9.1.0 Healthcare-associated infections (HCAI)

Key Points

- In 2011, 1,848 new cases of *Clostridium difficile*-infection (CDI) were notified. This represents a national crude incidence rate of 40.3 new cases per 100,000 population, an increase of 9.2% from 2010
- Of the 1,848 new CDI cases, 1,223 (66%) were reported from patients aged over 65 years
- In the voluntary enhanced surveillance scheme, 1,511 CDI cases [1,396 (92.3%) new and 107 (7.1%) recurrent] were reported from 41 acute hospitals. The national CDI incidence rate was 3.1 cases per 10,000 bed days used, which represents an increase from 2.8 in 2010. Twenty percent of all CDI cases were associated with the community and 9.5% were associated with nursing homes. While the majority of patients experienced onset of symptoms in healthcare facilities, 27% had onset of symptoms in the community
- Of the 204 specimens (14% of all samples) for which ribotyping data were available (from ten hospitals), the most common ribotypes reported were: 027 and 078 (n=26, 13% each), 014 (n=23, 11%), 005 (n=21, 10%), and 002 (n=17, 8%)

9.1.1 *Clostridium difficile* Infection

Notifiable *C. difficile* infection: New cases
New cases of CDI in persons two years or older have been notifiable in Ireland under the disease category "acute infectious gastroenteritis" (AIG) since May 2008. In 2011, recurrent CDI cases were not notifiable.

There were 1,848 cases of new CDI notified to Public Health Departments via the Computerised Infectious Diseases Reporting (CIDR) system in 2011. All cases were laboratory confirmed. This represents a national crude incidence rate (CIR) of 40.3 new CDI cases per 100,000 population, an increase of 9.2% from 36.9 cases per 100,000 population reported in 2010 (**Table 1**). Regional variation was observed in the incidence of CDI (Table 1). However, this most likely reflects differences in laboratory diagnosis and reporting rather than true variation in disease incidence. Identification of seasonal patterns in the CIDR data is hindered by late and batch notifications from laboratories.

As in 2010, the majority of new cases were in female patients (60.2%) and in older age groups. The mean age of cases was 67.6 years (range 2-98 years) (**Figure 1**) with 1,223 cases (66%) reported in patients aged over 65 years. Of note, the 75-84 year age group had the highest number of cases (n=504), representing 40.8% of the over 65 year age group.

The majority of cases were classified as 'hospital inpatient' (76%), with 11% classified as general practice patients, 3.8% as hospital outpatients or day patients,

Table 1. Number of notified cases, crude incidence rate of CDI in Ireland by HSE area, 2011, and total number with crude incidence rate for 2010 (Source, CIDR)

HSE Area	No. of cases	*CIR incl. 95% C.I.
East	781	48.2 (44.8 - 51.6)
Midlands	50	17.7 (12.8 - 22.6)
Mid West	96	25.3 (20.2 - 30.4)
North East	81	18.4 (14.4 - 22.4)
North West	79	30.6 (23.9 - 37.3)
South East	262	39.4 (34.6 - 44.2)
South	293	58.9 (52.2 - 65.6)
West	206	46.3 (40 - 52.6)
Total 2011	**1848**	**40.3 (38.5 - 42.1)**
Total 2010	**1693**	**36.9 (35.1 - 38.7)**

* Rates calculated using 2011 census data

5% as Emergency Department patients, and 4.1% as either 'other', 'not specified' or 'unknown'. However, this data does not provide information on the origin or onset of CDI, rather it represents the location of the patient at the time of CDI diagnosis. Information on the origin and onset of CDI cases is collected as part of the enhanced surveillance system.

Notifiable *C. difficile* infection: Outbreaks

In 2011, eight outbreaks of *C. difficile* infection, all healthcare-associated and involving 35 patients, were notified to Public Health Departments (**Table 2**). Four were linked to hospitals, two to nursing homes and two to long-term care facilities.

Enhanced surveillance of *C. difficile* infection

Although the notifiable CDI data provides important preliminary information on the burden of new cases of CDI in Ireland in 2011, it represents an underestimate of the true burden of CDI, as recurrent CDI cases are not captured and it does not capture information on the origin, onset or severity of CDI. National collation of *C. difficile* enhanced surveillance commenced on a voluntary basis on 1st August 2009. Information on case type, origin, onset and severity of CDI is collected using the European Society for Clinical Microbiology and Infectious Diseases Study Group on *C. difficile* (ESCMID-ESGCD) case definitions. By the end of 2011, 41 hospitals participated in the voluntary enhanced surveillance CDI scheme, comprising 35 acute public hospitals (24 general, eight tertiary and three specialist hospitals) and six private hospitals.

In 2011, 1,511 cases of CDI were reported to the enhanced surveillance scheme. Of these, 1,396 (92.3%) were classified as new CDI cases (representing 76% of all the new CDI cases notified to Public Health Departments via CIDR) and 107 (7.1%) as recurrent with eight (0.6%) of unknown case type. Of the reported cases, 57% (n=862) originated within the reporting healthcare facility, which corresponds to an overall national CDI incidence rate of 3.1 cases per 10,000 bed days used. The CDI rate has remained relatively stable since August 2009 with small fluctuations that are likely to be largely as a result of changes in laboratory testing protocols for *C. difficile* (**Figure 2**). (See Laboratory Survey of *C. difficile* Diagnostic and Reporting Practices below). The rate is based only on the number of new and recurrent CDI cases that originated in the participating healthcare facility and is calculated using acute public hospital activity data from the Business Intelligence Unit, Corporate Planning and Corporate Performance (CPCP) at the Health Services Executive (HSE). There was a wide range in the incidence of CDI among participating hospitals in 2011 (range, 0 – 7.8 cases per 10,000 bed days used; median, 2.2 cases). Tertiary hospitals (n=8) showed a higher median incidence rate compared to general hospitals (n = 24) (CDI rate = 2.8 versus 1.75 CDI cases per 10,000 BDU)). These differences in CDI median incidence rates may reflect inter-hospital variations in patient case mix, *C. difficile* ribotypes, laboratory testing protocols, antimicrobial prescribing policies, antimicrobial stewardship interventions and surveillance resources. No obvious seasonal trend for CDI in Ireland is distinguishable for 2011.

Table 2. CDI outbreaks reported in Ireland in 2011 by HSE area (Source, CIDR)

HSE Region	Outbreak location	Total number ill
East	Residential Home	3
East	Community Hospital/ Long Stay Unit	4
East	Hospital	6
East	Residential Home	2
East	Hospital	8
North East	Community Hospital/ Long Stay Unit	2
South	Hospital	2
West	Hospital	8

Severe CDI

A severe case of CDI is defined as a patient requiring admission to an intensive care unit (ICU) for treatment of CDI or its complications, a patient requiring colectomy or death within 30 days after diagnosis, if CDI is either the primary or contributory cause of death. Twenty-one (1.4%) severe cases were reported in 2011, which is similar to 2010 (1.6%); three patients required both surgery and ICU admission, five required surgery only and 13 required ICU admission without surgery. As for notifiable CDI, most cases reported through the enhanced surveillance scheme were female (61%) and in the over 65 age group (69%). Forty-three deaths were reported, of which two were directly attributed to CDI and 24 were not directly attributed to CDI. The cause of death for the remainder was either unknown or not specified.

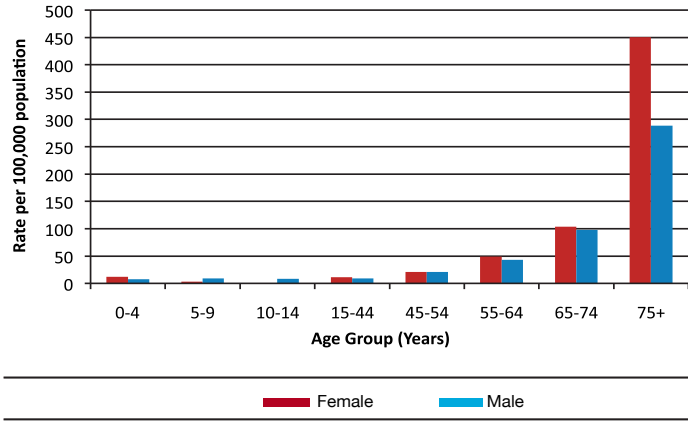

Figure 1: Age and Sex distribution of CDI in Ireland, 2011 (Source, CIDR)

** Rates calculated using 2011 census data*

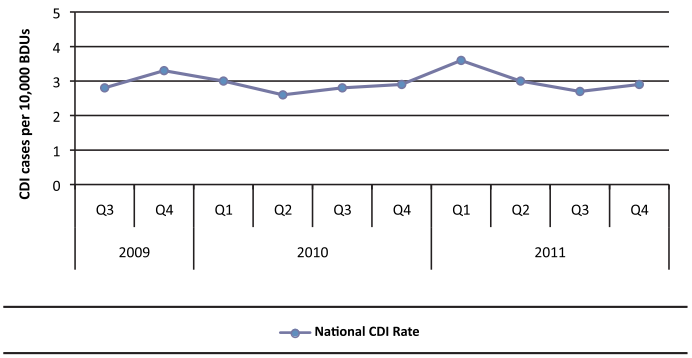

Figure 2. The quarterly rate of C. difficile infection in Ireland: 2009 - 2011)

Onset & origin of CDI

Onset: Patient location when symptoms of CDI commenced

Seventy-one percent (n=1,078) of patients had onset of CDI symptoms in a healthcare facility – healthcare onset (HCO), with 78% (n=841) of these occurring in the reporting hospital, 6% (n=69) in another hospital and 14% (n=149) in a nursing home (**Figure 3**). The remainder (n=19) had onset in another unspecified healthcare facility or of unknown onset. However, 27% (n=405) of all CDI cases had onset of symptoms in the community – community onset (CO), with 92% of these reported as unknown location of onset. A similar profile was reported in 2010 (**Figure 3**).

Origin: Location where the patient acquired the CDI

The majority of CDI cases, 74% (n=1,112) were healthcare-associated (HCA). Community-associated (CA) cases accounted for 20% (n = 300). The origin of 3% (n = 44) of CDI cases was unknown (i.e. the patient had been discharged from a healthcare facility between 4 and 12 weeks prior to CDI onset) and for the remaining 3% (n = 55) cases no information on case origin was provided.

Of the 1,112 HCA CDI cases, 76% (n=862) originated in the reporting hospital, 8% (n=89) originated in other hospitals, 13% (n=143) originated in nursing homes and 3% (n=18) originated in another unspecified healthcare facility or were of unknown origin (**Figure 3**).

Of the 1,112 HCA CDI patients:

- 92% (n=1,025) experienced onset of CDI symptoms at least 48 hours following admission to a healthcare facility (healthcare-onset, healthcare-associated)
- 7.5% (n=81) patients experienced symptom onset in the community within four weeks of discharge from a healthcare facility (community-onset, healthcare-associated)
- 0.5% (n = 6) of patients had no information recorded on symptom onset

Of the 300 CA CDI cases:

- 88% (n=265) patients experienced onset of CDI symptoms while outside a healthcare facility and without a history of discharge from a healthcare facility within the previous 12 weeks
- 11% (n=33) patients experienced symptom onset within the first 48 hours of admission to a healthcare facility, without a history of admission to or residence in a healthcare facility within the previous 12 weeks

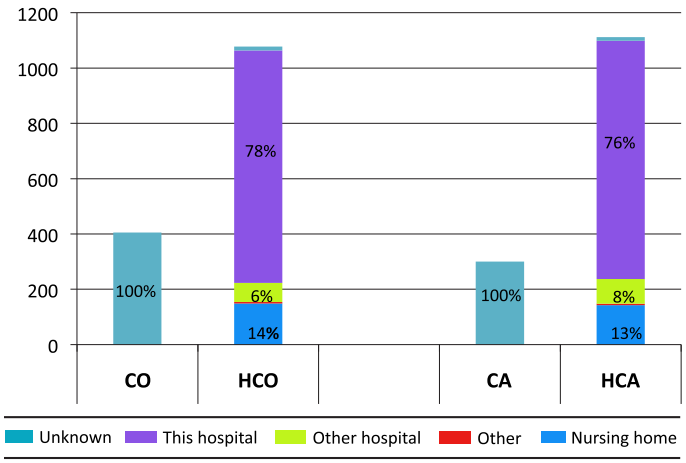

Figure 3. CDI Origin and Onset by Location where CDI Case Originated, 2011

CO: Community-onset; HCO: Healthcare-onset; CA: Community-associated CDI; HCA: Healthcare-associated CDI

No origin facility information was collected on the community-associated cases as this information is too resource-intensive to follow up on outside of the accute hospital setting.

In the second half of 2011, information was captured on the location where the patient's faecal specimen was taken. The reporting hospital accounted for the majority (65%) of patient specimens (n=483), whilst 3.5% (n=26) were taken in the GP practice, 5% (n=38) were taken in nursing homes, and 4% (n=21) were taken in a hospital other than the reporting hospital. For the remaining 24% (n=177) of specimens, no information was provided.

The collation of national data on *C. difficile* through CIDR notifications of new CDI cases and the enhanced CDI surveillance system, which captures both new and recurrent cases has provided a valuable insight into the burden of CDI in Ireland. There was an increase in the number of new CDI cases reported in 2011 compared to 2010. However, this underlying reason for this may be due to changes in laboratory testing protocols for *C. difficile*. (See Laboratory Survey of *C. difficile* Diagnostic and Reporting Practices below). In 2011, 7% of all CDI cases reported through the enhanced surveillance scheme were recurrent infections compared with 8% in 2010 and 14% in 2009. This may represent an improvement in infection prevention and control strategies and management of patients with CDI. However, it may also reflect changes in laboratory testing protocols. Recurrent CDI is difficult to manage clinically and just like new CDI, can result in severe infection, places a burden on limited isolation resources and results in significant patient morbidity. Therefore, knowledge of the burden of recurrent CDI in Ireland is essential to help guide preventative strategies.

During 2011 and 2010, 20% of all CDI cases were associated with the community and 10% of cases were associated with nursing homes, an increase from 8% in 2010. Moreover, 27% of all CDI cases had onset of symptoms in the community, consistent with the figure reported in 2010. This indicates that *C. difficile* infection is not confined to hospitals and is increasingly common in community and nursing home settings. It is essential that CDI is considered in the differential diagnosis of all patients presenting with diarrhoea and that specimens are sent in a timely fashion for laboratory diagnosis. Patients with CDI in healthcare facilities must be isolated with contact precautions as outlined in national guidelines. http://www.hpsc.ie/hpsc/A-Z/Gastroenteric/Clostridiumdifficile/Publications/File,2936,en.pdf. All healthcare professionals must promote practices known to reduce the incidence of CDI including; compliance with infection prevention and control measures, awareness of local CDI surveillance data and prudent use of antimicrobials. The national guidelines for antimicrobial stewardship in hospitals in Ireland are available at: http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/strategyforthecontrolofAntimicrobialResistanceinIrelandSARI/AntibioticStewardship/Publications/

C. difficile PCR ribotyping

As part of the voluntary *C. difficile* enhanced surveillance scheme, participating hospitals are requested to provide *C. difficile* PCR ribotyping information, where available. Ireland does not have a national *C. difficile* reference laboratory or ribotyping service. Therefore, laboratories submit specimens abroad for ribotyping. In 2011, ribotyping data was provided for 204 *C. difficile* isolates (14% of all samples) submitted from ten hospitals. The most common ribotypes reported were: 027 and 078 (n=26, 13% each), 014 (n=23, 11%), 005 (n=21, 10%), and 002 (n=17, 8%). In 2011, one hospital reported that 74% of healthcare-associated *C. difficile* isolates from 2011 were ribotyped. The most common ribotypes reported from that hospital were: 005 (n=14), 014 (n=12), 002 and 078 (n=11 each), 020 (n=8) and 027 (n=5).

Laboratory Survey of *C. difficile* diagnostic and reporting practices: 2011

Twenty-five of 29 Irish microbiology laboratories responding to a 2006 laboratory survey on *C. difficile* diagnostic practices performed on-site testing for *C. difficile* and all 25 reported use of an enzyme immunoassay for toxin detection. In all but one laboratory, the assay in use detected both toxin A and toxin B.

In May 2008, all new CDI cases became notifiable under the category of 'Acute Infectious Gastroenteritis' (AIG). In August 2009, the national voluntary *C. difficile* enhanced surveillance scheme commenced, collecting information on CDI case type (both new and recurrent cases), origin, onset and severity. Changes in the recommended *C. difficile* laboratory testing practice were proposed in 2009 and 2010 by the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) and the United Kingdom (UK) National Health Service (NHS).

The Irish laboratory survey was repeated in 2011. Of the 37 laboratories responding, 33 performed on-site testing for *C. difficile* and 58% reported a change to their testing algorithm in the past two years. The majority of laboratories (74%) reporting changed testing had moved from a one-step to a two-step testing algorithm. Seventeen (52%) continued to use a one-step test, whilst 16 (48%) used a two-step testing algorithm. For two-step algorithms, a variety of testing methodologies were in use (Table 3). Owing to considerable variations in current Irish laboratory *C. difficile* testing methodologies, inter-hospital comparison of CDI rates is not recommended as the data in the national quarterly enhanced surveillance reports are not adjusted for differences in the sensitivities of the different diagnostic methodologies used across the different laboratories.

With regard to PCR ribotyping of *C. difficile* isolates, the 2006 laboratory survey found that none of the laboratories surveyed routinely requested ribotyping and only 28% requested ribotyping in the setting of a suspected CDI outbreak. The 2011 repeat laboratory survey reported that 24 of 33 (73%) laboratories performing *C. difficile* testing reported having referred specimens for ribotyping. The criteria for referral varied between laboratories with 15 (62.5%) doing so in the event of an outbreak, 11 (46%) upon request and nine for severe infection (38%). Only four of 24 (17%) laboratories responding to the 2011 survey reported routine referral of specimens abroad for PCR ribotyping.

Table 3: Two-step testing algorithms in use in Irish microbiology laboratories – 2011

Step One	Step Two	Number of Laboratories
GDH	TOXIN EIA	11
GDH	TOXIN GENE PCR	4
TOXIN EIA	TOXIGENIC CULTURE	1

The 2011 microbiology laboratory survey also sought information regarding reporting practices for positive *C. difficile* laboratory results. Of the 37 laboratories, 35 (95%) provided information. The responses indicated local variation in the approach to notification with 19 laboratories (51%) routinely notifying all positive *C. difficile* laboratory results. Sixteen laboratories (43%) indicated that positive results were checked to ensure that the patient met the CDI case definition prior to notification and, for 12 of those 16 laboratories (75%), there was also local discussion of patients with positive *C. difficile* laboratory results in conjunction with the infection prevention and control team prior to notification. Twenty laboratories (54%) reported the existence of a mechanism to ensure correlation between CDI cases notified via CIDR and cases reported via the voluntary CDI enhanced surveillance scheme.

Conclusion

The first national *C. difficile* guidelines were published in May 2008. Since publication, there have been new developments in diagnosis and patient management and thanks to CIDR notification of new cases of CDI and the excellent participation in the voluntary CDI enhanced surveillance scheme, there has been a significant amount of information collected regarding the burden of CDI on the Irish healthcare system. There was an increase in the number of new CDI cases notified to CIDR between 2010 and 2011, which may partly be due to changes in laboratory testing protocols. Of the 1,511 CDI cases notified via enhanced surveillance, 92% were new and 7% were recurrent CDI. Twenty-seven percent of patients with CDI had symptom onset in the community.

For the purposes of CDI notification to public health and CDI enhanced surveillance, it is important that all positive *C. difficile* laboratory results are discussed with the clinician responsible for the patient to ascertain the following information:

1. That the patient with the positive laboratory test result for *C. difficile* meets the CDI case definition – if the case definition is not met, the laboratory result is not notifiable
2. Whether the patient has previously had a positive *C. difficile* test result within the past eight weeks:
   a. If yes, and the patient's diarrhoea had resolved but has subsequently returned, this represents recurrent CDI
   b. If yes, and the patient's diarrhoea has not yet resolved, this is a repeat positive specimen from the same CDI episode

The *C. difficile* Sub-Committee of the Health Protection Surveillance Centre reconvened in October 2011 to commence work on updating the 2008 *C. difficile* guideline document.