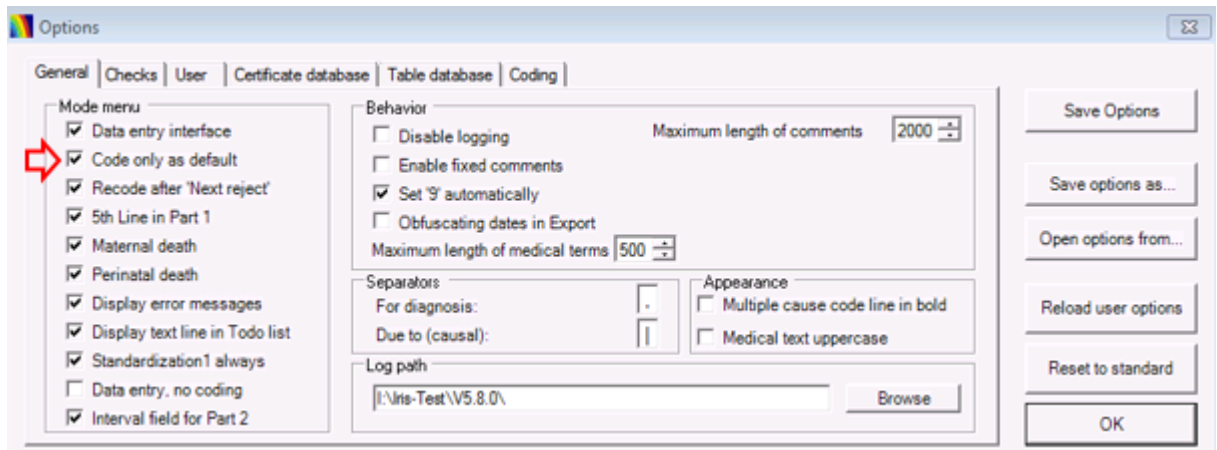
Figure 25 Options screen

When you open the work lot, you will see that the ICD-10-WHO codes text boxes to the right of the screen have a white background and that the 'Code only' check boxes are checked. You can now enter ICD-10-WHO codes in the code text boxes. When you have entered all codes for the record, then select the appropriate Manner of Death and then click "Recode" in the toolbar. If an underlying cause code appears in the text box "Underlying cause" and the Status is set to "Final", then the selection of the underlying cause is completed; or when click the "MUSE" button (or "MUSE" in the Coding menu, or use the hotkey Ctrl + U) instead "Recode" in the toolbar) the MUSE window opens and the selected underlying cause code is marked yellow. When you click on "Select UC" the "Underlying Cause" and the Status is set to "Final", then the selection of the underlying cause is completed. You can now save the record and move on to the next one by clicking on "Save next" in the toolbar (or by using the menu item "Save and next" in the Record menu, or by the hotkey F11).

You have coded your first death certificate.

3.4 Text entry mode

The Text entry mode is usable for the dictionary and the standardisation.

3.4.1 Dictionary

If you wish to use Iris for coding text rather than entering ICD-10-WHO codes, then you will need a dictionary with diagnostic expressions and the corresponding ICD-10-WHO codes. The dictionary is stored in the table "Dictionary" in the Iris Tables database (see Microsoft Access database located in the Iris folder on your computer).

The location of this database can be checked or changed in the Options (see chapter *4.5.10 Options*). All the text expressions on the death certificate that are present in the dictionary table will be coded automatically. An example of dictionary in English is provided, when you install Iris. The diagnostic texts and ICD codes are not up-to-date. You could share dictionaries with users from other countries or you have to develop your own dictionary.

If you want to build your own dictionary, copy an existing one and delete all records. Then enter text expressions in your own language and assign ICD-10-WHO codes to them (see also below chapter *6.1.3 Dictionary*). Enter the text expression in the 'DiagnosisText' field and the corresponding ICD-10-WHO code in the "Icd1" field. You may enter a second ICD-10-WHO code in the "Icd2" field or if necessary a third ICD-10-WHO code in the "Icd3" (main code for the expression should be entered first). Note that this is not an alternative code but should be used if two or three ICD-10-WHO codes are needed to code the expression. If you have to provide alternative codes, enter several records with the same 'DiagnosisText' field and different ICD-10-WHO codes. In this case Iris will display the alternatives and the coder is asked to select one of them.

The "IcdC" field is used for special applications, for example to provide more specific information on the location of ill-defined neoplasms (see *8.2.9 Connected codes and MUSE flags* and *Appendix 3: Connected codes for neoplasms*).

The values in the 'YearStart' and 'YearEnd' fields denote for which data years the code assignment applies. If the ICD-10-WHO code for an expression is changed, then you can include both the old and the new codes in the dictionary with the appropriate values for 'YearStart' and 'YearEnd'. Iris will select the correct code depending on the coding year set in the Options (menu Tools) in the coding tab. This means that the coding year must be greater or equal to the 'YearStart' value and equal or smaller that the 'YearEnd' value.

The 'DateIn' and the 'UserIn' fields must contain a value otherwise the entry will not be taken into account. Use the date of the day and the signature of the person who created the entry. More information on the Dictionary table is given in chapter *6.1.3 Dictionary*.

3.4.2 Standardisation

The text standardisation feature is optional. However, standardisation is very useful since text entry is easier it reduces the size of the dictionary and eventually results in a more powerful system.

In all languages, a single ICD-10-WHO code corresponds to a huge number of different literal expressions. For instance, in French, code I21.9 (Acute myocardial infarction) may be expressed by hundreds of different expressions. In order to restrict the size of the dictionary, and also to achieve a higher success rate when matching new text expressions to the dictionary, it is necessary to control the great variety of language. Therefore, non-standardized expressions should be converted into standard expressions. This can be done manually or automatically. Experienced coders will be able to standardize expressions manually, for example by correcting spelling mistakes or substituting unusual terms with synonyms. It should be stressed that manual standardisation requires substantial experience and a thorough knowledge of the ICD-10-WHO. Automatic standardisation, on the other hand, may require much effort to develop, but will be very efficient since Iris will apply it to all records.

For example, in French there are about 30 synonyms for the word "cancer": néoplasme, néo, K... If the dictionary contains the term "cancer" only and not all synonymous expressions, the cancer part of the dictionary is reduced by 30! To achieve this, the standardisation table just has to map each synonym of the word cancer to cancer.

The language standardisation in Iris is controlled by the five tables Standardisation0, Standardisation1, Separators, TimeIntervals and Standardisation2. If these tables are empty there is no standardisation. For further information please see chapter *6.1.4 Standardisation* and chapter *7. Standardisation in Iris*.

3.5 Time interval and disease status

Time interval is the delay between the onset of a disease and the time of death. The disease status is one of the mentions Acute, Chronic, Congenital or Sequel. Time

interval and disease status may change the coding. For instance "myocardial infarction" is coded to I21.9, but "myocardial infarction 5 years ago" is coded to I25.8.

Physicians sometimes specify a time interval in the diagnostic expression itself (e.g. "infarction 2 years ago") and sometimes in the Time interval column. If several diseases are reported on the same line and there is only one time expression in the Time Interval column, Iris cannot decide whether the stated interval refers to one, several or all of the reported conditions. In this case, how Iris behaves depends on settings in the Options menu. If the "Reject for interval reasons" box is ticked in the Checks tab of the Options window, the record will be rejected and the coder will have to decide to which of the conditions the time interval refers. If the "Reject for interval reasons" box is not ticked, the time interval will be ignored (see also chapter *4.5.10 Options*).

Physicians report time intervals differently: as dates ("infarction on 12/6/2001") or durations ("infarction 4 months ago"). Iris uses a standard notation of time intervals according to the following patterns:

xYears, xMonths, xWeeks, xDays, xHours or xMinutes

Where "x" is the number of units, there should be no blank between the number and the unit. The unit expressions can be translated in the translation file. Once doing that, the translated unit must be used consistently. These time interval expressions can be use directly when you enter text beside the diagnosis text or in the Time interval box. Time interval expressions must be enclosed into parenthesis when entering directly codes. For instance, enter "Myocardial infarction 7Years" using text but enter I2199(7Years) when coding directly. However, if you want to identify the time interval expressions in the text (but not in direct coding), the character "§" can be used if it is defined as the time interval delimiter in the Options (see chapter *4.5.10 Options*).
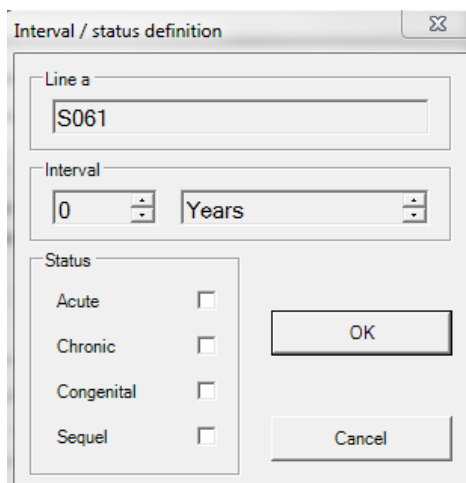
Physicians may also describe diseases with terms such as "acute", "chronic", "late effects of" or "congenital". Iris uses such disease status terms as well to modify the coding. For example, "stroke" is coded to I64, but "late effects of stroke" is coded to I69.4. For disease status, the standard notations are:

Acute, Chronic, Congenital, Sequel

The convention is the same than for Time, status can be entered as such in the text and in the "Time interval" text box or entered between parentheses when coding directly. They are also translatable.

There are two ways to enter standard notations:

- Automatically, by using standardisation. To feed a time interval or disease status into the coding, make sure that the time expression in the Diagnosis text or Time interval field matches one of the expressions in the 'TimeIntervals' table. A set of examples and basic functions for calculation of durations are provided in the 'TimeIntervals' table supplied with the Iris installation set (see also chapter *7.4.6 Time intervals*).
- By translating the physician's expression into standard notation manually. The coder could either type in the standard notation, or call the following window with the hot key Ctrl + T:

Figure 26 Interval / status definition

The Line field shows the line number and the ICD-10-WHO code concerned. The coder can either specify the time elapsed between onset and date of death, or tick a status. All combinations of status and interval are allowed.

3.6 Data entry

By default, Iris allows you to enter and update only the medical data. However, from Iris version 4.4.1 Iris offers two different modes to create or update other individual data.

3.6.1 Default coding

This is the mode used in previous versions of Iris and the standard mode in Iris version 4.4.1. It allows editing of text and code fields but not of fields with demographic data. This mode should be used when the data entry is not done by coders and when registered data are fetched from a mortality database application, coded and then sent back to the mortality database application.

3.6.2 Data entry interface

In the Data entry mode you can enter individual and medical data but coding is not available. This is the most restricted mode and it is intended for use by staff they are not medical coders.

You select this mode by clicking "Data Entry, no coding" on the Options panel (General panel). When you re-start Iris, data can be entered in all certificate fields. In this mode you can also use Iris to create a new work lot: Click Open, type in the name of lot you want to create and then click Create lot. (Currently Iris can create Access, Oracle, MSSQL, PostgreSQL and MySQL lot tables).

In this mode you can edit beyond the individual part, the age of the deceased, provided that a specific field for age is included in the "Ident" table (if you use Iris to create a new work lot, the age field is included automatically). If no age field is available, the field is displayed in grey and is not editable, but will be evaluated from date of birth and death. If you enter the age manually you must also state the unit of the age, otherwise the program will not accept it as a valid age expression. Only the units 'Years' and 'Days' are acceptable at the "Age" field. The whole set of units can only be interpreted by durations. By default, the expressions for unit are in English (for example "Years"), but you can change them to another language in the properties file (see these labels at the properties file: MYears, MMonths, MWeeks, MDays and MHours).

If values for sex and age are not filled in, the certificate will be rejected. However, you can make Iris accept empty fields for date of birth and death and for sex, if you open the "Ident" database and remove Mandatory = Yes for these fields from the table specification.

If you use the Create lot function, Iris prepares a table with the required structure automatically.

To exit the "Data Entry, no coding" mode, click on the Reset to standard button in the Options window.

Please look at chapter *4.5.11 Maintenance* for access to the "Data entry interface".

3.6.3 Coding with demographic fields open for editing

This mode is suitable for situations where medical coders also do the data entry. In this mode all fields are open for editing and coding is also available. You access this mode by selecting the "Data entry interface" as default setting in Tools-Options-General.

3.7 Translating the Iris interface

Iris labels (name of menus, items in menus, name of tools, etc.) and Iris messages can be translated into any language.

The translation file must be Unicode (UTF-8) encoded, otherwise characters that are not used in English (such as é, ö, Š) might disappear or get replaced by other characters on the screen.

Note that space for text is rather restricted in some parts of the Iris screen, and that translations must fit into the space available.

They are properties files for the interface in Czech, English, French, Portuguese and Spanish language (translated by users) available at the Iris website (*Downloads Iris*). If you wish to make your own translation available to other users, please send your translated properties file to the *Iris Institute*.

See also chapter *4.5.9 Translation*, on how to use the translation tool included in Iris from version 4.4.1.

3.8 Translating the label name

Iris shows the label name of the ICD-10-WHO codes in English. It is possible to translate the label in other languages and to change the label name for the emergency codes. Go to the Program Files folder where you installed Iris. Open the

Access database Iris Tables and open the table "ValidIcdCodes". In column Label you will find the labels name. Here you could change the label name to your language.

<u>Please note</u>: Do changes only at the column "Label" in this table.

3.9 Use of Iris by command line

Iris can be called by a command line. The syntax is:

Iris.exe lname=xxxxxx [lname=xxxxxx …] [year=xxxx] [-n] [-r]

- Iris.exe without parameters opens the regular user interface. With the –i (interactive) parameter, Iris opens the first specified lot in interactive mode.
- Lname specifies the work lots you want to process. You can specify one or more work lots.
- Year sets the data year. If the data year is not specified as a parameter, the data year specified in the Options menu is applied.
- Two options available on the interactive form for batch processing can be set as parameters:

  - -n   code certificates with initial status only
  - -r   Recode each line

If you specify more than one lot, all of them will be influenced by these parameters. The defaults for both settings are "false", which means that if these options are not selected all certificates are coded, independently of their status and lines that have been coded already not recoded.

The parameters must be separated by a blank. Whether to use the parameters or not is optional, and you can specify them in any order you prefer. However, at least one work lot must be specified.

For other parameters Iris will use the values set under Options in the interactive interface except the new feature when entire settings file – more precisely its path - can be set as parameter which holds the whole set of values. That makes command line functionality really flexible.

Examples:

- With one work lot:

    o Iris.exe lname=HUN2011BATCH02

- With two work lots:

    o Iris.exe lname=HUN2011TEST03 lname=HUN2011BATCH02

- With two work lots and a coding year specified:

    o Iris.exe lname=HUN2011TEST03 lname=HUN2011BATCH02
    year=2011

- With two work lots of certificates with initial status only:

    o Iris.exe lname=HUN2011TEST03 lname=HUN2011BATCH02–n

- With two work lots and each line recoded on "initial" status certificates:

    o Iris.exe lname=HUN2011TEST03 lname=HUN2011BATCH02–r-n

In command line mode Iris produces return values, which can be used to wrap Iris processing into a Windows batch file and assign various subsequent actions depending on the return value. The return values are:

0	success
2	no records coded
4	MUSE initialization error
5	Table database problem
6	coding failure
7	lot-specific error
8	invalid parameter(s)
9	technical failure or "Iris.exe.config" file is missing

3.10 Two users access the same certificate

Iris detects access conflicts and warns the coder if the record has been changed by another user. This should be avoided, because it can result in data loss. The same warning occurs when using Iris on a write protected database.

4. Menus and tools

Iris provides several menus and tools. Frequently used items are also accessible through hot keys or through the toolbar.

- Hot keys: For instance, you can open a work lot by pressing simultaneously the Control key and the letter O key (Ctrl + O). Available hot keys are listed in the menus to the right of the menu items (see also *Appendix 1: Iris hot keys*).
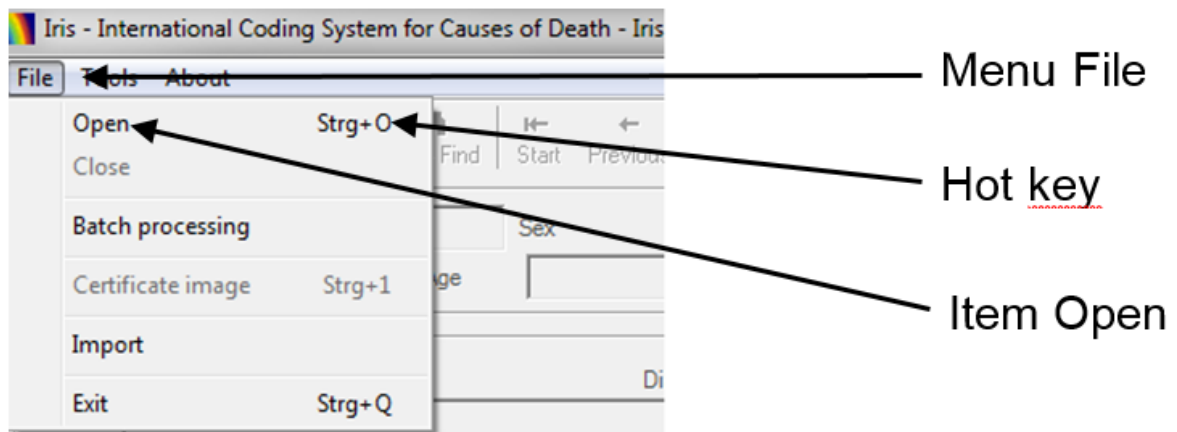
Figure 27 How can I open a work lot?

- Toolbar: Most common actions are accessible through buttons placed in the toolbar under the menu line:
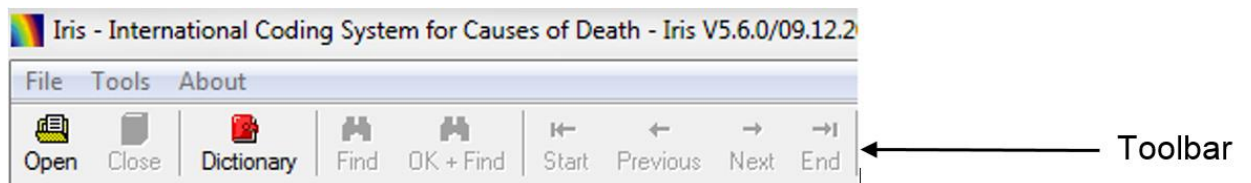
Figure 28 Toolbar at Main interface

When a tool or a menu item is disabled in Iris, it is because the action is not permitted under the present circumstances.

When Iris is launched, only the menus "File", "Tools" and "About" are displayed:
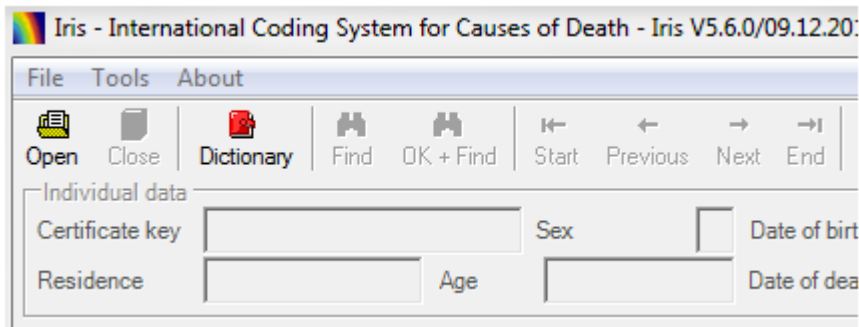
Figure 29 Menus with closed lot

When a lot is opened, the menus "Mode", "Lot" and "Coding" are made available:
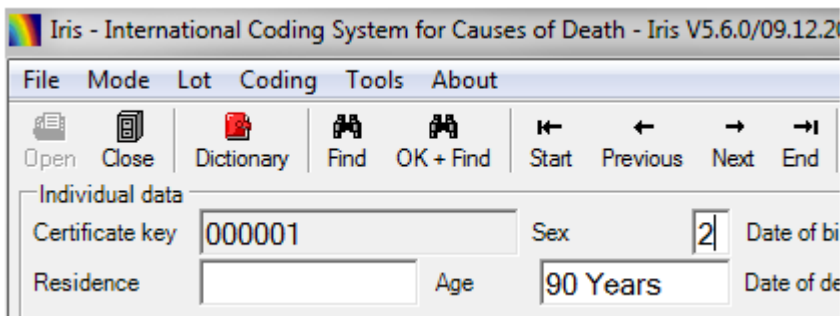
Figure 30 Menus with open lot

The next chapter explains each menu item in detail.

4.1 File menu

When the File menu is opened, it looks as below:
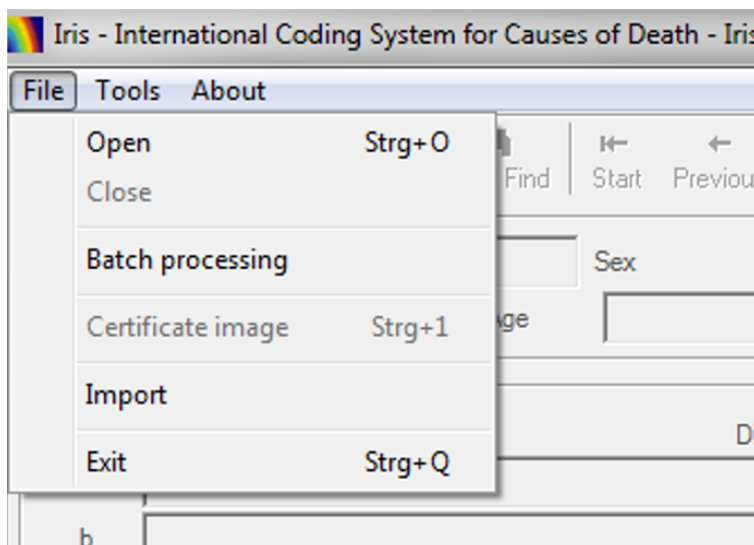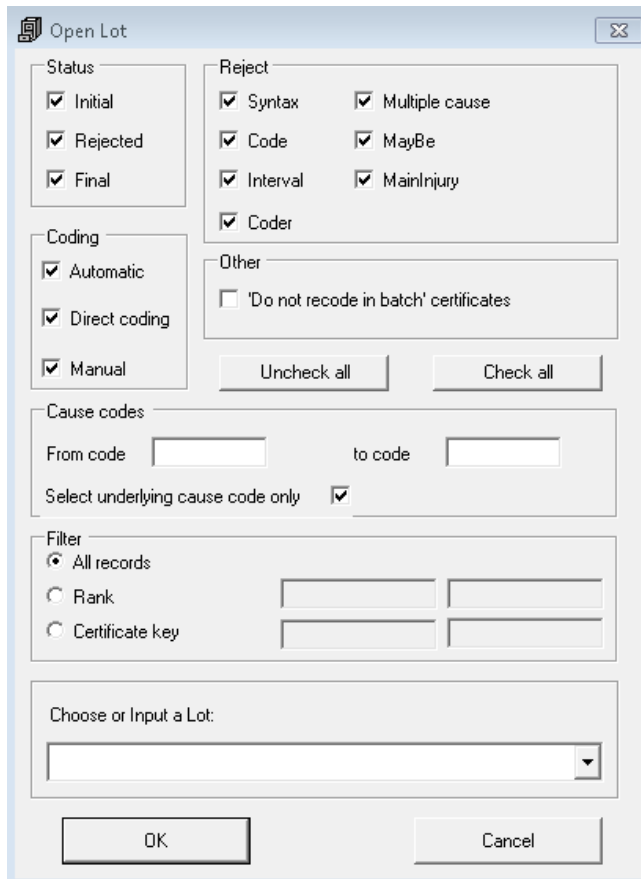
Figure 31 File menu

4.1.1 Open (Ctrl + O)

Click Open or press Ctrl + O to access the Open item. The following window is displayed:

Figure 32 Open lot
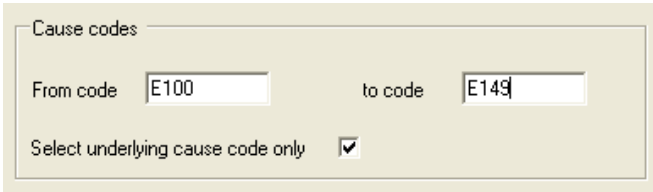
The check boxes in the Status and Reject blocks allow the coder to select subset of records from a selected work lot. This feature is very practical: for instance, the coder can select all records that are not coded by clicking the "Initial" tick box, or rejected records only by clicking the "Rejected" tick box. There is also a possibility to restrict the selection to a specific type of rejects, for example records with text expressions that have not been coded (tick box "Code"), or records where the decision tables or multicausal table processing resulted in an underlying cause that should be verified by the coder (tick box "MayBe").

Another useful feature is the coding mode selection. You can decide to open only the records that have been automatically coded by Iris or manually coded.

It is tedious to press each button separately for all these options. The two buttons "Uncheck all" and "Check all" may help you in this task. Note a sophistication here that may help you to save time. If you click "Uncheck all", all the tick boxes from the Status, Coding and Reject groups will be unchecked. If you want to open all the rejects, click on the Rejected tick box and all the kind of rejects will be selected. However, if you want to select only code rejects, just click the Code tick box: the status Rejected will be checked accordingly but all the others kind of rejects will remain unchecked.

The "Not recoded in batch" check box allows to select the records that have been flagged as such by the coders using the check box located under the underlying cause in Iris main window (see chapter *3.1 Interface*).

"Cause codes" group can be used to select the records according to ICD-10-WHO codes. For instance the following entries tell Iris to consider only the records with diabetes as underlying cause:

Figure 33 'Cause codes' area at the open lot menu

Did the check box "Select underlying cause only" been unchecked, Iris would have taken all records mentioning diabetes anywhere in Part 1 or 2.

The "Chose or Input a lot" drop list shows all the work lots available in the database specified in Options – "Certificate database" tab (see chapter *3.2 Lot preparation* and chapter *4.5.10 Options*). Lot names are presented without the suffix "Ident" or "MedCod": for instance, if you have created a lot called Lot1 with the tables Lot1Ident and Lot1MedCod, only the name Lot1 will appear in the drop list. You can also simply type in the name of the work lot, but without any suffix. For instance, to open the lot "Lot1" which corresponds to the two tables "Lot1Ident" and "Lot1MedCod" in the "Iris Certificates" database, just key in "Lot1" in the open dialog box. Lot names are not case sensitive, and you could type in "lot1" just as well as "Lot1". These two methods can be combined: if you start by typing the beginning of a lot name, Iris opens the

drop list and you can then select the right lot among the lots beginning with the letters you have already typed.

4.1.2 Close

Use the "Close" button to close an open work lot.

4.1.3 Batch processing

Use this command to code an entire work lot, or a subset of it, automatically. When you select batch processing Iris first asks you to open a lot (see chapter *4.1.1 Open (Ctrl + O)*). Next, the window below is shown:
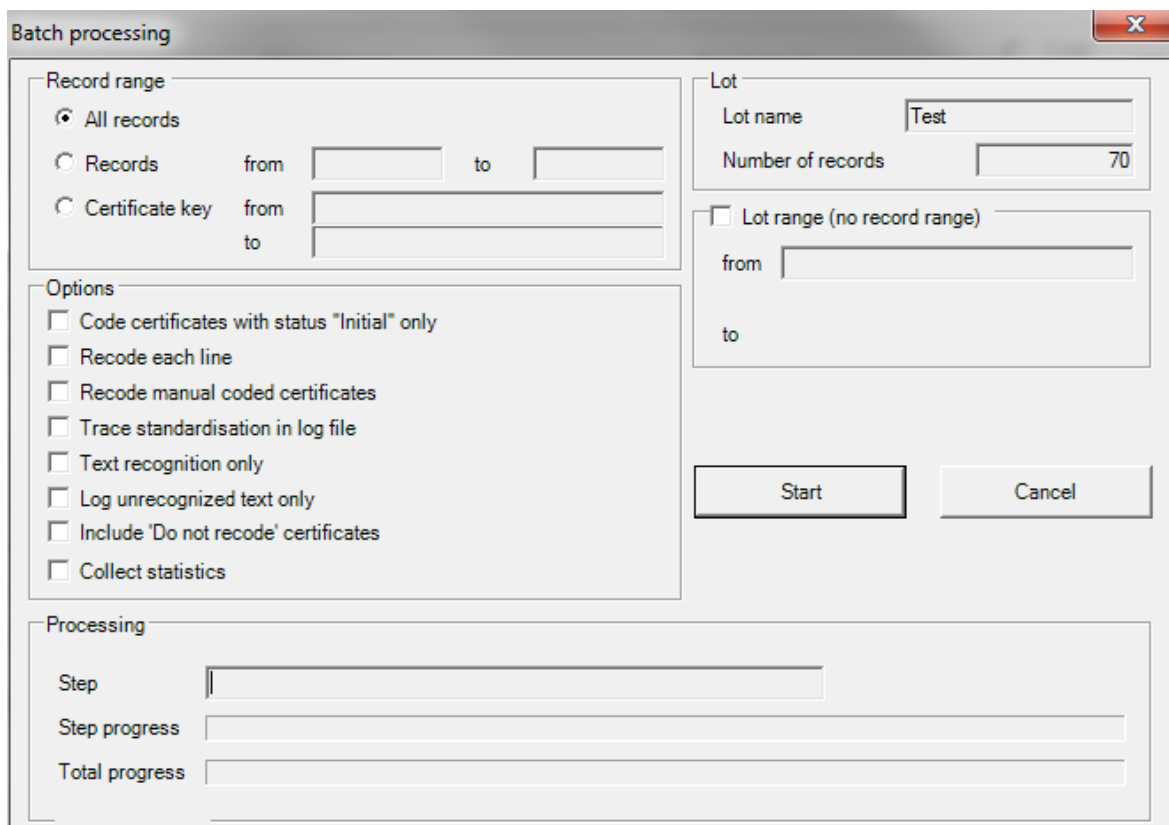
Figure 34 Batch processing screen

This window offers several possibilities to refine the selection of records that will be coded automatically.

Settings

The settings in the Record range block allow you to choose between coding all records in the work lot automatically or just a subset of them. If you decide to code a

subset, you can specify it by either record range number (e.g. records 1 to 500) or by certificate key number (e.g. 20101220_455 to 20101231_612). The default setting is that all records will be coded, so if you want to code a subset you must click either "Record" or "Certificate key" and add values to the "from" and "to" fields.

If you want to code several work lots at the same time, then use the Lot range feature. The first lot in the range is always the lot that you selected on the previous screen. Tick the Lot range box, and then select the last lot of the range from the drop list under Choose or input a lot. Keep in mind that batch processing on a great number of records may take several hours (about 1 hour for 10 000 records, depending on the power of your computer).

To select specific records for coding, check the corresponding boxes in the Options block. By default Iris codes all records in the work lot, except those that have been coded manually already (records tagged "Manual" in the coding block of the main interface, see chapter *3.1 Interface*) and those that have been flagged as "Do not recode in batch processing" in Iris main window (see chapter *3.1 Interface*).

Log file

Iris creates a log file for each batch processing. This log file is placed in the folder specified in Options – 'General' tab (see chapter *4.5.10 Options*).

Please note: If the log file is not shown, it could be that you haven´t the write permission for this folder. Please ask your IT department for the write permission or select another folder where you have these permissions (see chapter *4.5.10 Options*).

The log file is named according to the format "NameOfDatabaseyyyymmddIrisBatch.log" where "yyyy" is the year, "mm" the month and "dd" the day. All batches processed in the same day are included in the same file. By default the log file includes the name of the lot, the records processed, date and time of start and end of the processing. Example:

> Batch processing with lot: Mika3
> Processing of records 1 to 1961
> Start at 10/02/2007 16:05:44
> End at 10/02/2007 16:08:17
> End of batch processing

```
Batch processing lot: tmp
 Processing records 1 to 22
 Start at 24.01.2018 14:27:34

No records in lot: tmp
Batch processing completed

Certificates                          22
  Processed                           21
    Rejected                           0      0,0%
      Syntax                           0      0,0%
      Code                             0      0,0%
      Interval                         0      0,0%
      Multiple cause                   0      0,0%
      MayBe                            0      0,0%
      Coder                            0      0,0%
      MainInjury                       0      0,0%
    Final                             21    100,0%
  Not processed                        1
    Empty                              1
    Closed                             0
    Manual                             0
    Non initial                        0
    'Do not recoded' certificates      0
Terms processed                        0      0,0%
  Icd codes selected                   0      0,0%
  Non-recognized                       0      0,0%
--------------------------------------------------
```

Figure 35 Example of Log file with batch processing only

You may also choose to include a report of all language standardisations performed during the batch processing. If you wish to review the standardisations (which can be useful when you are developing and fine-tuning the language standardisation for your language) tick the box "Trace standardisation in log file". All filters in the standardisation tables that have modified a text string are listed in csv format (fields are separated by semicolons), together with the result of the text string modification. This report can be imported in Excel for further analysis.

```
Batch processing lot: tmpIris
 Processing records 1 to 94
 Start at 24.01.2018 14:47:55
  CertificateKey; LineNb; Table; MainKey; Rank; FilterIn; Text_in; FilterOut or Action Var; Text out
  000002;  5; Standardisation0; 100Status; 0009; \bPul?m?on(ar)?y\b; Metastatic lung cancer, Deep vein thrombosis.,
  000002;  5; Standardisation0; 100Status; 0010; \bPulmo?nary\b; Metastatic lung cancer, Deep vein thrombosis., pulm
  000002;  5; Standardisation1; 020Replace; 0005; \bPulmo(a)?n[ao]ry\b; Metastatic lung cancer, Deep vein thrombosis
  000002;  5; Standardisation1; 100Status; 0014; \bP[a-z]?(l)?u(l)?[ou]?[mn]?[ao]?[mn]?[ae](r)?(y)?\b; Metastatic lu
  000002;  5; Standardisation1; 100Status; 0021; \bm[ae][st](s)?[a-z](t)?(s)?(a)?(t)?s?a?[s]?t?ic\b; Metastatic lung
  000002;  5; Standardisation1; 100Status; 0052; \blu[mn][dg]?(s)?\b; metastatic lung cancer, Deep vein thrombosis.,
  000002;  5; Standardisation1; 100Status; 0081; \bc[ano][an]c?e+[lr]?\b; metastatic lung cancer, Deep vein thrombos
  000002;  5; Standardisation1; 100Status; 0132; \bp[ou](l)?mon(a)?r(a)?y\b; metastatic lung cancer, Deep vein throm
  000002;  5; Standardisation1; 100Status; 0197; \bth(r)?o(r)?mbr?(o)?s[ei]s\b; metastatic lung cancer, Deep vein th
  000002;  5; Standardisation1; 100Status; 0446; \bv[ae]in(s)?\b; metastatic lung cancer, Deep vein thrombosis., pul
  000002;  5; Standardisation1; 201Cancer; 0002; \bcancer\b; metastatic lung cancer, Deep vein thrombosis., pulmonar
  000002;  5; Standardisation1; 500Replace; 0109; \b([a-z]*\s){0,5}\s(emboli|embolus)\b; Deep vein thrombosis., pulm
```

Figure 36 Example of Log file with information of standardisation process

Additional you add the MUSE explanation to the log file. Tick the box "Logging MUSE explanation" at 'Options/User'.

```
Batch processing lot: tmp
 Processing records 1 to 22
 Start at 24.01.2018 14:28:26

000001
01|     |     |START OF SELECTION:
02|  SP1|     |(+) Single cause on certificate
03|     |I351 |Aortic (valve) insufficiency
04|   M1|     |(-) M1 isn't applied
05|   M2|     |(-) M2 isn't applied
06|   M4|     |(-) M4 isn't applied
I351
UC: I351

000002
01|SUBST|     |Considered as rheumatic heart diseases
02|SUBST|     |Considered as rheumatic heart diseases
03|     |     |START OF SELECTION:
04|  SP3|     |(+) I071  causes the other conditions of part 1!
05|     |I071 |Tricuspid insufficiency
06|  SP6|     |(-) Obvious cause of I071 isn't found
07|  SP7|     |(-) I071 isn't illdefined
08|  SP8|     |(-) Condition isn't unlikely to cause death
09|     |     |M1-conflict: I071 can be linked with ICD-10-codes I061[LMC],I051[LMC]
10|   M1|     |(+) Special instruction: I082 replaces I071 and I061 (combination with the first-mentioned condition)
11|     |I082 |Disorders of both aortic and tricuspid valves
12|   M1|     |(+) Special instruction: I083 replaces I082 and I051
13|     |I083 |Combined disorders of mitral, aortic and tricuspid valves
14|   M1|     |(-) M1 isn't applied
15|   M2|     |(-) M2 isn't applied
16|   M3|     |(+) Recheck steps SP6, M1 and M2
17|  SP6|     |(-) Obvious cause of I083 isn't found
18|  SP7|     |(-) Less than 2 causes on certificate!
19|   M1|     |(-) M1 isn't applied
20|   M2|     |(-) M2 isn't applied
21|   M4|     |(-) M4 isn't applied
I061/I051/I071
UC: I083
```

Figure 37 Example of Log file with the MUSE explanation

Batch processing of files with ICD-10-WHO codes only and no text:

The 'MedCod.CodeOnly' must be set to "1", otherwise Iris tries to code the empty text field and returns R99 for all records.

There is no specific program to process batch coding. However Iris can be launched two times on the same machine: one for instance can process a lot in batch while the other can be used to process another lot in interactive mode.

Please note: The two lots must be different, otherwise access conflicts may occur. Using Iris in this way the coders do not lose time for batch processing before they start coding.

Help function for improving standardisation
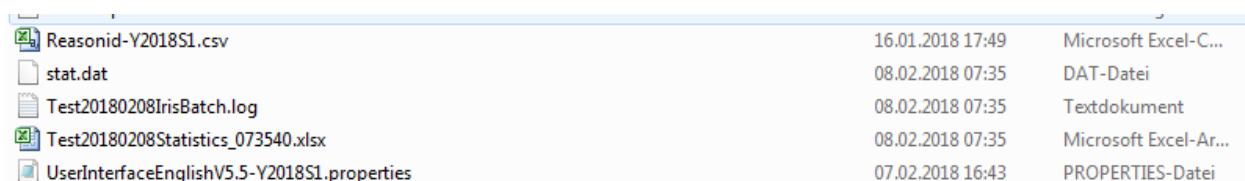
The 'Collect statistics' function counts successful application of Regular Expression entries during batch processing if this option is selected. Therefore to start or continue collecting the statistics it is necessary to switch on "Collect statistics" option at "Batch processing" window before each run, otherwise the batch wouldn't collect it. This provides a customized application of this gathering function.

At first run when "Collect statistics" function is used, a stat.dat file (at the installation folder) will be created which is responsible for the storage of the "historical data" of previous run(s). Every run with which this function is set on, the content of the file

(already collected data) will be read and the actual content will be added to it. An excel file is always created based on the latest content.

This aggregation continues until stat.dat file is available. If it is deleted, collection will start again from the beginning. This is either of the constraints that the file should be deleted manually at this moment.

The other constraint is that it registers and detects valid standardisation matches. If one line of the certificate is already coded it should be recoded and standardized again. Therefore "Recode each line" should be applied for already batched lots otherwise the batch skips the already coded lines.

Reasonid-Y2018S1.csv	16.01.2018 17:49	Microsoft Excel-C...
stat.dat	08.02.2018 07:35	DAT-Datei
Test20180208IrisBatch.log	08.02.2018 07:35	Textdokument
Test20180208Statistics_073540.xlsx	08.02.2018 07:35	Microsoft Excel-Ar...
UserInterfaceEnglishV5.5-Y2018S1.properties	07.02.2018 16:43	PROPERTIES-Datei

Figure 38 Overview about the files at the installation folder

Please note: If the statistics file is not shown it could be that you haven´t the write permission for this folder. Please ask your IT department for the write permission.

4.1.4 Open Image

If your mortality application includes scanned images of the death certificates, you can use this command to display the image. The format can be .bitmap, .jpeg, .gif, .tif or .pdf. The name of the image file must be included in the "Ident" file when you prepare the work lot (see chapter *6.2.1 Identification table (Ident)*, field 'CertImage'). Several images can be displayed. Also, you must specify the path to the image folder in Options (see chapter *4.5.10 Options*).

4.1.5 Import

Import and the corresponding export functions in the Tools menu are very convenient when you wish to exchange death certificates with another user (see chapter *4.5.1 Export death certificate*). The import function is available when no lot is open:
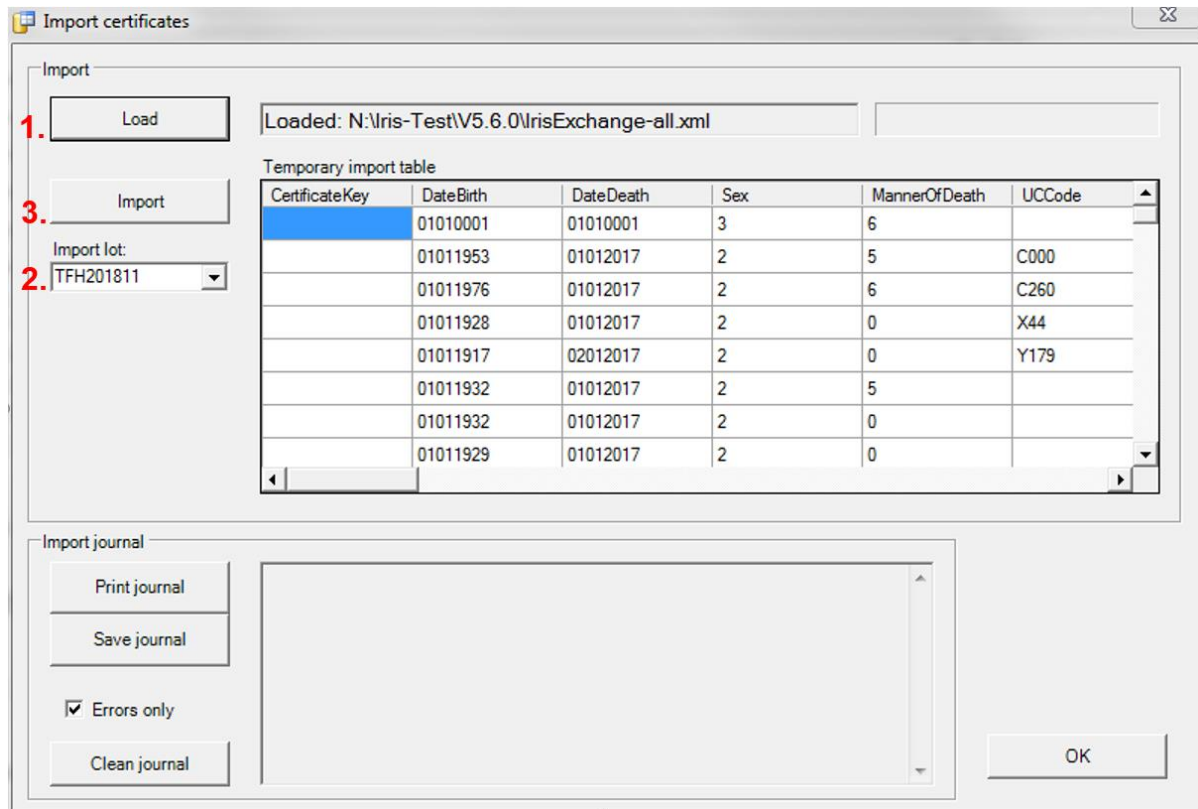
Figure 39 Screen of import certificates

This function has slightly changed compared to the previous versions. Please don't use the temporary import table any more (tmpImport), otherwise the import process became much easier.

Using the Import function you can import records from an xml file generated by the Export function. Click the 'Load' button and locate this xml file (1. Step). Click the 'Import' button (3. Step) to transfer the records from the xml file to an Iris work lot, which could be specified by selecting an existing one, or providing new lot name (2. step). In the former case the records will be added to the already existing records in the lot, in the latter case a new empty lot will be created and the content uploaded.

When the import is finished Iris displays a log of the import, which you can print and save.

When the import is completed, you can open this particular lot and work on it as with other work lots.

4.1.6 Exit (Ctrl + Q)

Use the Exit command to close Iris. If a work lot is open and the current record has been modified, Iris first asks whether you want to save the changes to the record.

4.2 Mode menu

The Mode menu is available only when a lot is open. The following image shows the Mode menu:
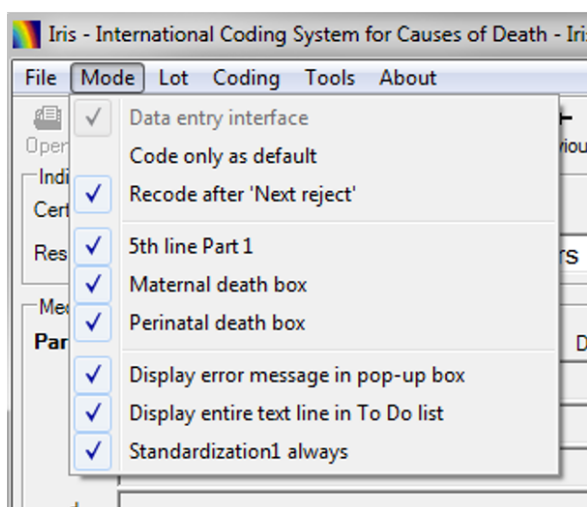
Figure 40 Mode menu

You can set the default value of each menu item in Options - General (see chapter *4.5.10 Options*). If you wish to, you can change them for the current Iris session by using the mode menu. Please note that if you change the mode while working on a certificate lot, the change will take effect when you move to the next record.

4.2.1 Data entry interface

In this mode all fields are open for editing and coding is also available (see chapter *3.6.2 Data entry interface*). This mode is suitable for situations where medical coders also do the data entry. Using this item, the Data entry mode can be set on or off for each record. Use the "Data entry interface" item in the Options to set or unset this mode by default (see chapter *4.5.10 Options*).

Please look at chapter *4.5.11 Maintenance* for access to the "Data entry interface".

4.2.2 Code only as default

In Code entry mode you type in ICD-10-WHO codes corresponding to the diagnostic expressions on the death certificate and not the expressions themselves (see chapter *3.3 Code entry mode*). No dictionary is needed and in the Code entry mode. You can use Iris even if you have not developed a dictionary and language standardisation procedures. The text boxes for cause-of-death texts are shown with a grey background and are read only fields (they cannot be modified). The duration in grey field (in Code only mode) don´t have any impact on the coding.

When the diagnosis text is not empty, the "Code only as default" will not set that line "code only". Explicitly, it's possible (checking the checkbox directly on that given line).

Figure 41 Checkbox for "Code only"

4.2.3 Recode after 'Next reject'

With this setting activated, each time you use 'Next reject' or 'Save next reject' to move to the next rejected record, Iris recodes the new record automatically. This gives you immediate access to the explanations (see chapter *4.4.5 Explain coding*). If the setting is not activated, you must first click Recode or Select in order to generate the explanations.

The setting is useful when you first review certificates that have been rejected during batch processing. If you have reviewed the rejected records already, however, it might be better to inactivate the recode setting. Otherwise, Iris will overwrite the manual coding you may have performed and the work will be lost.

4.2.4 5th line in Part 1

This feature displays a fifth line (line E) in Part 1 of the death certificate. While the international death certificate form has only four lines, it sometimes happens that the physician has used all four lines and that one of them contains an expression similar

to "Cardiovascular disease due to diabetes". The "due to" states a causal relationship, and to capture the relationship "diabetes" has to be moved to the line below "cardiovascular disease". With five lines in Part 1 there will be room to make the necessary adjustments. For example, if "Cardiovascular disease due to diabetes" is written on line D, you can move diabetes from line D to line E.

4.2.5 Maternal death box

If this item is selected, Iris will display the data related to pregnancy in the main window:

Figure 42 Maternal death box at the main interface

This data can be included in the Ident table when the lot is initialized. It can also be defined or updated by the coder at coding time.

4.2.6 Perinatal death box

This item displays perinatal data in the main window for children only:

Figure 43 Perinatal death box at the main interface

4.2.7 Display error message in pop-up box

This setting controls how coding error messages from Iris are displayed. If it is activated, a pop-up box with the error message appears. When you click "OK" in the error message box, the message is moved to the To-Do list box. If the feature is not activated, no pop-up box appears and the error message is displayed in the To-Do list immediately.

Advanced users will probably prefer to inactivate the setting, while pop-up boxes may be useful for coders learning how to use Iris.

4.2.8 Display entire text line in To-Do list

A text line may consist of several diagnostic expressions, and Iris may be able to code some of them but not all. With this setting activated, Iris displays the entire line that could not be fully coded. If it is inactivated, Iris displays only the part it could not code.

4.2.9 Standardisation1 always

If this option is ticked, Iris will always apply standardisation phase 1 (the standardisation steps specified in the Standardisation1 table) to your dictionary searches when using Dictionary tool but there is a much more important consequence of using this option that time interval text will be pre-standardized according to Standardisation1 table before applying to 'TimeInterval' table (see also chapter 7. Standardisation in Iris).

4.3 Lot menu

The lot menu is available only when a lot is open. The following image shows this menu:
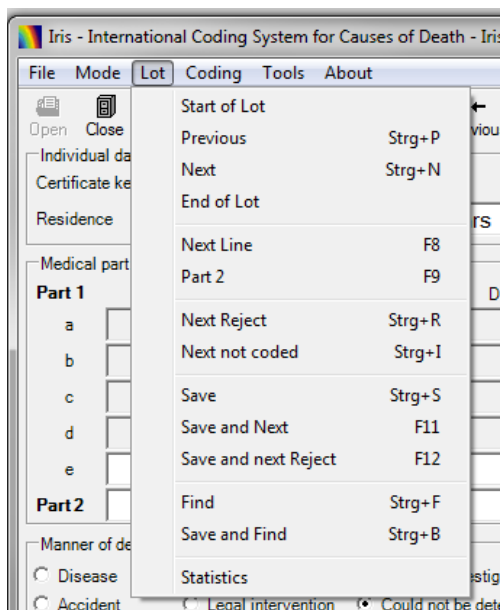
Figure 44 Lot menu

You can move to a specific record in the work lot by using the commands on the Lot menu. Through the Statistics you can generate general statistics on the lot.

4.3.1 Start of lot

The 'Start of lot' command takes you to the first record in the lot. If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.2 Previous (Ctrl + P)

The 'Previous' command takes you to the previous record. If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.3 Next (Ctrl + N)

The 'Next' command takes you to the following record. If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.4 End of Lot

The 'End of lot' command takes you to the last record in the lot. If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.5 Next line (F8)

The 'Next line' command (or pressing F8) moves the cursor to the next line of the death certificate.

4.3.6 Part 2 (F9)

The 'Part 2' command (or pressing F9) moves the cursor to Part 2 of the death certificate.

4.3.7 Next reject (Ctrl + R)

The 'Next reject' command (or pressing Ctrl + R) takes you to the next record in the lot which is rejected for manual review, either during batch processing or in previous interactive coding, and where the coding issue still has not been resolved. If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.8 Next not coded (Ctrl + I)

The 'Next not coded' command (or pressing Ctrl + I) takes you to the next record in the lot which has not been processed by Iris, either during batch processing or in previous interactive coding. If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.9 Save (Ctrl + S)

The 'Save' command (or pressing Ctrl + S) saves the changes you have made to the current death certificate and writes them to the database.

4.3.10 Save and next (F11)

The 'Save and next' command (or pressing F11) saves the changes you have made to the current death certificate and writes them to the database. After saving, it takes you to the next certificate in the work lot.

4.3.11 Save and next reject (F12)

The 'Save and next reject' command (or pressing F12) saves the changes you have made to the current death certificate and writes them to the database. After saving, it takes you to the next rejected certificate in the work lot.

When you review a batch-coded work lot and want to work on the records that Iris could not code but do not want to see the records that Iris did code, this command is very convenient.

4.3.12 Find (Ctrl + F)

Through the 'Find' command you can search for and display a specific record in the work. You can search by either certificate key (the identity in the work lot file), certificate rank (the sequence number), by part of text in the 'Comments' or 'Free text' box or by ICD-10-WHO code.

Figure 45 Search feature

If you want to find the certificate with the certificate key "1000203", just enter "1000203" in the certificate key box. To display the twenty-third death certificate in the lot, enter "23" in the certificate rank box. You can search for records both preceding and following the current record.

You can search for the content of the Comments field using the Certificate comment box. Enter a part of or the complete text. This search is not case sensitive. It is a forward search and Iris will not look for the preceding records including the current one.

The same applies for the ICD-10-WHO code fragment search. Iris will look for the ICD-10-WHO code part in Part 1 and 2. This search doesn't take into account the underlying cause: this must be considered when the underlying cause code is different from every code in Part 1 and 2.
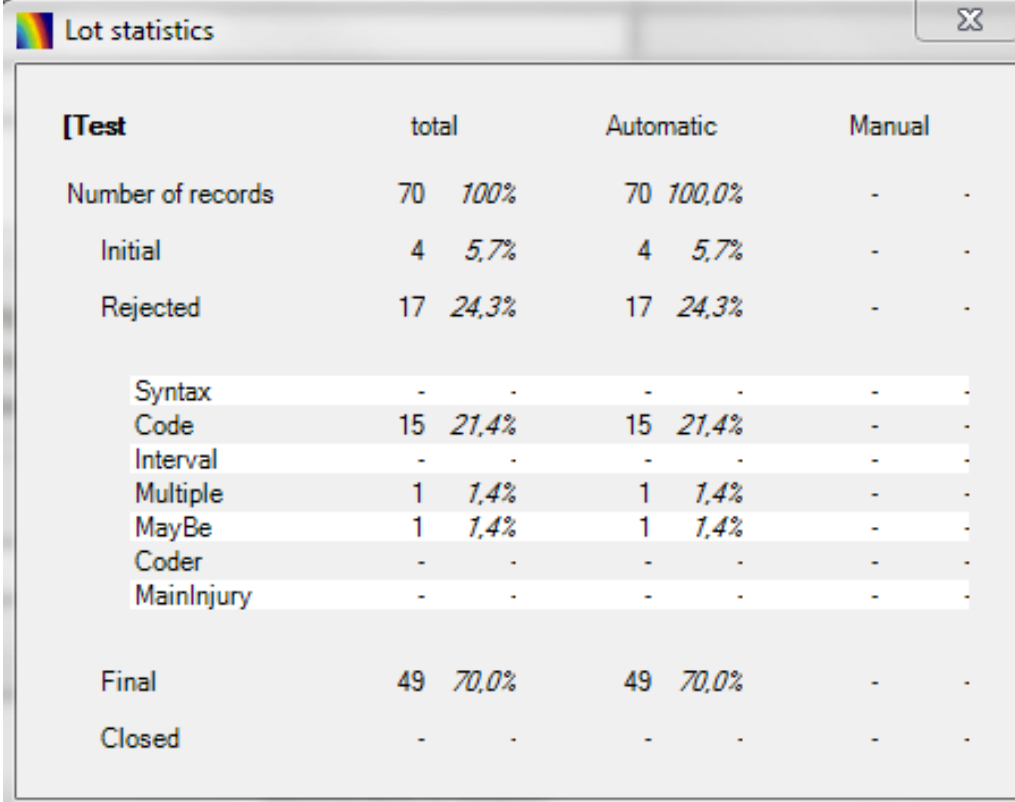
If the record you are leaving has been modified, Iris will first ask if you want to save the changes.

4.3.13 Save and find (Ctrl + B)

The 'Save and find' command (or Ctrl + B) performs the same function as the Find command, but changes you have made to the current record are automatically saved before Iris moves to the new record.

4.3.14 Statistics

The Statistics item displays coding statistics for the current work lot. For instance, the following statistics:

Lot statistics

[Test	total		Automatic		Manual	
Number of records	70	100%	70	100,0%	-	-
Initial	4	5,7%	4	5,7%	-	-
Rejected	17	24,3%	17	24,3%	-	-
Syntax	-	-	-	-	-	-
Code	15	21,4%	15	21,4%	-	-
Interval	-	-	-	-	-	-
Multiple	1	1,4%	1	1,4%	-	-
MayBe	1	1,4%	1	1,4%	-	-
Coder	-	-	-	-	-	-
MainInjury	-	-	-	-	-	-
Final	49	70,0%	49	70,0%	-	-
Closed	-	-	-	-	-	-

Figure 46 Lot statistics

It shows that the lot contains 10 records. 5 records are still in the initial state (not processed), 1 record has been processed but was rejected during processing and 4 records have reached the final state (fully coded). Details on types of rejects and coding are also provided.

4.4 Coding menu

The Coding menu contains all commands used for the coding and selection of underlying cause. This menu as well is available only when a lot is open. The following image shows the Coding menu:
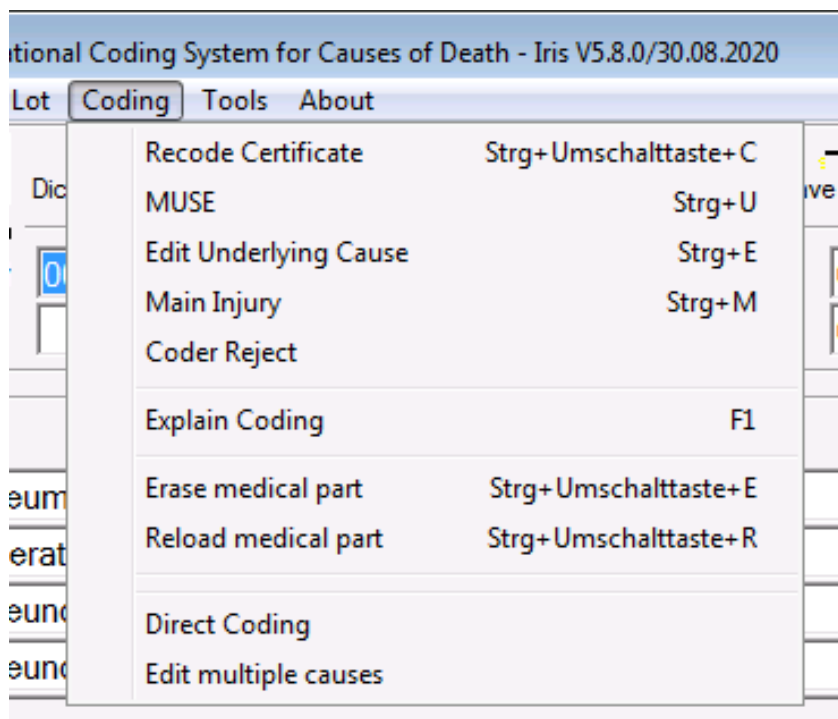
Figure 47 Coding menu

4.4.1 Recode Certificate (Ctrl + Shift + C)

The Recode certificate command (or pressing Ctrl + Shift + C) recodes the death certificate entirely. It first codes all texts in the Diagnosis text fields and then selects the underlying cause.

If Iris is able to identify the underlying cause it is displayed below the ICD-10 code fields. Otherwise Iris changes the record status to "Rejected", and no underlying cause is displayed.

4.4.2 MUSE (former 'Select underlying cause') (Ctrl + U)

Click the "MUSE button" (or "MUSE" in the Coding menu, or use the hotkey Ctrl + U) to open the MUSE explanation window. The underlying cause will recode starting from the displayed ICD-10 codes.

If you work in Code entry mode, or if the Code only boxes to the left of the 'ICD-10 codes' fields are checked, this command selects an underlying cause from the ICD-10-WHO codes in the ICD-10 codes fields. That is, it does not try to code the texts in the Diagnosis text fields. If you do not work in Code entry mode or if the Code

entry check boxes are not ticked, the select underlying cause command works in the same way as the recode certificate command.

If Iris is able to identify the underlying cause it is displayed below the ICD-10 code fields. Otherwise Iris changes the record status to "Rejected", and no underlying cause is displayed.

For settings at MUSE explanation window see chapter *5.2 MUSE explanation window – overview*.

4.4.3 Edit Underlying Cause (Ctrl + E)

The Edit underlying cause command (or pressing Ctrl + E) allows you to change the underlying cause code selected by Iris. The new underlying cause code must be a valid ICD-10-WHO code. The record is then flagged as "Manual", which means that the underlying cause has been selected manually. You can use Edit underlying cause even if no cause of death has been entered on the certificate, for example if you wish to use Iris for recording the underlying cause of death only.

4.4.4 Coder Reject

This command flags the current record as rejected. The type of reject is set to "Coder". This feature allows you to flag record for later review, for example if you want to research a particular item on the certificate, or if you want to refer the record to another coder. If you want to explain why you chose to reject the record, you can enter the explanation in the Comments field.

4.4.5 Explain Coding

Through the Explain command you can access logs and explanations on how Iris coded the current record. <u>Please note</u> that explanations are disabled when the box 'Disable logging' in the Options is ticked (see *4.5.10 Options*). When you open the Explain window the following image is displayed:
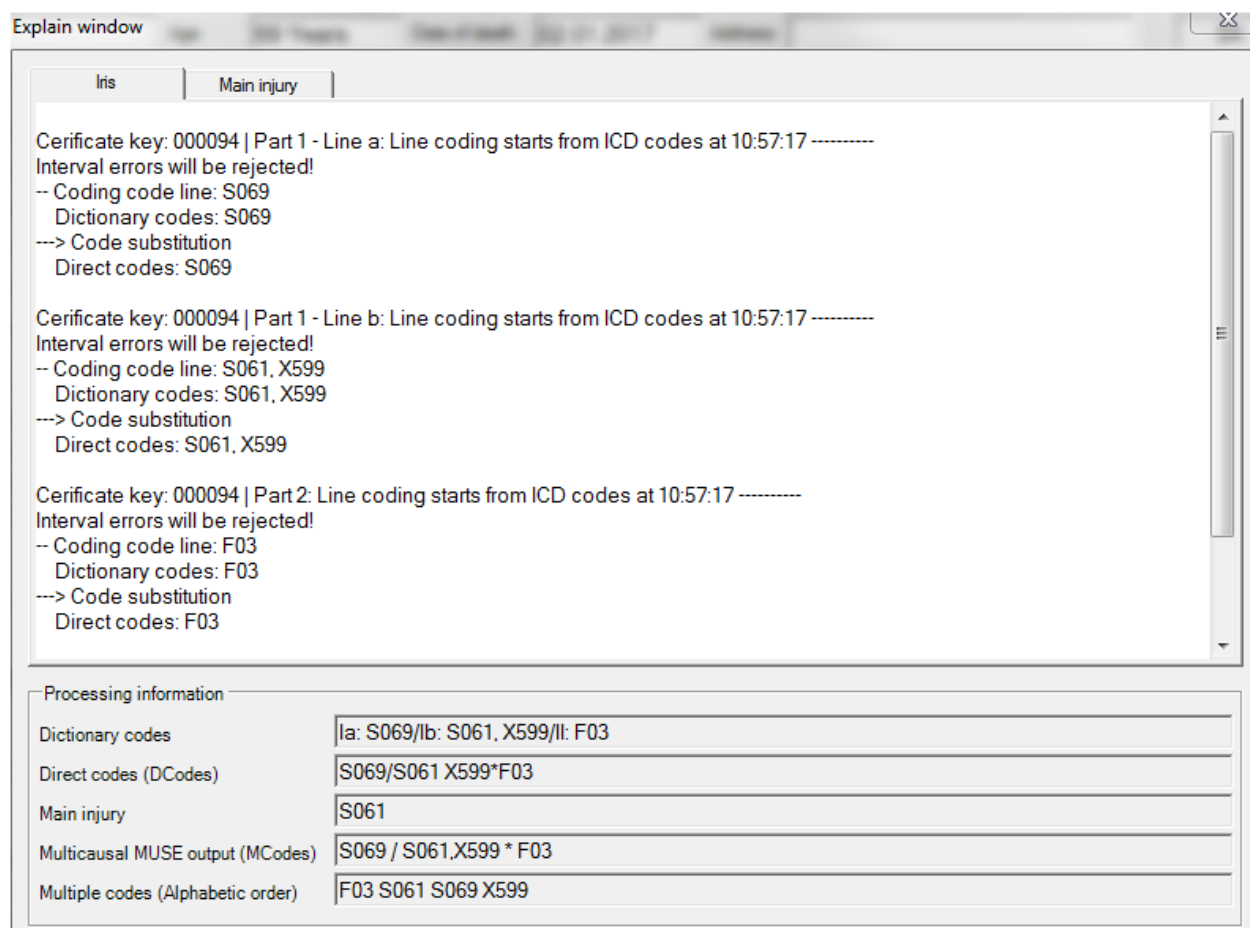
Figure 48 Explain window

The first tab (Iris) contains explanations on the coding process performed in Iris. If you want to copy the content of the tab, select the text you want to copy, right click on it and select the item "Copy" in the drop list. You can then paste the contents can into another document, for example an email or a Word file. The other tab contains the selection of the Main injury (it is shown only by external causes).

The second tab (Main injury) shows the main injury selection process. This tab is only provided if a chapter XX code is provided as underlying cause of death.

At the bottom of the window, the Processing information area shows:

- the ICD-10-WHO codes originally selected by Iris when the text expressions were matched to the dictionary [Selected codes]
- the ICD-10-WHO codes after substitution from the 'IcdSubstitution' table (this table contains only the created codes since version 5, the other entries at the file specMuse (specVxxxxSRxx-Muse.csv.DES), now) [Substituted codes]
- the main injury code is selected when a chapter XX code is provided as underlying cause of death
- the ICD-10-WHO codes produced by specMuse table (contains the rules for multiple cause coding with the multiple cause coding substitutions) [Icd codes (Acme[1] Input)]
- a set of multiple codes to be used for statistical analysis and tabulation [Multiple codes]

4.4.6 Erase medical part (Ctrl + Shift + E)

The Erase medical part command (or pressing Ctrl + Shift + E) deletes all cause-of-death text, ICD-10-WHO codes, time interval information, underlying cause and, if assigned, main injury code. If you erase the medical part Iris changes the status of the current record to "Initial". If you want to reverse this action and restore the deleted information, see next item.

4.4.7 Reload medical part (Ctrl + Shift + R)

If you have deleted or changed an item on the record, or if you have deleted all medical information, you can use the Restore medical part command (or press Ctrl + Shift + R) to bring the certificate back to the state it had when you last saved the record. If you have not saved the record since you opened it, Iris will bring it back to its original state.

4.4.8 Main injury (Ctrl + M)

Some countries always select a main injury code in addition to the underlying cause code when the underlying cause is in Chapter XX. If a main injury code is required in your country, you can force the coder to select a main injury by checking the box Main

---

[1] Automated Classification of Medical Entities

injury required in Options – Checks, Reject handling, Main injury required (see also chapter *4.5.10 Options*). If this setting is activated, Iris will remind the coder to select a main injury if the underlying cause if in Chapter XX. If the coder does not select a main injury before leaving the record, the record will be tagged as "Rejected".

Since Iris version 4.4.1, Iris automatically selects a main injury according to the instructions of ICD-10-WHO (Volume 2).

For the selection, Iris uses the injury priority list from Volume 2 (ICD-10, Volume 2, 7.7 Priority ranking of ICD-10 nature-of-injury codes). For this feature to work, the file injury_rank-Y20xxS1.csv (included in the installation package) must be placed in the same directory as the Iris.exe file. If you use the installation package, the file is placed in the correct folder automatically.

Some of the injury codes (from ICD-10, Volume 2, Appendix 7.7) are also on the trivial list (see ICD-10, Volume 2, Appendix 7.4), therefore we change rank 6 to rank 7 at the injury_rank-Y20xxS1.csv file for these codes. In these cases Iris can handle the rules and examples from chapter 4.2.6 (a) at ICD-10, Volume 2.
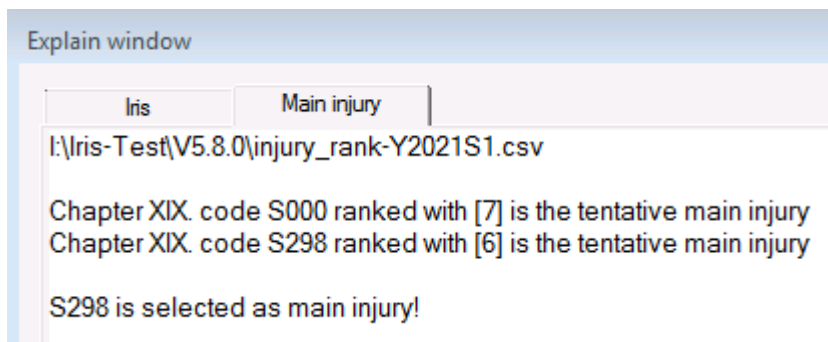
Figure 49 Explain window: Selection of main injury code

If for some reason Iris can´t select a main injury automatically and if Options-Checks is set to "main injury required", then the certificate will be rejected for manual review.

With the new module for selecting main injury automatically it is advisable to check all cases with an external cause as underlying cause of death, at least initially. To force a reject for manual review, make sure that the following record is present in your 'NonConsistentIcdCodes' (NCIC) table:

Table 2 Example of 'NonConsistentIcdCodes' (NCIC) table

Icd	Icd2	InconsFor	UcUse	YearStart	YearEnd	DateIn	UserIn
V010	Y899	U	M	2010	2020	2014-01-01	[name]

If injuries and poisoning appear on the same record, the multiple cause coding component might get into difficulties. In other cases too many of the multiple cause codes are deleted, which again might result in an underlying cause error. For that reason, all records with an underlying cause in Chapter XX that mention both injuries and poisoning are rejected for manual review.

To select manually or to correct the main injury code, use the Main injury command (or press Ctrl + M). The command is available only if the underlying cause is an external cause or poisoning (a code in Chapter XX; V01-Y98). The main injury code must be a valid code in Chapter XIX (S00-T98). All Chapter XIX codes you used when coding the record are displayed and you can choose one of them as the main injury code. You can also type a different code, for example if the main injury is a combination code that is not present among the listed Chapter XIX codes.
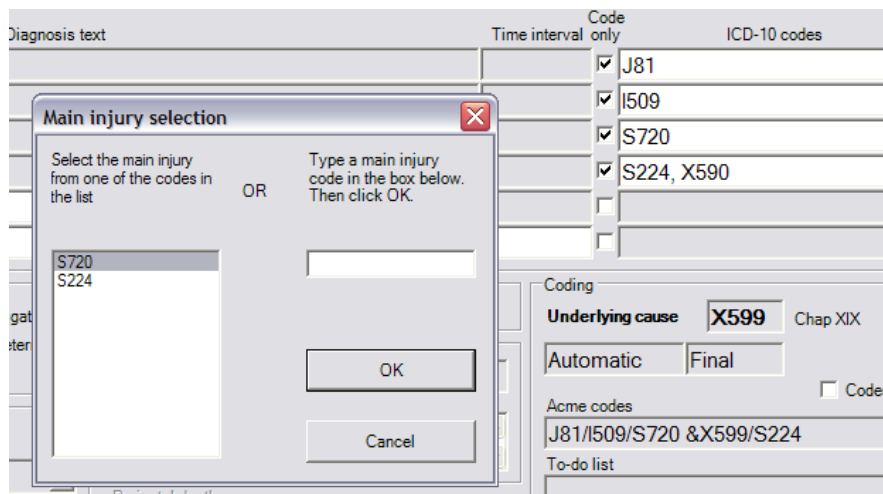
Figure 50 Main injury selection for Chapter XIX code

4.4.9 Edit multiple causes at 'Multiple codes browser'

Likewise clicking the 'MC' button at the Main interface, Iris opens an editing box (Multiple codes browser) for the multiple causes. The codes are arranged in a grid with one line each lines 1a-1e in Part 1 and one line for Part 2. Each line can have a

maximum of eight codes. You can edit the codes and also re-select the underlying cause (to reselect the UC click "Recode" in the browser box).

It is also possible to add or change codes at the 'Multiple cause codes' line (to reselect the UC click 'Recode' button). Please note: The 'Direct coding' window and the 'Multiple codes browser' are put together into the 'Multiple codes browser'.
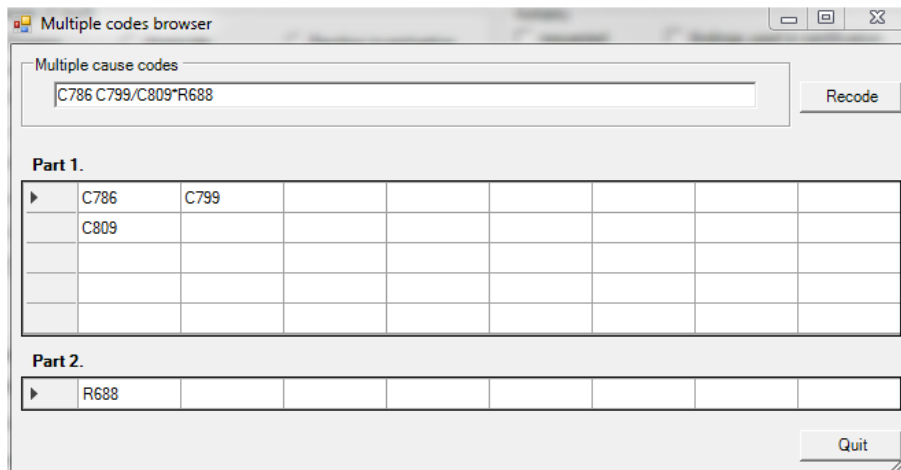
Figure 51 'Multiple codes browser' window with 'MC' button at the Main interface

4.5 Tools menu

The tools menu is only available when a lot is open. It offers some additional functions and also gives access to the Options feature, where you can change the default settings to best fit your requirements.
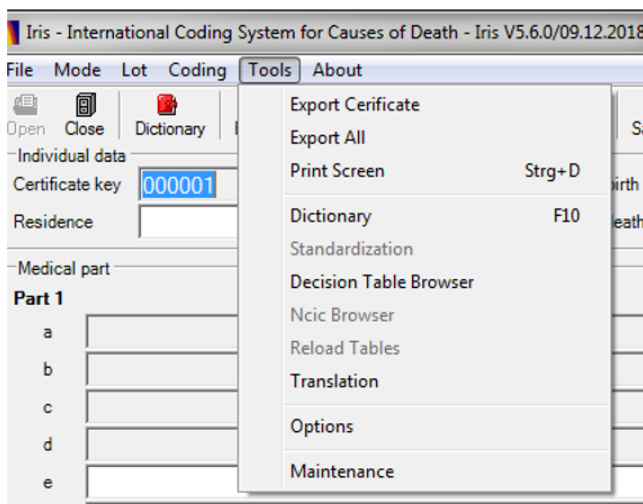
Figure 52 Tools menu

4.5.1 Export death certificate

The Export death certificate command generates an XML version of the current death certificate. It uses the XML schema "IrisExchange.xsd" (provided by Iris at installation time) to create an XML file with the death certificate information, "IrisExchange.xml", located in the folder defined in the log path of the Options (see chapter *4.5.10 Options*, General tab). This is a very convenient function to exchange death certificates with other users, who can then use the corresponding Import function in the File Menu to import the certificate to their computer (see chapter *4.1.5 Import* for a complete explanation of the Import function). However confidentiality aspects should be carefully considered when exchanging death certificates with other people. In particular, individual data such as name should be changed or deleted.

4.5.2 Export All

The Export all feature gives you the possibility to export all records in a work lot to an xml file. If you click Export all, Iris will ask you to state the name of the export file, and of the folder where to place the export file.

4.5.3 Print screen (Ctrl + D)

The Print screen command prints the main window as it is on the screen.

4.5.4 Dictionary tool

There are two versions of the dictionary tool available. The regular version, which is available to all users, permits the user to search the dictionary for a diagnosis text and/or code. In the developer's version, which requires that you enter a password, you can also make changes to the dictionary (for information about the password see *4.5.11 Maintenance*).

4.5.4.1 Regular dictionary tool

You can use the regular dictionary tool to browse the dictionary table. The regular dictionary window looks like the image below:
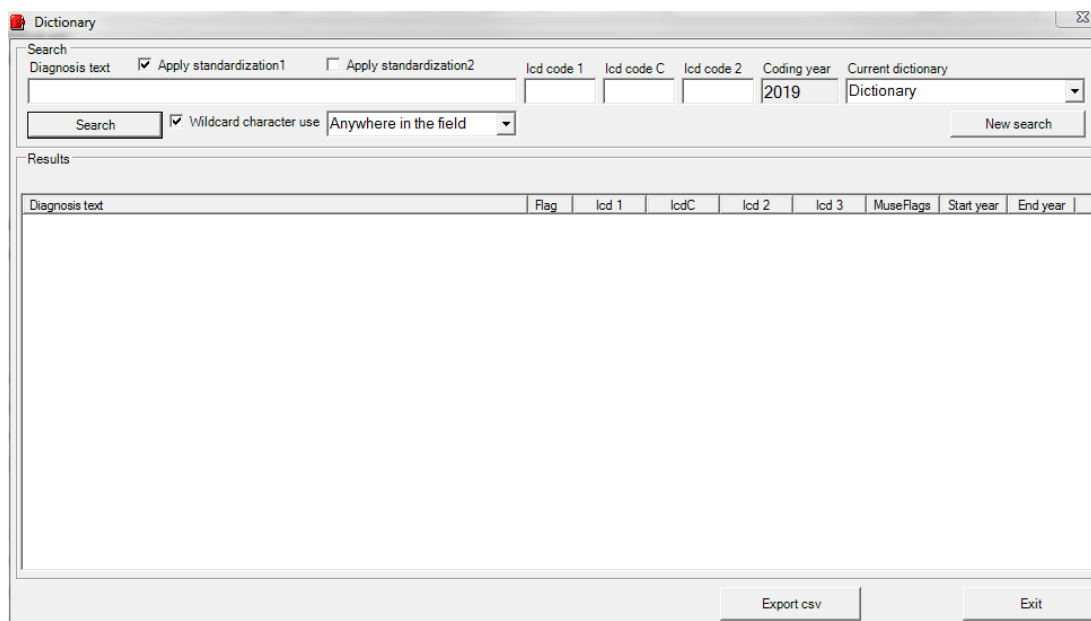
Figure 53 Screen of the regular dictionary tool

The Search block allows you to search in the dictionary for a specific text or ICD-10-WHO code. If you enter a text string in the Diagnosis text box, Iris looks for records with the same text. You can also select a text or a part of text before calling the Dictionary tool. Then the selected text will be copied in the diagnosis text box. The search is not case sensitive.

The list box next to the search button determines how the search is done. With the default option "Anywhere in the field", Iris looks for the string you entered in the Diagnosis text box wherever it is located in the dictionary expressions. For example, if you search for "cancer" and use the "Anywhere in the field option", Iris lists all entries in the dictionary that include the word "cancer". If you use the option "Start of the field", Iris lists all entries starting with the string you entered in the Diagnosis text box (in the previous example all records beginning with "cancer"). Similarly, the option "End of the field" shows you all dictionary entries that end with the string you entered in the Diagnosis text box. Finally, with the last option ("Whole field") Iris lists all entries that match exactly to the string you entered in the Diagnosis text box. So if you choose the "Whole field" setting and search for "cancer", Iris lists only records that contain the word "cancer" and nothing else.

You can use wildcard characters "*" or "?". The character "*" stands for any characters and "?" for one character. Compared to the previous research options,

wildcards allow to search on several separated words. For instance "Infarction*acute*" will search for all expressions starting with the word "infarction", followed by any words and including the mention "acute" followed again by any words. Wildcard characters can be combined with any of the search options. But please be careful when using wildcards with „Standardisation1" switched on as the latter option could replace wildcard characters according to the standardisation policy.

When the Standardisation1 check box is checked (default), Iris first applies the standardisation rules specified in the Standardisation1 table to the text you entered in the Diagnosis text box and then performs the search.

When the Standardisation2 check box is switched on, Iris first applies the standardisation rules specified in the Standardisation2 table to the text you entered in the Diagnosis text box and then performs the search.

You can also search for expressions coded to a specific ICD-10-WHO code. To do that, leave the Diagnosis text box empty, and enter the ICD-10-WHO code in the ICD-10-WHO code box. For instance, if you enter I219 (acute myocardial infarction) in the ICD-10-WHO code 1 box, Iris lists all expressions in the dictionary with the code I219.

You can mix text and code in the same search. For instance, if you enter "Infarction" in the Diagnosis text box and "I219" in the "Icd code 1 box", Iris lists all entries that both have the code I219 and that also include the word "infarction" in the diagnosis text.

Coding Year shows you the coding year specified in the options (see chapter *4.5.10 Options*, Coding tab). When you search the dictionary, Iris only scans entries valid for the data year you have specified in the Options setting.

The Current dictionary drop list, which allows you to choose between different dictionaries, is not available in all versions of Iris.

Press the New search button if you want to empty all fields and start a new search.

All dictionary records that match your search are shown in the Result block. If you want to copy a text or a code to the main screen, just double click the entry selected in the result block. The entry will then be copied in the Iris main window at the place

where the cursor was and commas will be inserted before and after the expression if needed. With the Export csv button, you can export all the entries found in the result block to a csv file that can be processed in Excel.

To transfer text and codes from the dictionary to the certificate, place the curser in the text or code field on the main screen where you would like to insert a text or ICD-10-WHO code fetched from the dictionary. Then open the dictionary, find the appropriate text or code and double-click it. If the curser was placed in any of the text fields Iris will copy the dictionary term and insert it at the place of the curser. If the curser was placed in the ICD-10-WHO codes field Iris will copy and insert the ICD-10-WHO codes.

An example of dictionary in English is provided, when you install Iris. The diagnostic texts and ICD codes are not up-to-date. Perhaps, you could share dictionaries with users from other countries or you have to develop your own dictionary.

4.5.4.2 Developer dictionary tool

If you have opened the developer version of the dictionary tool (see chapter *4.5.11 Maintenance*), you also have access to functions for updating and editing the dictionary. The interface is as follow:
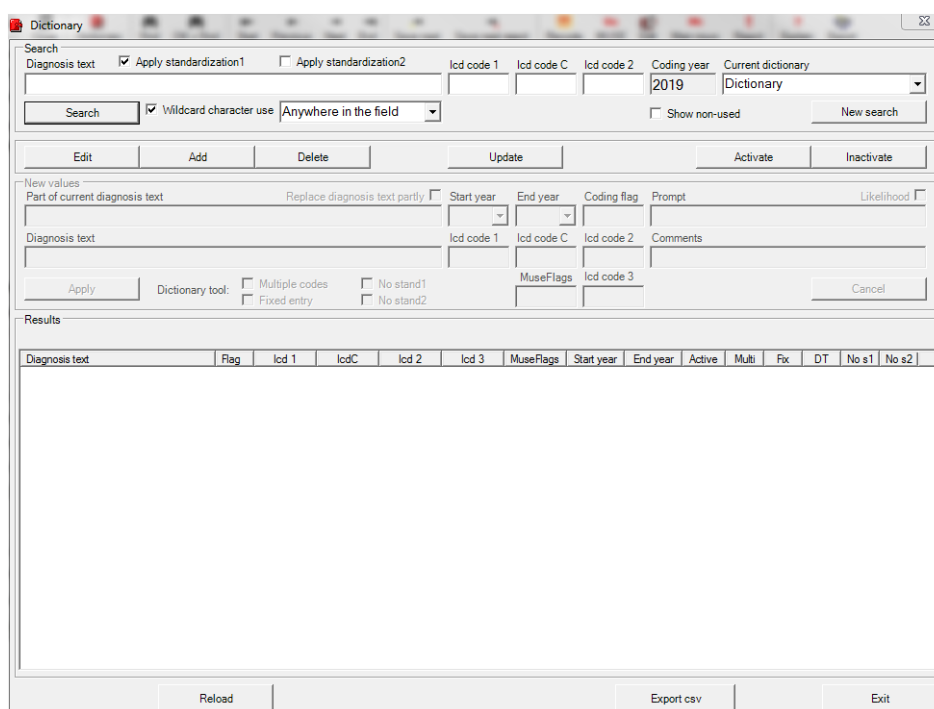
Figure 54 Screen of the developer dictionary tool

The Search part is the same as for the regular dictionary tool (see *previous chapter*). However, if the "Show non-used" check box is ticked searches will also include records that are not flagged as active or do not cover the current data year. Note that if you change this check box Iris will reload the dictionary into memory, which may take some time. Click only once and wait for a short while. With a big dictionary, it usually takes Iris 10 to 20 seconds to reload the dictionary.

New values block

Use this part of the interface to enter new records to the dictionary. How to add a record is explained below together with the edit and update features.

Figure 55 Screen for "New values"

Results block

Figure 56 Screen of the results

The Results block shows the records found according to the search criteria. You can select an individual record by clicking anywhere on the line. You can select a block of lines by clicking on the first (or last) line and then clicking again on the last (first) line

while pressing the shift key. You can select lines lying apart by clicking on each line while pressing the control (Ctrl) key.

Use the Reload button if you need to load the dictionary into memory again, for example if you have made changes to the dictionary and want to use the new records when coding the current work lot. Use the Exit button to close the dictionary tool.

Editing the dictionary

You can edit, delete or add records by using the Edit, Delete, Update, Activate and Inactivate buttons. If you want to change existing records, first perform a search (see above) so that the records you want to change are displayed in the Results block. Note that only highlighted records are affected and that you can change the selection (see *Results block* above in this chapter).

Edit button

If you click the edit button you can change certain values of a single record. If several records are highlighted as selected, only the first will be modified. Enter the new values you want to assign to the record in the appropriate boxes in the "New value" block. Once you have entered the new values, click the Edit button in the "New value" block (just below the Diagnosis text field) and Iris updates the record. If you do not want to enter the changes, just click the Cancel button. As soon as Iris has updated the record, it will also perform a new search based on the selection criteria in the Search block. The update may have had the effect that no records in the dictionary match the search criteria anymore. If so, the message "No result for this search!" is displayed.

Add button
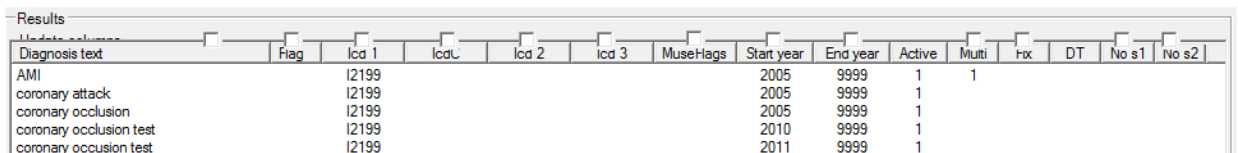
You can add a new entry to the dictionary by pressing the Add button. The New values block opens up, and you can enter diagnosis text, ICD-10-WHO codes and other values for the new dictionary record. Once you have entered the new values, click on the Add button in the new values are to update the dictionary with the new record. Otherwise click the Cancel button.

Delete button

This button removes the selected entries from the dictionary. A warning message is displayed before Iris deletes the records.

Update button

The Update button is similar to the Edit button but updates can be used to change more than one record at the same time. First, select the records you want to change. Next, tick the columns you want to edit (to the right of Update columns at the top of the Results block). In the example below, the user has ticked the start and end year values and these two variables can now be changed.

Diagnosis text	Flag	Icd 1	IcdC	Icd 2	Icd 3	MuseHags	Start year	End year	Active	Multi	Hx	DT	No s1	No s2
AMI		I2199					2005	9999	1	1				
coronary attack		I2199					2005	9999	1					
coronary occlusion		I2199					2005	9999	1					
coronary occlusion test		I2199					2010	9999	1					
coronary occusion test		I2199					2011	9999	1					

Figure 57 Screen of results with Update columns

Now enter the values you want to assign in the appropriate boxes in the "New value" block. Finally click the Update button in the "New value" block, and Iris updates the selected records. Otherwise click on the Cancel button.

You can update part of diagnosis texts using the "Replace diagnosis partly" check box. If you check this item and enter a text in the 'Part of current diagnosis text' box, this and only this text will be replaced in the selected lines.

As soon as Iris has updated the record, it will also perform a new search based on the selection criteria in the Search block. The update may have had the effect that no records in the dictionary match the search criteria anymore. If so, the message "No result for this search!" is displayed.

Activate button

For dictionary searches, Iris scans dictionary records that have a "1" flag in the Active field and that have a start year and end year that cover the current data year. If an entry does not have the "1" flag in the Active field, you can assign a "1" flag by clicking the Activate button.

Inactivate button

This button inactivates the selected entries. Inactivated entries will not appear in future searches unless the "Show non-used box" in the Search block is ticked.

For a more detailed description of the dictionary variables, please see chapter *6.1.3 Dictionary*.

4.5.5 Standardisation

If you have opened the developer's version of the dictionary tool (see chapter *4.5.11 Maintenance*), you also have access to the standardisation tool. It allows you to test the standardisation filters, to search and to update the standardisation tables. The window of the standardisation tool is shown below:

Figure 58 Screen of standardisation tool (with marked "Main key")

The Standardisation tool window is divided into several main blocks.

Search block

Use the Search block to select the standardisation table you want to work on. Select one of the standardisation tables through the Table drop list. You can then use the Main key drop list to show either the full table or just a part of it. If you want to see just a part, select one of the main keys in the drop list and Iris displays the records with that main key value.

If you tick the "Show unused" check box, inactivated entries and entries that do not belong to the coding year are also displayed. If you ticked or not ticked this check box Iris reloads the standardisation tables, which may take some time. Click once and then wait for a few seconds till Iris has loaded the standardisation tables into memory.

Function buttons

The function buttons – Delete, Activate, Inactivate, Update and Create dictionary – are explained below.

New values and testing block

You will use the new values and testing block to test and add new Regular Expressions (RegEx), and to edit expressions that are already present in the tables. The buttons and functions in this block are explained below. You will find additional information about RegEx at chapter 7. (Standardisation in Iris) and at the "Tutorial Regular Expressions" at *Downloads Iris*.

Result list

The Results list shows the entries you selected in the Search group by specifying a table name, and (optionally) a main key. You can select an individual record by clicking anywhere on the line. You can select a block of lines by clicking on the first (or last) line and then clicking again on the last (first) line while pressing the shift key. You can select lines lying apart by clicking on each line while pressing the control (Ctrl) key.

The Reload button at the bottom of the Standardisation window loads the standardisation tables into memory. The Exit button closes the Standardisation tool.

Use the buttons and functions described below to update, modify and test the standardisation tables.

Delete button

If you click this button the selected entry (or entries) will be deleted. Iris asks you to confirm the deletion before actually removing the records from the table.

Activate button

When Iris searches the table entries, it scans dictionary records that have a "1" flag in the Active field and that have a start year and end year that cover the current data year. If an entry does not have the "1" flag in the Active field, you can assign a "1" flag by clicking the Activate button.
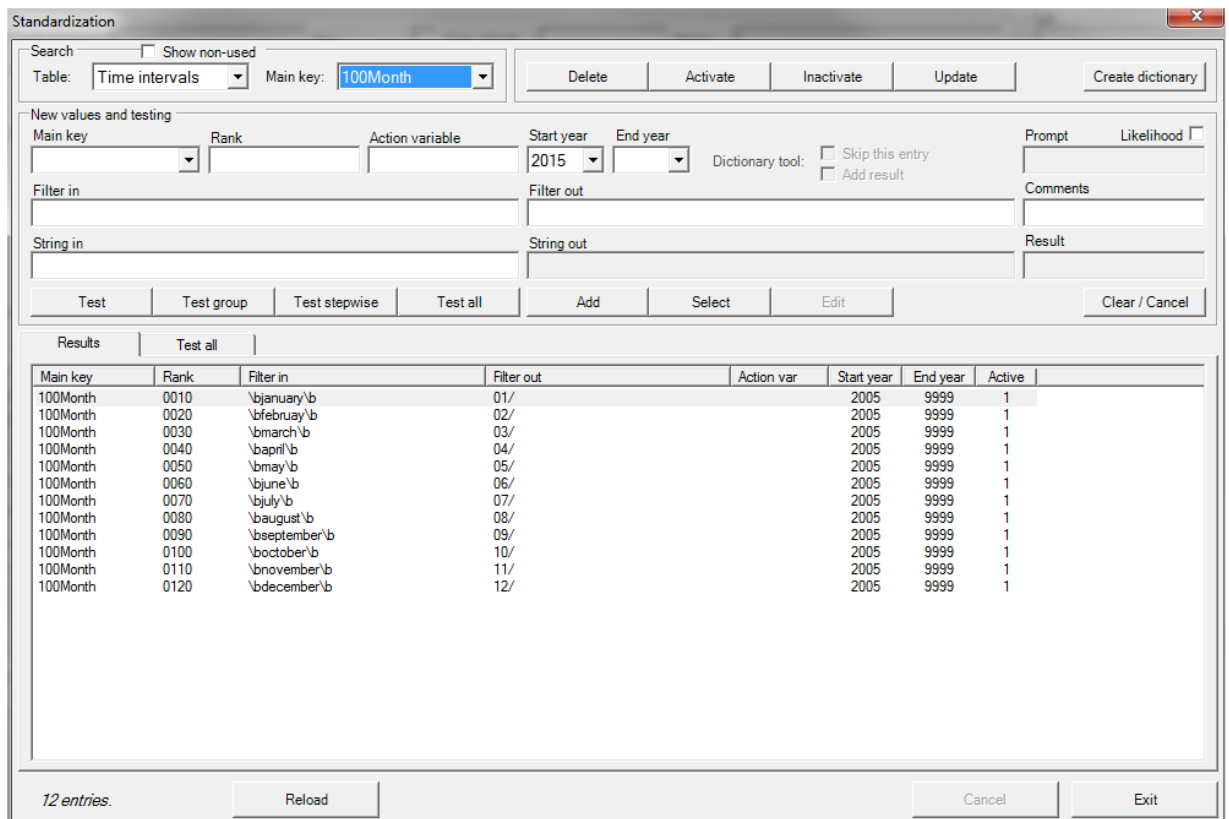
Inactivate button

This button inactivates the selected entries. Inactivated entries will not appear in future searches unless the "Show non-used box" in the Search block is ticked. Also, the deactivated entries will not be taken into account in the standardisation process.

Update button

By using the Update button you can modify several entries at the same time. However, you can only modify the variables 'Action Var', 'Start year', 'End year', 'No DT' and 'In DT' through the Update command. First select the entries you want to update in the Result list, and then click on the Update button. Next, tick the columns you want to edit (to the right of Update columns at the top of the Results block). Now enter the values you want to assign in the appropriate boxes in the "New values and testing" block. Finally click the Update button in the Search block, and Iris updates the selected records. Otherwise click on the Cancel button. In the example below, the user has ticked the 'Start year' and 'End year' variables and these two variables will be changed to 2011 and 2020 respectively.
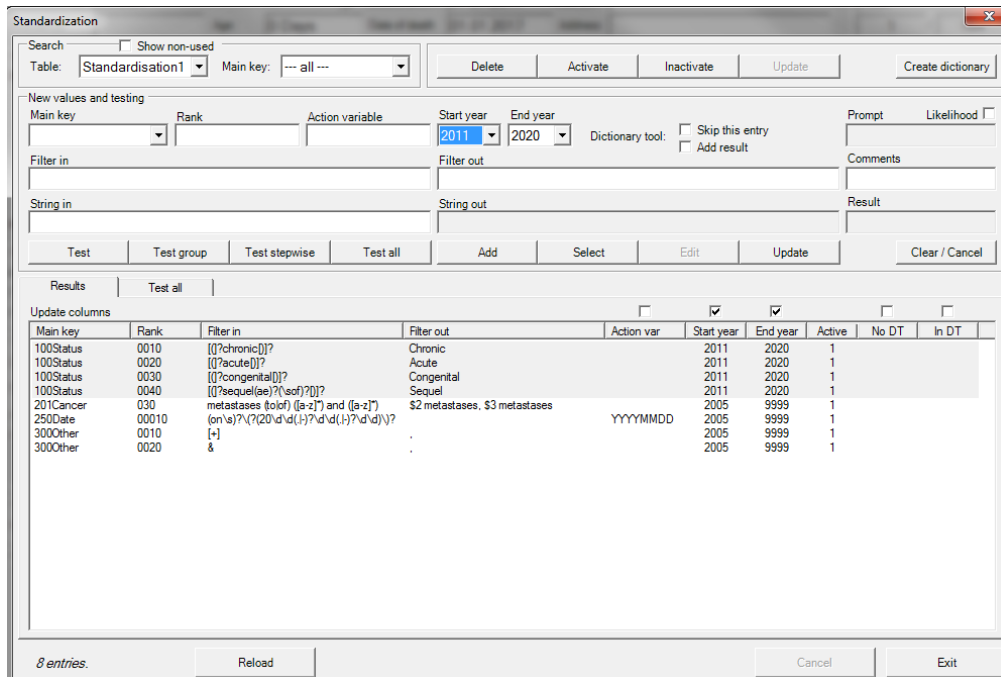
Figure 59 Screen of standardisation tool (with marked 'Start year and End year')

Create dictionary button

For future use.

The following test buttons are very useful when you want to check or create standardisation rules. You can test standardisation on any input string you like, and you can choose between testing a single standardisation rule, a group of rules or all standardisation procedures.

Test button

If you want to test an expression, first enter a Filter in and a Filter out in the "New values and testing" block. You can either select the filters from the Results list by double-clicking one of the records (Iris copies the values from the Results list to the testing block), or you can write the new filters yourself. To test, enter an expression in the String in field and click on the Test button. Iris now applies the filter to the text string and displays the output in the String out field. The Result field is changed to "Success!!" if filter matched the expression in the String in field. If the filter did not match, the 'Result' field is changed to "Failure!".

You can use Filter in and Filter out to change and correct a rule. Once the rule works correctly you can add it to the Standardisation table. To do so, enter values for main

key and rank, and then click the Add button. Make sure that you use a main key and rank that are not present in the standardisation table already. If you tested and modified a rule that was already present in the standardisation table, just click the Edit button to update the standardisation table.

Test group button

If you click Test group, Iris applies all filters in the Results list to the expression in the String in field. Iris displays the end product of the standardisation in the String out field. Further, the number of rules that were successfully applied and the total number of rules in the list are shown in the Result field.

Test stepwise button

The Test stepwise button works in the same way as the Test group button, but here Iris applies the filters one by one. Each time you click Test stepwise, Iris moves to the next filter and tries to apply it. The Result box shows for each line whether the filter matched to the text string or not.

Test all button

By pressing the "Test all button", you can make Iris apply all filters in all standardisation tables to the expression in the String in field. The number of rules that were successfully applied and the total number of rules in the list are shown in the Result field. If you want to see which filters Iris applied, click the Test all tab on the Result list. Iris now shows a full log of the standardisation procedure. The log states table name, key and rank of all filters that applied and show the input string, the Regular Expression involved and the output string for each step. This feature is particularly useful if you are developing complex standardisation strategies where the end result is dependent on rules in more than one standardisation table.

Add button

Use this button to add a new rule to the standardisation table and specified in the search area. State the main key name and a rank in the new values and testing block. Please note that the main key-rank combination must be different from the main key-rank combinations already present in the standardisation table.

Edit button

If you have modified a rule fetched from the Result list and are satisfied that it works correctly, you can write the corrected version back to the standardisation table by clicking the Edit button (in the new values and testing block).

Clear/cancel button

The Clear/Cancel button clears all values displayed in the "New values and testing" block.

4.5.6 Decision table browser (DTB)

This tool is very useful for experimented coders and teachers. It permits to browse the unicausal decision tables (DT) used for the selection of the underlying cause of death. The following example shows all the relationships using the Anchor code I64.

Figure 60 Screenshot of decision table browser

For the decision tables experts, the use of this tool and the results are self-explaining. The search works with wild characters at the Anchor code and Subcode field. For example if you enter "N" at the Anchor code field, the result will give you all code from chapter XIV (N000-N999). The search works without the dot between the third and fourth digit.

It is also possible to create printable version of the underlying decision tables in pdf format by clicking „Printable" button and selecting the directory. The system creates two printing ready documents in a human readable, structured format (as PDF files; they are named TABA and TABB). You can select between the "Classical order" (like as the *NCHS manual 2c* – sorted by subcode) and the "Original order" (as provided in previous Iris versions – sorted at first by rule type and then by subcode). Page number; Year/Version, Kind of tables (TABA or TABB) are denoted in the printed version of the decision tables. TABA includes the causal relationships and TABB the modifications.

You could also export the search result to an excel file by clicking "Export".

The Reasonid-YxxxxSx.csv file contains the 'Maybe' explanations and the file is available in the main directory. The browser match 'Maybe' entries with their explanations, only for modification rules. If a particular explanation is not available, a plain 'M' or 'Undefined Reason' will appear to indicate a maybe relationship.

Table 3 Explanation about unicausal rule types of ACME and decision tables (DT)

DT rule type	Description
DUETO	When one code (anchor code) is due to another code (subcode).
DS	Direct Sequel When the tentative starting point is considered a direct sequel of another condition on the certificate in Part 1 (must be on same or lower line as tentative underlying cause) or Part 2, and the code for the other condition is preferred over the code for the tentative underlying cause.
DSC	Direct Sequel with Combination When the tentative starting point is considered a direct sequel of another condition on the certificate in Part 1 (must be on same or lower line as tentative underlying cause) or Part 2, and the codes for the tentative underlying cause and the other condition combine into a third code.
ID	Ill-defined condition Provide the list of ill-defined conditions.

DT rule type	Description
IDDC	Ill-defined in Due to with Combination When the tentative starting point is an ill-defined condition in the due to position to another condition, and the codes for the tentative starting point and the other condition combine into a third code.
IDMC	Ill-defined with mention with combination When the tentative starting point is an ill-defined condition and is reported with mention of another condition on the certificate, and the codes for the tentative starting point and the other condition combine into a third code. (This rule is only available in Iris version 5, not in Iris version 4).
[SENMC]	Senility with mention with combination When the tentative starting point is senility (R54), and is reported with mention of another condition on the certificate, and the codes for the tentative starting point and the other condition combine into a third code. (This rule is no longer used in Iris version 5, it is replaced by IDMC).
[SENDC]	Senility in Due to with combination When the tentative starting point is senility (R54) and is reported in a due to position to another condition and the codes for the tentative starting point and the other condition combine into a third code. (This rule is no longer used in Iris version 5, it is replaced by IDDC).
TRIV	Trivial Condition Provide the list of conditions unlikely to cause death.
LMP	Linkage with Mention with Preference When the tentative underlying cause is reported with mention of another condition, in Part 1 or Part 2 of the certificate, and the code for the other condition is preferred over the code for the tentative underlying cause.
LMC	Linkage with Mention with Combination When the tentative underlying cause is reported with mention of another condition, in Part 1 or Part 2 of the certificate, and the codes for the tentative underlying cause and the other condition combine into a third code.
LDP	Linkage in Due to with Preference When the tentative underlying cause is reported in the due to position to another condition and the code for the other condition is preferred over the code for the tentative underlying cause.
LDC	Linkage in Due to with Combination When the tentative underlying cause is reported in the due to position to another condition and the codes for the tentative underlying cause and the other condition combine into a third code.

DT rule type	Description
SMP	Specificity with Mention with Preference When the tentative underlying cause describes a condition in general terms, and a condition which provides more precise information about the site or nature of this condition is reported anywhere on the certificate, and the code for the more precise condition is preferred over the code for the tentative underlying cause.
SMC	Specificity with Mention with Combination When the tentative underlying cause describes a condition in general terms, and a condition which provides more precise information about the site or nature of this condition is reported anywhere on the certificate, and the codes for the tentative underlying cause and the other condition combine into a third code.
SDC	Specificity in Due to with Combination When the tentative underlying cause is reported in the due to position to another condition, and can be regarded as an adjective modifying this condition, and the codes for the tentative underlying cause and the other conditions combine into a third code.

The explanations of the "condition" are listed at *chapter 5.4.4 Explanation of "condition" at specMuse file and MUSE Explanation window*

4.5.7 NCIC browser

In Maintenance mode, the 'NonConsistentIcdCodes' (NCIC) table can be accessed through a browser. You can use the NCIC browser to find all checks set for a specific ICD-10-WHO code and to change, add or delete checks. The browser also makes sure that all non-optional fields contain valid values, and provides fill-in help for fields with a restricted set of valid values.

Since 2013 Iris provided the possibility to use an extended file layout of the NCIC table. It is still possible to use the previous file layout, but some features (for example the possibility to set more than one rule for the same ICD-10-WHO code) are available only if you use the extended file layout.

With the extended file layout, it is now possible to specify checks especially for the main injury field. For checks of main injury, set InconsistentFor = I. In the 'UnderlyingCauseUse' field, you can then specify either N (invalid) or M (maybe). As before, Y in the 'UnderlyingCauseUse' field means that the code is accepted as main injury.

Please note: The file layout of the 'NonConsistentIcdCodes' table now specifies an incremental type index on the first field, 'NcicID' (please see the layout of the table provided with the installation package). If you use your own table, make sure that the layout agrees with the table in the installation package, otherwise checks with multiple conditions for the same ICD-10-WHO code might not work properly.

You have to adapt the 'NonConsistentIcdCodes' (NCIC) tables to the requirements of your country/region.

4.5.8 Reload tables

If you have modified the dictionary or the standardisation tables, the new versions will not take effect until you close and restart Iris, or you reload the tables. While you can use the reload commands in the dictionary and standardisation windows to reload the dictionary and standardisation tables respectively, this command reloads all tables used by Iris when processing a record.

4.5.9 Translation

This tool helps to translate the properties file that is used by Iris for interface and messages language. In the example below, an English properties file is used on the left to complete the translation of the French properties file.
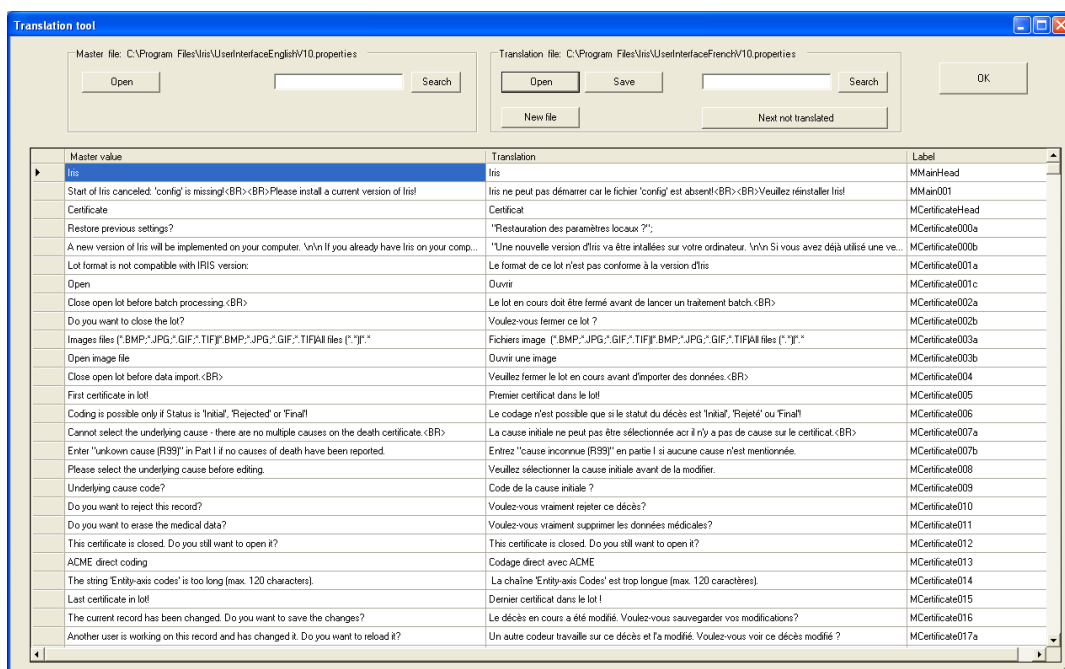
Figure 61 Screen of translation tool

The open buttons permit to open the two files, the "Master file" on the left and the file to be translated on the right. If such file doesn't exist click on new file to create it.

When the two files are open, the fields not translated of the left file are empty. These fields can be searched using the button "Next not translated".

The "Search" buttons allow to finding specific strings in the respective files.

The "Save" button write the translated file but do not quit the application.

The "OK" button exits the tool. If the translated file has been changed and not saved it asks for writing it before quitting.

4.5.10 Options

Through the Options you can set a wide variety of default values and parameters according to your own requirements. The Options window has six tabs that are explained below. The six buttons on the right side of the window are explained after.

Please note: The Close button [x] does not work at the "Options" window. You can close the window only with the "OK" button.

4.5.10.1 General Tab
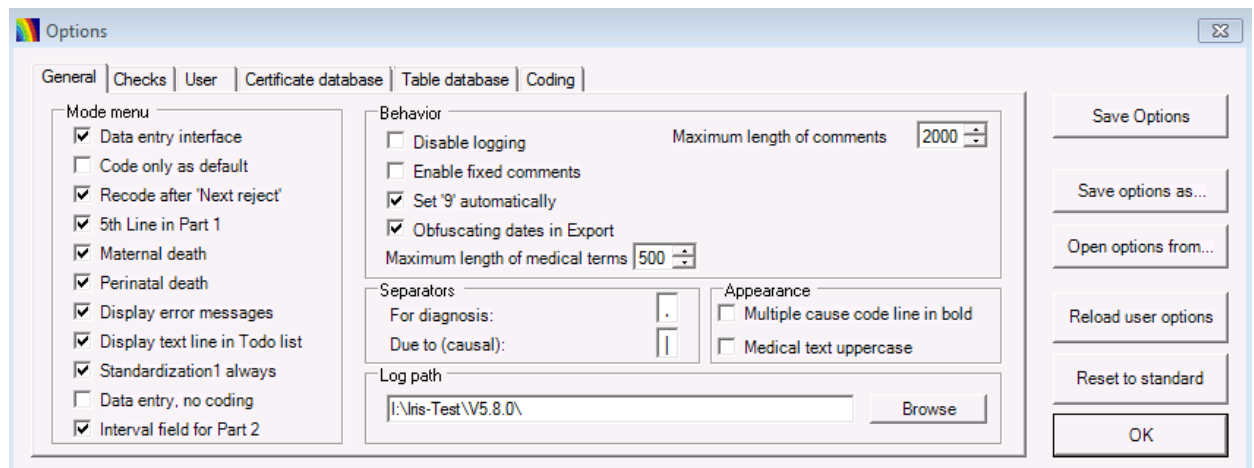
Figure 62 Screen of options with "General" tab

Mode menu

(See also *4.2 Mode menu*).

- Data entry interface

- In this mode all fields are open for editing and coding is also available. This mode is suitable for situations where medical coders also do the data entry. Using this item, the data entry interface is set by default. Use the Data entry interface item in the Mode menu to set or unset data entry for each record.

- Code only as default

    - In Code only mode you can enter ICD-10-WHO codes in the ICD-10-WHO codes fields, but not text in the Diagnosis text fields. Use this mode if you do not have access to a dictionary with text expressions and corresponding ICD-10-WHO codes, or if, for some other reason, you want to use Iris for selecting an underlying cause code from a set of ICD-10-WHO codes.

- Recode after "Next reject"

    - Each time you use "Next reject" or "Save and next reject" to move to the next rejected record, Iris recodes the new record automatically. This gives you immediate access to the explanations (see chapter *4.4.5 Explain coding*). If the setting is not activated, you must first click Recode or Select in order to generate the explanations.

- 5th line in Part 1

    - If this box is checked, Iris displays a fifth line (line E) in Part 1 of the death certificate. Line E can then be used if the physician states more than three "due to" relationships on the certificate.

- Maternal death

    - When this box is checked, Iris displays by default the field for additional information on maternal deaths.

- Perinatal death

    - When this box is checked, Iris displays by default the fields for additional information on perinatal deaths.

- 'Display error messages' in pop-up box

- o This setting determines how coding error messages are displayed. If this box is checked, Iris first shows all error messages in a pop-up window and then places the messages in the To-Do list. If it is not checked, Iris places the messages in the To-Do list only, and does not display them in a pop-up window.

- Display text line in To-do list

- o If Iris cannot fully code a text line from one of the Diagnosis text fields, an error message appears. If this box is checked the error message contains the complete line that Iris could not code. If the box is not checked, the error message shows only the part of the line that Iris could not code.

- Standardisation1 always

- o If this box is checked Iris will always apply the filters in the Standardisation1 table to any text strings that you search for in the dictionary.

- Data entry, no coding

- o This mode permits to enter individual and medical data but no coding is available. This is the most restricted mode and it is intended for use by staff they are not medical coders. For more information (see chapter *3.6.2 Data entry interface*).

- Interval field for Part 2

- o If this box is checked Iris will show the Time interval field for Part 2 at the Medical part.

Behavior

- Disable logging

- o If this box is not ticked, Iris stores a complete log of the batch processing – including processing statistics and a complete description of how the terms in Part 1 and Part 2 were modified in the language standardisation step - in the folder specified in the Log path field at the bottom of the Options window.

- o If this box is ticked, Iris stores the processing statistics but not the language standardisation. Note that to obtain the standardisation process in the log you also need to tick the box 'Trace standardisation in log file' in the Batch processing window (see chapter *4.1.3 Batch processing*).
- o If the Disable logging is ticked, then the Explain window will not contain any data under the Iris tab (see chapter *4.4.5 Explain coding*).

- Enable fixed comments

  - o If this box is ticked, you can use the Iris translation file (see chapter *3.6 Data entry*) to specify fixed comments or messages that can be sent back to the parent application.

  - o To specify such fixed messages, open the translation file and go to the heading "#StandardizedMessages (example)". Next, enter the message texts after "FixedComments=". If you want to use several such messages, enter them separated by a vertical bar, for example "Query01|Query02|Final". During coding, the coder can access the specified fixed messages by double-clicking the Comments field. A list of available fixed messages appears, and the coder selects which message to send back to the parent application by clicking that message. Iris places the message in the Comments field, from where it can be read by the parent application.
  This feature has been improved and a more detailed explanation can be attached to the previously defined fixed comments in turn. To do so, the comments themselves should be listed one by one and their corresponding explanation term with equal sign separated.
  For example "Query01=Query 1 explanation"

  - o This feature can be used to send specific messages or prompts that will trigger a specific action from Iris back to the parent application, for example an instruction to print a query letter.

- Set '9' automatically

  - o If this box is ticked, Iris automatically sets both the Place of occurrence code and the Activity code to 9. If it is not ticked, these two fields are left

empty. In either case the coder can change the Place of occurrence and Activity codes.

- o Note that the "Place of occurrence" and "Activity fields" are not available for editing if the Manner of Death is set to 'Disease'.

- Obfuscating dates in Export

  - o If this box is ticked, the date of birth will be 1st of January of the given year, the date of death will evaluated according to that, otherwise the original dates will be exported.

  - o Certificate key export works only if "Obfuscating dates in Export" is unchecked.

- Maximum length of medical terms

  - o Number of characters in medical text fields of Part 1 and Part 2 is defaulted to 500, but can be set between 50 and 500.

- Maximum length of comments

  - o Number of characters in comment field is defaulted to 2000, but can be set between 3 and 2000

Separators

If several conditions have been reported on the same line you must separate the text into single diagnostic expressions, or Iris will not be able to match the expressions to the dictionary. You can separate the expressions either manually or through Regular Expressions in the standardisation procedure. Further, you must use a standard separator that Iris recognizes. There are two types of separators, one for simple enumeration of conditions and one for indicating a causal relationship.

For simple enumerations, use the "For diagnosis", comma is the default separator. For example, "hypertension and gout" should be "hypertension, gout" after standardisation and with comma as separator.

If there is a stated causal relationship between the conditions, then the conditions should be separated by the "Due to (causal)" separator. The default causal separator

is | (vertical bar). For example, "hypertension due to diabetes" should be "hypertension | diabetes" after standardisation and with vertical bar as separator.

Appearance

If the "Multiple cause code line in bold" is ticked, Iris displays the codes in the 'Multiple cause codes' field (below the 'Underlying cause' fields) in bold typeface.

If „Medical text uppercase" is ticked, Iris shows medical terms in text fields of Part 1 and Part 2 uppercased.

Log path

The log path defines the place where Iris will store log files for the batch processing. Iris will store exported certificates (XML files) in the same location.

Please note: If the log file is not shown, it could be that you haven´t the write permission for this folder. Please ask your IT department for the write permission or select another folder where you have these permissions. You can change the path via the button 'Browse'.

4.5.10.2 Checks tab

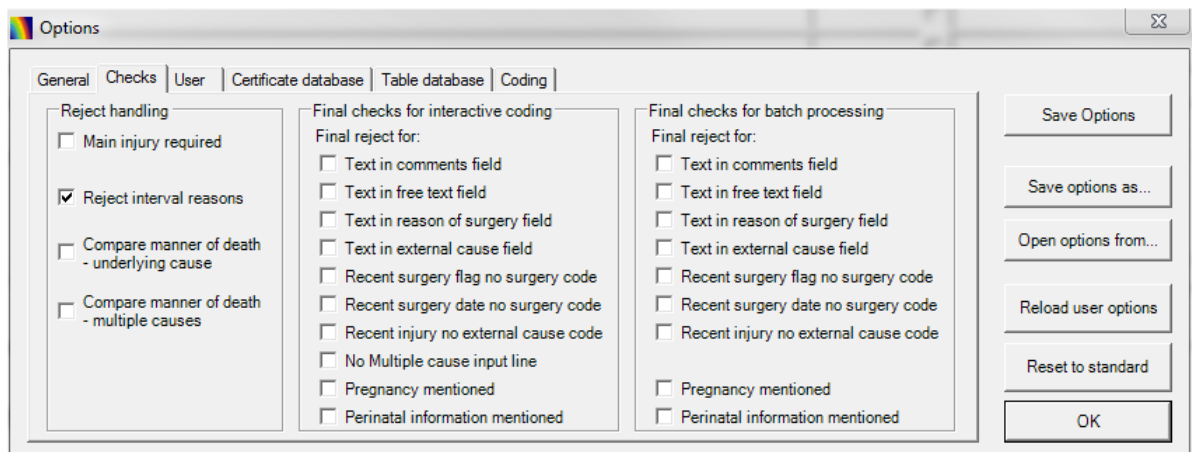**Figure 63 Screen of options with "Checks" tab**

Reject handling

- Main injury required

  o This setting specifies whether the coder is to supply a code for main injury in cases where the underlying cause is in Chapter XX (external causes and

poisoning). If box is ticked Iris prompts the coder to assign a main injury code. If the box is not ticked there is no such prompt.

- Reject for interval reasons

    o If several diseases are reported on the same line and there is only one time expression in the Time Interval column, Iris cannot decide whether the stated interval refers to one, several or all of the reported conditions. If the "Reject for interval reasons" box is ticked, the record will be rejected and the coder will have to decide to which of the conditions the time interval refers. If the "Reject for interval reasons" box is not ticked, the time interval will be ignored.

- Comparing manner of death - underlying cause

    o This setting checks UC (underlying cause) and MoD (Manner of Death) correspondence and rejects the certificate if they don't fit together. For example, in case of suicide the UC should fall between X60 and X849 or should equal Y870.

- Comparing manner of death - multiple causes

    o This setting checks reported multiple causes and MoD correspondence and rejects the certificate if they don't fit together. For example, in case of suicide all chapter XX codes reported on the certificate should fall between X60 and X849 or should equal Y870.

Final checks for interactive coding

This block lists the different criteria that will be applied to check a record after interactive coding. If one of these criteria is met, Iris will issue a message asking the code whether he wants to modify the coding or not.

Final checks for batch processing

This block lists the different criteria that will be applied to check a record after batch coding. If one of these criteria is met, Iris will reject the record.

4.5.10.3 User Tab
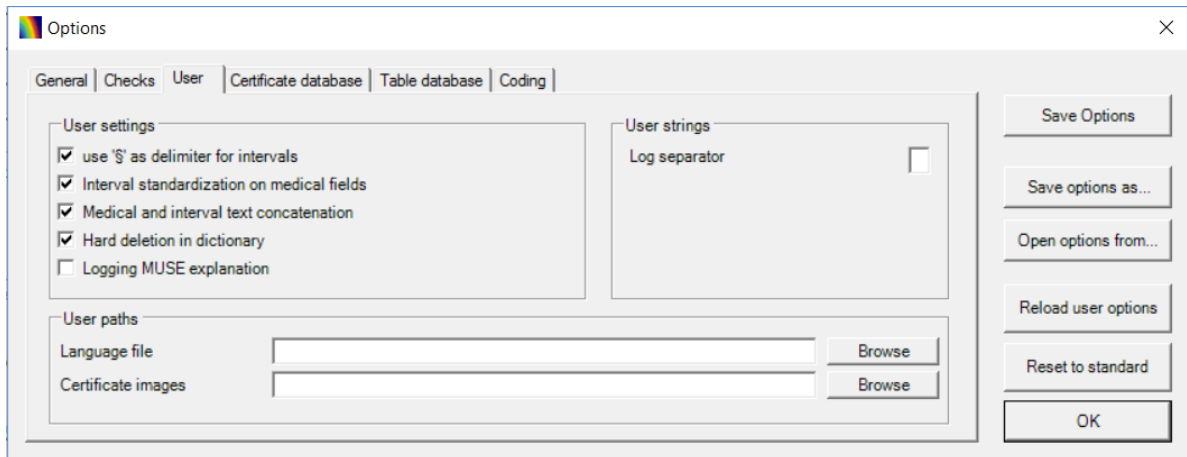
Figure 64 Screenshot of options with "User" tab

User settings

- Use '§' as delimiter intervals

  - In the User settings block, the first line allows to the character "§" as a time interval delimiter into diagnosis text (see chapter *3.5 Time interval and disease status*).

  - The Iris Institute provides two different tables for the time intervals ("TimeIntervals" and "TimeIntervals_Ref"). "TimeIntervals_Ref" is using the round bracket „()" as delimiter and the "TimeInterval" table is using the paragraph sign "§" as delimiter for the time interval. So it depends on what do you would like to use as delimiter. The round bracket is set as default.

- Interval standardisation on medical fields

  - Medical text in 'Diagnoses text' filed could contain interval expression (in most of the cases that's the reality), therefore Iris supports this historically. Accordingly, the standardisation process applies TimeIntervals standardisation as part of the standardisation order on the medical text, by default. This application could be neglected on medical text.

- Medical and interval text concatenation

  - Time interval field stands for interval text only, but as discusses previously, medical text (diagnoses field) could also hold interval information, therefore

Iris concatenates diagnoses field content and interval field content for sure when Interval field standardisation is achieved, by default. The system can be asked to use interval field context only by switching of this checkbox.

- Hard deletion in dictionary

  o Hard deletion (default) in the Dictionary tool allows deleting physically the records from the underlying database. Switching off this option (soft deletion), Dictionary tool will achieve logical deletion, where the records are not deleted physically but deactivated.

- Logging MUSE explanation

  o In version 5.4.x it became possible to log into the batch log file the coding explanation of MUSE of the certificates in batch mode. After running the batch, the coding steps and their explanations (as they appear in MUSE) can be analysed. Since version 5.6.0 the certificate key is provided at the batch log file.

User paths

- Language file

  o You can use the Language file field to state the location of a file with translations of all Iris labels. The original file, containing English texts, is called 'UserInterfaceEnglishVx.x-Y20xxSx.properties' and is included when you install Iris. You can translate the English texts in the translation tool into another language. If you then state the location and name of this new text file the Language file text box, all labels and messages are shown as in your translation (see chapter *3.7 Translating the Iris Interface* and chapter *4.5.9 Translation*).

- Certificate images

  o If you have scanned images of your certificates and want to make them accessible through the Open image command (see chapter *4.1.4 Open Image*), then specify the path to the folder where the death certificate pictures are located in the Certificate images field (in the User paths block).

4.5.10.4 Certificate Database Tab

The "Certificate database" tab contains settings that define the type of database management system used for the "Iris Certificates" database.

Iris offers connections to OLEDB databases, *Oracle, MSSQL, PostgreSQL* or *MySQL* server:

- For the default OLEDB manager, the "Provider" depends on which database management system you use. Use the following providers according to the version of Microsoft Access databases:

  - Access 1997 up to 2003: Provider = Microsoft.Jet.OLEDB.4.0
  - Access 2007: Provider = Microsoft.ACE.OLEDB.12.0
  - Access 2010: Provider = Microsoft.ACE.OLEDB.12.0
  - Access 2013: Provider = Microsoft.ACE.OLEDB.12.0
  - Access 2016: Provider = Microsoft.ACE.OLEDB.12.0

- For other database systems, look for the appropriate provider string on the website *www.connectionstrings.com*

- (Use OLEDB connection strings only). The default in the Provider field is for the Access database manager.

- The data source is the path where Iris will find the "Iris Certificates" database. You can use the "Browse" button to find the location.

- For MySQL or SQL server, you must state the name of both server and database name in the MySQL/SQL server block. You may need to supply user

identification and password to access the database in your specific implementation (check with the database administrator).

- The Oracle connection type requires "User Id" and "Password". You must also enter the name of your Oracle database in the "Database" field. The settings are stored in the tnsname.ora file. With the Oracle type connection, it is possible to use Oracle views with Iris.

- PostgreSQL is supported now.

4.5.10.5 Table Database Tab

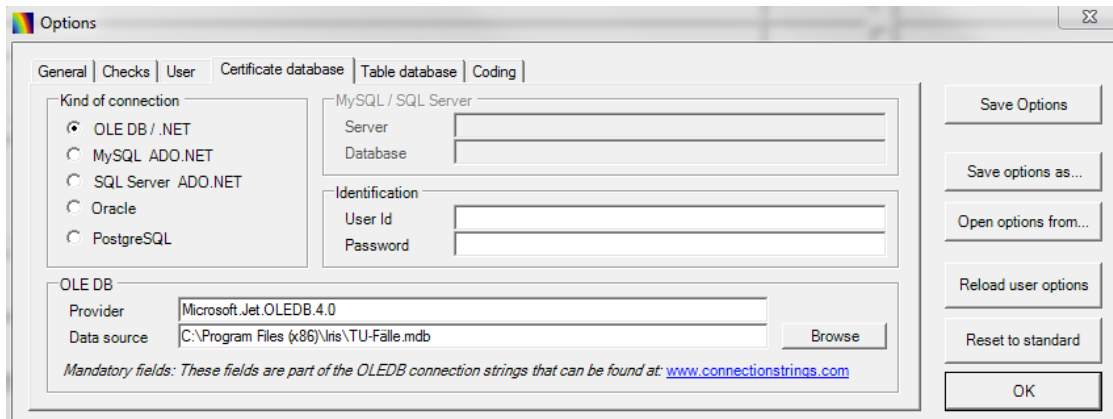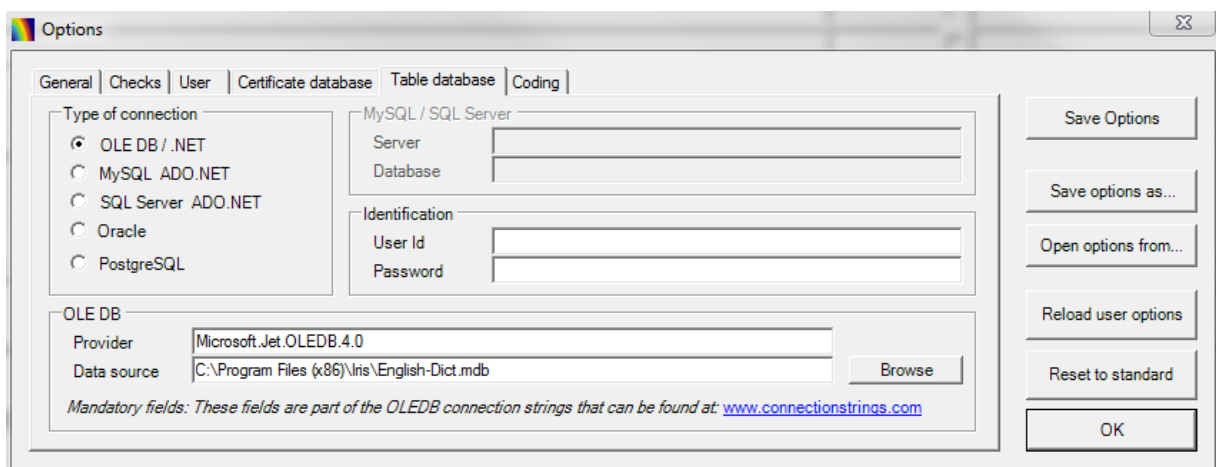**Figure 66 Screen of options with "Table database" tab**

The "Table database" tab contains settings that define the type of database management system used for the "Iris Tables" database. It works in the same way as the "Certificate database" tab, please see above.
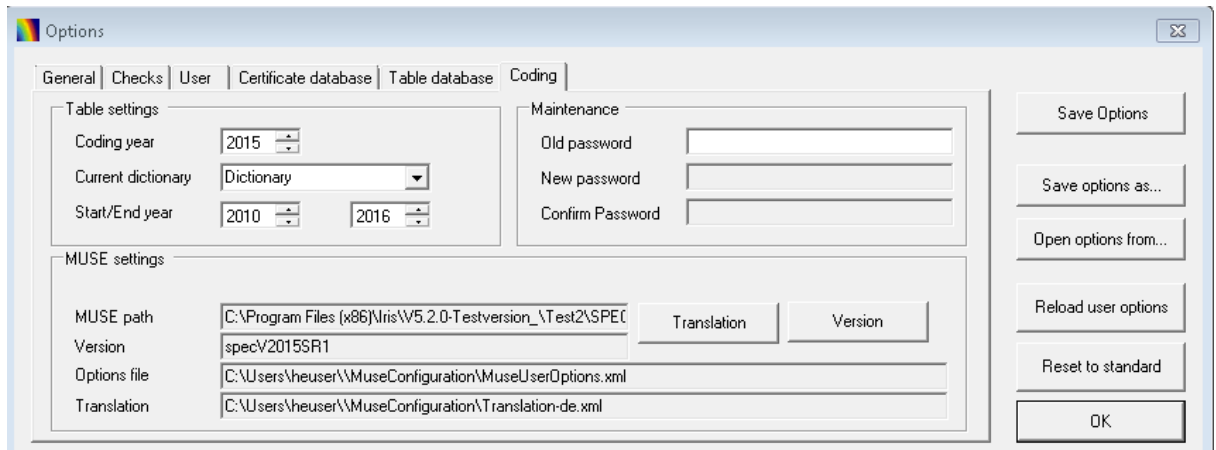
4.5.10.6 Coding Tab

The Coding tab contains various settings related to the coding itself.

Table settings block

- Coding year: This value determines which entries in the tables are valid. For instance, if an entry in the dictionary table has the Start year field set to 2005 and an End year field set to 2009 and the current coding year is set to 2010, this dictionary entry will not be available for coding. It works in the same way for other tables.

- Current dictionary: You can select your dictionary, if you use different dictionaries (e.g. if they are different national languages available).

- Start/End year: Here you can define the default values of the start and end years when creating entries in the dictionary and the standardisation tables.

Maintenance field

Here you can change the password for the developer's interface to the dictionary, standardisation tables and Data entry interface (see chapter *4.5.11 Maintenance*). The default password is PwdIris. It is recommended that you change this password if you do not want others to change the table content.

Please note*: If you lose your own password, the only way to reset the default password is to reinstall Iris.*

MUSE settings

At the MUSE settings you will find the 'Translation' button and the 'Version' button.
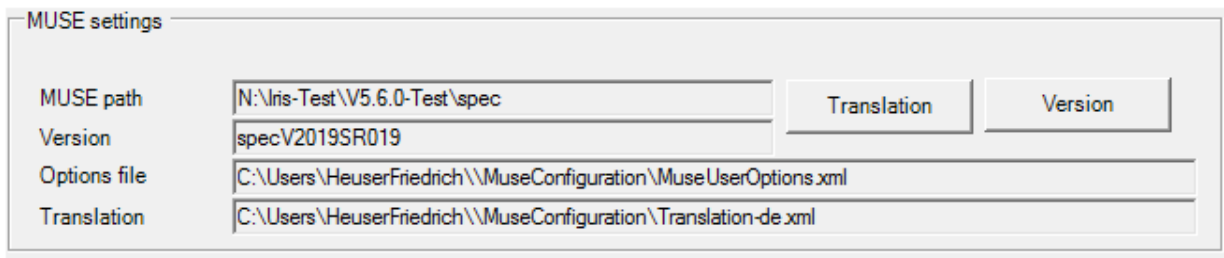
Figure 68 Screenshot of MUSE settings

If you click on 'Translation' you could translate the MUSE explanation window with all messages.
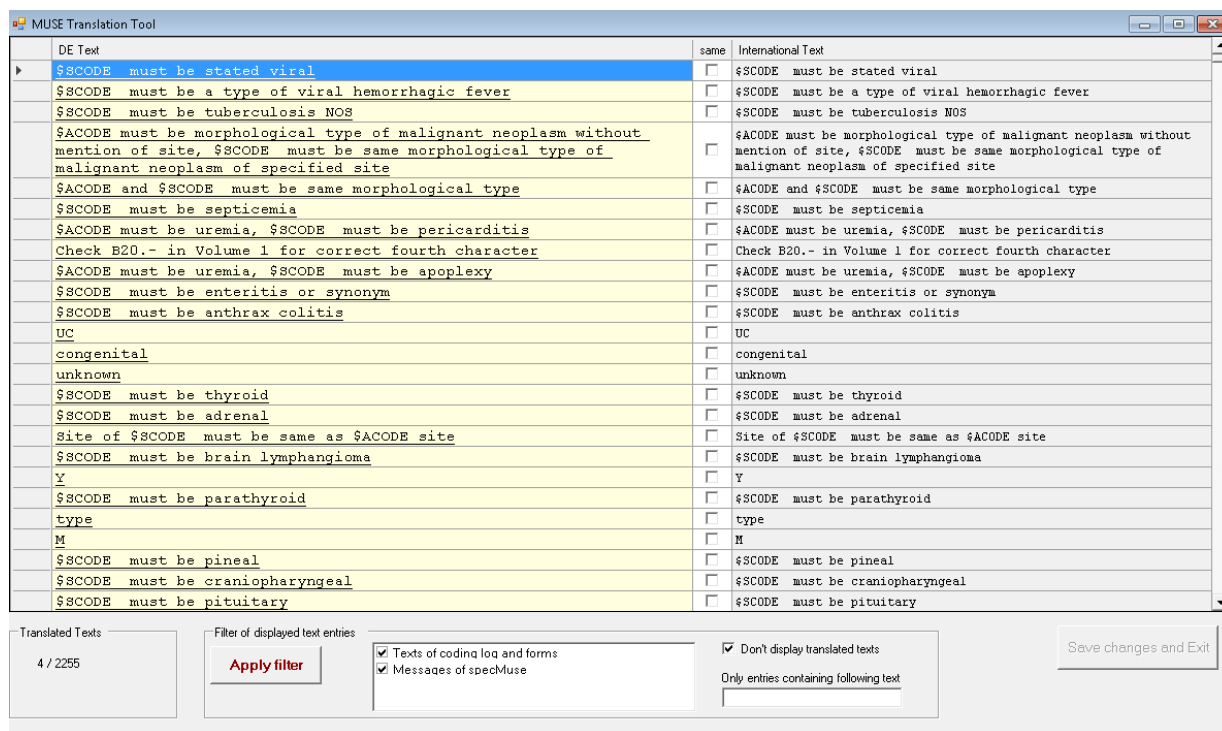
Figure 69 Screenshot of the MUSE translation tool

You could change the MUSE specifications, if you click the button "Version". At the MUSE specification window, you can you select the version of the spec file (if more than one version available). Furthermore you can change the path for the folder "spec", were you store the "spec" files. For more information see chapter *5.7 Configuration of MUSE*.
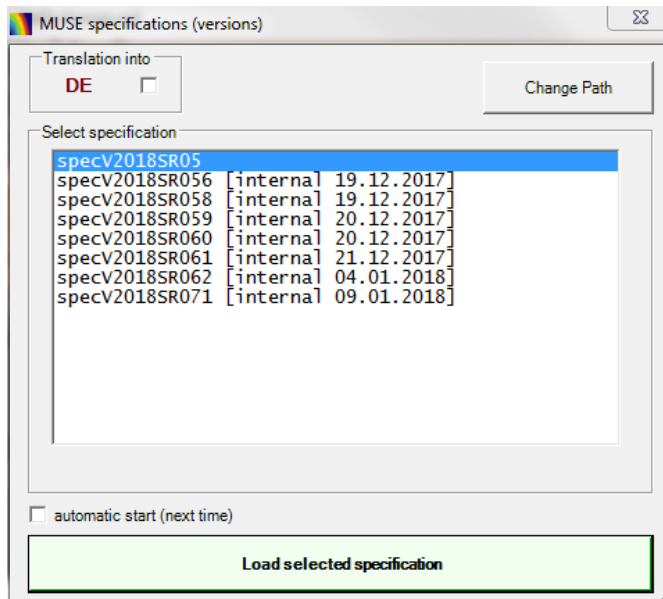
Figure 70 Screenshot of MUSE specifications
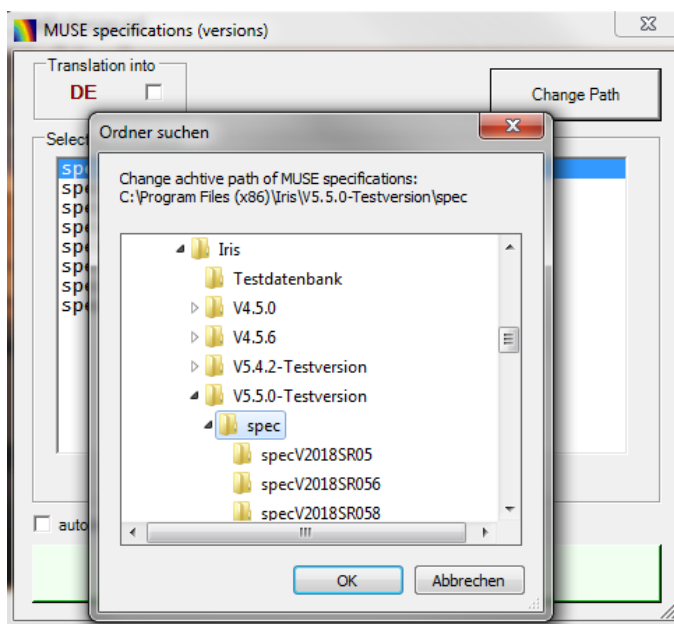
Figure 71 Change path of MUSE specifications

4.5.10.7 Buttons of the 'Options' window (right side)

The "OK" button on the right side quit the option window. The five others buttons of the windows are used to manage sets of options.
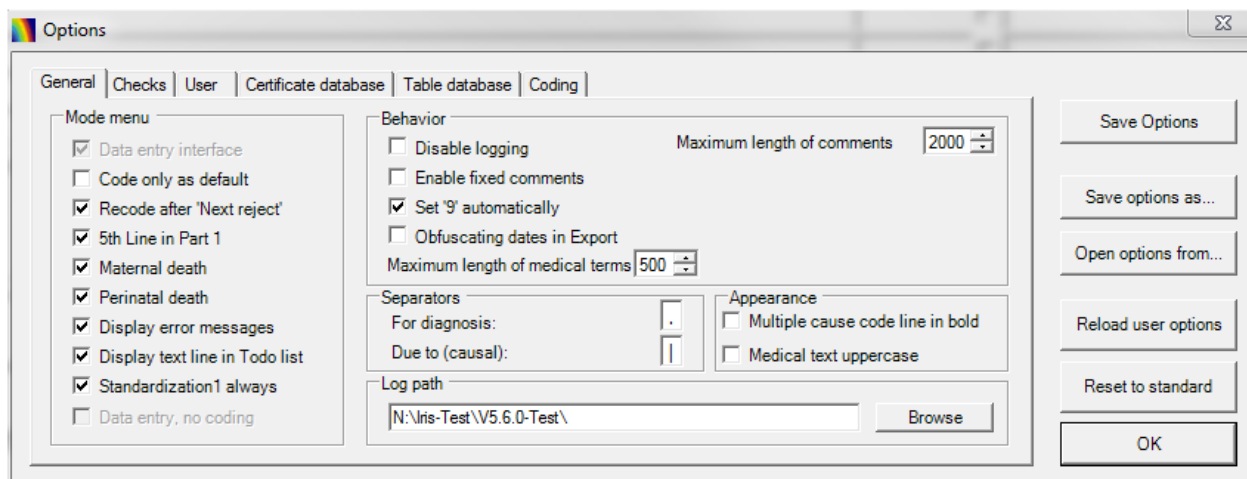
Figure 72 Screenshot of options with "General" tab

The "Save options" button saves all modifications in one go. If you change a setting in Options, the new setting remains active during the current Iris session. If you want to use this new setting as your default for future sessions, then click the Save Options button to store the new settings.

The "Save options as..." button permits to store and save all the present options in a text file where you want to. The "Open options from..." button allows you to reload options from such a text file. This feature is very convenient for users that have to work on different sets of lots. For instance a coder that works on two different years of death. In this case, the certificate options, the table and the coding options are different. To facilitate the swapping between each year, save the options of each year of death using "Save options as..." and open the set of options with the "Open options from..." when necessary.

If you have made a temporary change to the options, you can go back to your own default settings by clicking "Reload user options".

If you want to go back to the setting Iris had when you first installed it, then click "Reset to standard" button.

Some options will not take effect until next time you start Iris. If so, Iris will display a message asking if you want to save the new options and restart Iris.

4.5.11 Maintenance

The Maintenance item gives you access to the Dictionary developer tool, the Standardisation developer tool and Data entry interface. You will be asked to enter your password if you click on 'Maintenance'. When you next click the 'Dictionary' or 'Standardisation', Iris displays the developer's version of the tool.

The initial password is "PwdIris" and it can be changed in the 'Options' (see chapter *4.5.10.6 Coding tab* , *Maintenance field*).

When the password was correct a new item is show 'Development'. This item is for future use. You can log out from the developer part, when you click again on the 'Maintenance' item.

<u>Please note</u>*: If you lose your own password, the only way to reset the default password is to reinstall Iris.*

4.6 About menu

At the 'About Iris' item you find following information:

- Version of Iris

- Institutions who currently developing Iris

- Rights of third parties
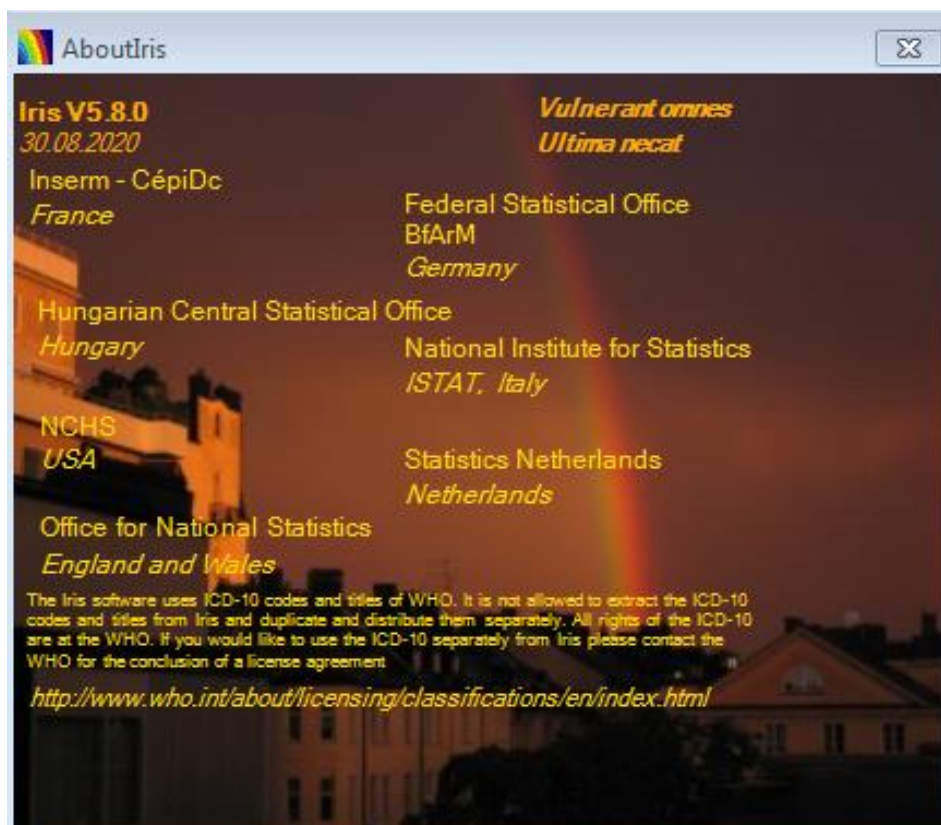
Figure 73 About menu (with the screen "About Iris")

The background picture has been taken in Stockholm on 28 June 2005 around 6 pm from a room in the "First Hotel Amaranten". The surroundings are nice including an excellent Indian restaurant and the metro is very close.

Apart from those practical aspects, the justification of this picture is that, according to the Greek Mythology, Iris is the Goddess of the rainbow. The maxim Vulnerant omnes, ultima necat (they all hurt, the last kills) can be found on many sundials as a definition of hours.

5.   MUSE in Iris

MUSE (**m**ulticausal and **u**nicausal **s**election **e**ngine) is a rule-based software component which processes electronic death certificates and selects the underlying and multiple causes of death. Data processing is done in accordance with the guidelines of Volume 2 of ICD-10-WHO.

5.1 MUSE introduction

MUSE logic is defined by two specification files (.csv format) being located in the subdirectory 'spec' of the installation directory:

- The file specCodes (specVxxxxSRxx-Codes.csv) contains the valid codes (ICD-10-WHO codes and created codes) for the MUSE logic [there is no change of the ValidIcdCodes table]. It is possible to translate the label name or to change the label name of the emergency codes at this file.
  <u>Please note</u>: Do changes only at the column "label" at this file. If you use national codes, please add them also to the specCodes file. Otherwise the national codes will be rejected as invalid.
- The file specMuse (specVxxxxSRxx-Muse.csv.DES) contains all multiple-cause and underlying cause of death coding instructions used by MUSE (the table entries based on international decisions and should not be modified by users).
  <u>Please note</u>: This file is encrypted, so it is not possible to do any changes or to look inside this file.

During initialization process the specification files are read by Iris and user is informed about the processed entries (see figure below).

Figure 74 MUSE initialization window (of MUSE version 2.5)

The decision tables (which were originally developed by National Center for Health Statistics (NCHS) and are now maintained by Iris Core Group) are a subset of the specification file "specMuse" (specVxxxxSRxx-Muse.csv.DES). MUSE decision logics can be modified simply by changing a specification file.

MUSE (version 1.0) is a result of collaboration between the Federal Statistical Office and the German Institute of Medical Documentation and Information (DIMDI). The common project "Improvement in quality of Causes of death statistics" has been funded with support of the Federal Ministry of Health. The Federal Statistical Office has been responsible for requirements analysis, technical design and software development of MUSE. In Germany MUSE has been in routine use since 2012.

The Iris Core Group evaluated MUSE for integration into the international Iris software. The evaluation gave rise to following major improvements:

- MUSE supports created codes: Since dictionaries of most Iris Core Group members (Sweden, Hungary, US, France and Italy) contain created codes this feature was added, see also *8.2.8 Created codes* and *Appendix 2: Created codes*.
- MUSE supports connected codes and flags: This new technical framework replaces the connected codes and flags of previous Iris versions (4.x), see also *5.6 Working with connected codes*, *8.2.9 Connected codes and MUSE flags* and *Appendix 3: Connected codes for neoplasms*.
- MUSE implements complex multiple-cause coding instructions of malignant neoplasms.

Nevertheless Iris/MUSE doesn't process all cases automatically. Following cases should be revised after Batch processing (they are rejected by Iris/MUSE):

- Post-procedural disorders (E89, G97, H59, H95, I97, K91, M96, N99)
- Pregnancy, childbirth and the puerperium (O00-O99) – [advice by MRG]
- Complications of medical and surgical care (Y40-Y84)
- Sequelae of medical and surgical care (Y88)

5.2 MUSE explanation window - overview

After clicking the "MUSE" button (toolbar at main interface) the correspondent window is presented to the user. Figure below shows an example:

Figure 75 Window of "MUSE Explanation"

Basic data (certificate number, age, sex and manner of death) are displayed in the first two group boxes of the upper left part.

The next group box on the right hand gives summarizing information about the 'Uni- and multicausal results'.

First the underlying cause of death (= **UC**) is shown. If one or more maybe instructions are performed during the processing, the final underlying cause of death will be selected for manual revision and an **orange** text "Maybe" will be displayed.

The user also sees the direct codes (**DCodes**), the multiple-cause codes (**MCodes**) and the codes used for unicausal selection (**UCodes**):

- Direct codes usually come automatically from Iris dictionary or are inserted manually by coder or changed by 'IcdSubstitution' table.

- If MUSE performs multiple-cause code modifications, the multiple-cause codes will differ from the direct codes and the text MCodes will be coloured **red**.

Figure 76 MCodes in red colour and with 'Maybe' reject

- Before the selection of underlying cause of death MUSE applies, additional code modifications (deletion or substitution of Z codes and deletion of Asterisk codes). This processing step is called "**p**reparation of **u**nicausal **s**election" (PUS). If MUSE performs one or more PUS modifications, the unicausal selection (UCodes) will be different from the multiple-cause codes (MCodes) and the text "UCodes" will be coloured **red**.

The next group box 'Codes (with changes)' contains for each line of the certificate (line 1a, 1b, 1c, 1d [Part 1] or Part 2) all codes processed by MUSE algorithm. Codes deleted by the application of a MUSE instruction are displayed in strikethrough formatting (~~red~~). Codes added to the direct codes are coloured **blue**. The finally selected underlying cause of death has a <mark>yellow</mark> background colour.

Every displayed code entry can carry following information:

- ICD-10 code (required)
- Connected ICD-10 code (optional, see chapter *5.6 Working with connected codes* and *8.2.9 Connected codes and MUSE flags*)
- Flags assigned to ICD-10 codes (optional, see chapter *5.3 Flags assigned to ICD-10 codes* and *8.2.9 Connected codes and MUSE flags*)
- Time intervals (optional)

For each line (1a, 1b, 1c, 1d, 1e and Part 2) 12 code entries are shown at most. Nevertheless MUSE internally processes more than 12 codes in a correct manner. There are a maximum number of lines of Part 1 (now 10 lines). If you have more than 10 lines, MUSE will you shown a message.

<u>Coding log:</u>

The group box 'Coding log' is on the bottom block of the window "MUSE explanation".
It shows MUSE processing steps row by row:

- **Blue** lines (type=SUBST): multiple-cause coding instructions performed by MUSE algorithm

- START OF SELECTION: Starting codes used for unicausal selection (see also UCodes) are displayed. The following lines represent unicausal processing steps

- **Grey** and **green** lines inform users about unicausal processing steps according to the ICD-10-WHO (Volume 2, paragraph 4.2.1 and 4.2.2). In the column type is shown the name of the corresponding starting point rules (**SP1 – SP8**) or modification rules (**M1 – M4**). Successfully applied rules are green. Usually another green row is added each time when a rule is applied successfully. It contains the new tentative selected underlying cause of death in the column UC. Rules which couldn't be applied are displayed in grey colour. The reason for non-application is displayed in the column message.

- If you tick the check box "**full log**" the grey lines are shown.

Example (see also figure above):

Row No 2 shows the application of starting point rule SP3. In column message the application of rule is explained: The first cause on lowest used line in Part 1 is I709 which causes the other conditions of Part 1. Row No 3 shows the temporarily selected starting point I709 (column UC) and the title of the ICD-10 code (column message).

5.2.1 'Multiple choice' feature at Coding log

Since MUSE 2.7 is also possible to use the 'Multiple choice' feature.
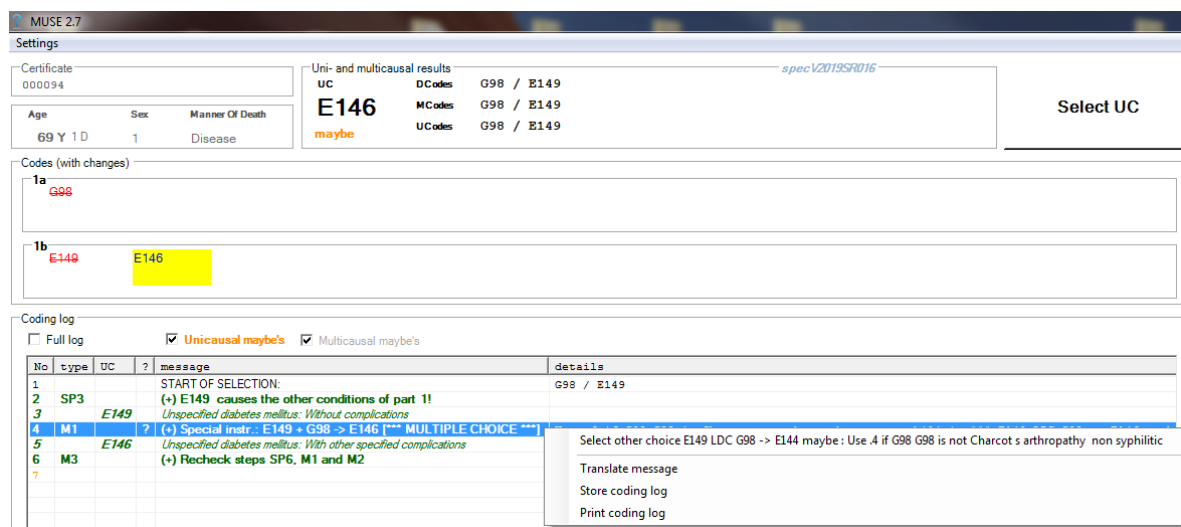
Figure 79 Screenshot for Multiple Choice feature

There are two entries in the decision tables for Step M1 with the same anchor code and same subcode:

E149 LDC G98 recode to E146 with Maybe – Use .6 if G98 is Charcot arthopathy

and

E149 LDC G98 recode to E144 with Maybe – Use .4 if G98 is not Charcot arthopathy

The certificate is rejected and the coder can select via the 'Multiple choice' feature the correct code. Go with your mouse over the line were 'Multiple choice' is mention, click on right, then a new window opens. Now, you can select the other choice for this coding example. This is the only one example to use this feature.

5.2.2 'Show multicausal instruction' at Coding log

When left click at the mouse on the multicausal instruction (blue line), a pop-up window appears.
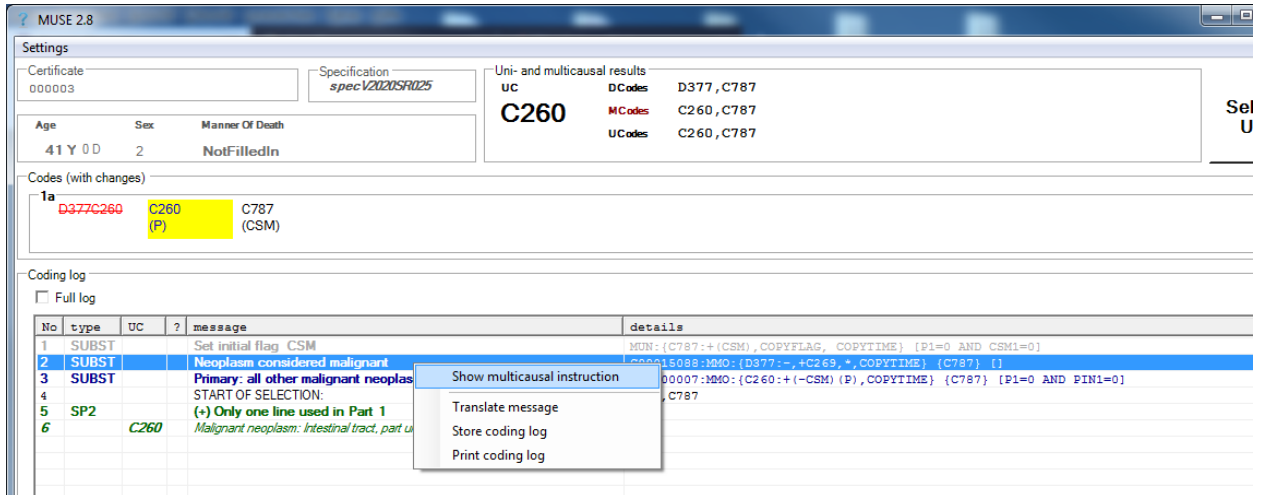
Figure 80 Screenshot shows the pop-up window with different options

Please select the option "Show multicausal instruction" and the "Multicausal instruction" window appears.
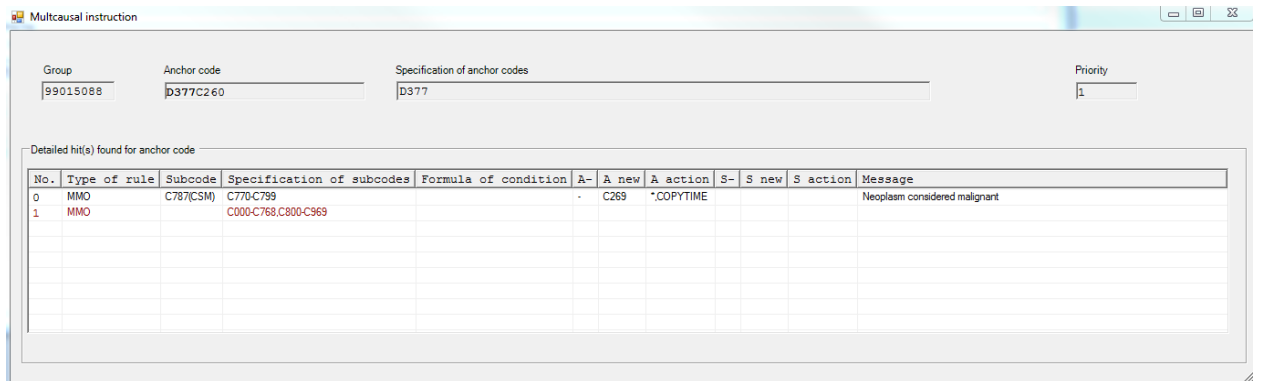
Figure 81 "Multicausal instruction" window

The specification of the selected instruction group is displayed in a separate window. Every instruction (black=includingj, red=excluding) is listed in detail.

Via mouse over on the headlines or displayed instruction a tooltip will appear.
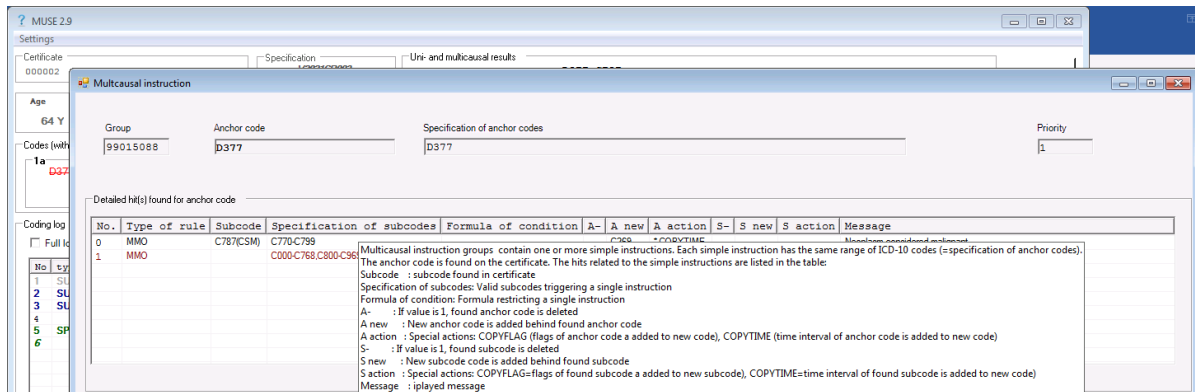
Figure 82 "Multicausal instruction" window with tooltip for the headlines

5.2.3 Settings at MUSE window

Sometimes there is a conflict with durations (time intervals) at the death certificates. For this situation there is a note in Volume 2 [paragraph 4.2.3 B. (k)]:

Do not accept a condition with a stated duration as due to a condition with a shorter duration (see at volume 2 the examples 6 and 8 in paragraph 4.2.1, Step SP3, for exceptions).

Concerning this instruction in Volume 2, Iris does not except a stated duration as due to a condition with a shorter duration. If you would like to check this cases manually, open the MUSE explanation window and click on 'Settings'. Please tick 'Check interval errors in Part 1' at MUSE settings (see below).
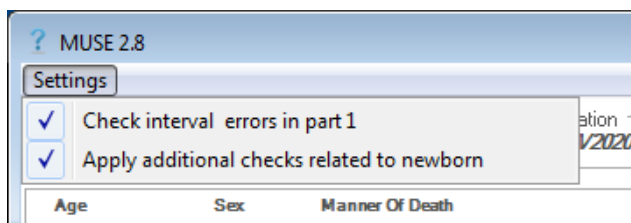
Figure 83 MUSE settings

Then Iris/MUSE will reject this case with an explanation at the Coding log.
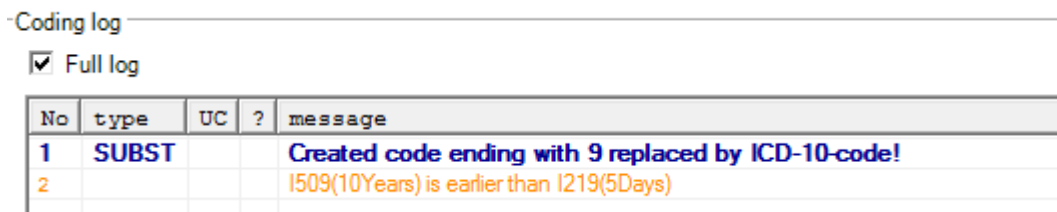
Figure 84 Message when check for time interval errors is enabled

There is also the possibility to do additional checks related to newborn. These checks involve the codes P07.0-P07.3 and refers to fields "Birthweight" and "Completed weeks" at the main interface. If you would like that Iris/MUSE change the UC concerning the "Birthweight" and "Completed weeks", than open the MUSE explanation window and click on 'Settings'. Please tick "Apply additional checks related to newborn".

5.3 Flags assigned to ICD-10 codes

Flags assigned to ICD-10 codes are inserted behind the corresponding ICD-10 code in the code lines of MUSE explanation window. The flag information is shown as flag code in round brackets. Here are some examples of flagged codes:

Glioblastoma	C719(P)
Thrombosis of arteria media cerebri	I660(TH)
Embolism of arteria media cerebri	I660(EM)

The correct assignment of flags to ICD-10 codes is very important for the correct processing of the MUSE algorithm. For example if a required P-flag wasn't assigned to a C code, the automatically selected underlying cause of death might be wrong.

Iris/MUSE supports several methods and levels for assignment of flags:

- flag assignment by dictionary
- flag assignment by standardisation
- flag assignment by computation (multiple-cause coding instructions)
- manual flag assignment (Add the flag behind the code with round brackets in the ICD-10 codes field at the main interface. If you have more than one flag for a code add them in alphabetic order behind the code. Is additional a duration provided, add the duration between code and flag in round brackets [e.g. I409(2Months)(A)]).
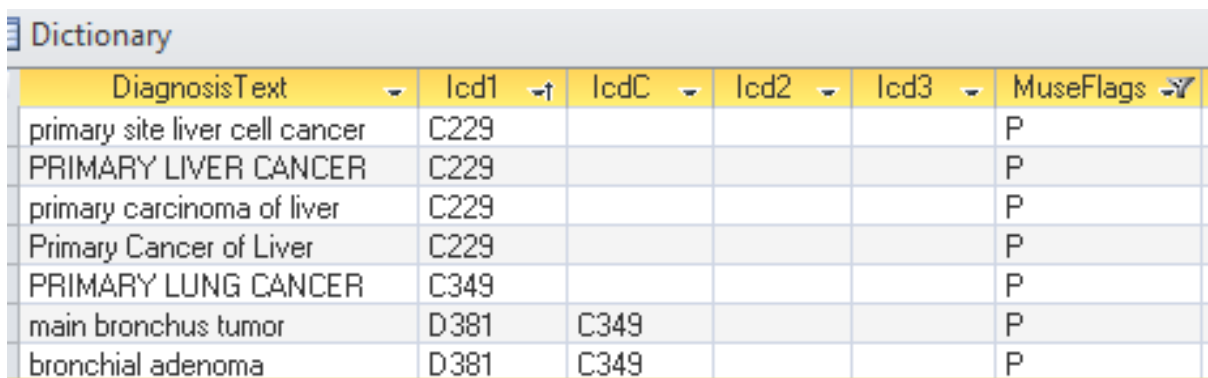
At the table below you will find a comprehensive survey of flags used by MUSE. Column "Assign. Dict." indicates whether a configuration of dictionary entries of the specified code range (see column "code ranges of flag") is required. Column "Assign. Stand." indicates whether a flag insertion should be added to the configuration of standardisation (see chapter 6. Database and 7. Standardisation in Iris). This action

can be useful if correct coding of long medical terms (e. g. with special qualifiers like "acute", "chronic") fails frequently.

To be able to assign MUSE flags at Dictionary level, a prerequisite is the extended Dictionary table structure ('MuseFlags' field added). It's important to notice that the schema of specifying flags at Dictionary level is different. Here only the flags themselves are expected without brackets, for example A for Acute and NOT (A). When more than one flag per ICD-10 code is necessary, they should be separated by | (vertical bar), for example A|P for Acute and Primary at the same time. It's just the representation for the dictionary the system will hold these flags for further processing with their brackets of course.
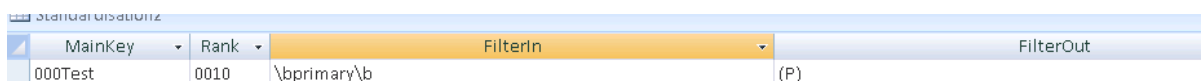
The standardisation level assignment is analogous to the old status information specification for Acute, Chronic, Sequel and Congenital. If these have already done, the system will transform them to appropriate Muse flag, (A), (C), (SEQ) and (CON) respectively. To provide a flag or flags, they should be specified in the 'FilterOut' field (at the standardisation), in their normal form being surrounded with brackets. If Primary flag 'P' should be added by standardisation for example, the relevant term, possibly 'primary' would be caught by 'FilterIn' field with (P) in the 'FilterOut' field.

Here are some examples:

Figure 85 Some examples from the dictionary with "MuseFlags" for primary (P)

Figure 86 Screenshot of the standardisation with MUSE flag example for primary (P)

Here is a fictive example with multiple flags (A), (CON) at the dictionary (where 'AAA' is the example term with these flags):

Figure 87 Screenshot of fictive example of multiple flags for a dictionary entry

Figure 88 Interface with different MUSE flags from the dictionary or standardisation

If you add more than one flag to a code, the flags must be in alphabetical order behind the code. Otherwise you got a syntax error.

Figure 89 Two examples with flags (first is coded final; second has a syntax error)

Table 4 Flags implemented by MUSE (represented a minimum of ICD-10-WHO codes)

Flag code	Description	ICD-10 code range of flag[2]	Assigned by dictionary	standardisation	computation
A	Acute This flag is assigned by Iris standardisation to diagnostic terms qualified as "acute" or other synonyms (as specified in the standardisation tables). It is used by MUSE both in multiple and selection steps: In the multiple cause coding, the flag (A) triggers the substitution of the unspecified code to the acute one, when there is a provision in the classification for a specific code for the "acute" type of the condition (see also example A1 below this table). During the selection process, to regulate the application of specific decision tables rules according to the presence of the modifier "acute". For instance, according to ICD-10, Volume 2, 2019, acute heart failure should be considered an ill-defined condition (step SP7, annex 7.3; Volume 2 ICD-10, 2019). Nevertheless the ICD-10 code for heart failure and acute heart failure are the same (I50.-). MUSE can distinguish these two conditions if the flag (A) is applied (see also example A2 below this table).[3]	Various ICD-10 codes that can have a specific code for the "acute" type.	yes (only I50.-)	yes	no
C	Chronic This flag is assigned by Iris standardisation to diagnostic terms qualified as "chronic" or other synonyms (as specified in the standardisation tables). It is used by MUSE in multiple coding steps. The flag (C) triggers the substitution of the unspecified code to the chronic one.	Various ICD-10 codes that can have a specific code for the "chronic" type.	no	yes	no
CON	Congenital This flag is assigned by Iris standardisation to diagnostic terms qualified as "congenital" or other synonyms (as specified in the standardisation tables). It is used by MUSE in multiple coding steps. The flag (CON) triggers the substitution of the unspecified code to the congenital one.	Various ICD-10 codes that can have a specific code for the "congenital" type.	no	yes	no

---

[2] Since table version 2017

[3] The use of the flag in selection rules is available only from Iris version 5 and with decision tables 2018 edition.

Flag code	Description	ICD-10 code range of flag[2]	Assigned by		
			dictionary	standardisation	computation
SEQ	Sequela This flag is assigned by Iris standardisation to diagnostic terms qualified as "sequela of" or other synonyms (as specified in the standardisation tables). It is used by MUSE in multiple coding steps. The flag (SEQ) triggers the substitution of the unspecified code to the sequela one.	A00-B99, E40-E678, G000-G08, G938, I213-I219, I248, I600-I679, J22, J40, J969, N059, N12, N19, N289, N309, O000-O927, R688, S000-T889, V010-Y849	no	yes	no
P	Primary This flag prevents the substitution of ICD-10 codes referring to primary (or presumed primary) malignant cancers into a secondary code. It is attributed in the dictionary or standardisation when the cancer is qualified as "primary" or synonyms or has a specified morphology indicating that the cancer is primary of the site. The main use of this flag is for cancers of common sites of metastasis, where it prevents the conversion to secondary according to the ICD-10 rules (paragraph 4.3.5 B Volume 2 ICD-10, 2019) (ICD-10 codes C229,C349,C381-C383,C384,C388,C400-C419,C480-C488,C493,C700-C709,C710-C719,C720,C728,C729,C760-C768). Nevertheless it is used also for other cancers that should not be converted into secondary, for example the presence of other cancers indicated as "primary in" (see paragraph 4.3.5 B (e) Volume 2 ICD-10, 2019). See also example P1 below this table.	C000-C768	yes	yes	yes
PIN	Primary in This flag is attributed by dictionary to diagnostic entries referring to malignant neoplasm described as "primary in" a specific site, "originating in" a specific site or with similar terms. MUSE assigns PIN flag to the code C800 by computation (see paragraph 4.3.5 B (e) Volume 2 ICD-10, 2019).	C000-C768, C800	yes	no	yes
CSM	Common site of metastases This is a computed flag. It isn't assigned by dictionary or standardisation. That's why this flag is never shown in the	See list of common site of metastases (ICD-10,	no	no	yes

Flag code	Description	ICD-10 code range of flag[2]	Assigned by		
			dictionary	standardisation	computation
	direct coding, but only in the explanations by MUSE. It is used by MUSE for identifying cancers of sites that can be considered as cancers of common sites of metastasis (see paragraph 4.3.5 B (a) Volume 2 ICD-10, 2019).	Volume 2, paragraph 4.3.5 B (a))			
MET	Metastatic This flag is attributed by dictionary to the ICD-10 codes referring to primary (or presumed primary) cancers when the diagnostic terms describe them as "metastatic". The term metastatic is not retained in the ICD-10 code but it is important for the correct application of ICD-10 rules. The flag can also be added by the standardisation. When the flag MET is applied to neoplasms other than malignant (D00-D48) MUSE will substitute the code with the corresponding malignant code, using the connected code if present. Please note that "metastatic" does not mean "secondary tumour spread". It is an ambiguous term used primarily in English and denotes a malignant neoplasm that is either primary causing metastatic spread, or metastatic spread from a primary tumour. If the expression "metastatic" is not used in your language in both these senses, you should not use the connected codes for "metastatic" in your dictionary (see paragraph 4.3.5 G, Volume 2, ICD-10, 2019).	C000-C768, D000-D489	yes	yes	yes
EM	Embolic Use this flag for clearly indicating the embolic nature of the arterial occlusion for pre-cerebral, cerebral and unspecified arteries. The information about the nature embolic or thrombotic of such diagnoses in not contained in the ICD-10 codes used in direct coding, but it can be relevant for further elaboration of MUSE. (See also example EM1 below this table).	I650-I669, I749	yes	no	no
TH	Thrombotic	I650-I669, I749	yes	no	no

Flag code	Description	ICD-10 code range of flag[2]	Assigned by		
			dictionary	standardisation	computation
	Use this flag for clearly indicating the thrombotic nature of the arterial occlusion for pre-cerebral, cerebral and unspecified arteries.				
RH	Rheumatic Use this flag if text clearly indicates that the valve disease is rheumatic. Some heart diseases are indexed by default as rheumatic and the ICD contains also codes for non-rheumatic type. The default rheumatic codes are substituted by MUSE into non-rheumatic under some conditions, according to ICD provisions. These substitutions should not be applicable if the diagnostic term is specified as "rheumatic". MUSE uses the flag to prevent the code substitution.	I050-I059, I060-I069, I070-I079, I080-I088	yes	yes	yes
nRH	Non-rheumatic Use this flag if text clearly indicates that the valve disease is non-rheumatic. The use of this flag is similar to what has been described for the flag RH. Some heart diseases are indexed by default as non-rheumatic and the ICD contains also codes for rheumatic type. The default non-rheumatic codes are substituted by MUSE into rheumatic under some conditions, according to ICD provisions. These substitutions should not be applicable if the diagnostic term is specified as "non-rheumatic". MUSE uses the flag to prevent the code substitution.	I340-I349, I350-I359, I360-I369	yes	yes	yes
TR	Traumatic Use this flag if text clearly indicates that the diagnosis term was traumatic. Some conditions (for example fractures) are by default indexed as traumatic (XIX chapter) and the ICD contains also codes for non-traumatic type. The default traumatic codes are substituted by MUSE into non-traumatic under some conditions, according to ICD provisions. These substitutions should not be applicable if the diagnostic term	S004, S050-S053, S060-S069, S092, S360-S369, S370-S379, S460, T093	yes	no	no

Flag code	Description	ICD-10 code range of flag[2]	Assigned by		
			dictionary	standardisation	computation
	is specified as "traumatic". MUSE uses the flag to prevent the code substitution.				
nTR	Non-traumatic Use this flag if text clearly indicates that the diagnosis term was non-traumatic. Some conditions are by default indexed as non-traumatic and the ICD contains also codes for non-traumatic type (e.g. cerebral haemorrhage). The default non-traumatic codes are substituted by MUSE into traumatic under some conditions, according to ICD provisions. These substitutions should not be applicable if the diagnostic term is specified as "non-traumatic". MUSE uses the flag to prevent the code substitution.	E274, G527, G542, G820-G825, G830-G839, G935, G936, G939, G959, H113, H114, H210, H313, H356, H431, H578, H720, H721, H729, H838, I233-I235, I288, I312, I600-I609, I610-I619, I620-I629, I710, I711, I713, I715, I718, I720-I729, I771, I772, I774, I871, J438, J439, J938, J939, J942, K222, K318, K440-K449, K625, K661, K768, K822, K832, K928, M621, M660, M661, N324, N421, N488, N501, N836, N857, N939, R041, R048, R049	yes	no	no

Examples

Example A1:

	Direct coding	Multiple cause	UC
1a Acute renal failure	N19(A)	N179	N179

In the Iris dictionary, the term "renal failure" is present. The term "acute" is recognized by standardisation and the flag (A) is attached to the code of renal failure NOS. MUSE uses the flag for the code substitution.

Example A2:

	Direct coding	Multiple cause	UC
1a Acute heart failure	I509(A)	I509(A)	
2 Diabetes, ketoacidosis	E149 E872	E149 E872	E141

The flag (A) is carried also during the selection process and allows distinguishing the acute heart failure from the non-specified heart failure (these two conditions are classified in the same ICD-10 code I509). In step SP7, MUSE recognizes I509(A) as an ill-defined condition and will select diabetes with ketoacidosis.

Example P1:

	Direct coding	Multiple cause	UC
1a Bronchogenic cancer	C349(P)	C349	C349
1b Prostate cancer	C61	C61	

C349 is used for both bronchogenic cancer and lung cancer. Nevertheless these two diagnostic expressions have a different behaviour in coding certificates with multiple cancers: lung can be considered a common site of metastasis while bronchus cannot. For making a distinction between these two terms we use a (P) (P = primary) in the dictionary and multicausal tables, so that MUSE could correctly process this certificate.

Example EM1:

	Direct coding	Multiple cause	UC
1a Embolism to arteria media cerebri	I660(EM)	I660(EM)	I634

In this example, the flag (EM), which stands for "embolic", is used to add the information about the presence of embolism to the code I660. This code is invalid as underlying cause; it must be substituted by one of the subcategories in I63.- for the underlying cause. For choosing the appropriate subcategory MUSE would need to know if the original disease is embolic or thrombotic and this information is not included in the code I660 but it is added by the flag (EM).

Here are some examples how you could implement flags in a dictionary.

DiagnosisText	Icd1	IcdC	Icd2	Icd3	MuseFlags	CodingFlag	Likelihood	Prompt	YearStart	YearEnd	DateIn	UserIn
nonrheumatic mitral cardiopathy	I349				nRH				2015	9999	29.04.2008	Iris
nonrheumatic mitral stenosis	I342				nRH				2015	9999	29.04.2008	Iris
nonrheumatic tricuspid degeneration	I369				nRH				2015	9999	29.04.2008	Iris
nonrheumatic tricuspid endocarditis	I368				nRH				2015	9999	29.04.2008	Iris
nonrheumatic tricuspid incompetency	I361				nRH				2015	9999	29.04.2008	Iris
rheumatic aortic endocarditis	I069				RH				2015	9999	29.04.2008	Iris
rheumatic aortic incompetency	I061				RH				2015	9999	29.04.2008	Iris
rheumatic aortic obstruction	I060				RH				2015	9999	29.04.2008	Iris
rheumatic aortic valve deformity	I068				RH				2015	9999	29.04.2008	Iris
rheumatic mitral incompetency	I051				RH				2015	9999	29.04.2008	Iris
Rheumatic mitral valve disease	I059				RH				2015	9999	09.10.2015	Iris
rheumatic tricuspid insufficiency	I071				RH				2015	9999	29.04.2008	Iris
rheumatic tricuspid stenosis	I070				RH				2015	9999	29.04.2008	Iris
Thrombosis of arteria media cerebri	I660				TH				2015	9999	09.10.2015	Iris
Thrombosis of vertebral artery	I650				TH				2015	9999	09.10.2015	Iris

Figure 90 Screenshot from a dictionary with examples for MUSE flag

For more information about MUSE flags see chapter *8.2.9 Connected codes and MUSE flags*.

5.4 Understanding multicausal processing

5.4.1 Introducing example

Multicausal processing of MUSE is explained by following example:

1a	brain cancer	
1b	kidney cancer	
1c		
1d		
2	breast cancer	5 Years

See figure below visualizes corresponding MUSE processing.

Figure 91 Example of multicausal processing

MUSE starts the processing with coded terms at the certificate: C719/C64*C509(5Y). First MUSE assigns automatically the CSM[4]-flag to C719 (see row in grey colours). The list of common sites of metastases is specified in paragraph 4.3.5 B (a) of Volume 2. Direct codes of the corresponding code list are considered as CSM by MUSE:

C229,C341-C349,C381-C388,C400-C419,C480-C488,C493,C700-C720,C728-C729,C760-C783,C786-C787,C793-C795,C798

Next multiple-cause coding instruction group G0013717 is applied. The **dark blue** row gives information about this step. In column "message" textual explanations are presented to coder. Next column "details" contains technical information about applied multiple-cause coding instruction. The identifier of the instruction group G0013717 is followed by the rule type MDTXSL2. This instruction is a binary instruction which is applied if a specified anchor code and a specified subcode are reported on the certificate. Additionally the rule type MDTXSL2 requires one of following relationships between both codes:

- anchor code is due to subcode in Part 1 (direct or indirect due to)
- anchor code is in the same line of subcode in Part 1 or Part 2
- anchor code is in Part 1 and subcode is in Part 2

In this case the anchor code C719(CSM) is due to subcode C64. The first code of the first curly bracket indicates the anchor code. Behind the colon the performed actions are shown: The minus sign (-) indicates the deletion of the anchor code. The plus sign indicates the converting of a new code. The expression "+C793(CSM)" means that new code C793 (with CSM-flag) is inserted behind the deleted anchor code. Both actions are also visualized in line 1a (Part 1) of MUSE explanation window: The deleted code has a red crossed out line, the new code is blue.

The first code of the second curly bracket represents the subcode (here C64). The subcode isn't changed. Therefore an action isn't displayed.

The square brackets show the "condition" 'CSM1=1 AND P1=0'. Data of both codes must comply with the condition:

---

[4] Common site of metastasis

- CSM1=1   means   "CSM-flag of anchor code is set"

- P1=0   means   "P-flag of anchor code isn't set"

Finally the text message "considered secondary" is added.

5.4.2 Unary code modifications

Frequently code modifications don't depend on reporting of other ICD-10 codes on the certificates, but on other specific criteria. They are called unary code modifications. The table below lists frequent unary code modifications of German data.

Table 5 Frequent unary code modifications

ID[5]	Description	Frequency of code modifications[6]
11000014	I258: Other forms of chronic ischaemic heart disease Time criterion: DAYSTODEATH1 >= 29	0,52%
11004129	N189: Chronic kidney disease, unspecified Flag criterion: N19 with chronic flag	0,05%

E.g. I219 (Acute myocardial infarction, unspecified) is recoded to I258 (Other forms of chronic ischaemic heart disease) if disease occurred more than 28 days before death. Following example exemplifies MUSE processing of unary code modifications:

1a	heart failure	
1b	myocardial infarction	2 Years
1c		
1d		
2		

See figure below visualizing corresponding MUSE explanation.

---

[5] ID of multiple-cause coding instruction group (please note that they have changed during the years).
[6] Analysis is based on 70.000 German death certificates.

Figure 92 Example of unary multicausal processing

Column "message" contains textual explanations provided by Iris Institute. Following column "details" informs about performed multiple-cause code modifications. After the identifier of multiple-cause coding instruction (G11000014) the type of the applied instruction (MUN[7]) is shown.

Code behind the first curly bracket represents the anchor code modified by this multiple-cause coding instruction. It is deleted (**-**) and replaced by a new code (**+I258**). The square brackets enclose the specific "condition" connected to the instruction. Here the period between occurrence of I219 and the death are greater than or equal 29 days (DAYSTODEATH >= 29).

5.4.3 Multicausal rule types and additional information

The table below summarizes multicausal rule types implemented by MUSE in the Multicausal decision tables (MCDT). Each rule type covers one or more relationships between anchor code and subcode. Each basic multiple-cause coding instruction has an unique rule type.

---

[7] MUN is an abbreviation for "Multicausal unary substitution" (see *5.4.3 Multicausal rule types and additional information*).

Table 6 Multicausal rule types of MUSE

MCDT Rule type	Description
MUN	**Multicausal Unary** code substitution For the code substitution MUSE needs only one code (Anchor code without Subcode). The anchor code is substituted. The substitution can happen: 1. with condition e.g.: - presence of a flag (chronic, acute, congenital, rheumatic, non-rheumatic, traumatic, non-traumatic, sequel, primary) - Age of decedent - Duration of the condition (days to death, years to death) 2. without condition e.g.: - Created code replacement by valid ICD-10 code
MNN	Binary **multicausal** replacement **Next Neighbour** in Part 1 or Part 2 MUSE needs an Anchor code and subcode in Part 1 or Part 2 (optional with condition). The anchor code and the subcode are reported together as next neighbour on the same line of the certificate (Part 1 or Part 2). The anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition
MMO	**Multicausal** replacement with **Mention Of** subcode MUSE needs an anchor code and a subcode in Part 1 or Part 2 (optional with condition). The anchor code is reported with mention of the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MMO1	**Multicausal** replacement **Mention Of Part 1** MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported with mention of the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MDT	**Multicausal** replacement code is **Due To** subcode in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in due to position with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MDTNN	**Multicausal** replacement code is **Due To** subcode or **Next Neighbour** in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported as next neighbour of the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.

MCDT Rule type	Description
MDTSL	**Multicausal** replacement **Due To** or **Same Line** in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in due to position with respect to the subcode or are both on the same line then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MCO	**Multicausal** replacement code is **Cause Of** subcode in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in cause of position with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MCONN	**Multicausal** replacement code is **Cause Of** subcode or **Next Neighbour** in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in cause of position or next neighbour with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MCOSL	**Multicausal** replacement code is **Cause Of** subcode or **Same Line** in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in cause of position or on the same line with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MSP	**Multicausal** replacement within the **Same Part** MUSE needs an Anchor code and a subcode both in Part 1 or Part 2 (optional with condition). The anchor code and the subcode are reported together on the same part of the certificate (Part 1 or Part 2), then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MSL	**Multicausal** replacement within the **Same Line** MUSE needs an Anchor code and a subcode both in Part 1 or Part 2 (optional with condition). The anchor code and the subcode are reported together on the same line of the certificate (any line in Part 1 or Part 2), then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MDTXSL	**Multicausal** replacement **Extended Due To** in Part 1 or **Same Line** in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in extended due to position with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.

MCDT Rule type	Description
MDTXSL2	**Multicausal** replacement **Extended Due To** in Part 1 or **Same Line** relationship in **Part 1 or Part 2** or anchor code in Part 1 and subcode in Part 2 MUSE needs an Anchor code and a subcode in Part 1 or Part 2 (optional with condition). Both the anchor code and the subcode are in part 1, the anchor code is reported in extended due to position with respect to the subcode or are both on the same line in Part 1 or Part 2 or anchor code is in Part 1 and subcode in Part 2. Then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MCOX	**Multicausal** replacement **Extended Cause Of** in Part 1 MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in extended cause of position with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MCOXSL	**Multicausal** replacement **Extended Cause Of** in Part 1 or **Same Line** relationship in Part 1. MUSE needs an Anchor code and a subcode in Part 1 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in extended cause of position or on the same line with respect to the subcode then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MDTXNN	**Multicausal** replacement **Extended Due To** in Part 1 or **Same Line** in Part 1 or **Next Neighbour i**n Part 1 or Part 2 MUSE needs an Anchor code and a subcode in Part 1 or Part 2 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in extended due to position with respect to the subcode or are next neighbour. Then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
MDTXNN2	**Multicausal** replacement **Extended Due To** in Part 1 or **Same Line** in Part 1 or **Next Neighbour** in **Part 1 or Part 2** or anchor code in Part 1 and subcode in Part 2 MUSE needs an Anchor code and a subcode in Part 1 or Part 2 (optional with condition). Both the anchor code and the subcode are in Part 1, the anchor code is reported in extended due to position with respect to the subcode or are next neighbour or anchor code is in Part 1 and subcode in Part 2. Then the anchor code or/and the subcode is substituted. Sometimes the substitution is limited by a condition.
UZU	**Unicausal** rule with **Z** codes or asterisk codes, **unary** Deleting, replacing or supplementing of Z codes or asterisk codes before the unicausal selection. This rule applied after all multicausal rules types.

MCDT Rule type	Description
UIP	**Unicausal** rule with **invalid** codes: other code **preferred** Replacement of a tentative underlying cause (TUC) by another mentioned cause (no deletion of the TUC code). This rules applied at Step M1. When this rule applied at Step M1 is called M1X.
UIC	**Unicausal** rule with **invalid** codes: **combination** Replacement of a tentative underlying cause (TUC) by another not mentioned cause (with deletion of the TUC code). This rules applied at Step M1. When this rule applied at Step M1 is called M1X.
URCC	**Unicausal replacement** of **created code** After unicausal selection the created codes are replaced by stem codes.
CMUN	**Checks Multicausal Unary** Multicausal unary plausibility checks (rejects with explanations)
CUUN	**Checks Unicausal Unary** Plausibility unary checks at the end (rejects with explanations)

The formatting in lines 1a, 1b, 1c, 1d and Part 2 is a result of all performed multiple-cause and underlying cause of death coding instruction. Keep in mind that inserts and deletions can be done by underlying cause of death coding instructions too. If for example a blue code has strikethrough formatting it means that this code was added first and deleted by another instruction.

On the Iris website, a PDF version of MUSE tables containing the substitution rules is available.

5.4.4 'Condition' at specMuse file and MUSE Explanation Window

Some multicausal and unicausal rules are applied only when a "condition" is fulfilled. The user cannot look at the specMuse file, but the user can see the "condition" at the Decision Table Browser and Coding log at the MUSE explanation window.

Here an overview about the "condition" which are used:

Table 7 Condition for age and duration

Condition	Explanation
AGEDAYS	Age of the decedent expressed in days
AGEDAYS1	Age of the decedent expressed in days at the time of onset of disease (referred to anchor code)
AGEDAYS2	Age of the decedent expressed in days at the time of onset of disease (referred to subcode)
AGEYEARS	Age of the decedent expressed in years
AGEYEARS1	Age of the decedent expressed in years at the time of onset of disease (referred to anchor code)
AGEYEARS2	Age of the decedent expressed in years at the time of onset of disease (referred to subcode)
DAYSTODEATH1	Time interval from onset to death in days (anchor code)
DAYSTODEATH2	Time interval from onset to death in days (subcode)
YEARSTODEATH1	Time interval from onset to death in years (anchor code)
YEARSTODEATH2	Time interval from onset to death in years (subcode)

Table 8 Condition for MUSE flags (also available for unicausal rules)

Condition	Explanation
A1 = 1	Flag should be present for anchor code
A1 = 0	Flag should not be present for anchor code
A2 = 1	Flag should be present for subcode
A2 = 0	Flag should not be present for subcode
…	[Explanations are also valid for the other MUSE flags]

Table 9 Condition for connected codes

Condition	Explanation
ICDC1 = [Connected Code]	Refers to connected code (anchor code)
ICDC2 = [Connected Code]	Refers to connected code (subcode)

Table 10 Condition for manner of death (MoD)

Condition	Explanation
MOD = 0	Disease
MOD = 1	Homicide

Condition	Explanation
MOD = 2	Accident
MOD = 3	Pending investigation
MOD = 4	Suicide
MOD = 5	Could not be determined
MOD = 6	Not filled in (Unknown)

Table 11 Other condition (also available for unicausal rules)

Condition	Explanation
SP = 0	Anchor code and subcode are not in the same part
SP = 1	Anchor code and subcode are in the same part
SL = 0	Anchor code and subcode are not in the same line
SL = 1	Anchor code and subcode are in the same line

Here some examples where you can find the condition at the "Coding log".

Figure 93 Condition for connected codes at the multiple cause rule

Figure 94 Other condition (SL=1) at unicausal rule

Figure 95 Condition for duration at multiple cause rule

5.5 Understanding unicausal processing

Since the WHO update for 2016 the coding rules have been changed in Volume 2 of ICD-10-WHO (2016 version). These updates are only in version 5 available.

MUSE implements following unicausal rules (Steps) according to ICD-10-WHO (Volume 2, paragraph 4.2.1 and 4.2.2):

- **SP1** - Single cause on certificate
- **SP2** - Only one line used in Part 1
- **SP3** - More than one line used in Part 1, first cause on lowest line explains all entries above
- **SP4** - First cause on lowest used line does not explain all entries above, but a sequence ends with the terminal condition
- **SP5** - No sequence in Part 1
- **SP6** - Obvious cause
- **SP7** - Ill-defined conditions
- **SP8** - Conditions unlikely to cause death
- **M1** - Special instructions
- **M2** - Specificity
- **M3** - Recheck Steps SP6, M1 and M2
- **M4** - Instructions on medical procedures, poisoning, main injury and maternal deaths[8]

Coding log shows unicausal steps after entry "START OF SELECTION" (see figure below). User can easily recognize the sequence of processed rules in column type:

- Successfully applied rules are in green letters. Usually another green line is added each time when a rule is applied successfully. It contains the new temporarily selected underlying cause of death in the column UC.
- Rules which couldn't be applied are displayed in grey colour. The reason for non-application is displayed in the column message.

---

[8] M4 isn't fully implemented by MUSE; manual revision is required. There are not any decision tables available for step M4.

5.5.1 Example 1 (SP1)

1a	I259	Ischemic heart disease
1b		
1c		
1d		
2		

Explanation: (Step SP1 – Only on condition either in Part 1 or Part 2)

With I259 is only one condition reported on the certificate. According to SP1 I259 is the starting point and it is also the underlying cause.

Figure 96 Unicausal coding example 1

5.5.2 Example 2 (SP1)

1a	C799	Metastasis
1b		
1c		
1d		
2		

Explanation: (Step SP1 – Only on condition either in Part 1 or Part 2)

C799 is only one condition reported on the certificate. According to SP1 it is selected as starting point. Then a special instruction (M1) is applied (see paragraph 4.2.5 at Volume 2):

C77–C79 Secondary malignant neoplasms

Not to be used for underlying-cause mortality coding. If the primary site of malignant neoplasm is not known or indicated, code to malignant neoplasm without specification of site (C80.).
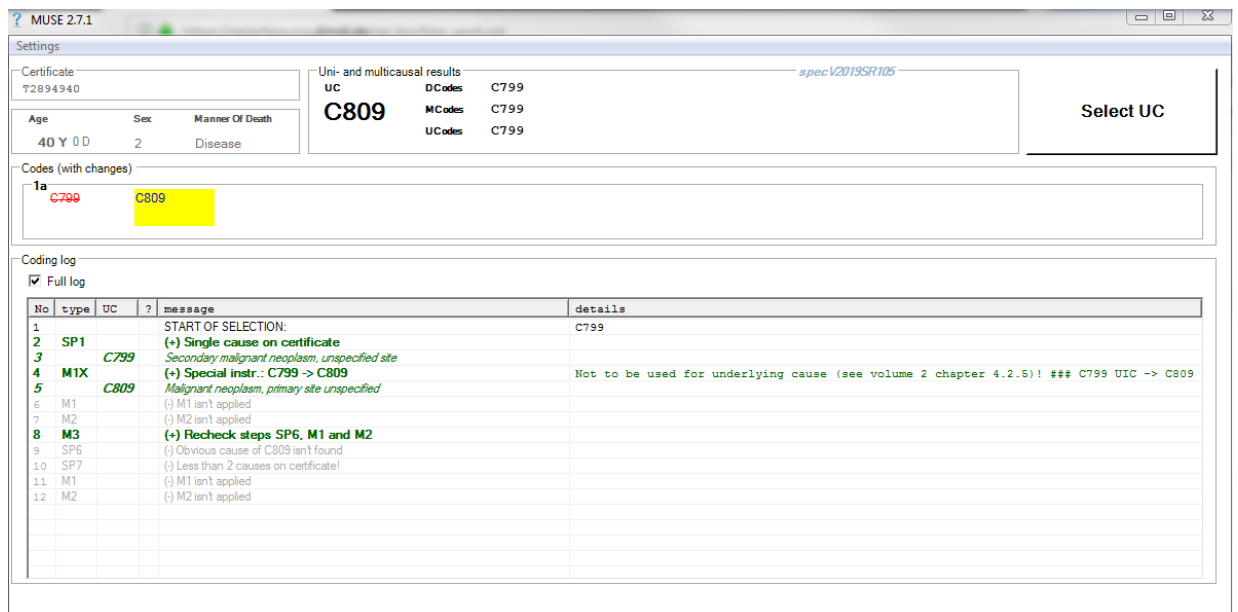
Figure 97 Unicausal coding example 2

M1X at Coding log means that Step M1 refers to the table (summary of codes not to be used in underlying-cause mortality coding) in Volume 2 (paragraph 4.2.5 Special instructions on linkages and other provisions (Step M1)).

5.5.3 Example 3 (SP2)

1a	I2199, E149	Myocardial infarction and Diabetes mellitus
1b		
1c		
1d		
2		

Explanation: (Step SP2 – Only one line used in Part 1)

SP2 is applied because only line 1a is used in Part 1. I219 is the first mentioned disease and used as starting point. Then MUSE goes to step SP6.

Figure 98 Unicausal coding example 3

5.5.4 Example 4 (SP2)

1a	I2199	Myocardial infarction
1b		
1c		
1d		
2	E149	Diabetes mellitus

Explanation: (Step SP2 – Only one line used in Part 1)

SP2 is applied because only line 1a is used in Part 1. I219 is the first mentioned disease and used as starting point. Then MUSE goes to SP6.

Figure 99 Unicausal coding example 4

5.5.5 Example 5 (SP3)

1a	J180	Bronchopneumonia
1b	G819	Hemiplegia
1c	I6399	Cerebral infarction
1d		
2		

Explanation: (Step SP3 – More than one line used in Part 1, first condition on lowest line explains all entries above)

I639 explains J180 and G819; so I639 is selected as starting point.

Figure 100 Unicausal coding example 5

5.5.6 Example 6 (SP3 [optional] time error)

1a	G819	Hemiplegia (2 Months)
1b	J180	Bronchopneumonia (1 Month)
1c	I6399	Cerebral infarction (2 Months)
1d		
2		

Explanation: (Step SP3 – cannot be applied if there is a conflict with duration)

MUSE warns (**orange**) that Hemiplegia is before Bronchopneumonia because the reported times between 1a and 1b are inconsistent. Because there is set an optional reject.
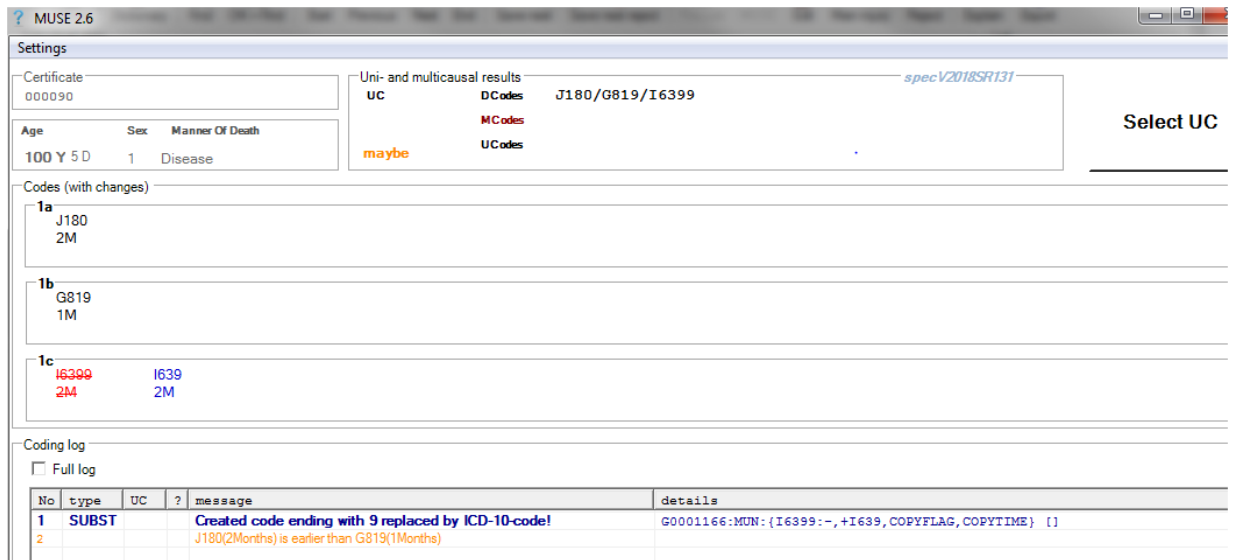
Figure 101 Unicausal coding example 6

More information about conflicts with duration at chapter *5.2 MUSE explanation window – overview* , Settings at MUSE window

5.5.7 Example 7 (SP3 [optional] time errors)

1a	G819	Hemiplegia (2 Months)
1b	J180	Bronchopneumonia (1 Month)
1c	I639	Cerebral infarction (1Month)
1d		
2		

Explanation: (Step SP3 – cannot be applied if there is a conflict with duration)

MUSE shows two warnings (**orange**):

G819 is before J180 because times between 1a and 1b are inconsistent.

G819 is before I639 because times between 1a and 1c are inconsistent.

Therefore SP3 cannot be applied (G819 cannot be explained by first cause on lowest used line).

Figure 102 Unicausal coding example 7

More information about conflicts with duration at chapter *5.2 MUSE explanation window – overview* , Settings at MUSE window.

5.5.8 Example 8 (SP4)

1a	C787	Liver metastases
1b	I6399, C169	Cerebral infarction and stomach cancer
1c		
1d		
2		

Explanation: (Step SP4 – First condition on lowest used line does not explain all entries above, but a sequence ends with the terminal condition)

Cerebral infarction cannot cause liver metastases, but liver metastases can be due to stomach cancer. Stomach cancer is the tentative starting point.

Figure 103 Unicausal coding example 8

5.5.9 Example 9 (SP4)

1a	I269	Pulmonary embolism
1b	C450, I871	Mesothelioma of pleura, Compression of vein
1c	J61	Pneumoconiosis due to asbestos
1d		
2		

Explanation: (Step SP4 – First condition on lowest used line does not explain all entries above, but a sequence ends with the terminal condition)

According to paragraph 4.2.3 B. (b) in Volume 2 of ICD-10 malignant neoplasms aren't accepted due to most other conditions: Asbestosis cannot cause mesothelioma of pleura. Therefore the sequence starts with in C450.

Figure 104 Unicausal coding example 9

5.5.10 Example 10 (SP5)

1a	C349(P)	Carcinoma of bronchus
1b	J969	Respiratory failure
1c		
1d		
2		

Explanation: (Step SP5 – No sequence in Part 1)

According to paragraph 4.2.3 B. (b) in Volume 2 of ICD-10 malignant neoplasms aren't accepted due to most other conditions.

Assign a P flag to C349 because lung cancer is coded as primary, if the malignant neoplasm is described as bronchogenic or of bronchus (see paragraph 4.3.5 in Volume 2 of ICD-10).

There is no sequence in Part 1 that ends with the terminal condition, because respiratory failure cannot cause carcinoma of bronchus. So there is no sequence ending with the terminal condition, the terminal condition itself – Carcinoma of bronchus – is the tentative starting point.

Figure 105 Unicausal coding example 10

5.5.11 Example 11 (SP6)

1a	J189	Pneumonia
1b		
1c		
1d		
2	I6399	Cerebral infarction

<u>Explanation</u>: (Step SP6 – Obvious cause)

Starting point is J189 (SP2). Consider I639 as obvious cause of pneumonia, because it is according to paragraph 4.2.4 K. (see Volume 2) a disease causing paralysis (such as cerebral haemorrhage and thrombosis). Therefore SP6 is applied.

Figure 106 Unicausal coding example 11

5.5.12 Example 12 (SP7)

1a	I489	Cardiac decompensation
1b	R54, E86	Old age, Dehydration
1c	I672, M819	Cerebral arterial sclerosis, Osteoporosis
1d		
2		

Explanation: (Step SP7 – Ill-defined conditions)

At first R54 (old age) is selected according to SP4 (R54 cannot be caused by conditions in 1c). R54 is an ill-defined condition. That's why selection is restarted without R54. Now, SP3 is applied because I672 explains the other conditions in line 1a and 1b in Part 1.
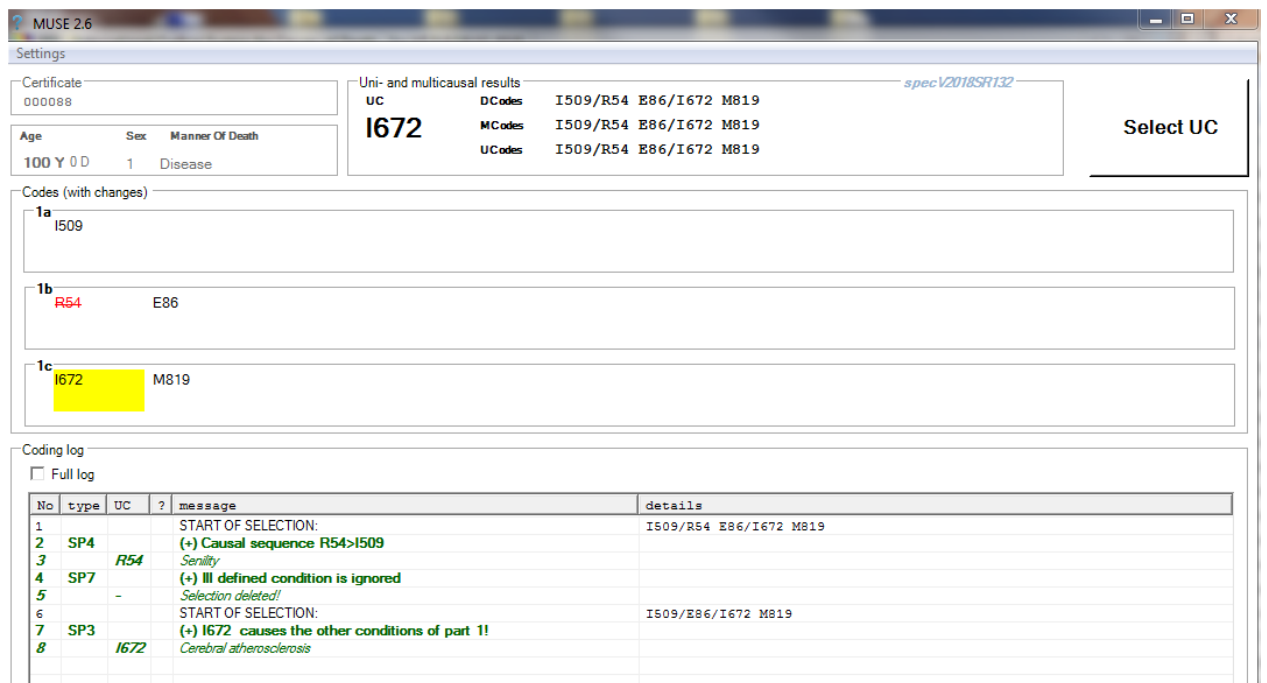
Figure 107 Unicausal coding example 12

5.5.13 Example 13 (SP7 with recoding)

1a	J189	Pneumonia
1b	R263	Immobility
1c		
1d		
2	F03	Dementia

<u>Explanation</u>: (Step SP7 – Ill-defined conditions)

According to SP3 ill-defined condition R263 is selected as starting point. SP7 is applied and selection starts again without R263. Row 5 at Coding log gives information about deletion of starting point R263. An addition row with rule type "SP7_RC" indicates recoding (RC) after application of SP7. Hypostatic pneumonia J182 is selected as new tentative starting point (TSP).

Figure 108 Unicausal coding example 13

5.5.14 Example 14 (SP7 – all condition are ill-defined)

1a	R54, R263	Old Age, Immobility
1b		
1c		
1d		
2		

Explanation: (Step SP7 – Ill-defined conditions)

According to SP2 the ill-defined condition R54 (Senility) is selected as starting point. After checking SP6 MUSE fails to apply SP7 (see row no. 5 at Coding log). The reason is following coding instruction (see paragraph 4.2.1 in Volume 2, Step SP7 – Ill-defined conditions):

"If there are other conditions reported on the certificate, check whether they are all ill-defined. If all other conditions are ill-defined, go to Step M1."
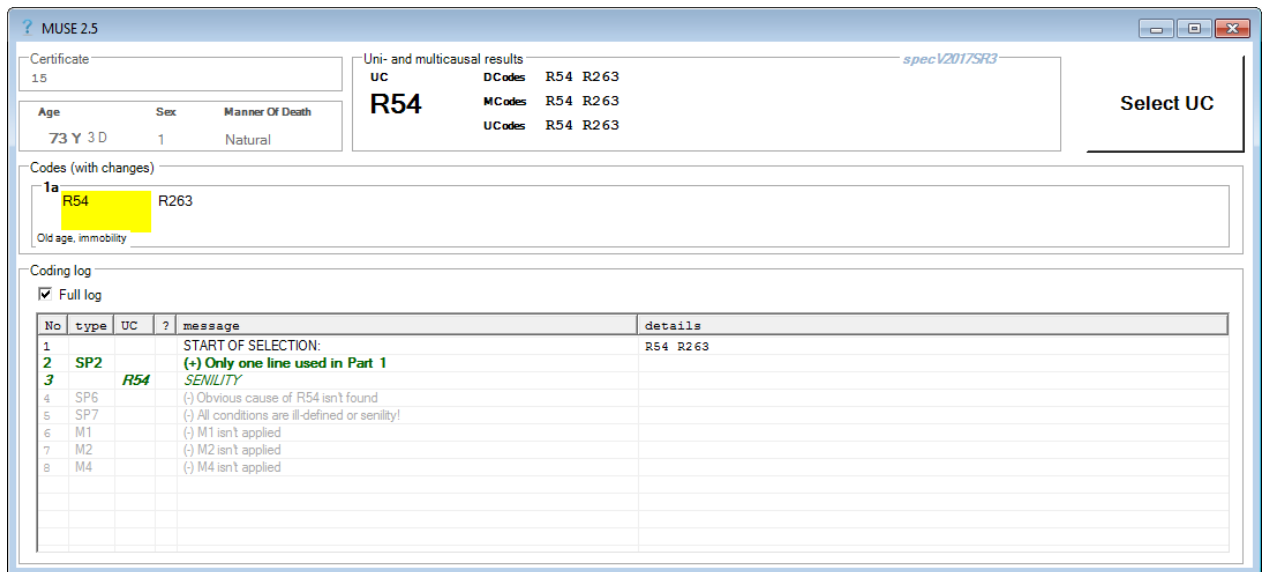
Figure 109 Unicausal coding example 14

5.5.15 Example 15 (SP8)

1a	J069	Upper respiratory infection
1b		
1c		
1d		
2	I6949, E149	Sequelae of stroke, Diabetes mellitus

<u>Explanation</u>: (Step SP8 – Conditions unlikely to cause death)

Starting point J069 is a condition unlikely to cause death condition and SP8 is applied. The selection starts again without J069 and I694 is selected as tentative starting point by step SP5.

Figure 110 Unicausal coding example 15

5.5.16 Example 16 (SP8 Condition unlikely to cause death accepted)

1a	A419	Sepsis
1b	K029	Caries
1c		
1d		
2		

Explanation: (Step SP8 – Conditions unlikely to cause death)

Starting point K029 causes the complication A419. Therefore it is accepted as tentative starting point (see message in row no. 6 at Coding log).
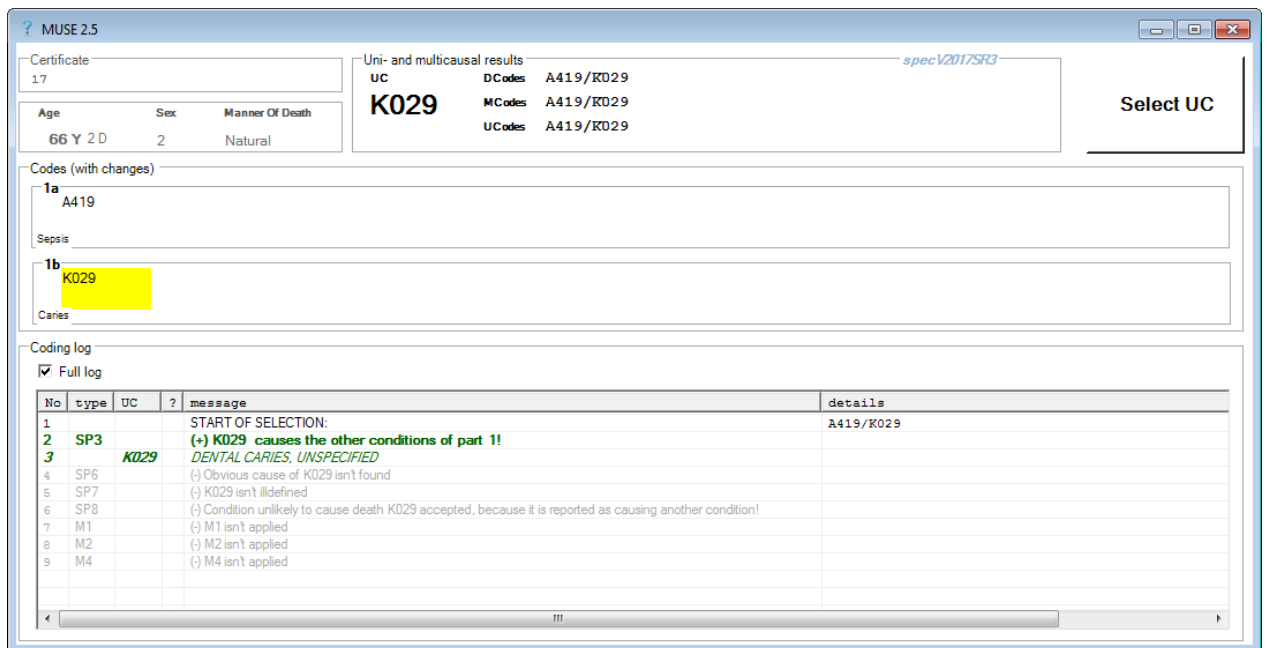
Figure 111 Unicausal coding example 16

5.5.17 Example 17 (M1)

1a	I6409	Stroke
1b	I709, I119	Atherosclerosis, Hypertensive heart disease
1c		
1d		
2		

Explanation: (Step M1 – Special instructions)

Starting point I709 can be modified by two special instructions (Linkages to I64 and I119, shown yellow row at Coding log). According to coding instructions 2019 the code I119 is selected as underlying cause[9].

Figure 112 Unicausal coding example 17

---

[9] According to older instructions (2016) I64 is selected as UC.

5.5.18 Example 18 (M2)

1a	I131	Hypertensive heart and renal disease with renal failure
1b	N182	Chronic kidney disease, stage 2
1c	N19	Kidney failure
1d		
2		

Explanation: (Step M2 – Specificity)

Starting point N19 can be modified by two instructions (SMP rule to N182 and I131, shown yellow row at Coding log). According to coding instructions 2019 the code I119 is selected as underlying cause[10].

Figure 113 Unicausal coding example 18

---

[10] According to older instructions (2016) I131 is selected as UC.

5.5.19 Example 19 (M3)

1a	A419	Sepsis
1b	I779, I743	Arterial disease, arterial embolism of left leg
1c		
1d		
2	C64	Malignant neoplasm of kidney

Explanation: (Step M3 – Recheck Steps SP6, M1 and M2)

The tentative starting point according to Step SP3 is I779. Arterial embolism of left leg, reported as the second condition on line 1(b), is a specific type of arterial disease. Therefore, select arterial embolism of left leg as the tentative underlying cause in Step M2. Reapply Step SP6, because the tentative starting point is not the same as the one selected in Steps SP1 to SP8. But the malignant neoplasm of kidney (C64) is an obvious cause of arterial embolism, and the malignant neoplasm of kidney is the new starting point. No further modifications apply. Code the malignant neoplasm of kidney (C64) as the underlying cause of death.

Figure 114 Unicausal coding example 19

5.6 Working with connected codes

Connected codes are specified in column "IcdC" of the Iris dictionary. The "MUSE explanation window" displays the code and the subsequent connected code (without separator). Here are some examples:

tumour of stomach	D371C169
brain tumour	D432C719
tumour of external upper lip	D370C000
tumour of kidney	D410C64

The connected code is a specific alternative to the main code. If specified conditions are fulfilled the main code will be substituted for the alternative code.

Example:

Following certificate should be coded with a connected code (direct codes):

1a	metastasis	C799
1b	kidney tumour	D410C64

The figure below shows the Coding log of the multiple-cause coding instruction which recodes D410 to C64.

No	type	UC	?	message	details
1	SUBST			Neoplasm considered malignant (other malignant neoplams are secondary)	G99015105:MMO:{D410:-,+C64,*,COPYTIME} {C799} []

Figure 115 Multiple-cause coding instruction with a connected code at Coding log

In column "message" the identification of the instruction group G99015105 is followed by the rule type MMO.

The first code of the first curly bracket indicates the anchor code (here D410). Behind the colon the performed actions are shown: The minus sign (-) indicates the deletion of the anchor code. The plus sign indicates the insertion of a new code. The expression "+C64,*" means that the default code C64 is added if no connected code is reported or that an existing connected code is added. Here the connected code and the default code are the same.

The first code of the second curly bracket represents the subcode (here C799).

Here the instruction group G99015105 is performed because the anchor code D410 (line 1b in Part 1) reported as cause of the subcode C799 (line 1a in Part 1).

For more information about connected codes see *8.2.9 Connected codes and MUSE flags* and *Appendix 3: Connected codes for neoplasms*.

5.7 Configuration of MUSE

5.7.1 MUSE content configuration and version management

MUSE logic is defined by specification files being located in the subdirectory *spec* of the installation directory of Iris (default settings). This configuration directory is called **main MUSE specification directory**.

<u>For example:</u> If executable file Iris.exe is in directory *"C:\Program Files\Iris\"* the default MUSE specification directory will be *"C:\Program Files\Iris***spec**\".*

On the other hand main Muse specification directory contains special subdirectories related to different versions of MUSE content specification. Each subdirectory is named according to following naming scheme:

`specV<nnnn>SR<n>`

`V<nnnn>` represents main versions like `V2017`, `V2018` etc.

`SR<nn>` represents optional service releases like `SR10`, `SR20`

During the start of Iris the MUSE specification window is displayed:
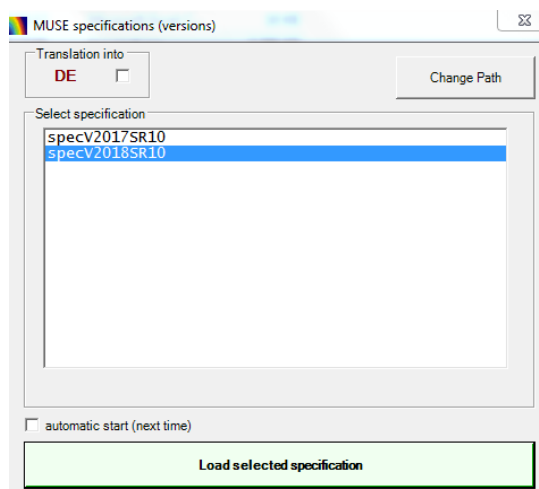
Figure 116 Screenshot of MUSE specification window

In the list box "Select specification" user should select one of the displayed MUSE specifications. After clicking the button "Load selected specification" the MUSE logics is loaded into the memory which may take some time. MUSE provides details on loaded specification files.

```
MUSE 2.7.1 Initialization

MUSE SPECIFICATION specV2019SR10 is loaded..
  > Path      N:\Iris-Test\V5.6.0\spec\specV2019SR10
 > User entries : 141
 > Codes        : 16370
```

Figure 117 MUSE initialization window with details on loaded specification

Further explanations of the MUSE initialization window:

Table 12 Explanations of the MUSE initialization window

Path	Directory of loaded MUSE specification
User entries	number of loaded text strings used for user information and messages
Codes	number of loaded codes (terminal and non-terminal ICD-10 codes and created codes) for the MUSE logic

Each specification directory contains two files:

MUSE codes file (naming scheme „specV<nnnn>SR<nn>-Codes.csv")

MUSE instructions file (naming scheme "specV<nnnn>SR<nn>-Muse.csv.DES")

These files are provided by Iris Institute and shouldn't be modified by users (see *5.1 MUSE introduction*).

5.7.2 MUSE user options

The user configuration settings of MUSE are stored (by default) in an option file "MuseUserOptions.xml" being located in subdirectory 'MuseConfiguration' of user

path[11]. Subdirectory and option file are created automatically after first start of MUSE[12]. If you would like to change the memory location look at section *2.2.3 Change of default path for MUSE configuration file*.

By default specification files are located in subdirectory "spec" of Iris installation folder. Parameter *SpecificationPath* of MuseUserOptions.xml controls the location of MUSE specifications. Several local Iris installations can share the specification files if MUSE specification is installed in a network folder and *SpecificationPath* is changed.

The specification path can be modified by user: by clicking on "Change Path" (upper right corner) at "*MUSE specification*" window a dialog box is opened which enables browsing of folders.
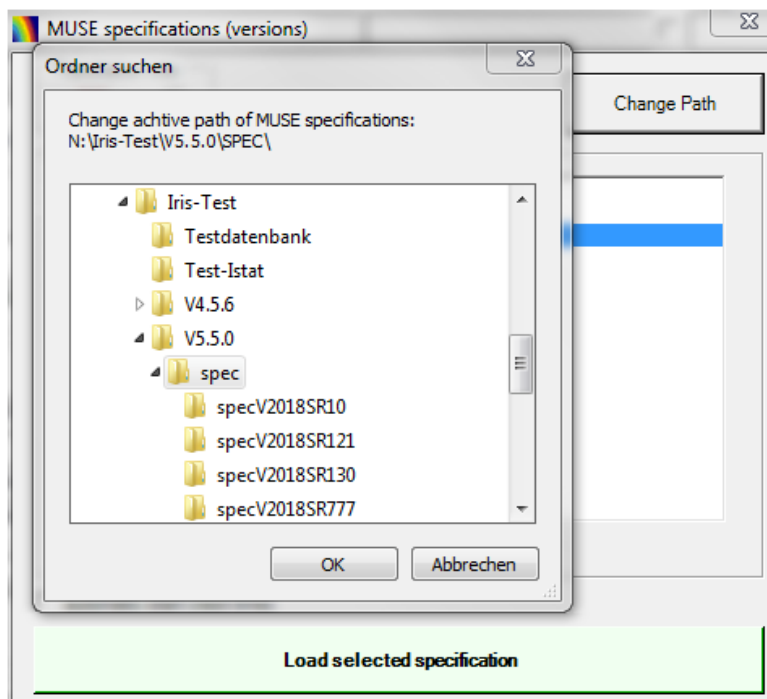
Figure 118 Change path of MUSE specification folder

After selection of a valid directory (with one or more specification versions) included versions are displayed and settings are stored in MUSE option file. If an invalid directory is selected an error message is shown.

---

[11] Environment variable USERPROFILE of a Windows System (e.g.: "C:\Users\xxxxxx\MuseConfiguration").
[12] User must own full permissions in his directory (read, write, create, delete).
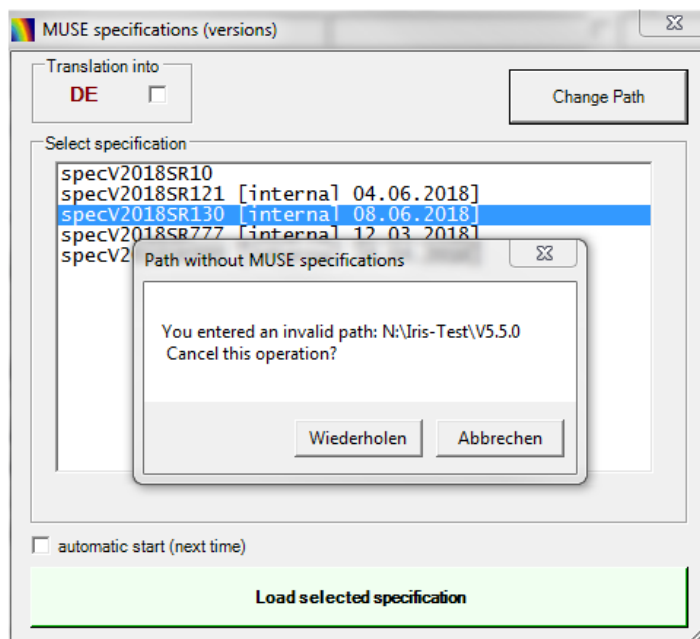
Figure 119 Error message – Entered an invalid path

5.7.3 MUSE translation tool

MUSE is provided by Iris Institute in English language. MUSE translation tool assists users to translate messages and labels into their native language. It can be applied to following types of messages:

- Global messages of Coding log at MUSE explanation window
  E. g.: "*Direct sequel*" is displayed in Coding log after application of SP6
- Messages of unicausal and multicausal messages[13]
  E.g.: "Considered as chronic"
- Labels of MUSE forms

There are different options to open the "MUSE Translation Tool":

- MUSE translation tool is shown after opening "*MUSE explanation window*" and by using the hot key 'CTRL + X' or
- after ticking checkbox "Translation into" at "*MUSE specification" window* and by clicking on "Load selected specification" or
- at "Options" window ("Coding" tab) by clicking on "Translation".

---

[13] These messages are stored in the MUSE instruction file ("specMuse file")

Initially, the table of all translatable text entries is presented. Third column "International text" contains English texts provided by Iris Institute. They cannot be changed by user. Texts (<mark>yellow</mark> background colour) of first column "Text XX"[14] are editable. They should be translated into user language.

Translated texts (being different from international text) are highlighted in green colour with white background. If translated and international text didn't differ, user should check the second column. In that case the entry is highlighted as translated.
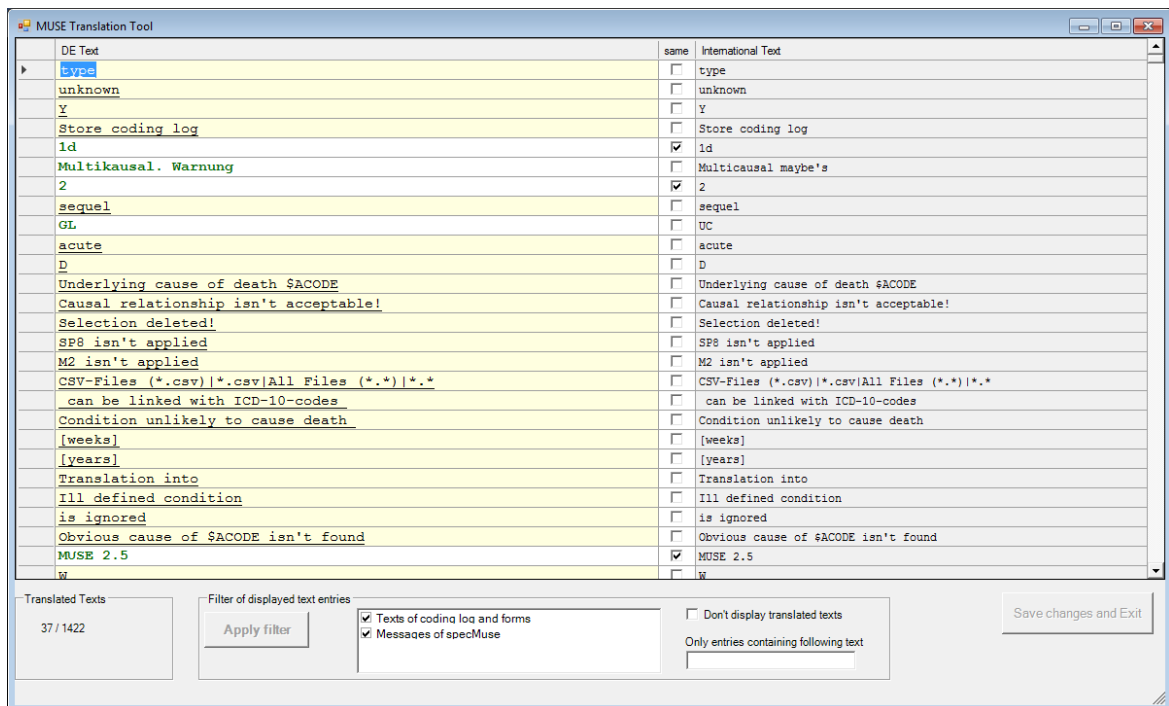
Figure 120 MUSE translation tool

This form offers several possibilities to refine the selection of displayed (field "Filter of displayed entries"):

- Checkbox "Texts of coding log and forms" = selection of message types a + c
- Checkbox "Messages of specMuse" = selection of message type b
- Checkbox "Don't display translated texts"
- Textfield "Only entries containing following text" = filter is applied to column International text
- Selection of entries with filter text anywhere in the column "id"[15]

---

[14] XX stands for target language like DE (German)
[15] Id's of general messages start with U:muse_info, id's of messages of specMuse file start with M:

Selection is changed after pressing the red button "Apply filter". MUSE translation tool displays multiple messages once. For example message "Considered as chronic" is used by some MUSE instructions, but only one translation is required.
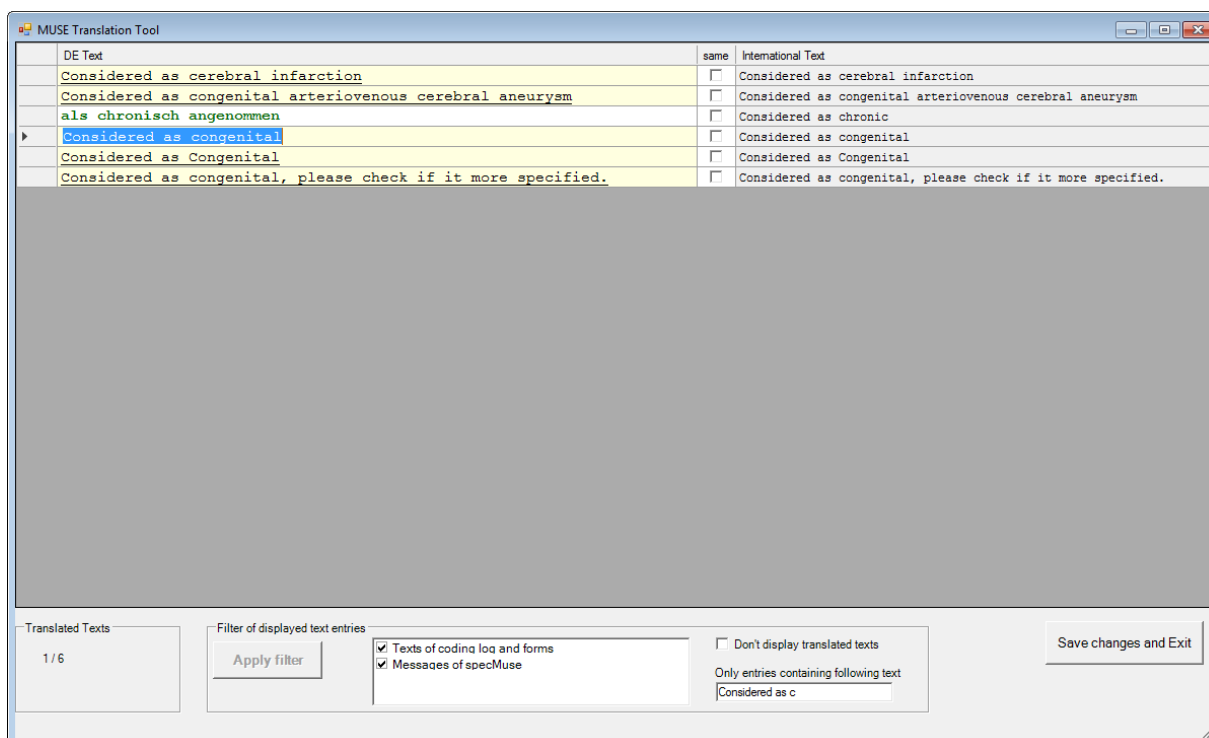
Figure 121 MUSE translation tool after translation of a line

After translation user should save his work by pressing the button "Save changes and Exit": The file *Translation-XX.xml* is stored in the subdirectory 'MuseConfiguration' of user path[16].

Please note: You should not translate the variable at the translation tool ($ACODE; $SCODE; $NCODE; $CODELIST).

Distribution of translation files

The Translation files can easily be distributed to other users. If a user wants to apply a new translation file created by another user he should copy this file (e.g. Translation-de.xml or Translation-nl.xml) into the directory *<user path>/MuseConfiguration*. Iris must be closed while doing so!

---

[16] Environment variable USERPROFILE of a Windows System (e.g.: "C:\Users\xxxxxx\MuseConfiguration").

Muse messages with variables

Many MUSE messages contain one or more of following variables:

$ACODE = value of anchor code

$SCODE = value of subcode

$NCODE = value of new code

$RULE = name of applied rule (SP1, SP2, …)

These variables shouldn't be changed or deleted, because MUSE inserts the values before displaying the messages. For example, if the "Coding log" at MUSE explanation window displays following text *"(+) Special instruction:* J851 replaces J181 and J852*"* then message string "$NCODE replaces $ACODE and $SCODE" (id U:muser_info_37) is used for construction of the long text. In German the translated message should be the string "$NCODE ersetzt $ACODE und $SCODE".

Updating translations after update of MUSE specifications

Usually a new MUSE specification includes new or modified messages. These new messages are loaded automatically after selection of a new version of MUSE specification. They are highlighted with yellow background (because they are not translated) and can be easily processed.

Step by step translation of "Coding log"

After selection of a row at the Coding log and pressing the right mouse button a context menu is displayed. User can translate the selected message directly.
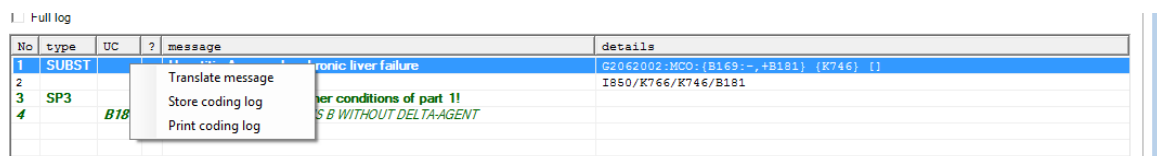
Figure 122 Context menu of Coding log: Direct translation of message

After selection of first item a small translation window is shown with translation entries related to the row of Coding log.

6. Databases

Iris uses two different databases:

- The "Certificates" database contains death certificate records (Lots).
- The "Iris Tables" database contains all the tables needed to analyse cause-of -death expressions.

Both databases are provided in installation folder. Furthermore, there are two types of tables in the "Iris Tables" database:

- Meta-tables containing technical data, such as lists of valid codes or code translations ('ValidIcdCodes' and 'IcdSubstitution' table). These tables are necessary for a correct functioning of Iris and you should NOT change or delete them. Exception: you have to adapt the 'NonConsistentIcdCodes' tables to the requirements of your country. Fully functional versions are included when you install Iris.
- Language-dependent files used for standardizing and coding expressions from the death certificates. These tables are empty or only contain a small number of records when you install Iris. To make coding and standardisation work satisfactorily, you will then have to add data appropriate to your own language. This concerns the Dictionary, Standardisation0, Standardisation1, Standardisation2, Separators and 'TimeIntervals' table. Perhaps, you could share the dictionary and standardisation tables with users from other countries or you have to develop your own dictionary.

Please note: The 'Type' of data at Microsoft Access database has changed a bit since MS Office 2013:

Table 13 Overview about the changes by MS Office

Type of data at MS Access before 2013	Type of data at MS Access since 2013
Text [up to 255 characters]	Short Text [up to 255 characters]
Memo [up to 64.000 characters]	Long Text [up to 64.000 characters]

6.1 Iris Tables database

This chapter reviews all tables included in the "Iris Tables" database.

6.1.1 IcdSubstitution

The 'IcdSubstitution' table contains only a list of created codes since version 5. Iris needs this list for the selection of the right created code, if user do not use created codes in their dictionary.
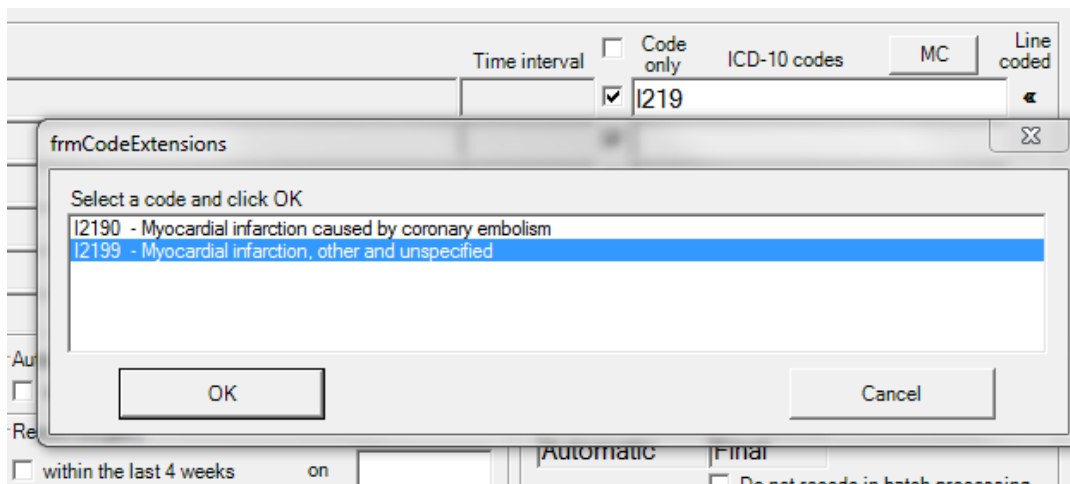
Figure 123 Pop-up window – selection of created code (if you haven´t created codes in your dictionary)

The other previous entries from the 'IcdSubstitution table' (from version 4) are at the specMuse file, now.

Additionally, you could use this table for the handling with national codes. For example: There are countries how have national code for dementia (F030, F…) or COVID-19 (U0720, U…). You could add the national code to the 'IcdSubstitution' table with the default code (e.g.: IcdIn=F030; IcdOut1=F03). Then Iris will substitute the national code to the default code. But you have to add the national code also to the 'ValidIcdCodes' table (see *6.1.7 ValidIcdCodes*) and SpecCodes file (see *5.1 MUSE introduction*) otherwise you will get the message that the code is invalid.

Please note: The national codes are not part of the decision tables and cannot be added there.

Table 14 Description of 'IcdSubstitution' table

Name	Type	Length	Comment
IcdIn	Text	5	Code to be substituted
IcdCIn	Text	5	[Not in use since Iris V5]
IcdOut1	Text	5	Icd-10-WHO code to be used instead of IcdIn (mandatory)
IcdOut2	Text	5	Icd-10-WHO code to be used instead of IcdIn (optional)
IcdOut3	Text	5	Icd-10-WHO code to be used instead of IcdIn (optional)
Type	Text	50	USCreated: For selection of US created code Before: Substitution is made before all other processing
Prompt	Text	250	Used to differentiate between coding alternatives
Origin	Text	50	Comment on the origin of the record
NationalExtension	Boolean		Used to flag records added by the user for national needs [True is -1 and False is 0]
YearStart	Number	Long integer	Coding year from which the entry can be used
YearEnd	Number	Long integer	Coding year up to and including which the entry can be used
DateIn	Date/Time		Date/Time the record was created
UserIn	Text	50	Name of the user that created the record
DateOut	Date/Time		Date/Time the record was deleted
UserOut	Text	50	Name of the user that deleted the record
Comments	Text	100	Free text

6.1.2 IcdErn

This table is deleted since Iris version 5. MUSE doesn´t need the ERN (Entity Reference Numbers) table.

6.1.3 Dictionary

The dictionary table is used to assign ICD-10-WHO codes to text entered in the Diagnosis text fields. It is not needed in Code only mode (see chapter *4.2 Mode menu*), but it is mandatory in Text entry mode. <u>Please note</u> that an example of dictionary in English is provided, when you install Iris. The diagnostic texts and ICD codes are not up-to-date. You can create your own dictionary and standardisations in

your language or you ask other countries if there is a dictionary available in your language.

Table 15 Description of dictionary

Name	Type	Length	Comment
DiagnosisText	Text	255	Text of the diagnosis
Icd1	Text	5	Icd-10-WHO code (mandatory)
IcdC[17]	Text	5	"Connected code": Provides additional information needed to achieve the correct multiple and/or underlying cause (see *8.2.9 Connected codes and MUSE flags* and *Appendix 3: Connected codes for neoplasms*).
Icd2	Text	5	2nd ICD-10-WHO code (optional) (main code for the expression should be entered first)
Icd3	Text	5	3rd ICD-10-WHO code (optional) (main code for the expression should be entered first)
MuseFlags	Text	255	See *5. MUSE in Iris* and *8.2.9 Connected codes and MUSE flags*. Two or more flags can be combined using by the vertical bar as separator, e.g.: EM|TH (for embolic and thrombotic).
CodingFlag[18]	Text	5	Has no effect in MUSE (see[19]).
Likelihood	Text	1	Add "?" if the coding is not certain. The coder will be asked to confirm the coding.
Prompt	Text	100	Used to display a message if likelihood = ? Add a message with max. 100 characters.
YearStart	Number	Long integer	Coding year from which the entry can be used
YearEnd	Number	Long integer	Coding year up to and including which the entry can be used
DateIn	Date/Time		Date/Time the record was created
UserIn	Text	50	Name of the user that created the record
DateOut	Date/Time		Date/Time the record was deleted

---

[17] The Connected Code (IcdC) field has been used to reach the correct ERN for Iris up till version 4. Starting with version 5 there will be no ERN's anymore. Therefore the "IcdC" field shall be used only if an alternative or additional code will influence the coding of the record.
[18] Use only as described in chapter *8.2.10 Coding Flag*
[19] If an expression can be coded in several ways and the coding is determined by other information on the certificate, for example a check box, you can enter one dictionary record for each pertinent value of the check box. When you create the work lot, assign a matching flag indicating the value of the tick box to the Ident.CodingFlags field. When coding the certificate, Iris will use the Dictionary record with a matching flag in the Dictionary.CodingFlag field.

Name	Type	Length	Comment
UserOut	Text	50	Name of the user that deleted the record
Comments	Text	100	Free text
OkForMultipleCodes	Text	1	Set to "1" if the record has the same Diagnosis text as another record, but another ICD-10-WHO code.[20]
FixForDT	Text	1	The diagnosis text will not be modified by language standardisation when Iris runs the Generate Dictionary procedure
DesignedByDT	Text	1	The text in the Diagnosis text field was modified by language standardisation when Iris runs the Generate Dictionary procedure
NoStand1ByDT	Text	1	Standardisation rules in the Standardisation1 table will not be applied when Iris runs the Generate Dictionary procedure
NoStand2ByDT	Text	1	Standardisation rules in the Standardisation2 table will not be applied when Iris runs the Generate Dictionary procedure

The dictionary table has no primary key. 'DiagnosisText' and 'Icd1' are indexed.

6.1.4 Standardisation0, Standardisation1 and Standardisation2

They are not used in Code only mode (see chapter *4.2 Mode menu*) and are not mandatory in Data entry mode. For an explanation on how to use the Standardisation table, see chapter *3.4.2 Standardisation*. All standardisation tables have the same structure.

Table 16 Description of standardisation tables

Name	Type	Length	Comment
MainKey	Text	50	Records with the same main key form a group [primary key]
Rank	Text	10	To make a distinction or order between records in the same group [primary key]
FilterIn	Text	255	Filter applied to the text. Use regular expressions syntax (more information about "RegEx" at chapter 7).

---

[20] Records with the same text but different codes provide coding alternatives. If Iris encounters an expression with two or more matching entries in the dictionary, as message box appears and the coder is asked to choose the appropriate code.

Name	Type	Length	Comment
FilterOut	Text	255	Output format if FilterIn succeeds. Additionally it can be used for MUSE Flags. Add them in following format, e.g.: (A) for acute or alternative §A§ or §Acute§ for use delimiter (C) for chronic or alternative §C§ or §Chronic§ for use delimiter; etc.
ActionVar	Text	10	If empty, means that the rule can be applied everywhere on the death certificate in text and time interval fields. The following values will restrict the application of the rules: Part1Only: application on Part 1 only Part2Only: application on Part 2 only TextOnly: application on Part 1 and Part 2 only DurOnly: application on duration only
Likelihood	Text	1	Add "?" if correspondence is not certain.
Prompt	Text	100	Used to display a message if likelihood = ?
YearStart	Number	Long integer	Coding year from which the entry can be used
YearEnd	Number	Long integer	Coding year up to and including which the entry can be used
DateIn	Date/Time		Date/Time the record was created
UserIn	Text	50	Name of the user that created the record
DateOut	Date/Time		Date/Time the record was deleted
UserOut	Text	50	Name of the user that deleted the record
Comments	Text	100	Free text
NoApplyForDT	Text	1	Do not apply the filter when Iris runs the Generate Dictionary procedure
AddResultInDT	Text	1	If the filter has applied successfully, add the output string to the dictionary

Since Iris version 5.5.0 you can use the help function for improving standardisation. Please see chapter *4.1.3 Batch processing*.

6.1.5 Separators

The Separators table has exactly the same structure as the Standardisation table (see chapter *6.1.4. Standardisation0, Standardisation1 and Standardisation2*). For an explanation on how to use the Separators table, see chapter *3.4.2 Standardisation*.

A minimum set of separator expressions are provided when you install Iris.

6.1.6 TimeIntervals

The 'TimeIntervals' table has exactly the same structure as the Standardisation table (see chapter *6.1.4. Standardisation0, Standardisation1 and Standardisation2*). For an explanation on how to use the 'TimeIntervals' table, see chapter *3.4.2 Standardisation*.

A minimum set of time interval expressions are provided when you install Iris. There are two tables: „The TimeIntervals_Ref" table used the round bracket „()" as delimiter for the time interval and the "TimeIntervals" table used the paragraph sign "§" as delimiter for the time interval.

However, if you want to identify the time interval expressions in the text, the character "§" can be used if it is defined as the time interval delimiter in the Options (see chapter *4.5.10 Options*).

6.1.7 ValidIcdCodes

<u>This table must be present in the "Iris Tables" database, is supplied by the Iris Core Group and the entries should not be modified by users.</u>

The 'ValidIcdCodes' table contains a list of ICD-10-WHO codes which can be used when coding with Iris and the properties pertaining to each code. Iris uses only valid ICD-10-WHO codes and created codes.

Furthermore this table contains the ICD-10-WHO label names. It is allowed to translate the label name to your language and to change the label name for the emergency codes (see chapter *3.8 Translating label name*). If you use national codes you have to add them to this table.

Table 17 Description of 'ValidIcdCodes' table

Name	Type	Length	Comment
Icd	Text	5	ICD-10-WHO code [set "Icd" as primary key]
Label	Memo		ICD-10-WHO label [You could translate them to your language].
Asterisk	Boolean		"Yes" if the ICD-10 code is an asterisk code. [Has no effect on the coding].

Name	Type	Length	Comment
AffectedByInterval	Boolean		"Yes" if the ICD-10 code may change according to duration. Duration can be expressed either as a date of onset or as a duration. [Has no effect on the coding].
AffectedByStatus	Boolean		"Yes" if the ICD-10 code may change according to status. Status can be Acute, Chronic, Congenital or Sequel. [Has no effect on the coding].
NationalExtension	Boolean		"Yes" for codes that are invalid internationally. [Has no effect on the coding].
ActionVar	Text	5	
YearStart	Number	Long integer	Coding year from which the entry can be used
YearEnd	Number	Long integer	Coding year up to and including which the entry can be used
DateIn	Date/Time		Date/Time the record was created
UserIn	Text	50	Name of the user that created the record
DateOut	Date/Time		Date/Time the record was deleted
UserOut	Text	50	Name of the user that deleted the record
Comments	Text	100	Free text

6.1.8 NonConsistentIcdCodes (NCIC)

This table contains codes which are limited in their use according to sex, age, rare diseases or are invalid for underlying cause and states the restrictions that apply to each code. ICD-10-WHO codes that do not have any such restrictions do not needed to include in this table. If Iris encounters an ICD-10-WHO code that is present in the table and the conditions specified in the table are met, Iris displays an error message. Since disease patterns vary considerably from region to region only a basic set of such restrictions are included in the 'NonConsistentIcdCodes' (NCIC) table at installation.

Please note:

As with the dictionary and the language standardisation tables, you have to adapt the 'NonConsistentIcdCodes' table to the requirements of your country or region.

The NCIC table does not include the created codes. If you need checks on created codes, please add them to the NCIC table (see *8.2.8 Created codes*).

Table 18 Description of 'NonConsistentIcdCodes' (NCIC) table

Name	Type	Length	Comment
NcicIcd	AutoNumber	Long integer	Auto incremental field for primary key
Icd	Text	5	ICD-10-WHO code, if a code range, the first code in the range
Icd2	Text	5	ICD-10-WHO code, if a code range, the last code in the range
InconsistentFor	Text	1	U: for underlying cause (UC) only M: for multiple causes (MC) only A: for both (UC and MC) I: for injury (for the main injury field only)
Sex	Text	1	M = male; F = female; 9 = irrelevant
SexConsistency	Text	1	C = compulsory; M = maybe; 9 = irrelevant
LowerAgeLimit (original format)	Number	Integer	999 = irrelevant; 000 = less than 1 day (< 24 hours); 001-006 = >=1 day and < 7 days (days); 011-013 = >=7 days and < 28 days (weeks); 101-111 = >=28 days and < 1 year (months); 201-299 = >=1 year and < 100 years (years); 300-324 = >=100 years and < 124 years (years)

LowerAgeLimit (new format)	Text	4	A disease can occur from the age of at least n completed days of life / years of life.
			9999 = irrelevant
			d000-d364 = 0 days (>= 0 days; from birth, inclusive fetal period) – up to 364 days (< 1 year)
			    d000 = less than 1 day (< 24 hours)
			    d001 = from 1 completed day (>= 1 day)
			    d007 = from 7 completed days
			    d028 = from 28 completed days
			    d364 = from 364 completed days
			y001-y124 = from 1 year (>= 1 year) – up to 124 years (>= 124 years)
			    y001 = from 1 completed year
			    y124 = from 124 completed years
			Except for the fetal death (P95) with the limits (d000: d000) no distinction is made between fetus and

Name	Type	Length	Comment
			newborn, here all diagnoses concerning the fetus or the newborn are marked with (d000: y001).
UpperAgeLimit (original format)	Number	Integer	999 = irrelevant; 000 = less than 1 day (< 24 hours); 001-006 = >=1 day and < 7 days (days); 011-013 = >=7 days and < 28 days (weeks); 101-111 = >=28 days and < 1 year (months); 201-299 = >=1 year and < 100 years (years); 300-324 = >=100 years and < 124 years (years)

UpperAgeLimit (new format)	Text	4	A disease can occur up to the age of at most m completed days of life / years of life.
			 9999 = irrelevant
			 d000-d364 = 0 days (< 0 days; before birth) – up to 364 days (<= 364 days; < 1 year)
			       d000 = fetal, before birth (< 0 days)
			       d001 = up to 1 completed day (<= 1 day)
			       d007 = up to 7 completed days
			       d028 = up to 28 completed days
			       d364 = up to 364 completed days
			 y001-y124 = up to 1 year (<= 1year) – up to 124 years (<= 124 years)
			 y001 = up to 1 completed year (up to the end of 1. life of year; up to the end of 365 day of life)
			 y124 = up to 124 completed years (up to the end of 124 year of life)
			 Except for the fetal death (P95) with the limits (d000: d000) no distinction is made between fetus and newborn, here all diagnoses concerning the fetus or the newborn are marked with (d000: y001).

AgeConsistency	Text	1	C = compulsory; M = maybe; 9 = irrelevant
RareDisease (Is this disease very unusual for your country?)	Text	1	Y = yes; N = No
PromptRare	Text	255	Message for rare disease check
UnderlyingCauseUse	Text	1	Y: yes, N: No, M: maybe
PromptUc	Text	255	Message for UC check
NationalExtension	Boolean		Set to "Yes" for codes that are invalid internationally.

Name	Type	Length	Comment
YearStart	Number	Long integer	Coding year from which the entry can be used
YearEnd	Number	Long integer	Coding year up to and including which the entry can be used
DateIn	Date/Time		Date/Time the record was created
UserIn	Text	50	Name of the user that created this record
DateOut	Date/Time		Date/Time the record was deleted
UserOut	Text	50	Name of the user that deleted the record
Comments	Text	255	Free text

6.2 Certificates database

The "Certificates" database contains two tables: an "Ident" table and a "MedCod" table.

- The "Ident" table contains all the individual data except the causes of death;
- The "MedCod" table contains the causes of death.

The "Ident" table has one record for each death certificate, and the "MedCod" table has one record for each line with causes of death. When you install Iris, the "Iris Certificates" database includes two tables called "aaareferenceIdent" and "aaareferenceMedCod". You can use these as templates when you create your own work lots. Please don´t use a space, underscore or hyphen in the table name. The table name for "MedCod" and "Ident" table should be the same (e.g. testIdent; testMecCod).

6.2.1 Identification table (Ident)

The "Ident" table contains all the individual data except the causes of death.

When you create this table you must state certificate key, date of Birth, date of death and sex. Other fields will be filled in by Iris or should be set as the description below (or see testIdent table supplied with Iris).

When you create your own database add at first Type and Length to the new database before you import your data. Otherwise you will lost information of your data.

Table 19 Description of Identification table (Ident)

Name	Type	Length	Comment
CertificateKey	Text	30	Primary key (equivalent of record in the "MedCod" table)
LastChange	Date/Time		When the record was last recoded
DateBirth	Date/Time		Date format depends on the language of the system (Windows culture). It's up to the user to manage non-standard date formats that may cause problem with Iris.[21]
DateDeath	Date/Time		Date format depends on the language of the system (Windows culture). It's up to the user to manage non-standard date formats that may cause problems with Iris.[22]
Age	Text	20	As an alternative to date of birth and date of death[23]
Sex	Text	1	1 = male; 2 = female; 3 until 8 = unknown, third sex; 9 = missing data
MannerOfDeath	Number	Byte	0: Disease 1: Homicide (Assault) 2: Accident 3: Pending investigation 4: Suicide (Intentional self-harm) 5: Could not be determined 6: Unknown (Not filled in) 8: Legal intervention 9: War
UCCode	Text	5	Underlying cause of death (UCOD or UC)
MainInjury	Text	5	Main injury code

---

[21] The DateBirth field should be checked before the record enter to Iris and if necessary it should be imputed a valid date.

[22] The DateDeath field should be checked before the record enter to Iris and if necessary it should be imputed a valid date.

[23] Some countries cannot use date of birth and date of death because of data protection legislation. If there is a need to suppress actual dates of birth and death, or if the dates are not available, the general mortality data system should calculate dummy dates giving the appropriate age, but with the actual dates changed. For deaths at ages below one year give the age in days. Always start calculations from the standard death date and then calculate a date of birth backwards.

Name	Type	Length	Comment
Status	Text	10	Initial: Record has not been processed by Iris Rejected: Record was rejected for manual intervention during processing Final: Record completely coded Closed: Record that cannot be modified anymore
Reject	Text	10	No: No reject Syntax: The string in the ICD-10-WHO codes field is not an ICD-10-WHO code Code: There is no code in the dictionary for this cause of death MultipleCause: Multicausal table rejected the record MayBe: Decision tables are unsure of the underlying cause Interval: Reject for interval reasons MainInjury: Main injury is required but doesn't exists Coder: Rejected by coder for later review
Coding	Text	10	Automatic: Multiple and underlying cause assigned by Iris Manual: Underlying cause assigned manually by coder UCDirect: Multiple cause code assigned manually by coder
CodingVersion	Text	255	Version of Iris and tables used for coding
CodingFlags	Text	50	Coding flags can be used to help selecting the right code in the dictionary (see 6.1.3 Dictionary). When several flags have to be specified in this field the separator is the character "|".
SelectedCodes	Text	255	ICD-10-WHO codes corresponding to the expressions on the death certificate, before substitution and modification (codes from dictionary or added manually by coder and also DCodes at MUSE explanation window)
SubstitutedCodes	Text	255	ICD-10-WHO codes come directly from dictionary or are inserted manually by coder or changed by IcdSubstitution table (DCodes at MUSE explanation window)

Name	Type	Length	Comment
ErnCodes	Text	255	[Not in use since Iris version 5].
AcmeCodes	Text	255	ICD-10-WHO codes after MUSE processing or changes at Multiple codes browser (Multicausal MUSE output - MCodes at MUSE explanation window)
MultipleCodes	Text	255	List of ICD10 codes reported on the death certificate with the addition of the underlying cause code if different from the other codes used (in alphabetical order)
Comments	Memo		Comment text box in Iris main window. "Type" is set as default to "Memo", but it is also possible to select "Text" with length between 2 until 1000 characters.
FreeText	Memo		Free text box in Iris main window
ToDoList	Memo		To-do list text box in Iris main window
CoderReject	Text	1	Set to "1" if the record has been rejected by the coder.
DiagnosisModified	Text	1	Set to "1" if a diagnosis text has been modified by the coder.
Residence	Text	50	
Name	Text	50	
Address	Text	50	
AutopsyRequested	Text	1	Set to "1" if autopsy was requested. U = Unknown; N = No (both are optional)
AutopsyUsed	Text	1	Set to "1" if findings used in certification. U = Unknown; N = No (both are optional)
RecentSurgery	Text	1	Set to "1" if surgery was performed within four weeks before death. U = Unknown; N = No (both are optional)
DateOfSurgery	Date/Time		Add date of surgery
ReasonSurgery	Memo		Specify reason for surgery (add free text)
DateOfInjury	Date/Time		Add date of injury
PlaceOfOccurence	Text	1	0= Home 1= Residential institution 2= School, other institution and public administrative area 3= Sports and athletics area

Name	Type	Length	Comment
			4= Street and highway
			5= Trade and service area
			6= Industrial and construction area
			7= Farm
			8= Other specified place
			9= Unspecified place
ActivityCode	Text	1	0= Sports
			1= Leisure
			2= Working for income
			3= Other work
			4= Resting, sleeping, eating or engaging in other vital activities
			8= Other specified activities
			9= Unspecified activities
ExternalFreeText	Memo		Free text description: how the external cause occurred, if poisoning specify poisoning agent.
Pregnancy	Text	1	For woman, was the deceased pregnant?
			0= Pregnant at time of death
			1= Had been pregnant within 42 days before death
			2= Had been pregnant within 43 days and 1 year before death
			3= Not pregnant
			9= Unknown
PregnancyContributeDeath	Text	1	Did the pregnancy contribute to the death?
			0= No
			1= Yes
			2= Unknown
Stillbirth	Text	1	Set to "1" for stillborn child.
			U = Unknown; N = No (both are optional)
MultiplePregnancy	Text	1	Set to "1" for fetus/newborn child in multiple pregnancy.
			U = Unknown; N = No (both are optional)
CompletedWeeks	Text	2	Number of completed weeks of pregnancy
BirthWeight	Text	4	Birthweight in grams
AgeOfMother	Text	2	Age of mother in years
ConditionMother	Memo		Maternal conditions that affected fetus/newborn
CertImage	Text	255	Filename of the certificate image. Several images can be specified separated by the character "|"

6.2.2 Medical causes of death table (MedCod)

The "MedCod" table contains the causes of death and has one record for each line on the certificate that contains a cause of death. The two fields 'CertificateKey' and 'LineNb' together constitute the table primary key.

Table 20 Description of Medical causes of death table (MedCod)

Name	Type	Length	Comment
CertificateKey	Text	30	Primary key (equivalent of record in the "Ident" table)
LineNb	Number	Integer	Primary key with following possible characters: 0 line "a" in Part 1 1 line "b" in Part 1 2 line "c" in Part 1 3 line "d" in Part 1 4 line "e" in Part 1 5 line in Part 2
TextLine	Memo		Diagnosis in free text, if available
CodeLine	Text	255	Iris/MUSE adds ICD-10-WHO codes corresponding to the causes of death in the "TextLine" field, or user can add the ICD-10-WHO code from certificate if 'TextLine' is empty.
IntervalLine	Text	255	Duration, onset or status for the diagnosis in the "TextLine" field
CodeOnly	Text	1	Set to "1" if the "MedCod" record is in Code only mode.
LineCoded	Text	1	Set to "1" if the "MedCod" record is in Data entry mode.

Concerning the primary keys (for the fields "CerteficateKey" and "LineNb") it is useful to prepare at first the 'MedCode' table and set the primary keys, then fill in the data to the database.

7.   Standardisation in Iris

Causes of deaths are usually reported by physicians on the death certificate with a rich and varying language. For instance, in French, the ICD-10-WHO category "I219" corresponding to "Myocardial acute infarction", includes more than 400 entries in the dictionary. Synonymy ("nécrose myocardique"), abbreviations ("IDM"), qualifying adjective ("infarctus du myocarde brutal terminal") and all the possible combinations of these explain this proliferation of medical terminology. Some languages other than French are even more inclined to offer a huge variety of possible expressions for the same ICD-10-WHO category.

In Iris, the Dictionary table gives the correspondence between a textual expression of a diagnosis ("Infarctus aigu du myocarde") and an ICD-10-WHO code ("I219"). It is important that the dictionary remains at a rather manageable size, mainly because it is easier to update and to keep it consistent. The dictionary should then include only standard expressions and the other various expressions mentioned by physicians would be mapped to these standard expressions. This can be done manually or automatically. Iris proposes a way to do it automatically.

Iris employs "rules" to standardize the text of causes of death. These rules are written by the user and are depending on the language with which causes of death are declared (Swedish, German, French …). A rule is made up of two filters. The first filter (FilterIn) identifies the "context". The content of the second filter (FilterOut) replaces the context when it is recognised. For instance if FilterIn is the word "probable" and FilterOut is empty, all the occurrences of the word probable will be deleted. Therefore, when the diagnosis "Probable infarction" is found on a death certificate, it is mapped to "infarction. 'FilterIn' and 'FilterOut' syntax is based on a language called "Regular Expressions" (RegEx). RegEx are very commonly used to process strings and have reached a "quasi" standard. Regular expressions (RegEx) are standardised strings to enable the search for specified text strings. They are widely used and can be embedded in many programming languages. Some programming languages use slight variations of RegEx but the ones described in this tutorial are widespread and the common way to write RegEx.

The following presents how to express a context with RegEx. Then rules are presented. The standardisation algorithm used in Iris is detailed and eventually, examples are given.

You will find additional information about RegEx at the "Tutorial Regular Expressions" at the *Downloads Iris*.

7.1 Context

The first problem is to identify the context with the right regular expression. This expression is stored in 'FilterIn'.

With Iris standardisation process, it must be known that:

- Filter matching is not case sensitive;
- Leading and trailing spaces are always deleted prior to applying a rule;
- Multiple blanks in the input text are always changed into single blank prior to applying a rule.

This means that, when identifying the context, the user should not worry about these aspects and remember that it is done by Iris. In particular, the user has not to be concerned with unwanted spaces introduced by the standardisation rules.

Different types of context are analysed below.

A specific string

When the context is a given string, just specify this string in 'FilterIn'. The expression "neo" will recognize the string neo in any situation: "perineorectal", "neocarcinoma", "perineo" or "neo".

A specific string starting a word

If a string is to be recognised only at the beginning of a word, add the metacharacter \b before the string (\b matches with a word limit). The expression "\bneo" will identify the string "neo" when it is preceded by a space ("diabete and neocarcinoma"), any punctuation mark ("Diabetes,neocarcinoma") or at the beginning of a line ("neonatal death"). This expression identifies also the string "neo" as a word.

A specific string ending a word

Add the metacharacter \b after the string. The expression "natal\b" will identify the string "natal" when it is followed by a space ("neonatal death"), when it is followed by a punctuation mark ("perinatal, premature") or at the end of a line ("neonatal"). This expression identifies also the string "natal" as a word.

A specific string as a word

Add the metacharacter \b before and after the string. The expression "\bcarcinoma\b" will be recognized only when preceded and followed by spaces, punctuation marks or line limits in any combination. Note that this is the best way to express synonymies. For instance, if you want to replace "neo" by "cancer", you have to identify "neo" as a word, otherwise you could change the word "neonatal" into "cancernatal", which is rather unfortunate.

A class of character(s)

You may want to recognise any letter, any digit or even any character instead of a specific string. There are several ways to recognise a class of characters:

\d   recognises a digit (0-9)

\w   recognises a letter, a digit or an underscore

[...]   recognizes a class of characters. For instance, [0-9] recognizes a digit, [a-z] a lower case letter, [-_] a hyphen or an underscore. Note the difference between [az] that matches with "a" or "z" and [a-z] that matches with all letters from "a" to "z"

. (full stop)   recognizes any character

The beginning of a line

The character "^" identifies the beginning of a line.

The end of a line

The character "$" identifies the end of a line.

Alternative

The "|" character means "or". For instance "a|z" means "letter a" or "letter z". It is the same expression as [az]. "|" express an alternative between what is on the left and what is on the right. "cancer|neoplasm of liver" will match with both "cancer" or "neoplasm of liver", but not with "cancer of liver". If the aim is to match with "cancer of liver" or "neoplasm of liver", use parentheses to limit the scope of the alternative. In this case, "(cancer|neoplasm) of liver" is the right expression.

Quantifiers

A quantifier expresses a number of elements; it is placed just after the element to quantify:

?   0 or 1 element

+   1 to n element(s)

*   0 to n element(s)

{a,b}   a to b elements. If b=a, may be written {a}.

Examples of quantifier use:

- "s?" identifies 0 or 1 "s". For instance "lungs?" will match with "lung" or "lungs"
- "\w+" will recognize a word including letters, digits and underscores (not hyphens...)
- ".*" will recognize any number of any characters including an empty string
- "\d{2}" recognizes two digits
- "\s" will recognize a blank

Escape character

Some characters called metacharacters have a specific meaning in RegEx: for instance "+" is a quantifier, "$" marks the end of a line; "." stands for any character. If it is needed to use one of these characters with its usual meaning it is necessary to "escape it". This is done with the metacharacter "\". For instance if you want to identify a full stop followed by a digit you have to write "\.\d" and not ".\d" which means "any

character followed by a digit". You don't need to escape special character when using class of characters with []. Thus "[.]\d" and "\.\d" are equivalent.

<u>Please note</u> that:

- "\" is also used to change some normal characters into metacharacters (e.g. "\w" means any letter and "w" is the letter w).
- "\" being a metacharacter, it must be escaped to express a normal backslash ("\\").

Parentheses

Parentheses group elements together. For instance if one wants to apply a quantifier to several elements, parentheses are necessary. "[.]\d?" recognizes a full stop followed by an optional digit, but "([.]\d)?" recognizes 0 or 1 pair of a full stop followed by a digit. Parentheses can also be used to identify parameters (see chapter *7.3 Standardisation algorithm*).

7.2 Rules

A standardisation rule is expressed by an input filter (FilterIn) and an output filter (FilterOut). As previously seen, FilterIn includes a regular expression that will be used to identify the context. If this context is successfully identified, it will be replaced by the content of FilterOut.

Table 21 Example of standardisation rule

FilterIn	FilterOut
Malignant\sneoplasm	cancer

Means that each time the specific string "malignant neoplasm" is encountered, it will be replaced by the string "cancer". This rule defines a synonymy.

Rules can be categorised in two classes: deletion rules and modification rules.

7.2.1 Deletion rules

In case of deletion, FilterOut is empty. A first type of deletion consists in discarding a specific word. If FilterIn contains the expression "\bprobable\b" and FilterOut is empty,

all the occurrences of the word "probable" will be discarded from the causes of death text.

Table 22 Examples of deletion rule

FilterIn	FilterOut
Most\slikely	

A second type of deletion concerns a class of words, for instance, in French the adjective "massif". Considering number and gender forms (in French, adjective agrees with the noun), we want to delete "massif", "massifs", "massive" and "massives". This can be done with four different filters of course, but it is easier to use only one filter. In this case, the common factor for the 4 words is "massi". However, if we write FilterIn as "massi", only these letters will be recognized and deleted and the expression "embolies pulmonaires massives" will result in "embolies pulmonaires ves" because "ves" hasn't been recognized. It is important to understand that only what has been recognized is deleted. So the correct FilterIn expression in this case is "massi(f|ve)s?" which means the string "massi" followed by "f" or "ve" and an optional "s".

Sometimes in a class of words, a character might be optional: for instance, in the class of words "postoperational", "post-operational", "postop" and "post-op", the hyphen is optional. The expression "post-?op[a-z]*" will match the 4 words (the expression "-?" makes the hyphen optional and the expression "[a-z]*" stands for 0 to n letters).

Deletions can be more complex. For instance, the following expression identifies an ICD-10-WHO code with two or three digits "\b[a-z]\d\d(\.\d)?\b". Let's analyse this expression:

\b	word limit/word boundary (beginning of a word)
[a-z]	one letter
\d\d	two digits
([.]\d)?	a full stop followed by one digit (optional)
\b	word limit/word boundary (end of a word)

So this expression matches with "A10" and A12.7" for instance, but not with "A127".

Note that only lower case letters are considered since Iris makes comparisons regardless of the case.

7.2.2 Modification rules

Modifications use a FilterOut field. When the regular expression in FilterIn matches with a string, <u>what is recognised by the RegEx is replaced by the content of FilterOut</u>.

Table 23 Example of modification rule

FilterIn	FilterOut
Malignant\sneoplasm	cancer

the word "cancer" will replace "malignant neoplasm". This works when FilterIn is a specific string, but when the context includes a class of characters, it is not sufficient. Let us suppose that we want to change expressions such as "malignant lung neoplasm" into "lung cancer". FilterIn will read:

Table 24 Example for FilterIn

FilterIn	FilterOut
Malignant\s\w+\sneoplasm	$1 cancer

Where \w+ stands for a non-empty word (1 to n letters, digit or underscores). At this stage, FilterOut should mention the word identified by \w+ followed by the word "cancer". To do so, a RegEx can use parentheses and the metacharacter "$". The rule becomes:

Table 25 Example for FilterIn and FilterOut

FilterIn	FilterOut
Malignant\s(\w+)\sneoplasm	$1 cancer

the parentheses "catch" the word and $1 returns this word (in fact the content of the first pair of parentheses in FilterIn).

So parentheses in FilterIn can be returned in FilterOut using the notation $i where I is the rank of the parentheses. In the FilterIn "(aaa) bbb (ccc)", $1 refers to "aaa" and $2 to "ccc".

More Complex, in "((aaaa) bbbb (cccc))", $1 refers to "aaaa bbbb cccc", $2 to "aaaa" and $3 to "cccc"!

To summarise, the only metacharacter used in FilterOut writing is "$". Note that its meaning in FilterOut is different from its meaning in FilterIn (end of string).

7.3 Standardisation algorithm

Standardisation in Iris consists in the modification or the deletion of certain parts of text in the causes of death. The standardisation process is based on five tables (Standardisation0, Standardisation1, Separators, TimeIntervals and Standardisation2). Each table has exactly the same structure (see these tables in chapter *6.1.4 Standardisation*). The only difference is the sequence of application of these tables:

Table 26 Sequence of standardisation tables

Standardisation	Sequence	Where applied
Standardisation0	1	Text
Standardisation1	2	Text and duration (Time intervals)
Separators	3	Text
TimeIntervals	4	Text and duration (Time intervals)
Standardisation2	5	Text

Standardisation1 only occurs in the time interval field if „Standardisation1 always" is set to true at the *Options*. Rules can be grouped by using the same key. This makes the standardisation tables easier to read, but more important is that each group is applied as a whole. The algorithm is the following:

```
Read the causes of death text line

while all causes are not coded

      For each group in Standardisation0 table

            apply the group to non-coded causes

            if all causes are coded

                  stop standardisation

      End for
```

```
For each group in Standardisation1 table

        apply the group to non-coded causes

        try to code the non-coded causes

        if all causes are coded

                stop standardisation

End for

For each group in Separator table

        apply the group to non-coded causes

        try to code the non-coded causes

        if all causes are coded

                stop standardisation

End for

For each group in TimeIntervals table

        apply the group to non-coded causes

        try to code the non-coded causes

        if all causes are coded

                stop standardisation

End for

For each group in Standardisation2 table

        apply the group to non-coded causes

        try to code the non-coded causes

        if all causes are coded

                stop standardisation

End for

End while
```

In Standardisation1 and Standardisation2, after application of each group (if the input has changed due to the application of the group) a dictionary search is achieved. This granularity is introduced only in Standardisation1 and Standardisation2.

At the end of this process, diagnoses not coded are reported to the user.

7.3.1 Which table to use?

- Standardisation0 table is to be used for rules that are applied before any coding: no coding attempt is done before or during the application of Standardisation0 table.

- Standardisation1 table should include rules that perform frequent deletions or modifications.

- Separators table should group all the filters dedicated to non-standard diagnosis separators processing. Usually, the standard separator is the comma (","). However physicians may use a different separator in some cases, namely a word ("with", "due to") or a special character ("/", "-", ...). Non-causal separators should be replaced by the standard separator (by default ","). A causal separator should be replaced by the special character "|" (see *7.4 Examples* at the end of this chapter).

- TimeIntervals table aims at standardise the various expressions of the onset of a condition. Iris needs standardised time intervals (see "*Time intervals and disease status*"). Of course the physicians are not aware of this and it is possible to automate this mapping. For instance, you can use TimeIntervals filters to format the free time interval expression "2 years ago" into the standardised Iris time interval (2Years). Moreover, when the physician uses dates instead of intervals (e.g. "since march 2001") it is possible to force Iris to calculate the interval and to standardise the interval. See examples at the end of this chapter. Please note that this table is also applied to the text entered in the Time Interval column of the death certificate.

- Standardisation2 table should include last resort rules (exceptions for instance).

Note that the order of rules is important in all tables. For instance if one wants to standardise expressions such as "cancer of lung" into "lung cancer", all cancer

synonyms should have been replaced before. This will avoid specific rule to standardise "malignant neoplasm of lung" for instance.

7.3.2 How to group rules?

Rules should be grouped according to what they do. For instance group all the rules dealing with hyphen standardisation together. Rules are grouped by assigning the same MainKey field in the standardisation table. It is a good habit to start the MainKey with a number, so that the place of the group among others in the table is controlled. If Hyphens rules are to be the first in Standardisation1 table, MainKey field may be "0010Hyphen". Inside the group, rules can be ranked using the Rank field. It is advised to use a number system that allows easy inclusion of new rules (e.g. "000100", "000200").

Note that rule with exceptions can be handled with Iris standardisation. For instance, most of the time the word "terminal" (end-stage) does not influence the coding, except for "renal insufficiency": "Insuffisance rénale" is coded N19 and "Insuffisance rénale terminale" N18.0. In any other cases "terminal" can be deleted. If the rule that delete "terminal" is placed at the end of Standardisation1 or in Standardisation2 table, it will not be applied to "Insuffisance rénale terminale" because this expression will have already been coded during previous attempts.

7.4 Examples

7.4.1 Spelling normalisation (German)

German standardisation maps "ß", "ä", "ö" and "ü" in any context to "ss", "ae", "oe" and "ue" respectively. German standardisation also maps both "k" and "z" letters to "c" when these letters are part of a word. So "k" and "z" must be followed or preceded by letters.

Table 27 Examples for German standardisation

MainKey	Rank	FilterIn	FilterOut
0020BuchstNorm	0010	ä	ae
0020BuchstNorm	0020	ö	oe
0020BuchstNorm	0030	ü	ue
0020BuchstNorm	0035	ß	ss
0020BuchstNorm	0040	[kz]([a-z])	c$1
0020BuchstNorm	0050	([a-z])[kz]	$1c

These rules can be placed either in Standardsation1 or Standardisation2 table.

7.4.2 Hyphens

Hyphen is widely used with different meanings:

- as a word separator equivalent to a comma
- at the beginning of a line (equivalent to a bullet)
- at the end of a line (equivalent to a full stop)
- as a separator of figures in a date

Depending on situations and languages, the hyphen has to be discarded, kept or replaced by a standard separator. The following rules are an example of hyphen standardisation.

Table 28 Examples for the hyphen in the standardisation

Mainkey	Rank	FilterIn	FilterOut	Example
0030Hyphen	0010	^-\s?([a-z])	$1	"-artrit" → "artrit"
0030Hyphen	0020	([a-z])\s?-$	$1	"parkinsonism-" → "parkinsonism"
0030Hyphen	0030	([a-z]\s)-(\d)	$1$2	"DM -98" → "DM 98"
0030Hyphen	0040	(\d)\s?-\s?(\d)	$1-$2	"1998 – 10" → "1998-10"
0030Hyphen	0050	([a-z])\s?-\s?([a-z]{2})	$1, $2	"DM – infarct" → "DM, infarct"

- rule 0010 discards hyphen at the beginning of a line (use of "^")
- rule 0020 discards hyphen at the end of a line (use of "$")
- rule 0030 discards hyphen before a digit when preceded by a word
- rule 0040 discards spaces around an hyphen between numbers (date)

- rule 0050 changes hyphen between words into a coma

Again these rules are given as example and should be adapted to national habits.

7.4.3 Plural to singular (Sweden)

When plural forms do not change coding and when they can be easily identified, the singular form can be considered as the standard form and the plural changed into singular. The following rules are applied for Swedish.

Table 29 Examples for plural to singular

Mainkey	Rank	FilterIn	FilterOut	Example
0030Plural	0010	([a-z]+)enen\b	$1en	"benen" → "ben"
0030Plural	0020	([a-z]+)rala\b	$1ral	"centrala" → "central"

7.4.4 Delete ICD-10-WHO codes

Table 30 Example for delete ICD-10-WHO codes in the diagnosis text

MainKey	Rank	FilterIn	FilterOut	Example
040IcdCode	0010	\b[a-z]\d\d([.]\d+)?\b		"AMI I21.9" → "AMI"

This RegEx has already been commented before (see chapter *7.2.1 Deletion rules*). A slight modification has been done to accept an optional fifth digit after the optional forth digit.

When applied to the string "Pneumonia J18.", this rule will give the output string "Pneumonia .". Strange? No the filter "\b[a-z]\d\d" matches with "J18" but not with the optional part "([.]\d+)?". After that the full stop matches with "\b", but "\b" just indicates the word limit, it does not "catch" the full stop. Thus this full stop is not part of the context and is kept.

7.4.5 Separators

Non-causal separators

Iris asks for a unique delimiter to separate diagnoses. The default delimiter is the comma (","). However, the original text may have diagnoses separated by other delimiters, for instance full stops. The rule of thumb could be "change full stops that separate words into a comma". However, it should not apply to full stops that separate

digits or appear at the end of a line. The first category must be kept and the second category must be deleted. This leads to the following rules:

Table 31 Examples for the separator table

MainKey	Rank	FilterIn	FilterOut
0010FullStops	0020	[\s.]*[.][\s.]*$	
0010FullStops	0030	([0-9])[\s.]*[.][\s.]*(0-9])	$1.$2
0010FullStops	0040	([a-z])[\s.]*[.][\s.]*([a-z])	$1, $2

The first rule deletes any combination of space and full stop in any order placed at the end of a line provided that there is at least one full stop. Let's analyse this expression:

[\s.]*   0 to n combination of spaces and full stops in any order or number
[.]   1 full stop
[\s.]*   0 to n combination of spaces and full stop in any order or number
$ end of line

The second rule replaces spaces and full stops placed between two digits by one full stop. The last rule replaces full stops and spaces between words by a coma.

Causal separators

The standard causal separator for Iris is "|" (vertical bar). When this separator is encountered in a line, the diagnoses on its right are placed on the line below. So the configuration "a | b" is interpreted as "a is due to b".

Table 32 Examples for causal separator

MainKey	Rank	FilterIn	FilterOut
00100Du	0010	\bdus?\sà\b	|
00100Du	0020	\bdues?\sà\b	|
00300Entraine	0010	(.+)\sentrainant\s(.+)	$2 | $1
00400Diarrhée	0010	Diarrhée\sdues\sa\sdéshydratation	déshydratation | diarrhée

In the table above, the two first rules detect cases where the physician wrote things such as "métastases dues à un cancer" (metastases due to cancer). In this case, the rule will replace the original expression by "métastases | cancer". If this occurs on line a for instance, the cancer will be placed on line B.

Rules 00300 and 00400 are doing the same work but the place of effect and cause are changed. For instance, rule 00300 applied to "cancer entraînant métastases" (cancer giving rise to metastases) will give "metastases | cancer".

7.4.6 Time intervals

There are two types of time interval rules.

The first type of rules uses FilterIn and FilterOut as other standardisations rules. For instance:

Table 33 Examples for the TimeIntervals table

MainKey	Rank	FilterIn	FilterOut
010DUREE	00100	Depuis\s(\d\d ?)\sans ?\b	($1Years)
010DUREE	00200	Depuis\s(\d\d ?)\smois\b	($1Months)
010DUREE	00300	Depuis\s(\d\d ?)\sjours ?\b	($1Days)
010DUREE	00400	Depuis\s(\d\d ?)\sheures ?\b	($1Hours)
010DUREE	00500	Depuis\s(\d\d?)\sminutes?\b	($1Minutes)

These rules standardise time intervals in French. The first rule transforms the expression "diabète depuis 15 ans" (diabetes 15 years ago) into "diabète(15Years)" which is the standard time interval expression for Iris.

The second type of rules uses only FilterIn and an ActionVar. The ActionVar calls a routine in Iris that makes some computation. In the following table:

Table 34 Example for the ActionVar

MainKey	Rank	FilterIn	FilterOut	ActionVar
020DATE	00100	Depuis\sle\s(\d\d ?)[.](\d\d ?)[.](\d{4})$		DDMMYYYY

The expression identified by FilterIn will be submitted to the method DDMMYYYY specified as ActionVar. The method DDMMYYYY will search for a date in the form day/month/year (with year on 4 digits) and compute the difference between this date and the date of death. This lapse of time will then be transformed into an Iris time

interval. Let's suppose that this rule is applied to the line "Hypertension depuis le 12/10/1996" and that the date of death is 4/8/2003. Then the time interval computed by DDMMYYYY will be (7Years). Iris automatically selects the best unit for the time interval.

Rules including an ActionVar work in this way:

- FilterIn identifies an expression that contains a date
- Iris extracts the date according to ActionVar method specifications
- The ActionVar method compute the time Interval with the date of death
- The time interval is standardised and the best unit is selected
- The expression identified by FilterIn is deleted

ActionVar methods determine the format of the date. The following ActionVar are now available:

Table 35 Overview about the ActionVar

ActionVar	Example
DDMMYYYY	2/2/2001
DDMMYY	12 1 98
DDMMMMYYYY	8 août 2002
DDMMMMYYYY	9 janvier 1978
MMMMYYYY	septembre 1978
MMMMYYYY	mai 2004
MMMM	juin
YYYY	2001
YY	97
MMYYYY	9/2003
MMYY	9/02
DDMM	02-12
YYYYMMDD	1976/9/12
YYMMDD	04/1/2

ActionVar	Example
YYYYMMMDD	19 May 2000
YYMMMDD	99/11/8
YYYYMMMM	1976 September
YYMMM	88 May
YYYYMM	1967-4
YYMM	99-12
MMDD	7/21

The following table gives example of the different uses of the ActionVar in French:

Table 36 Examples of French ActionVar

MainKey	Rank	FilterIn	FilterOut	ActionVar
010DUREE	00100	Depuis\s(\d\d ?)\sans ?\b	($1Years)	
010DUREE	00200	depuis\s(\d\d ?)\smois\b	($1Months)	
010DUREE	00300	Depuis\s(\d\d ?)\sjours ?\b	($1Days)	
010DUREE	00400	depuis\s(\d\d ?)\sheures ?\b	($1Hours)	
010DUREE	00500	Depuis\s(\d\d?)\sminutes?\b	($1Minutes)	
020DATE	00100	Depuis\s(\d\d ?[.]\d\d ?[.]\d{4})$		DDMMYYYY
020DATE	00110	Depuis\s(\d\d ?[.]\d\d ?[.]\d\d)$		DDMMYY
020DATE	00120	Depuis\s(\d\d?[.]\w+[.]\d{4})$		DDMMMMYYYY
020DATE	00130	Depuis\s(\d\d?[.]\w+[.]\d\d)$		DDMMMMYY
020DATE	00140	Depuis\s(\w+[.]\d{4})$		MMMMYYYY
020DATE	00150	Depuis\s(\w+[.]\d\d)$		MMMMYY
020DATE	00160	Depuis\s(\w+)$		MMMM
020DATE	00170	Depuis\s(\d{4})$		YYYY
020DATE	00180	Depuis\s(\d\d)$		YY
020DATE	00190	Depuis\s(\d\d ?[.]\d{4})$		MMYYYY
020DATE	00200	Depuis\s(\d\d ?.[.]\d\d)$		MMYY
020DATE	00210	Depuis\s(\d\d ?[.]\d\d ?)$		DDMM
020DATE	00300	Depuis\s(\d{4}[.]\d\d ?[.]\d\d ?)$		YYYYMMDD

MainKey	Rank	FilterIn	FilterOut	ActionVar
020DATE	00310	Depuis\s(\d\d[.]\d\d ?[.]\d\d ?)$		YYMMDD
020DATE	00320	Depuis\s(\d{4}[.]\w+[.]\d\d ?)$		YYYYMMMDD
020DATE	00330	Depuis\s(\d\d[.]\w+[.]\d\d?)$		YYMMMDD
020DATE	00340	Depuis\s(\d{4}[.]\w+)$		YYYYMMMM
020DATE	00350	Depuis\s(\d\d[.]\w+)$		YYMMMM
020DATE	00360	Depuis[ ](\d{4}[.]\d\d)$		YYYYMM
020DATE	00370	Depuis\s(\d\d[.]\d\d ?)$		YYMM
020DATE	00380	Depuis\s(\d\d ?[.]\d\d ?)$		MMDD

7.5 Main meta characters used in Regular Expressions (RegEx)

Table 37 Description about the main meta characters

Meta-character	Description
.	any character
[...]	a class of characters
[^...]	complement of a class of characters
^	start of line
$	end of line
\<	start of word
\>	end of word
\b	word limit (beginning or end of a word)
		alternative ("or")
?	0 or 1 element
*	0 to n elements
+	1 to n elements
{a}	"a" elements
{a,b}	"a" to "b" elements (no spaces between {})
\	character escape
\t	tabulation
\s	blank
\n	new line

Meta-character	Description
\r	carriage return
\w	a letter or a figure
\d	a figure [0-9]

You will find additional information about RegEx at the "Tutorial Regular Expressions" at the *Downloads Iris*.

8.   Table Maintenance by Users

The users have to maintenance some Iris tables by themselves.

8.1. Tables maintained by the user

There are two kinds of tables in the "Iris Tables" database:

- Tables related to the language of the death certificates and the interface
- Meta-tables that are necessary for the inner workings of Iris

The language-dependent tables, primarily the dictionary of medical expressions and the language standardisation, must be developed individually for each language or country. In contrast, the meta-tables should not be changed by the user, except for translations of prompts.

The language-related tables are:

- Dictionary [with some mandatory content]
- NonConsistentIcdCodes (NCIC)
- Separators
- Standardisation0
- Standardisation1
- Standardisation2
- TimeIntervals [must use a fixed format for the output of the standardisation]

Iris uses the 'NonConsistentIcdCodes' table to check the causes of death against the individual's sex and age, and whether the assigned underlying cause code is valid as underlying cause. Although the international version of Iris contains a 'NonConsistentIcdCodes' table with basic checks, it might be necessary to modify the table according to the local and regional health situation.

For guidelines and suggestions concerning development and maintenance of the dictionary, please see chapter *8.2 Developing and maintaining the dictionary* below.

The 'ValidIcdCodes' table contains all valid ICD-10 codes and label names. Since Version 5 the 'IcdSubstitution' table contains only a list of created codes and the 'IcdErn' table is deleted.

8.2. Developing and maintaining the dictionary

The dictionary is stored in the table "Dictionary" in the "Iris Tables" database. The location of this database can be changed in the *Options*.

If you want to build your own dictionary, copy the dictionary which is available in the Iris installation file to your own "Iris Tables" database and then delete all records. Then enter text expressions in your own language and assign ICD-10-WHO codes to them. Please note that an example of dictionary in English is provided, when you install Iris. The diagnostic texts and ICD codes are not up-to-date. You can create your own dictionary and standardisations in your language or you ask other countries if there is a dictionary available in your language.

Although it is possible to enter terms and ICD-10-WHO codes directly into the tables by using a database manager, we strongly recommend that you use the "Iris dictionary tool" when building your dictionary. The dictionary tool checks that the ICD-10-WHO codes you enter are valid and also ensures that other variables in the dictionary are set correctly, for example user identity and start date. If these are not correctly filled in, Iris will not be able to use the record.

When you add new terms to the dictionary, enter the text expression in the 'DiagnosisText' field and the corresponding ICD-10-WHO code in the Icd1 field and, if the expression requires two or even three ICD-10-WHO codes, add also a code in the Icd2 field (and Icd3 if necessary).

The values in the 'YearStart' and 'YearEnd' fields denote for which data years the ICD-10-WHO code will be used. This means that if the ICD-10-WHO code for an expression is changed, for example due to an official WHO update to the ICD-10-WHO, then you can include both the old and the new code in the dictionary. Just assign the appropriate values to 'YearStart' and 'YearEnd', and Iris will select the ICD-10-WHO code according to the coding year set in the Options.

The 'UserIn' field must contain a value otherwise Iris will not use the entry. We recommend that you use the date of the day when the entry was created and the user identity of the person who created the entry.

8.2.1 What to include?

In principle, the dictionary can be very big (several hundreds of thousands of terms) and there will still be no negative impact on speed or performance. However, a very big dictionary is more difficult to maintain, and for that reason it is advisable to keep the dictionary as compact as possible.

The dictionary will work more efficiently if it contains single terms rather than long compound expressions. For example, "breast cancer with metastases" is a common expression on death certificates. Add the two components separately, "breast cancer" and "metastases", and then include "with" as a phrase separator in the Separators table. This allows Iris to code "breast cancer" also in combination with other expressions (such as "breast cancer with brain metastases") and of course also "metastases" in other contexts ("such as "lung cancer with metastases"). This approach requires fewer dictionary entries than if you would include each occurring combination of cancer and metastases in the dictionary.

Also note that dictionary entries should be kept a short as possible, since the chance of obtaining a dictionary match decreases considerably with the length of the expression. Therefore, use standardisation to split compound terms into their components and add the components separately to the dictionary. Also, delete text elements that do not change the ICD-10-WHO code for the expression, and make sure that your language standardisation procedure also removes such superfluous text elements (for instance, according to the instructions in Volume 2 of the ICD-10-WHO expressions such as "possibly" or "perhaps" should not influence the coding according and can be deleted; in most diagnostic terms the qualifiers "right" or "left" do not influence the coding, and except in some special cases they can be removed).

8.2.2 ICD-10-WHO version

When you assign ICD-10-WHO codes to the terms in the dictionary, you should use the most recent version of ICD-10-WHO. This means that the official updates should be implemented according to the schedule at the *WHO website* for ICD-10-WHO updates.

Iris/MUSE uses only valid ICD-10-WHO codes.

8.2.3 No decimal point in the codes

<u>Please note</u> that the decimal point is not used by Iris. For example, enter I259 for ischemic heart disease, not I25.9.

8.2.4 Two ICD-10-WHO codes for one text term

It is possible to add one, two or three ICD-10 code for one term to the dictionary. Some diagnostic expressions require more than one ICD-10-WHO code. For example, "diabetic nephropathy" codes to E14.2 + N08.3. In such cases, place the main code for the condition in the Icd1 field and the secondary code in the Icd2 code. For "diabetic nephropathy", the main code is E142. Place it in Icd1, and place the secondary code N083 in Icd2. Do not enter dagger or asterisk symbols. For more information about the 'dagger and asterisk' system see at ICD-10-WHO, Volume 2 (paragraph 3.1.3 Two codes for certain conditions).

The main code for the expression should be entered at first.

There are special requirements for external causes and injuries, please see below.

8.2.5 Asterisk codes and codes in Z00-Z99

You can use asterisk (*) codes in your dictionary, but only in the Icd2 field [dagger (†) code in Icd1]. Asterisk codes will deleted by MUSE before MUSE starts the selection. The same applies to interactive coding: you can use asterisk, but only following the main code for the condition. For more information about the 'dagger and asterisk' system see at ICD-10-WHO, Volume 2 (paragraph 3.1.3 Two codes for certain conditions). <u>Please note</u> that you should not use the asterisk symbol either in the dictionary or in interactive coding.

Z codes (Z00-Z99) will be deleted or substituted by MUSE before MUSE starts the selection. The codes Z00-Z99 should not be used for international comparison or for primary mortality coding (see note at *Volume 1, ICD-10-WHO*).

8.2.6 Injuries and external causes

Injuries (codes from Chapter XIX, Volume 1, ICD-10-WHO) require a default external cause code (from Chapter XX, Volume 1, ICD-10-WHO). For example, the dictionary entry for "drowning" is T751 in Icd1 and W74 in Icd2.

The injury code (Chapter XIX) should be placed in the Icd1 field and the external cause code (Chapter XX) in the Icd2 field at the dictionary.

8.2.7 Created codes

For some broader ICD-10-WHO categories the diagnostic information provided by the ICD-10-WHO code is not sufficient for a correct selection of the underlying cause. Further information might be needed, for example on the location of the disease or on other circumstances that are not captured by the ICD-10-WHO code alone. For example, both acquired cardiomyopathy and hereditary cardiomyopathy are coded to I42.9. To evaluate a statement that cardiomyopathy was due to another condition, the coding systems needs to know whether the condition was specified as acquired or hereditary. If it was specified as hereditary, then the stated sequence is not accepted. If it was specified as acquired, however, then the sequence is accepted.

For the most common conditions where such additional information is needed the system uses created codes (*Appendix 2: Created codes*). Created codes are subdivisions of the ICD-10-WHO code that do not exist in the international version of ICD-10-WHO. If the coder enters an ICD-10-WHO code for which Iris uses created code subdivisions, the coder will be asked to select one of the corresponding created codes. Similarly, if the dictionary contains the ICD-10-WHO code and not the created code subdivisions, the record is rejected for manual review and the coder has to select which one of the created codes to use. These requests for additional information may slow down the coding process considerably. You can avoid such requests for additional information and speed up the coding by using created codes in the dictionary.

The created codes are used by the decision tables component and are determined by the National Center for Health Statistics (NCHS). Although most created codes are the same from one version of MMDS (Mortality Medical Data System) to the next, there might be minor differences. The created codes used in Iris are listed in *Appendix 2: Created codes*.

8.2.8 Alternative ICD-10-WHO codes for the same text term

For several diagnostic expressions the ICD-10-WHO code depends on the circumstances. For example, the ICD-10-WHO code for "cerebral haemorrhage" can be I61.9 (default code), O99.4 (obstetrical), P52.4 (fetus or newborn), S06.2 (traumatic), and so on. In some cases it is sufficient to enter the default code in the dictionary, and Iris will change the ICD-10-WHO codes if necessary.

In exceptional cases, however, Iris cannot modify the default code correctly. It could happen, for example, when the dictionary contains expressions in different languages and a term means different things in different languages. If so, the dictionary should contain one entry for each alternative code for the term. When Iris encounters a certificate with the ambiguous term all coding alternatives will be displayed, and the coder will be asked to choose one of them interactively.

<u>Please note</u> that alternative codes for the same term is always an exception. You should not put alternative codes in the dictionary unless you have established that the automatic code modification in Iris does not work. Normally Iris does not expect to find duplicate dictionary records with the same text but different codes. When Iris generates a dictionary with standardised terms it also checks for such duplicate entries with different ICD-10-WHO codes and flags them as errors, since the identical texts could be an effect of inaccurate language standardisation. Therefore, if you do want to include records with alternative ICD-10-WHO codes, set the variable 'OKForMultipleCodes' to "1" in the dictionary table. This prevents Iris from flagging these entries as errors.

8.2.9 Connected codes and MUSE flags

With the integration of the new MUSE module in Iris the detail that cannot be coded with ICD-10 codes sometimes needs to be specified through separate ways. This is handled in two ways:

- by a combination of two ICD-10 codes used as so called "Connected Codes"
- by additional information represented as so called "Flags" or "MUSE flags"

Connected codes or MUSE flags should only be used if necessary to arrive at the correct codes for multiple or underlying causes.

8.2.9.1 Connected Codes

Connected codes are codes where two existing ICD-10 Codes are used together in order to fully carry the information of the diagnosis text and where the diagnosis text represents only one disease.

The text recognition uses the written diagnosis text of a line or of part of a line. It doesn't know the context of the other lines or parts. The multicausal part of MUSE tries to find more precise codes by using the context information. In most cases ICD-10 coding is sufficient. But sometimes ICD-10 categories are to coarse or general and then MUSE needs additional information. MUSE supports connected codes: The technical framework replaced the connected codes of previous Iris versions (4.x).

Neoplasms

The ICD-10 code "trachea tumour" is D381. But D381 represents trachea tumour, lung tumour or bronchial tumour. Loss of information is too severe if MUSE performs an "implication of malignancy" according to paragraph 4.3.5 (ICD-10, Volume 2, 2019). If there is a metastasis it tries to find an optimal C code. But after ICD-10 coding it cannot decide whether C349 or C33 is the correct one.

Therefore in the dictionary the code D381 is given together with the correct code for malignant tumour of trachea: C33. If the context of the certificate indicates that the tumour is malignant, C33 will be selected for further multiple cause coding. If not, the tables will give the malignant code C349 as default.

The person maintaining a language version dictionary will have to decide from the term which connected code would be correct and has to enter it in the dictionary in the filed IcdC.

In the further processing in the MUSE module the logic will decide which code is correct for further use.

Only if a code combination is implemented in the decision tables of the MUSE module a connected code will be used. Therefore a list of possible Connected Codes will be given in the annex in order to indicate to the user which code connections he has to implement.

There is the option to give two ICD-10 codes in Icd1 and Icd2 as well but this is primarily intended for two separate diseases that are carried in one diagnosis text and do not have to be connected for a coding matter.

In the "IcdC" field codes can be carried that hold additional information for example the precise localisation of a tumour. They might be deleted later in the process.

If you don´t use connected codes for neoplasms in your dictionary, MUSE will select a specific code for the malignant neoplasm. But it could be that the selected code in not correct if you don´t use connected code in your dictionary (e.g. D381 – explanation see above). For these cases there is no longer a reject implemented.

The connected codes for neoplasms are listed in _Appendix 3: Connected codes for neoplasms_.

Cancer cachexia

The code C80.9 does not allow to distinguish between "Cancer cachexia" (indicating the presence of a cancer) and "Malignant neoplasm, primary site unspecified". Therefore use the connected code R64 in the dictionary for each terms referring to "cancer cachexia" at the code C80.9.

Neoplasm of unspecified behaviour with mention of cancer cachexia (C809R64) will be substituted in malignant neoplasm; other rules will apply for cancer unspecified C80.9.

Table 38 Connected code for Cancer Cachexia

Diagnosistext	Icd1	IcdC
Cancer Cachexia	C809	R64

Example 1a (with connected code for Cancer Cachexia – coding without error):

1a	Carcinosis of abdomen	C798
1b	Liver cancer	C229
1c	Cancer cachexia	C809R64
MC	C798/C229/C809	
UC	C229	

Example 1b (without connected code for Cancer Cachexia – coding with error):

1a	Carcinosis of abdomen	C798
1b	Liver cancer	C229
1c	Cancer cachexia	C809
MC	C798/C787/C809	
UC	C809	

In this example the MC code for liver cancer is not correct [the MC should be C229 instead of C787] and also the code for UCOD is not correct [the UC should be C229 instead of C809]. Iris/MUSE cannot distinguish between "Cancer cachexia" and "Malignant neoplasm" in C80.9. Therefore use the connected code R64 for Cancer Cachexia (C80.9) at the dictionary.

Streptococcal infection and Enterococcal infection

The code A49.1 does not allow to distinguish between "Streptococcal infection" and "Enterococcal infection". Therefore use a connected code in the dictionary for each terms referring to "Streptococcal infection" and "Enterococcal infection" at the code A49.1.

Table 39 Connected codes for Streptococcal infection and Enterococcal infection

Diagnosistext	Icd1	IcdC
Streptococcal infection	A491	B955
Enterococcal infection	A491	B952
Streptococcal infection group A	A491	B950
Streptococcal infection group B	A491	B951
Streptococcal infection group D	A491	B952
Pneumococcal infection	A491	B953

Example 2:

1a	Sepsis	A419
1b	Streptococcal infection	A491B955
MC	A409	
UC	A409	

Example 3:

1a	Pneumonia	J189
1b	Enterococcal infection	A491B952
MC	J158	
UC	J158	

Example 4:

1a	Meningitis	G039
1b	Pneumococcal infection	A491B953
MC	G001	
UC	G001	

Staphylococcal infection

The code A49.0 does not allow to distinguish between "Staphylococcal infection" and "Staphylococcus aureus infection". Therefore use a connected code in the dictionary for each terms referring to "Staphylococcal infection" and "Staphylococcus aureus infection" at the code A49.0.

Table 40 Connected codes for Staphylococcal infection

Diagnosistext	Icd1	IcdC
Staphylococcal infection	A490	B958
Staphylococcus aureus infection	A490	B956

Other bacterial infection

The code A49.8 does not allow to distinguish between the other bacterial infections. Therefore use a connected code in the dictionary for each terms referring to other bacterial infections at the code A49.8.

Table 41 Connected codes for Other bacterial infection

Diagnosistext	Icd1	IcdC
Klebsiella (K.) pneumoniae infection	A498	B961
Friedländer's (bacillus) infection	A498	B961
Escherichia (E.) coli infection	A498	B962

Diagnosistext	Icd1	IcdC
Proteus (mirabilis) (morganii) (vulgaris) infection	A498	B964
Pseudomonas (aeruginosa) infection	A498	B965

Example 5:

1a	Pneumonia	J189
1b	Proteus infection	A498B964
MC	J156	
UC	J156	

Example 6:

1a	Sepsis	A419
1b	Escherichia coli infection	A498B962
MC	A415	
UC	A415	

Other specified infections specific to the perinatal period

The code P39.8 does not allow to distinguish between the other specified infections specific to the perinatal period. Therefore use a connected code in the dictionary for each terms referring to other specified infections specific to the perinatal period at the code P39.8.

Table 42 Connected codes for Other specified infections specific to the perinatal period

Diagnosistext[24]	Icd1	IcdC
Streptococcal infection group A	P398	B950
Streptococcal infection group B	P398	B951
Streptococcal infection group D	P398	B952
Streptococcus infection	P398	B955
Staphylococcus aureus infection	P398	B956
Staphylococcal infection	P398	B958
Klebsiella (K.) pneumoniae infection	P398	B961

---

[24] arising in the perinatal period

Diagnosistext[24]	Icd1	IcdC
Escherichia (E.) coli infection	P398	B962
Haemophilus influenzae infection	P398	B963
Pseudomonas (aeruginosa) infection	P398	B965

Other viral agents

The code B97.8 does not allow to distinguish between "Human metapneumovirus" and other viral agents classified at B97.8. Therefore use a connected code in the dictionary for the term "Human metapneumovirus".

Table 43 Connected code for Human metapneumovirus (Other viral agents)

Diagnosistext	Icd1	IcdC
Human metapneumovirus	B978	J123

Haemothorax and Haemopneumothorax

The code J94.2 does not allow to distinguish between "Haemothorax" and "Haemopneumothorax". Therefore use a connected code in the dictionary for each terms referring to "Haemothorax" and "Haemopneumothorax" at the code J94.2.

Table 44 Connected codes for Haemothorax and Haemopneumothorax

Diagnosistext	Icd1	IcdC
Haemothorax	J942	S271
Haemopneumothorax	J942	S272

Example 7:

1a	Haemothorax	J942S271
1b	Fall	W19
MC	S271/W19	
UC	W19 with main injury S271	

Example 8:

1a	Haemopneumothorax	J942S272
1b	Fall	W19
MC	S272/W19	
UC	W19 with main injury S272	

8.2.9.2 MUSE Flags

Flags are used to add a very specific part of information from the text on the death certificate to the assigned ICD-10 code. A very straight forward example is the word "primary" that comes with malignant tumours. In some cases the Volume 2 recodes ICD-10 codes from the chapter of primary malignant cancers to secondary because they are a frequent site for metastasis. But, there is a rule to not do so if the text clearly identifies the cancer as primary, either by the word primary or by the morphology of the tumour. Once the text is coded the information is lost, if not carried in a flag. Therefore the field "MuseFlags" provides the person maintaining the dictionary to indicate that a text clearly is identified as a primary tumour. The dictionary entry will be marked with the respective flag and the MUSE module coding will take the flag into account and not recode this code to a secondary cancer.

Coding example: the text in the dictionary is "primary lung cancer", the flag is set to indicate the tumour being primary and the code is C349. Another text in the dictionary is "lung cancer", no flag is set and the code is C349. Depending on the text on the certificate the code C349 is selected with or without the flag. In case it is selected without a flag and another cancer is present on the certificate, the code is modified by MUSE to C780. If the flag is present, the modification will not be performed by MUSE and the code will stay at C349.

Another way to set a flag is through standardisation. If a certain text is specified in the standardisation and a match to the text on the certificate can be found, a flag can be added to a text as specified in the standardisation tables.

There are other flags in Iris that are set by the system, e.g. the flag for reason for surgery will be introduced at some point. But as the user of Iris will not have to implement this separately in the language specific dictionary or standardisation table, this will not be described here.

To identify "Acute heart failure" in I50.-, please use the "A" flag for "Acute heart failure" in I50.- in your dictionary. The term heart failure will be changed to ill-defined condition if it is described as "acute" [see ICD-10-WHO, Volume 2, Appendix 7.3].

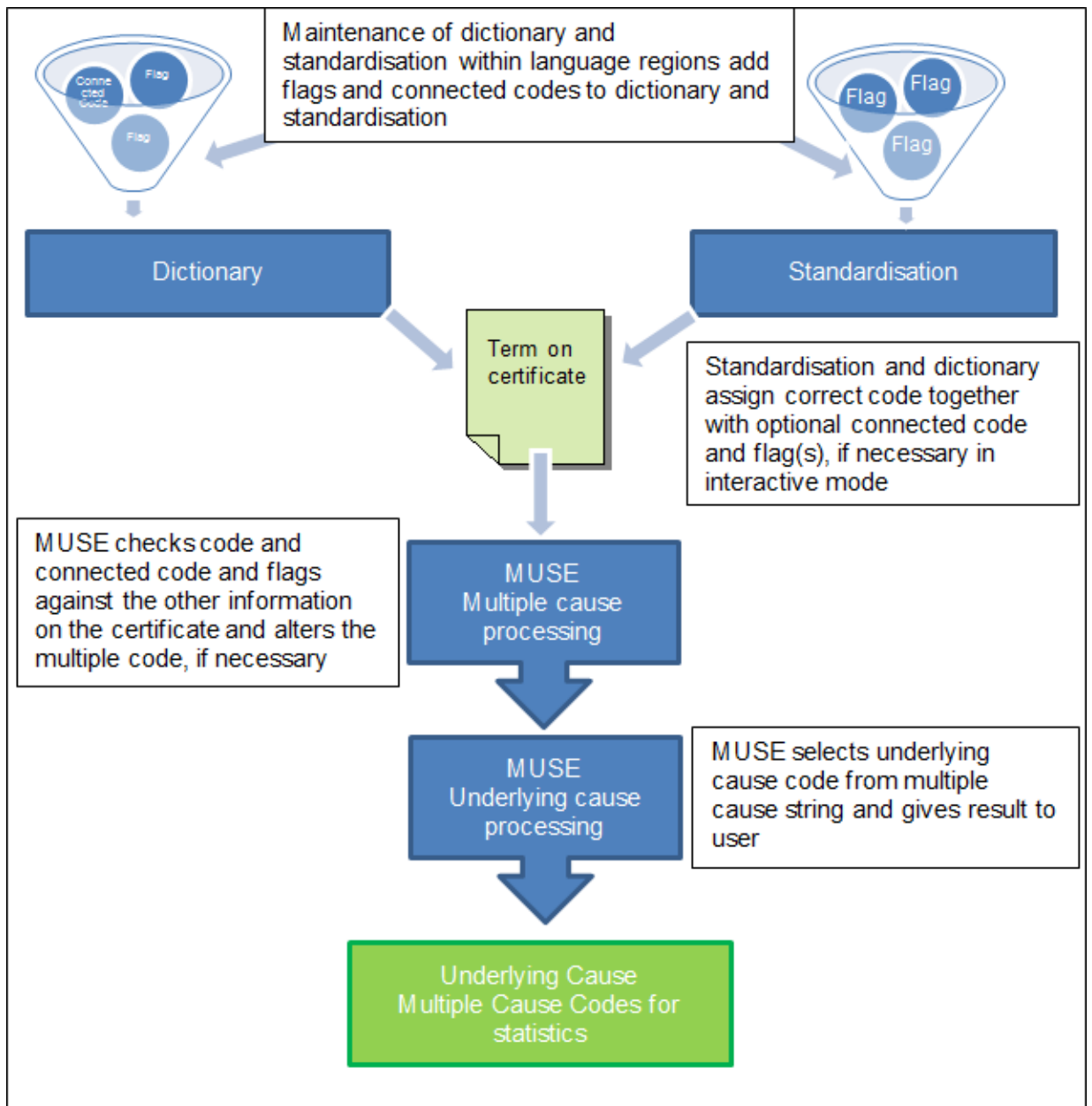The table at chapter *5.3 Flags assigned to ICD-10 codes* gives examples for flags that are recommended to be used.

Figure 124 Connected codes and MUSE flags in use

Transformation of connected codes from V 4 to V 5

Iris transfers the old connected codes to the new MUSE flags:

Table 45 Transformation of connected codes from Iris version 4 to MUSE flags in Iris version 5

Connected code in Iris version 4	MUSE flag in Iris version 5	Description
C799	MET	Metastatic
C800	P	Primary
R688	nTR	Non-traumatic
T149	TR	Traumatic

It is possible to use the old connected codes or the new MUSE flags, <u>except</u> unspecified tumors.

8.2.10 Coding Flags

<u>Use the 'coding flags' only as described in this chapter.</u>

If an expression can be coded in several ways and the coding is determined by information contained in a check box on the certificate, you can enter one dictionary record for each value of the check box. For example, you might want to code the expression "operation" to Y83.9, but only if the certifier had ticked the check box for "surgery within four weeks before death" on the death certificate. To achieve this, enter a dictionary record for the expression "operation", give it the ICD1 code Y839 and a value of, for example, "Op4w" in the 'CodingFlag' field. Also enter a second dictionary record for the expression "operation" and assign a non-informative code in the ICD1 field, such as R688. In this second record, leave the 'CodingFlag' field empty.

Next, when you create the work lot, set the value of the 'CodingFlags' field in the Ident table to "Op4w", if the certifier has ticked the checkbox for recent surgery.

When Iris codes the record and encounters the term "operation" it will check the value of the 'CodingFlags' field in the "Ident" table and compare it to the 'CodingFlag' field in the dictionary. If the two fields match, Iris will use that dictionary record to code the term. So if the 'CodingFlag' value is "Op4w" in both the dictionary record and in the

"Ident" table, then "operation" is coded to Y839. It the 'CodingFlags' value in the Ident table is blank, Iris will use the dictionary entry for "operation" with a blank value in 'CodingFlag' field, and R688 at Icd1 field.

You can use any kind of expression as coding flags, and "Op4w" in the example above could just as well have been "RecentSurgery", "Flag1" or "dog".

9.   Previous Iris versions

Iris V5.8.0 – February 2021

Please see the release notes for version 5.8.0.

Iris V5.7.0 – February 2020

Please see the release notes for version 5.7.0.

Iris V5.6.0 – February 2019

Please see the release notes for version 5.6.0.

Iris V5.5.0 – March 2018

Please see the release notes for version 5.5.0.

Iris V5.4.0 – March 2017

Please see the release notes for version 5.4.0. This is the first version of Iris version 5 (with MUSE). We released also some test versions of Iris version 5 before Iris version 5.4.0 (Test versions: V5.0.4, V5.1.4, V5.2.1 and V5.3.3).

Iris V4.5.6 – March 2016

Please see the release notes for version 4.5.6. This was the final version of Iris version 4 (with MMDS).

Iris V4.5.3 – June 2015

Please see the release notes for version 4.5.3.

Iris V4.5.0 – February 2015

Please see the release notes for version 4.5.0.

Iris V4.4.1 – February 2014

Please see the release notes for version 4.4.1.

Iris V4.3.2 – November 2013

Please see the release notes for version 4.3.2.

Iris V4.2.3 – June 2013

- Correction of bug: Standardisation 1 in dictionary searches
- Correction of bug: Consistency checks in batch processing
- Correction of bug: Pop-up boxes for consistency checks in interactive coding

- Correction of bug: "No ERN" message
- Correction of bug: NonConsistentIcdCodes table
- Correction of bug: Procedure handling "metastatic" neoplasms

Iris V4.2.0 – February 2013

- ACME browser can now be used in a network environment
- Y400-Y849 can be used with any Manner of Death (MoD)
- Duplicate codes on the same line are pruned automatically
- In non-maintenance mode, it is sufficient to separate input codes by a blank (comma + blank is not required)
- Certificate viewer supports multi-page images
- The handling of ICD-10-WHO code edits has been improved
- Iris can be called by a line command

Iris V4.1.3 – August 2012

- Addition of the ACME table browser in the tool menu
- Open a lot by selecting ICD-10-WHO code
- Availability of checks in interactive and batch coding in the Options
- An extended Find function allows to find record from text comment or ICD-10-WHO codes
- Possibility to manually modify ACME input codes for expert coders
- Exchanges of text between the main screen and the dictionary are facilitated
- Use of "classic" wildcards characters in dictionary searches
- Csv exports of the search result in the dictionary

Iris V4.0.38 – May 2011

Iris V4.0 – January 2011

- Development of tools for dictionary and standardisation table maintenance
- Sophisticated processing of time interval associated with diagnoses
- Introduction of many optional individual data in Iris main window (external cause, maternal death, injury, perinatal death)
- Possibility to select the records of a lot at opening according to status and reject codes

- Additional features to facilitate coder work

- Easy translation of Iris interface names and messages in any language

Iris V3.3 – January 2009

- Correction of known errors

- Creation of Find Record Type window

Iris V3.21 – June 2008

- Correction of known errors

- Correction of IcdErn, IcdSubstitution and ValidIcd tables

Iris V3.2 – April 2008

- Correction of known errors

- Copy button added in Explain window

- Correction of IcdErn, IcdSubstitution and ValidIcd tables

- Modification for Oracle databases

Iris V3.1 – March 2008

- Correction of known errors

- Test MSSQL server

- Message on syntax error more explicit

- Dictionary tool

- Impression of death certificate

- Tools/Standardisation: edit button

- Reload tables without leaving the current lot

- Management of durations with multiple codes (change of ValidIcdCodes structure)

- Added Z codes to IcdSubstitution table

- Revise and update manual

Iris V3.0 – August 2007

- Correction of known errors

- German version is included

- International version is improved

- NonConsistentIcdCodes table is included for plausibility checks

- An example of dictionary in English is provided, when you install Iris
- Large certificate key is implemented (30 characters), User key is dropped

Iris V2.3 – December 2006

- Correction of known errors
- Deployment improvement (keep existent tables)
- allow to process a given number of records in Batch
- Rename Surgery table Procedure table
- Coder reject
- Main injury editing
- Creation of valid ICD-10-WHO codes Table
- Check UC code: Edit, Code entry mode, Main Injury
- US Created codes management (e.g. G2000, G2009 instead of G20)
- Edit ICD-10-WHO is available even when the death certificate is empty (no causes of death entered). This allows the use of Iris to capture underlying causes of death manually coded without using coding capabilities of Iris.
- Include a free for additional comments on the death certificate.
- Reorganise the back of Iris main window. Use tools instead of buttons.
- Iris shouldn't discard Z and asterisk codes since MICAR and ACME will handle these codes.

Iris V2.2 – March 2006

- Correction of known errors
- apply group don't eliminate multiple blanks
- standardisation tool crashes if empty tables
- find works when no lot is open
- MICAR code for Undetermined intent not correct
- Reorganisation of classes (LotManager and CodingManager)
- Batch processing: option to reprocess every record
- Batch processing performances improved (hashtables on Dictionary and IcdErn tables)
- Research on Certificate key in Find tool
- Suppress 5th character AFTER substitutions

- Review individual data interface in main window

- Use of Paradox databases (Extended Properties=Paradox 5.x;)

- Causal separator standardisation

- Standardisation of time intervals

- Development of standardisation chapter in the manual

- Test deck

Iris V2.1 – December 2005

- Diagnostic text zones are extended to 255 characters (tables "MedCod" and dictionary)

- Culture changed from French to neutral in install program

- Improvement of Iris explanations

- Options should now be correctly saved

- Erase of medical data: a warning message is displayed, the shortcut key is changed to ctrl D and a possibility to restore the original causes of death is given

- Manner of Death: change "Could not be determined" by "undetermined intent" to comply with ICD-10-WHO

- A coding menu has been added with items to recode, delete and restore the medical part. The recode function is accessible via the toolbar

- Standardisation tool has been improved. In particular, all the keys of the selected standardisation table are automatically listed

- Button "Save" has been changed into "Save and next record"

- User Key is displayed instead of certificate key

- Sex may be undetermined (any value other than 1 or 2)

- ICD-10-WHO codes are truncated to 4 characters if there is no substitution

- Manual underlying cause editing is now possible

Iris V2.0 – September 2005

- This version includes the possibility to code directly from text (Dictionary and standardisation). Code entry mode only. The versions 1 of Iris aimed at defining the algorithm of selection of the underlying cause (code substitution, ERN correspondence, MICAR and ACME modules use).

Appendix 1: Iris hot keys

Open a work lot and close Iris

Open work lot	Ctrl + O
Exit from Iris	Ctrl + Q

Move to another certificate

Save and go to next rejected certificate	F12
Save and go to next certificate	F11
Go to next rejected certificate	Ctrl + R
Go to next not coded certificate (status = "Initial")	Ctrl + I
Go to previous certificate	Ctrl + P
Go to next certificate	Ctrl + N
Save changes to certificate	Ctrl + S
Find certificate	Ctrl + F
Save changes and find new certificate	Ctrl + B

Move on the screen

Go to next line	F8
Go to Part 2	F9

Coding

Show certificate image	Ctrl + 1
Open MUSE explanation window	Ctrl + U
Recode all expressions	Ctrl + Shift + C
Edit underlying cause	Ctrl + E
Open "Main injury selection" window (code from chapter XIX)	Ctrl + M
Delete record (certificate) [only at data entry mode]	Ctrl + Shift + D
Erase "Medical part" and "Coding" part (except MC codes)	Ctrl + Shift + E
Restore original text	Ctrl + Shift + R
Assign status "Acute" (at Medical part)	F5

Assign status "Chronic" (at Medical part)	F6
Assign status "Sequel" (at Medical part)	F7
Open "Dictionary" tool	F10
Display "Explain window"	F1
Print screen	Ctrl + D
Interval / status definition window	Ctrl + T

MUSE windows (only if MUSE explanation window is open)

Open "MUSE Translation Tool"	Ctrl + X
Open "MUSE specification" window	Ctrl + Z

Appendix 2: Created codes

The created code for C2290 is deleted since Iris version 5. Please use the P flag in the column MuseFlags in the dictionary.

The created code K7290 is deleted by recommendation of the Mortality Reference Group (MRG).

The created code J8490 and M1990 are deleted by recommendation of the Table Group (TG). For M1990-M1999 see optional 5th digits at volume 1 of ICD-10-WHO.

Table 46 List of 'Created codes' used in Iris for 2021

Basic code of ICD-10-WHO	Subdivisions code	Title
A169	A1690	Tuberculosis, unspecified, not described as respiratory or pulmonary
A169	A1699	Tuberculosis, unspecified, described as respiratory or pulmonary
C229	Add "P" Flag at dictionary in column "MuseFlags"	Liver cancer, specified as primary but morphology not stated [see also *8.2.9 Connected codes and MUSE flags* and *Appendix 3: Connected codes for neoplasms*]
C229	-	Liver cancer, unspecified, not qualified as primary
E039	E0390	Hypothyroidism, advanced, grave, severe or similar
E039	E0399	Hypothyroidism, not described as advanced, grave, severe or similar
G122	G1220	Motor neuron disease, advanced, grave, severe or similar
G122	G1229	Motor neuron disease, not described as advanced, grave, severe or similar
G20	G2000	Parkinson's disease, advanced, grave, severe or similar
G20	G2009	Parkinson's disease, not described as advanced, grave, severe or similar
I219	I2190	Acute Myocardial infarction, unspecified, caused by embolism
I219	I2199	Acute Myocardial infarction, unspecified, not caused by embolism
I420	I4200	Dilated cardiomyopathy, described as familial, idiopathic or primary
I420	I4209	Dilated cardiomyopathy, not described as familial, idiopathic or primary
I421	I4210	Obstructive hypertrophic cardiomyopathy, described as familial, idiopathic or primary
I421	I4219	Obstructive hypertrophic cardiomyopathy, not described as familial, idiopathic or primary
I422	I4220	Other hypertrophic cardiomyopathy, described as familial, idiopathic or primary
I422	I4229	Other hypertrophic cardiomyopathy, not described as familial, idiopathic or primary

Basic code of ICD-10-WHO	Subdivisions code	Title
I425	I4250	Other restrictive cardiomyopathy, described as familial, idiopathic or primary
I425	I4259	Other restrictive cardiomyopathy, not described as familial, idiopathic or primary
I428	I4280	Other cardiomyopathies, described as familial, idiopathic or primary
I428	I4289	Other cardiomyopathies, not described as familial, idiopathic or primary
I429	I4290	Cardiomyopathy, described as familial, idiopathic or primary
I429	I4299	Cardiomyopathy, unspecified, not described as familial, idiopathic or primary
I500	I5000	Congestive heart failure, described as advanced, grave, severe or similar
I500	I5009	Congestive heart failure, not described as advanced, grave, severe or similar
I514	I5140	Myocarditis, described as arteriosclerotic
I514	I5149	Myocarditis, unspecified, not described as arteriosclerotic
I515	I5150	Myocardial degeneration, described as arteriosclerotic
I515	I5159	Myocardial degeneration, not described as arteriosclerotic
I600	I6000	Subarachnoid haemorrhage from carotid siphon and bifurcation, caused by ruptured carotid aneurysm
I600	I6009	Subarachnoid haemorrhage from carotid siphon and bifurcation, not caused by ruptured carotid aneurysm
I606	I6060	Subarachnoid haemorrhage from other intracranial arteries, caused by ruptured aneurysm (congenital) in circle of Willis
I606	I6069	Subarachnoid haemorrhage from other intracranial arteries, not caused by ruptured aneurysm (congenital) in circle of Willis
I607	I6070	Subarachnoid haemorrhage from intracranial artery, caused by ruptured berry aneurysm (congenital) or ruptured military aneurysm
I607	I6079	Subarachnoid haemorrhage from intracranial artery, unspecified, not caused by ruptured berry aneurysm (congenital) or ruptured military aneurysm
I608	I6080	Other subarachnoid haemorrhage, caused by other ruptured aneurysm
I608	I6089	Other subarachnoid haemorrhage, not caused by other ruptured aneurysm
I609	I6090	Subarachnoid haemorrhage, caused by ruptured (arteriosclerotic) cerebral aneurysm
I609	I6099	Subarachnoid haemorrhage, unspecified, not caused by ruptured (arteriosclerotic) cerebral aneurysm
I610	I6100	Intracerebral haemorrhage in hemisphere, subcortical, described as multiple or similar
I610	I6109	Intracerebral haemorrhage in hemisphere, subcortical, not described as multiple or similar
I611	I6110	Intracerebral haemorrhage in hemisphere, cortical, described as multiple or similar

Basic code of ICD-10-WHO	Subdivisions code	Title
I611	I6119	Intracerebral haemorrhage in hemisphere, cortical, not described as multiple or similar
I612	I6120	Intracerebral haemorrhage in hemisphere, described as multiple or similar
I612	I6129	Intracerebral haemorrhage in hemisphere, unspecified, not described as multiple or similar
I613	I6130	Intracerebral haemorrhage in brain stem, described as multiple or similar
I613	I6139	Intracerebral haemorrhage in brain stem, unspecified, not described as multiple or similar
I614	I6140	Intracerebral haemorrhage in cerebellum, described as multiple or similar
I614	I6149	Intracerebral haemorrhage in cerebellum, unspecified, not described as multiple or similar
I615	I6150	Intracerebral haemorrhage, intraventricular, described as multiple or similar
I615	I6159	Intracerebral haemorrhage, intraventricular, unspecified, not described as multiple or similar
I618	I6180	Other intracerebral haemorrhage, described as multiple or similar
I618	I6189	Other intracerebral haemorrhage, unspecified, not described as multiple or similar
I619	I6190	Intracerebral haemorrhage, described as multiple or similar
I619	I6199	Intracerebral haemorrhage, unspecified, not described as multiple or similar
I630	I6300	Cerebral infarction due to thrombosis of precerebral arteries, described as multiple or similar
I630	I6309	Cerebral infarction due to thrombosis of precerebral arteries, not described as multiple or similar
I631	I6310	Cerebral infarction due to embolism of precerebral arteries, described as multiple or similar
I631	I6319	Cerebral infarction due to embolism of precerebral arteries, not described as multiple or similar
I632	I6320	Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries, described as multiple or similar
I632	I6329	Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries, not described as multiple or similar
I633	I6330	Cerebral infarction due to thrombi of cerebral arteries, described as multiple or similar
I633	I6339	Cerebral infarction due to thrombosis of cerebral arteries, not described as multiple or similar
I634	I6340	Cerebral infarction due to embolism of cerebral arteries, described as multiple or similar
I634	I6349	Cerebral infarction due to embolism of cerebral arteries, not described as multiple or similar

Basic code of ICD-10-WHO	Subdivisions code	Title
I635	I6350	Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries, described as multiple or similar
I635	I6359	Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries, not described as multiple or similar
I636	I6360	Cerebral infarction due to cerebral venous thrombosis, non-pyogenic, described as multiple or similar
I636	I6369	Cerebral infarction due to cerebral venous thrombosis, non-pyogenic, not described as multiple or similar
I638	I6380	Other cerebral infarction, described as multiple or similar
I638	I6389	Other cerebral infarction, not described as multiple or similar
I639	I6390	Cerebral infarction, described as multiple or similar
I639	I6399	Cerebral infarction, unspecified, not described as multiple or similar
I64	I6400	Stroke, not specified as haemorrhage or infarction, described as multiple or similar
I64	I6409	Stroke, not specified as haemorrhage or infarction, not described as multiple or similar
I691	I6910	Sequelae of intracerebral haemorrhage, described as multiple or similar
I691	I6919	Sequelae of intracerebral haemorrhage, not described as multiple or similar
I693	I6930	Sequelae of cerebral infarction, described as multiple or similar
I693	I6939	Sequelae of cerebral infarction, not described as multiple or similar
I694	I6940	Sequelae of strokes, not specified as haemorrhage or infarction, described as multiple or similar
I694	I6949	Sequelae of stroke, not specified as haemorrhage or infarction, not described as multiple or similar
J101	J1010	Influenza, flu, grippe (viral), influenza virus identified, without specified manifestations
J101	J1019	Influenza with other respiratory manifestations, seasonal influenza virus identified (other than pneumonia)
J111	J1110	Influenza, flu, grippe (viral), influenza virus not identified, without specified manifestations
J111	J1119	Influenza with other respiratory manifestations, virus not identified (other than pneumonia)
J984	J9840	Lung disease (acute) (chronic), not otherwise specified
J984	J9849	Other disorders of lung, not described as lung disease
K319	K3190	Disease or lesion of stomach, unspecified
K319	K3199	Disease or lesion of duodenum, unspecified

Basic code of ICD-10-WHO	Subdivisions code	Title
K550	K5500	Acute vascular disorders of intestine, described as embolism (it does not include infarction or thrombosis, only embolism)
K550	K5509	Acute vascular disorders of intestine, not described as embolism
K631	K6310	Perforation of intestine (non-traumatic), unspecified part
K631	K6319	Perforation of intestine (non-traumatic), specified part
K720	K7200	Acute hepatic failure (so stated)
K720	K7209	Acute and subacute hepatic failure, described otherwise as acute
K721	K7210	Chronic hepatic failure (so stated)
K721	K7219	Chronic hepatic failure, described otherwise as chronic
Q278	Q2780	Congenital aneurysm of peripheral vascular system
Q278	Q2789	Other specified congenital malformations of peripheral vascular system, not described as aneurysm
Q282	Q2820	Congenital arteriovenous cerebral aneurysm (non-ruptured)
Q282	Q2829	Arteriovenous malformation of cerebral vessels, not described as aneurysm
Q283	Q2830	Congenital cerebral aneurysm (non-ruptured)
Q283	Q2839	Other malformations of cerebral vessels, not described as aneurysm
R58	R5800	Haemorrhage of unspecified site
R58	R5809	Haemorrhage, not elsewhere classified
R99	R97	Cause unknown (so stated)
R99	R999	Other ill-defined and unspecified causes of mortality

'Multiple' in created codes I6100-I6940 (ending with 0) – Code to 'multiple' when stated as such or by any other similar designation (e.g. 'Strokes').

Appendix 3: Connected codes for neoplasms

The following list contains possible to connected codes for in situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behaviour.

Table 47 In situ neoplasms; Benign neoplasms; Neoplasms of uncertain or unknown behaviour: List of possible ICD codes that can be used as connected codes in Iris

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D000	C000-C148	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D001	C150-C159	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D002	C160-C169	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D010	C180, C182-C189	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D013	C210-C218	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D014	C170-C179	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D015	C221, C229, C23-C249	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D017	C210-C212, C250-C259, C260-C261	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D020	C320-C329	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D022	C340-C349	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D023	C300-C319	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D038	C438-C439	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D048	C448-C449	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D050	C500-C509	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D051	C500-C509	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D057	C500-C509	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D059	C500-C509	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D071	C510-C519	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D074	C600-C609	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D076	C620-C629, C630-C637	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D090	C670-C679	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D091	C64-C66, C680-C689	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D092	C690-C699	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D093	C73-C759	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D097	C380, C690-C699, C760-C768	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D100	C000-C009	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D101	C01-C029	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D102	C040-C049	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D103	C030-C039, C050-C069	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D104	C090-C099	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D105	C100-C109	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D106	C110-C119	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D107	C12-C139	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D109	C140-C148	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D117	C080-C088	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D123	C183-C185	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D126	C188-C189	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D129	C210-C218	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D130	C150-C159	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D131	C160-C169	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D133	C171-C179	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D134	C221, C229	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D135	C23, C240-C249	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D136	C250-C253, C257-C259	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D139	C260-C269	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D140	C300-C319	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D141	C320-C329	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D143	C340-C349	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D152	C381-C383	If code is recoded as primary due to other information on the certificate, the anatomical location can be coded more specific
D157	C384, C388, C390-C398	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D159	C761	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D169	C408-C409, C418-C419	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D180	C461, C480, C490-C499, C509, C696	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D181	C461, C480, C490-C499, C509, C696	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D197	C452-C457	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D201	C481-C488	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D219	C498-C499	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D229	C438-C439	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D239	C448-C449	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D24	C500-C509	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D250	C530-C549	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D251	C530-C549	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D252	C530-C549	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D259	C530-C549	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D260	C530-C539	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D261	C540-C549	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D267	C510-C58	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D280	C510-C519	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D282	C570-C574	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D287	C577-C579	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D290	C600-C609	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D292	C620-C629	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D297	C631, C637-C638	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D303	C670-C679	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D307	C681-C388	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D319	C698-C699	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D330	C710-C715	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D331	C716-C717	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D332	C718-C719	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D333	C722-C725	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D334	C720-C721	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D337	C720-C729	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D339	C728-C729	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D350	C740-C749	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D357	C750-C759	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D361	C470-C479	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D367	C760-C768	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D370	C000-C148	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D371	C160-C169	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D372	C170-C179	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D374	C180; C182-C189	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D375	C19; C20	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D376	C221; C229; C23-C249	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D377	C150-C159; C210-C212; C250-C259; C260-C261	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D380	C320-C329	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D381	C33-C349	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D383	C381-C383	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
dD385	C300-C319	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D386	C390-C399	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D390	C530-C55	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D397	C510-C52; C570-C577	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D401	C620-C629	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D407	C600-C609; C630-C637	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D414	C670-C679	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D430	C710-C715	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D431	C716-C717	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D433	C722-C725	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D434	C720-C721	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D441	C740-C749	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

Icd1 Code	Possible codes that can be used in "IcdC" field depending on the text given	Reason for implementation
D480	C400-C419	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D481	C490-C499; C696	If code is recoded as primary due to other information on the certificate, the anatomical location can be coded more specific
D482	C470-C479	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D484	C481-C482	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D485	C440-C449	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D486	C500-C509	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis
D487	C380; C690-C699; C760-C765	Neoplasm considered as malignant due to malignant neoplasm or cause of metastasis

D45-D47 should not be converted to a malignant neoplasm.

For more information about connected codes (cancer cachexia, infectious agents, etc.) see also *8.2.9 Connected codes and MUSE flags*.

Appendix 4: Schema for the implementation of Direct Selection feature

Figure 125 Schema for the implementation of Direct Selection feature

Appendix 5: List of tables in this manual

Appendix 6: List of figures in this manual

Appendix 7: List of revised terms in the manual and software

Table 48 List of revised terms

Through Iris version 4	Since Iris version 5
MMDS (Mortality Medical Data System)	-
-	MUSE (Multicausal and Unicausal Selection Engine)
ACME (Automated Classification of Medical Entities)	Decision tables [decision tables for selection of underlying cause]
MICAR (Mortality Medical Indexing, Classification, and Retrieval)	-
ERN (Entity Reference Numbers)	-
-	specMuse [contains the rules for multiple cause coding with the multiple cause coding substitutions]
ACME direct coding	Direct coding
AcmeMaybe	Maybe [unsureness of the underlying cause and unsureness of the multiple cause]
ACME Browser	Decision Table Browser (DTB)
ACME Editor	Decision Table Editor (DTE)
ACME Codes	Decision Table Codes
'Select' Button	'MUSE' Button

Appendix 8: List of abbreviations in the manual and software

Table 49 List of abbreviations and terms with explanation

Abbreviation/Term	Explanation
.accdb	Microsoft Database [since Access 2007]
.bitmap	A type of memory organization or image file format used to store digital images.
.config	A configuration file used to configure the parameters and initial settings for some computer programs. They are used for user applications, server processes and operating system settings.
.csv	Comma-separated values [file format to store data (numbers and text) in plain text]
.dat	A generic data file that stores information specific to the application it refers to
.DES	Data Encryption Standard [symmetric-key algorithm for the encryption of electronic data]
.dll	Dynamic Link Library
.exe	A common filename extension denoting an executable file; the main execution point of a computer program.
.gif	Graphics Interchange Format [a graphic format for pictures]
.ico	An image file format for computer icons in Microsoft Windows.
.jpeg	Joint Photographic Experts Group [method of lossy compression for digital images]
.log	A log file records either events that occur in an operating system or other software runs, or messages between different users of communication software.
.mdb	Microsoft Database [since Access 2007 also .accdb]
.msi	Microsoft Installer [a software component and application programming interface (API) of Microsoft Windows used for the installation, maintenance, and removal of software]
.Net	An open source developer platform for building many different types of applications developed by Microsoft.
.Net Framework	A software framework developed by Microsoft
.pdf	Portable Document Format [present documents, including text formatting and images, in a manner independent of application software, hardware and operating systems]
.properties	A file extension for files to store the configurable parameters of an application.
.tif	Tagged Image File Format [file format for storing images]
.xml	Extensible Markup Language [defines a set of rules for encoding documents in a format that is both human-readable and machine-readable]
.xsd	XML Schema Definition [specifies how to formally describe the elements in an Extensible Markup Language (XML) document]
.zip	An archive file format that supports lossless data compression.

Abbreviation/Term	Explanation
ACME	Automated Classification of Medical Entities
ADO.NET	A data access technology from Microsoft .NET Framework that provides communication between relational and non-relational systems through a common set of components.
DCodes	Direct codes
DT	Decision tables
DTB	Decision Table Browser
DTE	Decision Table Editor
ERN	Entity Reference Numbers [MUSE doesn´t need the ERN]
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
MC	Multiple cause
MCOD	Multiple cause of death
MCDT	Multicausal decision tables
MCodes	Multiple-cause codes
MICAR	Mortality Medical Indexing, Classification, and Retrieval
MMDS	Mortality Medical Data System
MoD	Manner of Death
MRG	Mortality Reference Group (improves international comparability of mortality data by establishing standardized application of the ICD).
MS Office	Microsoft Office
MSSQL	Microsoft SQL Server [a relational database management system developed by Microsoft]
MUSE	Multicausal and Unicausal Selection Engine
MySQL	An open-source relational database management system (RDBMS).
NCHS	National Center for Health Statistics
NCIC	NonConsistentIcdCodes tables
OLE DB	Object Linking and Embedding, Database [also written as OLEDB or OLE-DB; programming interface designed by Microsoft for access to different data sources]
Oracle	Oracle Database is a multi-model database management system produced and marketed by Oracle Corporation
PostgreSQL	An object-relational database management system (ORDBMS).
RegEx	Regular Expression [Is a sequence of characters that define a search pattern. Usually such patterns are used by string searching algorithms for "find" or "find and replace" operations on strings, or for input validation.]

Abbreviation/Term	Explanation
specCodes	This file contains the valid codes (ICD-10-WHO codes and created codes) for the MUSE logic (specVxxxxSRxx-Codes.csv).
specMuse	This file includes multicausal and unicausal tables (rules) are used by MUSE (specVxxxxSRxx-Muse.csv.DES).
TG	Table Group (Subgroup of Mortality Reference Group – discussed decision tables for automated coding systems); suspended since October 2018
TSP	Tentative starting point
TUC	Tentative underlying cause of death
UC	Underlying cause (of death)
UCOD	Underlying cause of death
UCodes	Codes used for unicausal selection
URC	Update and Revision Committee for ICD-10 [replaced by the Classification and Statistics Advisory Committee (CSAC) for ICD-11]
WHO	World Health Organisation