CRVS technical guide

Correctly coding deaths due to COVID-19: Guidance for Iris automated mortality coders

June 2021
Resources available from the University of Melbourne, Bloomberg Philanthropies Data for Health Initiative

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Suggested citation
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Correctly coding deaths due to COVID-19: Guidance for Iris automated mortality coders

This guidance document provides information for Iris automated mortality coders to correctly code deaths due to COVID-19. More information on mortality coding, including guidance for manually coding deaths due to COVID-19, is available at: https://crvsgateway.info/resources

Introduction

The COVID-19 global pandemic has been recognised as a public health emergency. In a public health emergency, mortality surveillance is extremely important to monitor the disease progression in the population. Mortality data are also important to assess the impact of interventions.

Certification of death is one of the first steps in obtaining an overview of the health of individuals (see Box 1). A properly completed cause of death certificate provides a description of the order, type and association of events that have resulted in the death. The diagnoses reported on the certificate are coded according to the International Statistical Classification of Diseases and Related Health Problems, 10th edition (ICD-10), and this coded data can then be analysed and used both nationally and internationally regardless of the language used to complete the certification.

Box 1: Certifying deaths due to COVID-19: WHO guidelines for doctors

If a patient dies following a COVID-19 infection, this must be recorded on the death certificate. Generally, patients with a COVID-19 infection die from severe respiratory distress caused by pneumonia. Pneumonia, in these cases, is caused by the coronavirus which results in the COVID-19 disease. In such cases, COVID-19 is the underlying cause of death and should be reported in the lowest used line of Part 1 of the death certificate.

The current understanding is that mortality from COVID-19 is higher among patients with co-existing chronic illnesses such as diabetes mellitus, hypertension, or chronic obstructive pulmonary disease (among others). These co-morbidities increase the risk of dying from COVID-19. Whilst COVID-19 is reported in Part 1 as the underlying cause of death, other co-morbidities that may have contributed to death should be reported in Part 2 of the death certificate.

It is also important to state whether a COVID-19 infection is laboratory confirmed or not. In situations where a COVID-19 infection is not laboratory confirmed, but clinical and epidemiological information are suggestive of the diagnosis, a probable or suspected diagnosis of COVID-19 should still be reported as the underlying cause on the lowest used line in the death certificate.

For more information on how to correctly certify deaths due to COVID-19, see: https://crvsgateway.info/file/15072/3922
COVID-19 mortality coding guidelines

This document guides Iris automated mortality coders to correctly code the death certificates of patients who have died from COVID-19. Guidance is provided for both Iris Version 5, and Iris Version 4 or older.

Emergency ICD codes for COVID-19

Two new emergency ICD-10 codes for COVID-19 have been designated by the World Health Organization (WHO), assigned from Chapter XXII (Codes for special purposes):

1. **U07.1**: COVID-19, virus identified (laboratory confirmed)
2. **U07.2**: COVID-19, virus not identified (laboratory unconfirmed). Used for:
   - Clinically-epidemiologically diagnosed COVID-19
   - Probable COVID-19
   - Suspected COVID-19

Doctors are required to properly record a COVID-19 diagnosis on the death certificate to allow coders to correctly assign one of the two codes. Both U07.1 and U07.2 may be used for mortality coding as the underlying cause of death.

Although both categories, U07.1 (COVID-19, virus identified) and U07.2 (COVID-19, virus not identified), are suitable for cause of death coding, it is recognised that in many countries, detail regarding the laboratory confirmation (or otherwise) of COVID-19 will not be reported on the death certificate. In the absence of this detail, it is recommended, for mortality coding purposes only, to code COVID-19 provisionally to U07.1 unless it is stated as “probable” or “suspected”.

COVID-19 is considered a global pandemic and, therefore, has become an extremely important public health problem. Due to the disease’s public health importance and the intense requirement of disease data, in ICD mortality coding rules, COVID-19 is not considered as “due to” or as “an obvious consequence of any other disease”. This situation is similar to the coding rules applied for influenza.

Recent updates to COVID – 19 codes

An additional set of ICD categories has been introduced to document the presentation of the following:

- Conditions that occur in the context of COVID – 19
- Immunization to prevent COVID – 19
- An adverse reaction to a COVID – 19 vaccine

**U08**  Personal history of COVID-19

**U08.9**  Personal history of COVID-19, unspecified

Note: This optional code is used to record an earlier episode of COVID-19, confirmed or probable that influences the person’s health status, and the person no longer suffers of COVID-19. **This code should not be used for primary mortality tabulation.**

**U09**  Post COVID-19 condition

**U09.9**  Post COVID-19 condition, unspecified

Note: This optional code serves to allow the establishment of a link with COVID-19. This code is not to be used in cases that still are presenting COVID-19.

---

1 In ICD-11, the code for a confirmed diagnosis of COVID-19 is RA01.0, and the code for a clinical diagnosis (suspected or probable) is RA01.1. ICD-11
U10  Multisystem inflammatory syndrome associated with COVID-19 Cytokine storm
     Kawasaki-like syndrome
     Paediatric Inflammatory Multisystem Syndrome (PIMS)
     Multisystem Inflammatory Syndrome in Children (MIS-C)

Excludes: Mucocutaneous lymph node syndrome [Kawasaki] (M30.3)

U11  Need for immunization against COVID-19

U11.9  Need for immunization against COVID-19, unspecified

Note: This code should not be used for international comparison or for primary mortality coding. This optional code is intended to be used when a person who may or may not be sick encounters health services for the specific purpose of receiving a COVID-19 vaccine.

Prophylactic COVID-19 vaccination

Excludes: immunization not carried out (Z28.-)

U12  COVID-19 vaccines causing adverse effects in therapeutic use

U12.9  COVID-19 vaccines causing adverse effects in therapeutic use, unspecified

Note: This code is to be used as an external cause code (i.e. as a subcategory under Y59 Other and unspecified vaccines and biological substances). In addition to this, a code from another chapter of the classification should be used indicating the nature of the adverse effect.

Correct administration of COVID-19 vaccine in prophylactic therapeutic use as the cause of any adverse effect.

**Dictionary updates for COVID-19 codes**

Iris users are required to update the dictionary with COVID-19 ICD codes. However, as the Iris Institute no longer supports versions of Iris older than 5, new decision table updates are not available for Iris Version 4. Users of this and previous versions will therefore not be able to automatically select the underlying cause of death when it is COVID-19. COVID-19 deaths will need to be manually selected. To do this, it is advisable for Version 4 users to implement a “reject” function of the record via the dictionary. Instructions for implementing this function are provided below.
How to update the Iris dictionary


Overview of instructions to update the dictionary:

1. Go to ‘Tools’ in the Iris file menu
2. Select ‘Maintenance’
3. Enter the maintenance default password ‘PwdIris’. If you have already changed the password, use the new one
4. Open the dictionary (this opens the developer’s dictionary tool)
5. Click ‘Add’ and then the ‘New values’ section will be opened
6. Under diagnosis text, enter the new value ‘COVID-19, laboratory confirmed’
7. Enter the code ‘U071’ in the ICD-10 box
8. Set the start and end years
9. Click ‘Add’. Now the dictionary is updated
10. Repeat the same steps to enter ‘COVID-19, laboratory unconfirmed’ (U072)
11. Update the standardisation tables for different diagnostic expressions of COVID-19 (e.g. COVID-19 virus identified, COVID-19, Corona virus disease 2019, etc.).

This is a dictionary update for those using Iris Version 4 only. Updating the dictionary does not mean that the decision tables are updated to recognise U071 and U072. Therefore, a reject for all COVID-19 records must be set up, causing a guidance message to appear whenever COVID-19 needs to be coded manually.

Instructions to set up the reject function:

12. Go to Iris tables
13. Open the dictionary table
14. Find the newly added diagnosis text ‘COVID-19’
15. Go to the ‘likelihood’ column against COVID-19 and enter ‘?’ (only one character is allowed)
16. Go to the ‘prompt’ column and enter the reject message you want displayed when the record is rejected (up to 100 characters are allowed)
17. Save the changes and close the dictionary table
18. Restart Iris.

Once the reject function has been set up, whenever a COVID-19 record is encountered the message will display reminding users to code COVID-19 deaths manually.
Decision table rules for emergency ICD codes U07.1 and U07.2

In accordance with the WHO recommendations, the Iris Institute developed new causal relations in the decision tables, considering that:

- Public health interest is to give priority to U07.1 and U07.2 as underlying causes of death
- The selection rules should not limit the acceptance of sequences reported by certifiers as concerning the consequences of COVID-19.

The tables have been prepared by the Iris Core Group based on current knowledge, and the possibility exists that they could change following international advice. Iris preserves the codes of COVID-19 (U07.1 and U07.2) in the multiple cause string, so the multiple cause data can be used for the count of certificates mentioning COVID-19. The new tables also allow users to check cases where COVID-19, although mentioned, is not selected as the final underlying cause of death.

Update – Decision Tables for emergency codes (U08.9, U09.9, U10.9, U11.9, U12.9)

The responsible committee of the WHO Family of International Classifications (WHO-FIC) Network concluded that the ICD-10 emergency codes U08.9, U09.9, U10.9, U11.9 and U12.9 are assigned to “COVID-19” cases.

The third and fourth update in relation to the COVID-19 includes these new titles of the new emergency codes:

- U08.9 Personal history of COVID-19, unspecified
- U09.9 Post COVID-19 condition, unspecified
- U10.9 Multisystem inflammatory syndrome associated with COVID-19, unspecified
- U11.9 Need for immunization against COVID-19, unspecified
- U12.9 COVID-19 vaccines causing adverse effects in therapeutic use, unspecified

The Iris Institute developed the following causal relations, taking the new codes into account:

- Code for personal history: U08.9 should not interact with mortality coding as other Z codes. This code will not be taken into account for the unicausal selection.
- Code for post COVID-19 condition: U09.9 should be used only in multiple cause coding; it should have the same due to than U07.1-U07.2, as well as for the direct sequel rules (DS). Once the code is selected as underlying cause (not to be used for underlying cause coding), it should be converted into U07.1.
- Code for multisystem inflammatory syndrome: U10.9 should have the same rules as COVID-19. If U07.1 or U07.2 are selected as temporary underlying cause and if there is mention of multisystem inflammatory syndrome, U10.9 should be considered as more specific than U07.1 and U07.2.
- Code for need of immunization against COVID-19: U11.9 should not interact with mortality coding as other Z codes. This code will not be taken into account for the unicausal selection.
- Code for COVID-19 vaccines causing adverse effects in therapeutic use: U12.9 should be used as an external cause code (i.e. as a subcategory under Y59 Other and unspecified vaccines and biological substances). In addition to this, a code from another chapter of the classification should be used indicating the nature of the adverse effect.

The tables have been prepared by the Iris Core Group based on the current knowledge and after discussion in the Mortality Reference Group (MRG).

Moreover, all codes for COVID-19 are kept in the multiple cause string and can be used for analyzing cases where COVID-19 is mentioned, but not selected as UC. There is also the possibility to implement a reject for these cases via the “Dictionary” and/or the “NonConsistentIcdCodes” (NCIC) table.

For more information about COVID-19, please visit the WHO website:

- [https://www.who.int/health-topics/coronavirus#tab=tab_1](https://www.who.int/health-topics/coronavirus#tab=tab_1)

Updated decision tables contained within MUSE (Multicausal and Unicausal Selection Engine) are available for the users of Iris Version 5, at: [https://www.dimdi.de/dynamic/downloads/iris-institute/tables-updates/muse/specv2021sr20.zip](https://www.dimdi.de/dynamic/downloads/iris-institute/tables-updates/muse/specv2021sr20.zip)
**Users of Iris Version 5.8**

Users of Iris Version 5 are advised to install the updated tables through the Iris website at:  

**Users of Iris Version 4 and older**

For users of Iris Version 4, an overview of decision table updates is available in Microsoft Excel format (see Figure 1). This can be downloaded at:  

**Figure 1: Decision table updates for Iris Version 4**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS FROM</td>
<td>ADDRESS TO</td>
<td>RULE</td>
<td>SUBADDRESS FROM</td>
<td>SUBADDRESS TO</td>
</tr>
<tr>
<td>1</td>
<td>ADDRESS FROM</td>
<td>ADDRESS TO</td>
<td>RULE</td>
<td>SUBADDRESS FROM</td>
</tr>
<tr>
<td>2</td>
<td>A040</td>
<td>A050</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>3</td>
<td>A052</td>
<td>A099</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>4</td>
<td>A240</td>
<td>A269</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>5</td>
<td>A280</td>
<td>A289</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>6</td>
<td>A310</td>
<td>A329</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>7</td>
<td>A400</td>
<td>A499</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>8</td>
<td>A740</td>
<td>A749</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>9</td>
<td>A812</td>
<td>A819</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>10</td>
<td>A870</td>
<td>A88</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>11</td>
<td>A930</td>
<td>A84</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>12</td>
<td>A968</td>
<td>A969</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>13</td>
<td>A99</td>
<td>B029</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>14</td>
<td>B07</td>
<td>B159</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>15</td>
<td>B172</td>
<td>B178</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>16</td>
<td>B188</td>
<td>B199</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>17</td>
<td>B250</td>
<td>B259</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>18</td>
<td>B270</td>
<td>B49</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>19</td>
<td>B580</td>
<td>B89</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>20</td>
<td>B99</td>
<td>B100</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>21</td>
<td>D900</td>
<td>D65</td>
<td>DUE</td>
<td>U071</td>
</tr>
<tr>
<td>22</td>
<td>D983</td>
<td>D98</td>
<td>DUE</td>
<td>U071</td>
</tr>
</tbody>
</table>

Figure 1: Decision table updates for Iris Version 4

In the Excel updates, the span of codes with in the ‘ADDRRESS_FROM – ADDRESS_TO’ indicates the range of address codes (Figure 2). The ‘RULE’ column indicates the mortality coding rule being applied. The rule ‘DUE’ means a Table D causal relationship. The span of codes in the within the ‘SUBADDRESS_FROM – SUBADDRESS_TO’ indicate sub-address codes.
Iris Version 5.8 decision table browser - for Iris Version 4 users

Iris Version 4 coders are able to use the decision table browser of the Iris Version 5.7 to use updated decision tables for the application of mortality coding rules (Figure 6). The decision table browser also allows coders to print the decision tables as PDF files (Figures 7a and 7b). To do this, coders need to download Version 5.7 from the Iris website and save it in a separate folder on the computer. This is only for the purpose of applying coding rules using the updated decision table browser.

Figure 6: Iris 5.8 decision table browser

![Decision Table Browser for Iris Version 5.8](image)

Figure 7a: Decision tables TABA (Causal relationships) in PDF

![Decision Table PDF for Iris Version 5.8](image)
Figure 7b: Decision tables TABB (modifications) in PDF

--- J189 ---
CONTINUED
--- J189 ---
CONTINUED

<table>
<thead>
<tr>
<th>DS</th>
<th>E110 - E118</th>
<th>LMC</th>
<th>J852 - J851</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS</td>
<td>E120 - E128</td>
<td>DS</td>
<td>J930 - J949</td>
</tr>
<tr>
<td>DS</td>
<td>E130 - E138</td>
<td>DS</td>
<td>K210 - K229</td>
</tr>
<tr>
<td>DS</td>
<td>E140 - E148</td>
<td>DS</td>
<td>K500 - K519</td>
</tr>
<tr>
<td>DS</td>
<td>E15</td>
<td>DS</td>
<td>K550 - K552</td>
</tr>
<tr>
<td>DS</td>
<td>E40 - E43</td>
<td>DS</td>
<td>K558 - K559</td>
</tr>
<tr>
<td>DS</td>
<td>E46</td>
<td>DS</td>
<td>K700 - K719</td>
</tr>
<tr>
<td>DS</td>
<td>E640</td>
<td>DS</td>
<td>K730 - K746</td>
</tr>
<tr>
<td>DS</td>
<td>E754</td>
<td>DS</td>
<td>M K754</td>
</tr>
<tr>
<td>DS</td>
<td>E840 - E849</td>
<td>DS</td>
<td>K762 - K769</td>
</tr>
<tr>
<td>DS</td>
<td>M E850 - E858</td>
<td>DS</td>
<td>K850 - K861</td>
</tr>
<tr>
<td>DS</td>
<td>M E859</td>
<td>DS</td>
<td>K900 - K919</td>
</tr>
<tr>
<td>DS</td>
<td>F010 - F03</td>
<td>DS</td>
<td>L401</td>
</tr>
<tr>
<td>DS</td>
<td>F202</td>
<td>DS</td>
<td>L405</td>
</tr>
<tr>
<td>DS</td>
<td>F322 - F323</td>
<td>DS</td>
<td>L409</td>
</tr>
<tr>
<td>DS</td>
<td>F332 - F333</td>
<td>DS</td>
<td>M000 - M009</td>
</tr>
<tr>
<td>DS</td>
<td>F500</td>
<td>DS</td>
<td>M M020 - M029</td>
</tr>
<tr>
<td>DS</td>
<td>F502</td>
<td>DS</td>
<td>M050 - M089</td>
</tr>
</tbody>
</table>

Coding COVID-19: case examples for automated coders

Coding example 1

Coding instructions for this case are based on the example completed International Form of Medical Certificate of Cause of Death, Frame A, shown in Figure 8.

Figure 8: Completed International Form of Medical Certificate of Cause of Death, Frame A – case example 1

<table>
<thead>
<tr>
<th>Frame A: Medical data: Part 1 and 2</th>
<th>Cause of death</th>
<th>Time interval from onset to death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Report disease or condition directly leading to death on line a</td>
<td>Severe Respiratory distress syndrome</td>
<td>1 day</td>
</tr>
<tr>
<td></td>
<td>Pneumonia</td>
<td>5 days</td>
</tr>
<tr>
<td></td>
<td>COVID - 19 virus identified</td>
<td>8 days</td>
</tr>
<tr>
<td>2 Other significant conditions contributing to death (time intervals can be included in brackets after the condition)</td>
<td>Hypertension (10 years)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus type 2 (15 years)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 9 shows the screen of the Iris Version 5.7 main window, displaying the results of the automatic coding of case example 1 (Figure 8).
Figure 9: Iris Version 5.8 automated coding

The MUSE 2.8 window (Figure 10) explains the above automatic Iris Version 5.7 coding process.

Figure 10: MUSE 2.8 coding explanation.
Coding example 2

Coding instructions for this case are based on the example completed International Form of Medical Certificate of Cause of Death, Frame A, shown in Figure 11.

**Figure 11: Completed International Form of Medical Certificate of Cause of Death, Frame A – case example 2**

<table>
<thead>
<tr>
<th>Frame A</th>
<th>Medical data: Part 1 and 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Report disease or condition directly leading to death on line a</td>
</tr>
<tr>
<td></td>
<td>Respiratory failure</td>
</tr>
<tr>
<td></td>
<td>1 day</td>
</tr>
<tr>
<td></td>
<td>Pneumonia</td>
</tr>
<tr>
<td></td>
<td>5 days</td>
</tr>
<tr>
<td></td>
<td>Corona Virus Disease (COVID - 19) No laboratory confirmation</td>
</tr>
<tr>
<td></td>
<td>8 days</td>
</tr>
<tr>
<td>2</td>
<td>Other significant conditions contributing to death (time intervals can be included in brackets after the condition)</td>
</tr>
<tr>
<td></td>
<td>Hypertension (10 years) Diabetes mellitus type 2 (15 years) Bronchial Asthma (10 years)</td>
</tr>
</tbody>
</table>

**Figure 12** shows the screen of the Iris Version 5.7 main window, displaying the results of the automatic coding of case example 2 (Figure 11).

**Figure 12: Iris Version 5.8 automated coding**
The MUSE 2.8 window (Figure 13) explains the above automatic Iris Version 5.7 coding process.

**Figure 13: MUSE 2.9 coding explanation**

![Figure 13: MUSE 2.9 coding explanation](image)

**Coding example 3**

Coding instructions for this case are based on the example completed International Form of Medical Certificate of Cause of Death, Frame A, shown in Figure 14.

**Figure 14: Completed International Form of Medical Certificate of Cause of Death, Frame A – case example 3**

<table>
<thead>
<tr>
<th>Frame A: Medical data: Part 1 and 2</th>
<th>Cause of death</th>
<th>Time interval from onset to death</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Report disease or condition directly leading to death on line a</td>
<td>Cardiac arrest</td>
<td>30 minutes</td>
</tr>
<tr>
<td>b Report chain of events in due to order (if applicable)</td>
<td>Non ST elevated myocardial infarction</td>
<td>2 days</td>
</tr>
<tr>
<td>c State the underlying cause on the lowest used line</td>
<td>Coronary arteriosclerosis</td>
<td>2 Years</td>
</tr>
<tr>
<td>d Due to:</td>
<td>COVID-19 laboratory confirmed (17 days), Diabetes mellitus type 2 (10 years), Smoking (30 years), Hypertension (10 years), Obesity, Hypercholesterolaemia</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 15** shows the screen of the Iris Version 5.7 main window, displaying the results of the automatic coding of case example 3 (Figure 14).
Figure 15: Iris Version 5.8 automated coding

The MUSE 2.9 window (Figure 16) explains the above automatic Iris Version 5.7 coding process.

Figure 16: MUSE 2.9 coding explanation
Please note that in this example, the certifier has considered that myocardial infarction is due to the patient’s pre-existing coronary arteriosclerosis. However, hypertension, obesity, smoking and hypercholesterolaemia may have contributed to it. This underlying cause of death selection in this case is, therefore, myocardial infarction.

In cases where the certifier has considered a myocardial infarction is due to a COVID-19 infection, and COVID-19 is reported in the lowest used line of Part 1, COVID-19 will be selected as the underlying cause of death. Updated MMDS tables support a ‘DUE TO’ relationship between codes in the range I20.0 – I24.9 with U07.1 – U07.2.

**Coding example 4**

Coding instructions for this case are based on the example completed International Form of Medical Certificate of Cause of Death, Frame A, shown in **Figure 17**.

**Figure 17: Completed International Form of Medical Certificate of Cause of Death, Frame A – case example 4**

<table>
<thead>
<tr>
<th>Frame A: Medical data: Part 1 and 2</th>
<th>Cause of death</th>
<th>Time interval from onset to death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Report disease or condition directly leading to death on line a</td>
<td>Respiratory failure</td>
<td>3 days</td>
</tr>
<tr>
<td>2 Report chain of events in due order (if applicable)</td>
<td>Pneumonia</td>
<td>7 days</td>
</tr>
<tr>
<td>3 State the underlying cause on the lowest used line</td>
<td>Pregnancy complicated by COVID-19, 32 weeks pregnant</td>
<td>14 days</td>
</tr>
</tbody>
</table>

**Figure 18** shows the screen of the Iris Version 5.7 main window, displaying the results of the automatic coding of case example 4 (**Figure 17**).
Figure 18: Iris Version 5.8 automated coding

![Iris Version 5.8 automated coding](image1)

The MUSE 2.8 window (Figure 19) explains the above automatic Iris Version 5.7 coding process.

Figure 19: MUSE 2.9 coding explanation

![MUSE 2.9 coding explanation](image2)
Coding example 5

Coding instructions for this case are based on the example completed International Form of Medical Certificate of Cause of Death, Frame A, shown in Figure 20.

<table>
<thead>
<tr>
<th>Frame A: Medical data: Part 1 and 2</th>
<th>Cause of death</th>
<th>Time interval from onset to death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Report disease or condition directly leading to death on line a</td>
<td>Cytokine storm</td>
<td>2 days</td>
</tr>
<tr>
<td>2 Report chain of events in due order (if applicable)</td>
<td>Pneumonia</td>
<td>5 days</td>
</tr>
<tr>
<td>3 State the underlying cause on the lowest used line</td>
<td>COVID – 19 virus identified</td>
<td>8 days</td>
</tr>
<tr>
<td>4 Other significant conditions contributing to death (time intervals can be included in brackets after the condition)</td>
<td>Hypertension (10 years)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus type 2 (15 years)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 21 shows the screen of the Iris Version 5.8 main window, displaying the results of the automatic coding of case example 5 (Figure 19).

The MUSE 2.9 window (Figure 21) explains the above automatic Iris Version 5.7 coding process.
Figure 22: MUSE 2.9 coding explanation

![MUSE 2.9 coding explanation](image-url)
Coding example 6

Coding instructions for this case are based on the example completed International Form of Medical Certificate of Cause of Death, Frame A, shown in Figure 23.

<table>
<thead>
<tr>
<th>Frame A: Medical data: Part 1 and 2</th>
<th>Cause of death</th>
<th>Time interval from onset to death</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Respiratory failure</td>
<td>3 days</td>
</tr>
<tr>
<td>b</td>
<td>Pneumonia</td>
<td>5 days</td>
</tr>
<tr>
<td>c</td>
<td>Lung fibrosis</td>
<td>2 Months</td>
</tr>
<tr>
<td>d</td>
<td>Post Covid 19 condition</td>
<td>6 Months</td>
</tr>
</tbody>
</table>

2 Other significant conditions contributing to death (time intervals can be included in brackets after the condition)

Figure 24 shows the screen of the Iris Version 5.8 main window, displaying the results of the automatic coding of case example 6 (Figure 23).
Figure 25: MUSE 2.9 coding explanation
The program partners on this initiative include: The University of Melbourne, Australia; CDC Foundation, USA; Vital Strategies, USA; Johns Hopkins Bloomberg School of Public Health, USA; World Health Organization, Switzerland.

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