Surveillance of *Clostridium difficile* infection (CDI) in Belgium

Working group Meeting June 13 2016
Hosted by WIV-ISP
Cristina Valencia
Dr Marie-Laurence Lambert
Objectives of Meeting

• Annual report 2016
• Research projects
• CDI surveillance in Belgium: what’s next…
  • Changes in protocol
  • Health Data
  • ECDC CDI protocol
2016 Annual Report
Overview
Annual Report 2016

- Hospital epidemiological & Reference Laboratory surveillance data 2008 - 2015
- Hospital stay data (RCM/ MZG) 1999 – 2013
- Death registrations 1998 - 2013
Overview

Surveillance data (1)

Mandatory 2007-2014*

- Acute hospitals, 1 semester/yr
- Case based – NSIHweb1
- Reference lab – samples from 5 consec pts / hosp / sem
  Confirmation & Ribotyping

* 2015 the first year of voluntary surveillance*

*Ref: Arrêté Royal 19 Jun 2007*
Overview

Surveillance data (2)

• Change in legislation – July 2014*

1/4 mandatory surveillance programs:
- Surgical site infection
- Vancomycin resistant enterococci
- Pneumonia or septicaemia in ICU
- *Clostridium difficile* infection

*Ref: Arrêté Royal 8 Jan 2015*
2008-2015 Surveillance data
Hospital Participation 2015

• High participation (despite surveillance being voluntary)

2015: 141 hospitals at least 1 semester
115 hospitals 2 semesters (increase from last year)
Episodes of CDI in hospitalized patients, 2015

- 2975 CDI episodes reported,
  - 60% hospital associated (onset >= 2d after admission)
- 2799 patients
Characteristics of Patients
(Part 1)

• 42% patients >80 years old
  • 29% 65-79 years old
  • 27% 3-64 years old

• Department of Diagnosis
  • 49% Geriatrics
  • 9.0% Intensive care unit
  • 8.6% Haemato-oncology
  • 8.3% Internal medicine
Characteristics of Patients
(Part 2)

- Complications
  - 70% No complications
  - 7% Any severe complication*
  - 3% Death (direct or indirect result of CDI) within 30 days
  - 2% Pseudo membranous colitis, admission in ICU, surgery for CDI complication

*Any severe complication: death (as a direct or indirect result of CDI) within 30 days of onset of infection, or pseudomembranous colitis, or admission to the intensive care unit or colectomy as a result of CDI
ICU- Intensive care unit
Incidence of *Clostridium difficile* infection in acute** hospitals, Belgium 2008-2015

*Definition of hospital associated infection*: onset of symptoms 2 days or more after admission in the declaring hospital (onset date – admission date ≥ 2)

**Acute hospitals** defined by mean length of stay <14 days, chronic ≥ 14 days
Incidence of *Clostridium difficile infection* in acute** hospitals, per region. Belgium 2008-2015

*Definition of hospital associated infection*: onset of symptoms 2 days or more after admission in the declaring hospital (onset date – admission date ≥2)

**Acute hospitals** defined by mean length of stay <14 days, chronic ≥ 14 days
Incidence of *Clostridium difficile* infection in Belgian hospitals, per month. Belgium 2008-2015

*Definition of hospital associated infection:* onset of symptoms 2 days or more after admission in the declaring hospital (onset date – admission date ≥2)
Variation in incidence of hospital-associated *Clostridium difficile* infections (Acute only*)

Variation can be presented via use of funnel plots

- Funnel plots are a graphical aid for institutional comparisons
- An estimate of the parameter is plotted against a measure of its precision
- Here: incidence of CDI against size of the hospital (number of hospital-days)
- Visual identification of outliers (95%, 99.8%)

*Acute hospitals* defined by mean length of stay <14 days, chronic >= 14 days

Only acute hospitals providing data for the whole year are included.
Variation in incidence of hospital-associated *Clostridium difficile* infections (Acute only*)

*Acute hospitals* defined by mean length of stay <14 days, chronic >= 14 days

Only acute hospitals providing data for the whole year are included.

**Funnel plot** based on hospitals providing data for one or two semesters.
2008-2015 Reference Laboratory Data

Courtesy of M. Delmée and J Van Broeck, from the NRC
Microbiological surveillance (1)

• In 2015, 97 hospitals sent 2011 isolates to the reference laboratory

• 108/2011 (5%): no *C. difficile*

• First 5 *C. diff* isolates received per hospital-semester = 689 isolates analysed as part of the surveillance programme

• Large variety of ribotypes, many isolated only once
Distribution of *C. difficile* strains, in Belgian hospitals, 2009-2015

Per strains

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total strains</td>
<td>389</td>
<td>505</td>
<td>462</td>
<td>648</td>
<td>585</td>
<td>616</td>
<td>689</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>BR027 (UCL027)</td>
<td>18</td>
<td>12</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BR014 (UCL 16)</td>
<td>11</td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>BR078 (UCL 3)</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>BR020 (UCL16a)</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>BR002(UCL32)</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>
Distribution of *C. difficile* strains, in Belgian hospitals, 2009-2015

Per hospitals

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total hospitals</strong></td>
<td>104</td>
<td>103</td>
<td>84</td>
<td>111</td>
<td>103</td>
<td>112</td>
<td>97</td>
</tr>
<tr>
<td>% of hospitals where strain was isolated</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>BR027 (UCL027)</td>
<td>34</td>
<td>33</td>
<td>20</td>
<td>17</td>
<td>15</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>BR014 (UCL 16)</td>
<td>34</td>
<td>33</td>
<td>38</td>
<td>40</td>
<td>37</td>
<td>37</td>
<td>47</td>
</tr>
<tr>
<td>BR078 (UCL 3)</td>
<td>11</td>
<td>25</td>
<td>24</td>
<td>31</td>
<td>24</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td>BR020 (UCL16a)</td>
<td>38</td>
<td>28</td>
<td>37</td>
<td>37</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BR002(UCL32)</td>
<td>35</td>
<td>27</td>
<td>24</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1999-2013 Hospital stay data
Hospital stay data* 1999-2013

- Hospital stays (RHM/MKG) with diagnosis code ICD-9-CM 008.45: “Intestinal infection due to C. difficile” as primary or secondary diagnosis

- Provide historical long time trends

- Exhaustive counting of CDI in Belgian hospitals
  - total burden of disease, CDI : 3989 (2013)

- Allows validation of surveillance data

*Source: Service Fédéral Santé Publique / Federale Overheidsdienst
*Hospital stays with diagnosis code ICD-9-CM 008.45: “Intestinal infection due to C. difficile”

*Source: Service Fédéral Santé Publique / Federale Overheidsdienst
Validation of surveillance data

Mean incidence of *Clostridium difficile* infections per 1000 admissions, Belgium 2011-2013, according to data source

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital stay* (administrative) data (RHM/MZG)(a)</td>
<td>1.80</td>
<td>1.95</td>
<td>2.03</td>
</tr>
<tr>
<td>Surveillance data (b)</td>
<td>1.44</td>
<td>1.50</td>
<td>1.62</td>
</tr>
<tr>
<td>a/b (*100)</td>
<td>125%</td>
<td>130%</td>
<td>125%</td>
</tr>
</tbody>
</table>

*(stays with ICD-9-CM 008.45)*

*Source: Service Fédéral Santé Publique / Federale Overheidsdienst*
1998-2013 Death Registration data
Death registration data* 1998-2013

- ICD-10 code A04.7 as underlying cause of death: “death due to a *Clostridium difficile* related enterocolitis”

**Number of death certificates with ICD-10 code (2013)**

- Brussels= 13
- Flanders= 33
- Wallonia=32
- Belgium=78

*Source: DGSIE (“Statistics Belgium”)

**Underlying cause of death**: the disease which initiated the train of morbid events leading directly to death
Age standardized CDI mortality rate, by region

Source deaths: DGSIE ICD-10 code A04.7; Population data: https://www.wiv-isp.be/epidemio/spma/index.htm 2014
Standardised using 2005 Belgian population, as a standard, 3 age groups 0-64, 65-79, >80
International comparisons

*How do we measure up to other countries?*
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>2010 - 2015</th>
<th>Earliest CDI rate</th>
<th>Most recent CDI rate</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Annuality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td></td>
<td>1.2</td>
<td>1.2</td>
<td>HA-CIDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
<td>5.5</td>
<td>5.3</td>
<td>HA-CIDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td>3.0</td>
<td>3.1</td>
<td>HA-CIDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>France</td>
<td></td>
<td>503</td>
<td>534</td>
<td>All CDI</td>
<td>No denominator</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>4.5</td>
<td>3.8</td>
<td>HA-CIDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td>2.8</td>
<td>3.8</td>
<td>HA-CIDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Ireland</td>
<td></td>
<td>2.6</td>
<td>2.3</td>
<td>All CDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Italy (Emilia-Romagna)</td>
<td></td>
<td>3.3</td>
<td>3.9</td>
<td>All CDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td>15.0</td>
<td>16.2</td>
<td>All CDI</td>
<td>Admissions</td>
<td>May - Apr</td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td>6.1</td>
<td>9.6</td>
<td>All CDI</td>
<td>Patient-days</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td>3507</td>
<td>HA-CIDI</td>
<td>No denominator</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Slovakia</td>
<td></td>
<td>1.8</td>
<td>23.3</td>
<td>All CDI</td>
<td>Population</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td>3.6</td>
<td>18.3</td>
<td>All CDI</td>
<td>Population</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td>23.1</td>
<td>HA-CIDI</td>
<td>Patients (prevalence)</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td>85</td>
<td>79</td>
<td>All CDI</td>
<td>Population</td>
<td>Jan - Dec</td>
</tr>
<tr>
<td>UK – England</td>
<td></td>
<td>3.0</td>
<td>1.5</td>
<td>HA-CIDI</td>
<td>Patient-days</td>
<td>Apr - May</td>
</tr>
<tr>
<td>UK – N. Ireland</td>
<td></td>
<td>3.0</td>
<td>2.6</td>
<td>All CDI</td>
<td>Patient-days</td>
<td>Apr - May</td>
</tr>
<tr>
<td>UK – Scotland</td>
<td></td>
<td>5.9</td>
<td>3.4</td>
<td>All CDI &gt;15yrs</td>
<td>Patient-days</td>
<td>Oct - Sep</td>
</tr>
<tr>
<td>UK – Wales</td>
<td></td>
<td>6.2</td>
<td>3.0</td>
<td>All CDI</td>
<td>Admissions</td>
<td>Apr - May</td>
</tr>
</tbody>
</table>

Source: Carl Suetens, ‘News from CDI surveillance in Europe’. Presentation. ESCMID 2016. 11 April 2016, Amsterdam, The Netherlands
International Comparisons

Healthcare-associated CDI per 10,000 bed-days

Source: Carl Suetens, ‘News from CDI surveillance in Europe’. Presentation. ESCMID 2016. 11 April 2016, Amsterdam, The Netherlands
International Comparisons

*Healthcare-associated CDI per 10 000 bed-days*

- Ireland, Germany, and the UK have reported a decrease in their incidence in the last year (2014-2015)

- Reported variations between European countries could be explained by methodological differences
  - Case Definitions
  - Diagnostic Tests
  - Demographic Factors
  - Socio economic Factors

- Increase in prevalence of ribotype 027 across Europe

- **Belgium incidence** of CDI is the lowest compared to other European countries

Source: Karl Suetens, ‘News from CDI surveillance in Europe’. Presentation. ESCMID 2016. 11 April 2016, Amsterdam, The Netherlands
DISCUSSION
Key findings (1) - Incidence

- 2015: high participation from hospitals despite surveillance not compulsory
  - (QI effect?)
- Incidence HA-CDI highest since 2008
  - Highest increase in Flanders
  - Wide variation in incidence suggest potential for improvement
- Belgium seems to have one of the lowest incidence in Europe
Key findings (2) microbiological surveillance

- Wide variety of circulating strains
- More prevalent ribotype: ribo BRO14 (UCL16)
- BRO27 found in 15% of hospitals (down from 34% in 2009)
- BR078 (hypervirulent) found in 42% of hospitals (up from 11% in 2009),
Key finding (3)
burden of CDI disease in Belgium

- On average, +/- 4000 CDI episodes in Belgian hospitals per year
  
  \((\text{so: } \text{RHM/MKG})\)

- 78 directly attributable deaths in 2013, (down from 137 in 2009) \((\text{so: death registry})\)
Limitations

- No surveillance data validations
- NSIH web1 data collection system obsolete
  - No change possible in the last 5 years
  - No data on diagnosis algorithms used in hospitals
C. difficile surveillance in Belgian hospitals
THE FUTURE
The future of *C. difficile* surveillance in Belgian hospitals (1)

**Protocol changes**

- Most hospitals do not do *C. difficile* culture in routine anymore

- Participation to surveillance requires sending 5 consecutive strains to the reference laboratory
  - (ECDC: 10)

- Should this be maintained?
The future of *C. difficile* surveillance in Belgian hospitals (2) New software

- New Health data software:
  - launch expected this year, fully operational January 1, 2017
  - Ease of data collection
  - Improved feed-back
    - Including funnel plots
  - Timely implementation of protocol changes
    - Including ECDC requests

- Hospitals candidates for pilot studies?
The future of *C. difficile* surveillance in Belgian hospitals (2). Validation

- Validation study
  - Planned 2017 (combined with SEP)
  - Protocol to be developed
The future of *C. difficile* surveillance in Belgian hospitals (3) ECDC

- ECDC surveillance network
Update on implementation of ECDC CDI protocol
ECDC CDI surveillance protocol

- Finalized January 2016
- 3 surveillance options:
  - **Minimal** aggregate *hospital* denominator and numerator, diagnostic algorithms, testing frequency
  - **Light**: minimal + *case*-based numerator data
  - **Enhanced**: light + descriptive *microbiology* (e.g. Ribotype)

- Belgium protocol very similar to “enhanced” ECDC protocol (small adaptations in 2015)
The future of *C. difficile* surveillance in Belgian hospitals (2)
ECDC surveillance network

- Preliminary results for January-February 2016
- 19 countries - not Belgium –
  - Belgian did not submit data because request not compatible with Belgian 6-month surveillance period

- Full case-based Belgian CDI surveillance database (first semester 2016) to be submitted in tESSY in September 2016.
What lies ahead for ECDC and CDI?

2016
- 14 September: training protocol and software
- Launch of outsourced microbiological support
- Euro surveillance manuscripts on ECDIS-Net project

2017
- First European CDI report
- CDI surveillance feedback reports to participating hospitals
Report 2016 soon available at


- Main report – English
- Résumé – FR
- Samenvattung - NL
Thank you for your attention