Enhanced Surveillance of *Clostridioides (Clostridium) difficile* Infection in Ireland: Q2 2021 National Report

Executive Summary

- Extraordinarily, this report includes enhanced surveillance of *C. difficile* infection (CDI) in Ireland from Q1 & Q2 of 2021 with a focus on Q2 2021, compared with Q2 2020, in the executive summary. This report compares the most recent Q2 2021 case epidemiology with Q2 2020 and also compares Q1 2021 with Q1 2020 in Table 1 and Figure 1
- During Q2 2021, a total of 436 cases of CDI were reported to the enhanced surveillance scheme from 57 acute public and private hospitals across Ireland
- The national overall rate of CDI in hospitalised patients was 4.2 cases per 10,000 bed days used (BDU) [373 cases], which is similar to that reported for Q2 2020 [314 cases; rate = 4.2]
- There were 194 cases of CDI deemed to be hospital-acquired (HA-CDI), of which 181 were new, representing a national new HA-CDI rate of 2.0 [median rate = 1.3]
- With regard to acquisition, while *C. difficile* was mostly associated with acute hospitals (194; 44%), there were many cases associated with the community (155; 36%) whereby patients had no overnight stay in a healthcare facility (HCF) in the 12 weeks prior to symptom onset.
- CDI symptom onset occurred in the community for 46% of all cases (202):
    - This emphasises the importance of considering CDI when evaluating any patient with potentially infectious diarrhoea in all healthcare settings, including hospitals, primary care and long-term care facilities (LTCF). Guidance on CDI for primary and long-term care settings is available at the following link:

      http://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/clostridioidesdifficile/guidelines/File,14387,en.pdf
    - It also emphasises the importance for all microbiology laboratories in Ireland to implement the recommendations of the national *C. difficile* clinical guidelines to routinely include *C. difficile* testing for all faeces specimens that take the shape of the container submitted from patients aged ≥2 years, regardless of patient location or clinician request. Guidance on *C. difficile* testing is available in Section 2.5, pages 43 – 54 of the national *C. difficile* clinical guidelines
- Ribotyping data was available for just 20% of cases, with ribotypes 078 (17% of ribotyped cases), 020 (9%) and 014 (8%) the most frequently reported.

Part 1: National CDI Epidemiology Q2 2021

CDI data was reported to the enhanced surveillance programme from 57 acute public and private hospitals across Ireland (***Appendix A***). There were 436 reported CDI cases in patients aged ≥2 years. Of those, 373 were reported in hospitalised patients, giving a national CDI rate in hospitalised patients of 4.2 cases per 10,000 bed days used (BDU), which is similar to that reported for Q2 2020 [314 cases; rate 4.2]. The majority were aged ≥65 years (71%) and were female (62%). ***Table 1*** displays the breakdown of all CDI cases for Q1 and Q2 2021 compared with Q1 and Q2 2020 case data, by case type, origin, onset and severity. In Q2 2021, 17 cases of severe CDI were reported (4%), defined as requiring critical care admission or colectomy due to complications of CDI in ***Table 2***, versus nine cases (2%) for Q2 2020, the highest since enhanced surveillance began. However, caution is advised as it is too early to determine the nature of this trend, if any is present. CDI case definitions are summarised in ***Appendix B***.

CDI Case Type

The majority were categorised as new infections (89%), with 7% recurrent and for 4%, the CDI case type was unknown.

CDI Origin

The majority were categorised as healthcare-associated (HCA) CDI [n=246; 56%], with community-associated (CA) CDI accounting for 36% [n=155]. For the remainder, the origin either could not be determined [n=20; 5%] or was unknown [n=15; 3%]. Of the 246 HCA-CDI cases, the origin was the reporting hospital, termed hospital-acquired (HA) for 194 (79%), a LTCF for 26 (10.5%) and 'other' or 'unknown healthcare facility' for 26 (10.5%). The proportion of community-acquired cases is above historical limits since Q2 2020 and was at its highest in Q2 2021 since enhanced surveillance of CDI began. The rise in the proportion of cases attributed to the community may be in part due to the impact of COVID-19 on the setting of patients who may normally have been transferred for treatment to acute hospitals.

CDI Onset

Patient locations at onset of CDI symptoms included; while admitted to a healthcare facility, termed healthcare-onset (HO) for 226 cases (52%), while residing in the community, termed community-onset (CO) for 202 cases (46%), and unknown patient location for eight cases (2%). This increased trend in community onset of CDI cases may reflect the increased incidence of CDI acquisition in community settings. However, caution in the interpretation of these data is warranted pending further investigation into the nature of healthcare contact provided within community settings. Of 226 HO CDI cases, the reporting hospital was the onset location for 188 (83%), a LTCF for 22 (10%), other healthcare facilities for 13 (6%) and unknown healthcare location for three cases (1%).

Table 1. National CDI epidemiology: Q1 & Q2 2021 versus 2020

	2020				2021			
	Q1		Q2		Q1		Q2	
	n	%	n	%	n	%	n	%
Total reported cases	**486**	-	**391**	-	**383**	-	**436**	-
CDI Case Type								
– New	397	*82%*	343	*88%*	333	*87%*	387	*89%*
– Recurrent	65	*13%*	35	*9%*	34	*9%*	32	*7%*
– Unknown	24	*5%*	13	*3%*	16	*4%*	17	*4%*
CDI Origin								
– Healthcare-associated (HCA)	**301**	***62%***	**223**	***57%***	**223**	***58%***	**246**	***56%***
Reporting hospital	250	*83%*	184	*83%*	185	*83%*	194	*79%*
Long term care facility	34	*11%*	16	*7%*	20	*9%*	26	*11%*
Other healthcare facility	16	*5%*	20	*9%*	16	*7%*	23	*9%*
Unknown healthcare facility	1	*0%*	3	*1%*	2	*1%*	3	*1%*
– Community associated (CA)	**121**	***25%***	**114**	***29%***	**115**	***30%***	**155**	***36%***
– Discharged 4 – 12 weeks from HCF	**34**	***7%***	**29**	***7%***	**23**	***6%***	**20**	***5%***
– Unknown origin	**30**	***6%***	**25**	***6%***	**22**	***6%***	**15**	***3%***
CDI Onset								
– Healthcare onset (HO)	**278**	***57%***	**207**	***53%***	**202**	***53%***	**226**	***52%***
Reporting hospital	235	*85%*	174	*84%*	173	*86%*	188	*83%*
Long term care facility	31	*11%*	14	*7%*	22	*11%*	22	*10%*
Other healthcare facility	5	*2%*	15	*7%*	7	*3%*	13	*6%*
Unknown location	7	*3%*	4	*2%*	-	-	3	*1%*
– Community onset (CO)	**191**	***39%***	**166**	***42%***	**172**	***45%***	**202**	***46%***
– Unknown onset location	**17**	***3%***	**18**	***5%***	**9**	***2%***	**8**	***2%***
CDI Severity								
Critical care admission or colectomy	7	*1%*	9	*2%*	12	*3%*	17	*4%*

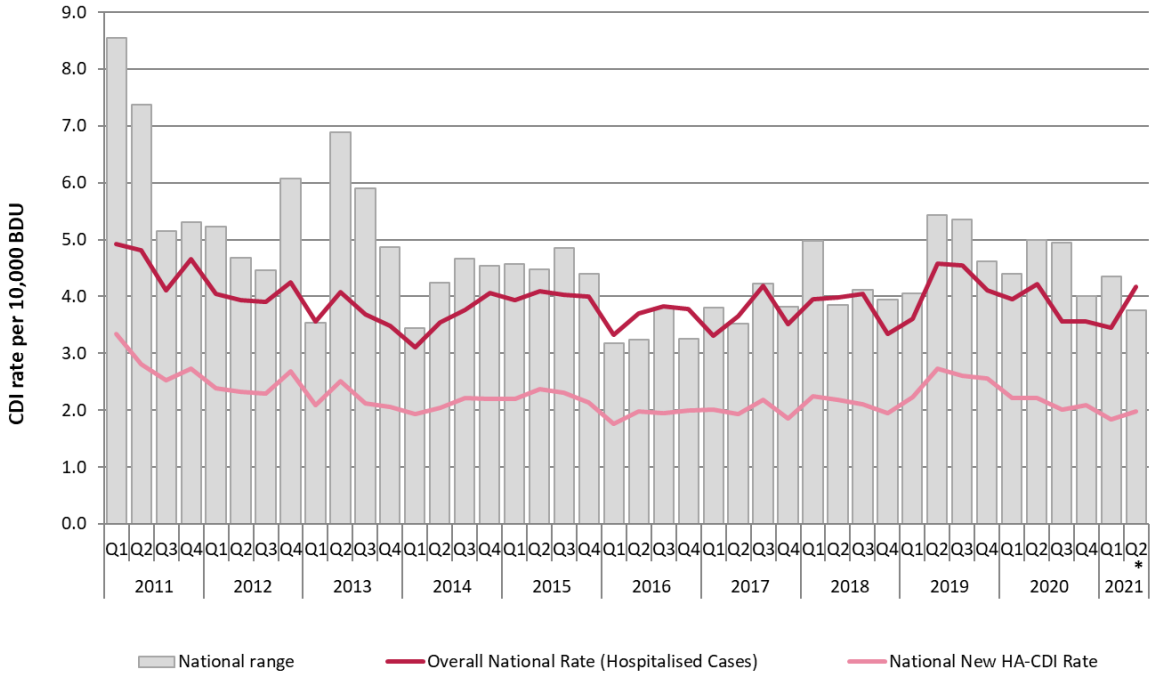
Table 2. Severity of illness: Q2 2021

Surgery (Colectomy)	ICU Admission			Total
	Yes	No	Unknown	
Yes	2	2	-	**4**
No	13	361	-	**374**
Unknown	-	27	31	**58**
Total	**15**	**390**	**31**	**436**

Part 2: Hospital-acquired CDI (HA-CDI) Epidemiology – Q2 2021

Data on HA-CDI was reported from 57 acute public and private hospitals across Ireland. There were 194 HA-CDI cases in patients aged ≥2 years during Q2 2021. Of those, 181 were new HA-CDI cases, representing a national new HA-CDI rate of 2.0 [median rate = 1.3], lower than that reported for Q2 2020 [165 cases; rate = 2.2; median rate = 1.6]. ***Figure 1*** displays quarterly HA-CDI rates since 2011 and ***Table 3*** displays quarterly HA-CDI data from 2019 to 2021.

Figure 1. Quarterly national HA-CDI rates: 2011 – 2021



*Q2 2021 rate is a proxy rate based on Q1 bed days used due missing data following cyber-attack

The overall national CDI rate represents all CDI diagnosed in hospitalised patients per 10,000 BDU, while the HA-CDI rate represents **new** cases of hospital-acquired CDI per 10,000 BDUs. Raw data for this graph is provided in Table 3. The national range is represented by the 5th to 95th percentile of the CDI rate.

CDI Case Type

The majority of 194 HA-CDI cases were categorised as new infections (181; 93%), with 12 (6%) recurrent cases. For one case, the case type was unknown.

CDI Onset

Patient locations at onset of HA-CDI symptoms included; while admitted to a healthcare facility, termed healthcare-onset (HO) for 166 cases (86%) and while residing in the community, termed community-onset (CO) for 28 cases (14%).

Of 166 HO-CDI cases, the reporting hospital was the onset location for 164 (98.8%), another hospital for one case (0.6%) and was unknown for one case (0.6%).

Table 3. Quarterly HA-CDI data: 2019 – 2021

YearQ	Number of participating hospitals[a]	Number of cases reported				CDI rate per 10,000 BDUs[b]		
		New	Recurrent	Unknown	Total	Rate	Range[c]	Median
2019Q3	57	268	26	2	**296**	2.6	0 - 5.4	1.6
2019Q4	57	267	19	0	**286**	2.6	0 - 4.6	1.4
2020Q1	57	215	34	1	**250**	2.2	0 - 4.4	1.5
2020Q2	57	165	17	2	**184**	2.2	0 - 5.0	1.6
2020Q3	57	184	8	2	**194**	2.0	0 - 4.9	1.5
2020Q4	57	188	15	0	**203**	2.1	0 - 4.0	1.2
2021Q1	57	164	20	1	**185**	1.8	0 - 4.4	0.9
2021Q2	57	181	12	1	**194**	2.0	0 - 3.8	1.3

a Since Q1 2012, 97% of all tertiary and general hospitals participated in the enhanced surveillance system.
b The CDI rate is the number of **new** cases of CDI that were acquired in the reporting hospital - per 10,000 bed days used (BDUs).
c The national range corresponds to the 5th to 95th percentile of the data.
Data for Q1-2 2021 are provisional

Part 3: *C. difficile* Testing Methods – Q2 2021

All 57 hospitals participating in the enhanced CDI surveillance system during Q2 2021 reported use of a *C. difficile* testing method recommended by the updated National Clinical Guidelines for Surveillance, Diagnosis & Management of *C. difficile* Infection in Ireland (2014). This includes either one of a variety of two-step testing methods (n=47; 82%) or a single-step method using molecular polymerase chain reaction (PCR) test for *C. difficile* toxin gene (n = 10; 18%), as displayed in ***Table 4***, along with stratification by hospital type.

Table 4. *C. difficile* testing methods utilised in Q2 2021, by hospital type

Test Category	Hospital Type				Total
	General	Private	Specialist	Tertiary	
1 STEP: PCR for toxin gene	4	-	4	2	**10**
2 STEP: GDH EIA, followed by confirmatory *C. difficile* toxin EIA	2	3	-	-	**5**
2 STEP: Combined GDH with toxin EIA, followed by toxin EIA*	1	-	-	-	**1**
2 STEP: Combined GDH with toxin EIA, followed by PCR**	3	6	1	-	**10**
2 STEP: GDH EIA, followed by confirmatory toxin PCR	3	-	-	-	**3**
2 STEP: PCR, followed by confirmatory toxin EIA	14	2	5	7	**28**
Total	**27**	**11**	**10**	**9**	**57**

PCR for *C. difficile* toxin gene: Polymerase chain reaction (PCR) for the detection of TcdA and/or TcdB genes
GDH EIA Enzyme immunoassay (EIA) for the detection of glutamate dehydrogenase (GDH) of *C. difficile*
GDH AND TOXIN EIA: Enzyme immunoassay (EIA) for the detection of both *C. difficile* GDH and *C. difficile* toxin TcdA and/or TcdB
***2 STEP: Combined GDH with toxin EIA, followed by confirmatory toxin EIA:** Addition of a confirmatory toxin EIA test (using a different EIA kit) if the initial toxin EIA is negative
****2 STEP: Combined GDH with toxin EIA, followed by confirmatory PCR:** Addition of confirmatory PCR if the initial toxin EIA is negative

Part 4: *C. difficile* Ribotyping – Q2 2021

Ribotyping data was available for just 20% of CDI cases reported to the CDI enhanced surveillance scheme. Ribotypes 078 (17% of ribotyped cases), 020 (9%) and 014 (8%) were the most frequently reported.

The commencement of CDI whole genome-sequencing at the new national funded *C. difficile* Reference Laboratory Service at Public Health Laboratory, Cherry Orchard hospital is expected to begin presently. This is a very welcome step which had been recommended in the national *C. difficile* guidelines since 2008.

The establishment of this national reference laboratory service will add significantly to the understanding of the epidemiology of this important healthcare-associated infection and ultimately to its control and prevention, both here in Ireland and internationally.

Acknowledgments

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Appendix A: National CDI Enhanced Surveillance Participating Hospitals

Hospital Group	Hospital Name	Category	Type of Hospital
Dublin Midlands	Adelaide & Meath & National Children's Hospital, Tallaght	Tertiary	Model 4
	Coombe Women and Infant's University Hospital	Specialist	-
	Midland Regional Hospital Portlaoise	General	Model 3
	Midland Regional Hospital Tullamore	General	Model 3
	Naas General Hospital	General	Model 3
	St James's Hospital	Tertiary	Model 4
	St Luke's Hospital, Dublin	Specialist	-
Ireland East Hospital Group	Cappagh National Orthopaedic Hospital, Dublin	Specialist	-
	Mater Misericordiae University Hospital	Tertiary	Model 4
	Midland Regional Hospital Mullingar	General	Model 3
	National Maternity Hospital, Holles Street	Specialist	-
	Our Lady's Hospital, Navan	General	Model 3
	Royal Victoria Eye & Ear Hospital, Dublin	Specialist	-
	St Columcille's Hospital, Loughlinstown	General	Model 2
	St Luke's General Hospital, Kilkenny	General	Model 3
	St Michael's Hospital, Dun Laoghaire	General	Model 2
	St Vincent's University Hospital	Tertiary	Model 4
	Wexford General Hospital	General	Model 3
RCSI Hospital Group	Beaumont Hospital	Tertiary	Model 4
	Cavan General Hospital	General	Model 3
	Connolly Hospital, Blanchardstown	General	Model 3
	Louth County Hospital, Dundalk	General	Model 2
	Our Lady of Lourdes Hospital, Drogheda	General	Model 3
Saolta Hospital Group	Letterkenny General Hospital	General	Model 3
	Mayo General Hospital, Castlebar	General	Model 3
	Portiuncula University Hospital, Ballinasloe	General	Model 3
	Roscommon University Hospital	General	Model 2
	Sligo General Hospital	General	Model 3
	University College Hospital Galway	Tertiary	Model 4
South/South West Hospital Group	Bantry General Hospital	General	Model 2
	Cork University Hospital	Tertiary	Model 4
	Cork University Maternity Hospital	Specialist	-
	Kerry General Hospital, Tralee	General	Model 3
	Lourdes Orthopaedic Hospital, Kilcreene, Kilkenny	Specialist	-
	Mallow General Hospital	General	Model 2
	Mercy University Hospital, Cork	General	Model 3
	South Infirmary - Victoria University Hospital, Cork	General	Model 2
	South Tipperary General Hospital, Clonmel	General	Model 3
	Waterford Regional Hospital	Tertiary	Model 4
UL Hospital Group	Croom Hospital	Specialist	-
	Ennis Hospital	General	Model 2
	Nenagh Hospital	General	Model 2
	St John's Hospital	General	Model 2
	University Hospital, Limerick	Tertiary	Model 4
	University Maternity Hospital	Specialist	-
Private Hospitals	Aut Even, Kilkenny	Private	-
	Beacon Hospital, Dublin	Private	-
	Blackrock Clinic	Private	-
	Bon Secours, Cork	Private	-
	Bon Secours, Galway	Private	-
	Bon Secours, Glasnevin	Private	-
	Bon Secours, Tralee	Private	-
	Galway Clinic	Private	-
	Mater Private, Dublin	Private	-
	Mater Private, Cork	Private	-
	St Vincents Private Hospital	Private	-
Children's Health Ireland	Children's University Hospital, Temple Street	Specialist	-

Appendix B
Case Definitions for Surveillance of *Clostridioides difficile* Infection

***For surveillance purposes, a confirmed Clostridioides difficile* infection (CDI) case is a patient two years or older, to whom one or more of the following criteria applies:**

- Diarrhoeal* stools or toxic megacolon, with either a positive laboratory assay for *C. difficile* toxin A (TcdA) and/or toxin B (TcdB) in stools or a toxin-producing *C. difficile* organism detected in stool via culture or other means.
- Pseudomembranous colitis (PMC) revealed by lower gastrointestinal endoscopy.
- Colonic histopathology characteristic of *C. difficile* infection (with or without diarrhoea) on a specimen obtained during endoscopy, colectomy or autopsy.

*** Diarrhoea is defined as three or more loose/watery bowel movements (which are unusual or different for the patient) in a 24 hour period**

CASE TYPE

- **New Case of CDI:**
  - The first episode of CDI, **OR**
  - A subsequent episode of CDI with onset of symptoms **more than eight weeks** after the onset of a previous episode.

- **Recurrent Case of CDI:**
  - A patient with an episode of CDI that occurs **within eight weeks** following the onset of a previous episode **provided that CDI symptoms from the earlier episode resolved with or without therapy.**

ONSET

- **Healthcare onset** » Symptoms start during a stay in a healthcare facility.
- **Community onset** » Symptoms start in a community setting, outside healthcare facilities.
- **No information available** » If no information was available on onset of symptoms

ORIGIN

- **Healthcare-associated case.** This is a CDI patient with either:
  - Onset of symptoms at least 48 hours following admission to a healthcare facility (healthcare-onset, healthcare-associated), OR
  - With onset of symptoms in the community within four weeks following discharge from a healthcare facility (community-onset, healthcare-associated).
- **Community-associated case.** This is a CDI patient with either:
  - Onset of symptoms while outside a healthcare facility, and without discharge from a healthcare facility within the previous 12 weeks (community-onset, community-associated), OR
  - With onset of symptoms within 48 hours following admission to a healthcare facility without residence in a healthcare facility within the previous 12 weeks (healthcare-onset, community-associated).
- **Discharged 4 – 12 weeks from a healthcare facility**

»This is a CDI patient who was discharged from a healthcare facility between four and 12 weeks before the onset of symptoms.

- **No information available**

SEVERE CDI Case

This is a CDI patient to whom any of the following criteria apply:

- Admission to an intensive care unit for treatment of CDI or its complications (e.g., for shock requiring vasopressor therapy)
- Surgery (colectomy) for toxic megacolon, perforation or refractory colitis
- Death within 30 days after diagnosis if CDI is either the primary or a contributive cause