

## Methodology

### ICD Codes used to identify Clostridium Difficile

National Records of Scotland (NRS) applies the rules of the International Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10), in order to determine the ICD-10 code for the underlying cause of each death registered in Scotland. The complexity of these rules can result, in some cases, in the underlying cause of death coded by NRS being different from that which a health board might expect (more information about this is given by the page on [death certificates and coding the causes of death](#)). The guidelines for coding set out by the World Health Organisation, and applied by NRS staff (with medical advice from the Information Services Division of NHS National Services Scotland), in relation to Clostridium difficile are:

- code A04.7 – ‘Enterocolitis due to Clostridium difficile’ - applies when the death certificate mentions ‘Clostridium difficile’ along with ‘Enterocolitis’ or ‘Diarrhoea’;

otherwise

- code A41.4 - ‘Septicaemia due to anaerobes’ - applies where the death certificate mentions ‘Septicaemia’ which is due to ‘Clostridium difficile’ (or any wording associated with C. diff.). (NB: this code does not apply if the clostridium difficile infection is due to septicaemia);

otherwise

- code A49.8 – ‘Other bacterial infections of unspecified site’ - applies when ‘infection’ is included on the death certificate together with ‘Clostridium difficile’, or when ‘Clostridium difficile’ is mentioned on its own.

Two points should be mentioned. First, NRS's figures for Clostridium difficile deaths do not include cases where codes A41.4 and A49.8 were used without any mention of Clostridium difficile. Second, there is a slight change to the codes which are allocated for deaths registered with effect from the start of 2011: thereafter, references to ‘clostridium difficile infection’ or to ‘clostridium difficile’ result in code A04.7 rather than A49.8 - which will have no effect at all on the figures for Clostridium difficile deaths.

For each death, NRS assigns a single code for the underlying cause of death and, depending upon what was written on the death certificate, may assign several other codes for other factors which contributed to the occurrence of the death. Statistics on three bases can therefore be produced:

- deaths for which Clostridium difficile was the underlying cause - the only cases counted are those which have an ‘underlying cause’ code of A04.7 (i.e. ‘Enterocolitis due to Clostridium difficile’) or which have an ‘underlying cause’

code of either A41.4 or A49.8 (i.e. 'Septicaemia due to anaerobes' or 'Other bacterial infections of unspecified site') together with a mention of 'Clostridium difficile' (or a synonym - see below);

- deaths for which Clostridium difficile was a contributory factor - the cases counted are those which have a mention of 'Clostridium difficile' (or a synonym) but the 'underlying cause' code is not A04.7, A41.4 or A49.8;
- deaths for which there was any mention of clostridium difficile - all cases which have a mention of 'Clostridium difficile' (or a synonym) are counted.

### **Identifying deaths involving Clostridium difficile - 2008 onwards**

As codes A41.4 and A49.8 can be used for deaths involving certain other infections, deaths involving clostridium difficile cannot be identified solely from the ICD-10 codes. Therefore, with effect from deaths registered in 2008, NRS, has added a special supplementary code to its statistical record for each death for which clostridium difficile was mentioned.

NRS's medical coders allocate supplementary codes as and when they code the death records. Then, shortly before NRS freezes its statistical data for a calendar year, it checks that the supplementary codes for clostridium difficile have been allocated correctly. NRS runs a computer program which scans the cause of death for character strings such as 'clostridium', 'c. diff.' and other pieces of text which have been used in the case of previous clostridium difficile deaths, the aim being to cover all the likely 'synonyms' for clostridium difficile. The program thus finds all the apparent 'candidates' for being counted as deaths involving clostridium difficile. NRS staff then (i) scrutinise all the candidates which have not been given the supplementary code, and all the deaths for which the supplementary code was allocated but which have not been identified as candidates, (ii) decide whether or not each of them should be counted, and (iii), if necessary, add or remove the supplementary code (whatever is appropriate in each case). For example, the program would identify as apparent 'candidates' deaths for which, first, 'clostridium difficile infection' and, second, 'viral gastroenteritis (clostridium difficile negative)' were included in the cause of death: NRS staff would see that the first case should have the supplementary code, and that the second should not, and act accordingly. NRS then uses the supplementary code to identify deaths for which clostridium difficile was mentioned, and the ICD-10 code for the underlying cause of death to determine whether or not clostridium difficile was the underlying cause of death.

### **Identifying deaths involving Clostridium difficile - 2007 and earlier years**

For the purposes of producing the statistics shown in the tables of clostridium difficile deaths, NRS created an 'extract' file which contained copies of the records for all deaths which might involve Clostridium difficile. All deaths which had the code A04.7 'Enterocolitis due to Clostridium difficile' were included automatically. Deaths which had the code A41.4 'Septicaemia due to anaerobes' or A49.8 'Other bacterial infections of unspecified site' were clearly candidates for inclusion. However, deaths for which other codes had been assigned might have had Clostridium difficile

mentioned. Therefore, NRS searched the cause of death text for all deaths for a mention of:

- Clostridium difficile;
- something that was clearly an abbreviation (e.g. 'C. diff.');
- Clostridium (but no mention of 'difficile') and also a mention of 'colitis', 'bowel infection', 'diarrhoea' or similar; or
- pseudomembranous colitis (a condition which is almost always caused by Clostridium difficile);

All cases which contained such text were included in the 'extract' file (but deaths for which the text simply stated 'Clostridium infection' were excluded). These selection criteria were agreed with NRS's medical adviser. Detailed inspection of the text was required because of numerous spelling errors and the use of various non-standard abbreviations.

Having identified which records were for deaths which involved clostridium difficile, NRS used the ICD-10 code for the underlying cause of death to determine whether or not clostridium difficile was the underlying cause of each of the deaths.

### **ICD-10 code A09**

A previous version of this note stated that ICD-10 code A09 ('Diarrhoea and gastroenteritis of presumed infectious origin') applied when there was a presumed infectious origin of diarrhoea and gastroenteritis along with any wording associated with 'Clostridium difficile' on the death certificate. However, no such cases have arisen in practice, and it is not expected that any will do so in future, given the way in which the coding rules operate. At one time, 'A09' was mentioned in the Office of National Statistics's (ONS) annual article on deaths in England and Wales involving clostridium difficile (in a footnote, which listed some potentially relevant ICD-10 codes - the ones for which deaths would be counted if clostridium difficile was mentioned), but that is no longer the case now. Therefore, code A09 is not mentioned elsewhere in this note.

### **Why these figures must be used with caution**

In its [Report on Review of Clostridium difficile Associated Disease \(CDAD\) cases and Mortality in all Acute Hospitals in Scotland ...](#) (published on 7 August 2008), Health Protection Scotland (HPS) wrote that:

"... four NHS boards undertook detailed case note reviews .... [and] ... found marked discrepancies between the General Register Office for Scotland (GROS) data and the actual cause of death."

The discrepancies were due to the way in which the death certificate was completed. Most arose because:

- the death certificate mentioned *Clostridium difficile* when (in the investigators' view) it should not have done so - (e.g.) "24 should not have had CDAD on the death certificate in any category"; or
- the death certificate mentioned *Clostridium difficile* in what the investigators believed was the wrong place - (e.g.) "in 5 of 6 cases where CDAD was reported as the underlying cause of death, it should have been a contributory factor".

The report also referred to "3 cases where CDAD appeared in the GROS codes [but] was not on the original death certificate stub". A review of these cases at the National Records of Scotland (NRS), formerly GROS, showed that *Clostridium difficile* was indeed mentioned on the death certificate - but must not have been noted on the stub, which is intended to provide a summary of what was recorded on the death certificate.

NRS's coding of the causes of death is based on the information on the death certificate. If *Clostridium difficile* is mentioned on a death certificate when it should not have been, the number of *Clostridium difficile* deaths will be over-estimated. Therefore, these figures must be used with caution.

Following the Health Protection Scotland investigation in 2008, which was commissioned by the Scottish Government, some Health Boards reviewed or revised their guidance to doctors regarding the completion of death certificates. This was done in order to reduce the number of occasions on which *Clostridium difficile* is mentioned in the wrong part of the death certificate, or is mentioned when it was not a cause of death. This change in recording practice will lead to a break in the series of statistics on *Clostridium difficile* associated deaths: statistics for 2008 will not be directly comparable to those for 2007 and earlier years, nor to those for 2009 and later years.

### **Why there are differences between some of the figures which are published**

There are a number of reasons why there may be differences between the figures which are produced by different bodies, or are published at different times.

First, because a range of information is available from the death certificate (as described on the ['Death Certificates and Coding the Causes of Death'](#) page), figures for *Clostridium difficile* can be produced on the following bases:

- 'underlying cause' - cases where *Clostridium difficile* was the cause which initiated the chain of morbid events leading directly to death;
- 'contributory factor' - cases where *Clostridium difficile* was not the underlying cause of death, but it did contribute to the occurrence of the death - e.g. it did not cause the death, but may have hastened its occurrence; and
- 'any mention' - i.e. *Clostridium difficile* either appeared to be the underlying cause of the death, or was just a factor which was thought to have contributed to, or hastened, the death.

Second, when coding deaths, NRS applies the rules of the International Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10). The complexity of these rules can result, in some cases, in the cause of death coded by NRS differing from that which a health board would choose.

Third, NRS's normal practice is to count deaths on the basis of the area of usual residence of the deceased rather than of the place of occurrence of death. (When the person's usual residence is outwith Scotland the place of occurrence is used). Therefore, the number of deaths for (say) a healthboard area is normally the number of deaths of residents of that area (plus the small number of deaths of people from outwith Scotland which occurred in that area). However, figures for *Clostridium difficile* deaths can also be produced on the basis of the health board which contains the hospital in which the death occurred (with people who died at home being counted as "non-hospital" deaths). For some health boards, the two sets of figures will differ, due to residents of one area having died in hospitals in another area.