Laboratory-identified Multidrug-Resistant Organism (MDRO) & *Clostridium difficile* Infection (CDI) Events for Long-term Care Facilities (LTCFs)

Background: *Clostridium difficile* infections (CDI), methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* spp. (VRE), and certain multidrug-resistant gram-negative bacilli (e.g. carbapenem-resistant *Enterobacteriaceae)* have increased in prevalence in U.S. healthcare settings over the last three decades, and have important implications for residents of long-term care facilities (LTCF). Studies have demonstrated a large proportion of residents are at risk for carrying or acquiring these multidrug-resistant organisms (MDRO) in LTCF. MDRO infections are associated with increased lengths of stay, hospitalizations and readmissions, increased healthcare costs, and mortality due to more severe illnesses and limited treatment options. CDI can present a variety of ways including uncomplicated diarrhea, pseudomembranous colitis, and toxic megacolon, which can, in some instances, lead to sepsis and even death. Infections from *C. difficile* represent a subset of gastroenteritis and gastrointestinal tract infections. Standard definitions for CDI should be incorporated into infection surveillance programs to obtain a more complete understanding of how *C. difficile* can manifest and be transmitted in LTCFs.

The Laboratory-identified (LabID) Event Module of the NHSN LTCF Component is a tool designed for use in certified skilled nursing facilities/nursing homes (LTC:SKILLNURS) and intermediate/chronic care facilities for the developmentally disabled (LTC:DEVDIS) to help meet criteria outlined in guidelines for the prevention, control, and surveillance of MDRO & CDI [1-5]. As outlined in these guidelines, these pathogens may require specialized monitoring to evaluate if intensified infection control efforts are required to reduce the occurrence of these organisms and related infections. The goal of this module is to provide a mechanism for facilities to collect, report, and analyze data that will inform infection control staff of the impact of prevention efforts. This module contains two options, one focused on CDI and the second on select MDROs.

References:

1: Smith et al. SHEA/APIC Guideline: Infection Prevention and Control in the Long-Term Care Facility. Infection Control and Hospital Epidemiology 2008;29:785-814.

2: Healthcare Infection Control Practices Advisory Committee (HICPAC) approved guidelines for the control of multidrug resistant organism (MDRO). Available at www.cdc.gov/hicpac/pdf/MDRO/MDROGuideline2006.pdf

3: Cohen et al. Clinical Practice Guideline for Clostridium difficile infection in Adults: 2010 Update by SHEA and IDSA. Infection Control and Hospital Epidemiology 2010;31:431-55.

4: Simor et al. Clostridium difficile in Long-Term Care Facilities for the Elderly. SHEA Position Paper. Infection Control and Hospital Epidemiology 2002;23:696-703.

5: Cohen et al. Recommendations for Metrics for Multidrug-Resistant Organisms in Healthcare Settings: SHEA/HICPAC Position Paper. Infection Control and Hospital Epidemiology 2008;29:901-13.

I. *Clostridium difficile* Infection (CDI) Surveillance by Laboratory-identified (LabID) Event

Methods: Facilities may choose to monitor *Clostridium difficile* infections (CDI) using laboratory-identified (LabID) event surveillance. This surveillance method allows laboratory data to be used without clinical evaluation of the resident for signs or symptoms, allowing for a less labor intensive method to track *C. difficile*. This method provides proxy measures of *C. difficile* infections and healthcare exposure based solely on laboratory data and limited resident admission/transfer data.

The data collected will enable participating facilities and CDC to calculate several infection measures for CDI (listed below). NHSN forms should be used to collect all required data, using the definitions of each data field as indicated in the *Table of Instructions.*

Settings: CDI LabID Event reporting is currently available for certified skilled nursing facilities/nursing homes (LTC:SKILLNURS) and intermediate/chronic care facilities for the developmentally disabled (LTC:DEVDIS). Events reported should include *C. difficile* positive laboratory assays obtained from any resident who is receiving care at the facility. Laboratory results available from other healthcare facilities before the resident was admitted to your facility should not be reported as LabID Events.

Requirements: Facilities must report numerators (CDI LabID Events) and denominators (number of resident admissions, number of resident-days, and number of residents who are receiving antibiotic treatment for *C. difficile* at the time of admission into the LTCF) for the entire facility, referred to as facility-wide inpatient (FacWideIN), each month for at least 6 consecutive months to provide meaningful measures. *C. difficile* laboratory testing should be performed only on liquid or watery stool samples (i.e., conforming to the shape of the specimen collection container).

Facilities must indicate their reporting for the calendar month in the *Monthly Reporting Plan for LTCF* (CDC 57.141).

Definitions:

C. difficile positive laboratory assay: A positive result for a laboratory test for *C. difficile* toxin A and/or B (e.g., enzyme immunoassay, or EIA test), **OR** a toxin-producing *C. difficile* organism detected in the stool specimen by culture or other laboratory means (e.g., nucleic acid amplification testing by polymerase-chain reaction, or PCR).

CDI Laboratory-identified (LabID) Event: All non-duplicate *C. difficile* positive laboratory assays tested on liquid or watery stool samples (i.e., conforming to the shape of the specimen collection container), and obtained while a resident is receiving care in the long-term care facility. See Figure 1 - *C. difficile* Test Result Algorithm for

Laboratory-identified (LabID) Events. **NOTE**: Laboratory results obtained from outside facilities, before a resident's admission, should not be entered as LabID Events.

Duplicate *C. difficile*-positive laboratory assay: Any *C. difficile* positive laboratory test obtained from the *same* resident while receiving care in the LTCF following a previous *C. difficile* positive test *within the past two weeks (14 days*) that was also was collected while the resident was receiving care in the LTCF. The day of specimen collection is considered as Day 1.

NOTE: LabID event rules apply to specimens collected while the resident is receiving care in the LTCF. Specimens collected while the resident is receiving care outside of the LTCF are not taken into consideration for LabID Event reporting for the LTCF.

EXAMPLE: Mr. T is a long-term resident in your LTCF and has not recently transferred in or out of the facility. On January 1, a liquid stool specimen is collected from Mr. T, and the test result is positive for *C. difficile* toxin. After verifying that Mr. T does not have a positive *C. difficile* positive laboratory assay test in the previous 14 days, you enter a CDI LabID Event into the NHSN. Over the next week, Mr. T seems to improve and the diarrhea resolves. However, on January 13, he has several episodes of diarrhea, and a liquid stool specimen is collected, which subsequently tests positive *C. difficile* toxin. It has not been more than 14 days since the most recent *C. difficile* toxin-positive laboratory result for Mr. T, so this *C. difficile* test result is considered a duplicate CDI LabID Event, and is not entered into the NHSN. On January 20, Mr. T has another *C. difficile* toxin-positive laboratory result. While it has been more than 14 days since the initial positive *C. difficile* toxin-positive laboratory result was entered into NHSN (January 1), it has not been more than 14 days since his most recent *C. difficile* toxin-positive laboratory result (January 13). Therefore, the *C. difficile* toxin-positive laboratory result collected on January 20 is considered a duplicate, and is not entered into the NHSN. On February 10, Mr. T has another *C. difficile* toxin-positive laboratory result. Since it has been more than 14 days since his most recent *C. difficile* toxin-positive laboratory result (January 20) while in your facility, this CDI LabID Event is entered into the NHSN.

EXAMPLE: Classification of CDI LabID Events as Duplicate

Date of Positive *C. difficile* Lab Test for a Resident (collected while in the LTCF)	**Duplicate**	**Enter as a CDI LabID Event?**
January 1	No	Yes
January 13	Yes	No (within 2 weeks of positive test, January 1)
January 20	Yes	No (within 2 weeks of positive test, January 13)
February 10	No	Yes

Categorizations of CDI LabID Events: All CDI LabID Events will be categorized by NHSN. Categorizations are based on specimens collected while the resident was receiving care in the LTCF.

Incident CDI LabID Event: Either the first CDI LabID Event ever entered for an individual resident in the facility, or a subsequent LabID Event entered > 8 weeks after the most recent CDI LabID Event reported for an individual resident while receiving care in the LTCF.

Recurrent CDI LabID Event: Any CDI LabID Event entered > 2 weeks and ≤ 8 weeks after the most recent CDI LabID Event reported for an individual resident while receiving care in the LTCF.

EXAMPLE: NHSN Classification of CDI LabID Events as **Incident or Recurrent**

Resident ID	Current Admit Date	CDI Event Date (i.e., date of specimen collection)	Categorization
1111	01/01/2015	01/05/2015	Incident
1111	01/01/2015	01/07/2015	Duplicate (*Not reported in NHSN*)
1111	01/01/2015	01/25/2015	Recurrent
1111	01/01/2015	02/2/2015	Duplicate (*Not reported in NHSN*)
1111	01/01/2015	03/11/2015	Recurrent
1111	01/01/2015	05/20/2015	Incident

Further Categorizations of CDI LabID Events: All incident or recurrent LabID Events will be further categorized by NHSN into Community-onset vs. LTCF-onset. These additional categorizations are based on date of current admission to facility and date of specimen collection. Because of variability in documenting time of admission to the LTCF, calendar days are used to categorize LabID Events.

Community-onset (CO) LabID Event: Date specimen collected ≤ 3 calendar days from date of current admission to the facility (i.e., days 1, 2, or 3 of admission).

Long-term Care Facility-onset (LO) LabID Event: Date specimen collected > 3 calendar days after current admission to the facility (i.e., on or after day 4).

LO LabID Events can be further sub-classified as:

Acute Care Transfer-Long-term Care Facility-onset (ACT-LO): LTCF-onset (LO) LabID Event with date specimen collected ≤ 4 weeks following date of last transfer from an Acute Care Facility (Hospital, Long-term acute care hospital, or acute inpatient rehabilitation facility only).

EXAMPLE: NHSN Classification of Lab ID Events as **Community-onset or LTCF-onset**				
Admission date June 4th	June 5th	June 6th	June 7th	June 8th
day 1	day 2	day 3	day 4	day 5
Community-onset (CO)			**Long-term Care Facility-onset (LO)**	

Numerator and Denominator Data:

Numerator: Data on each CDI LabID Event will be reported using the *Laboratory-identified MDRO or CDI Event for LTCF* form (CDC 57.138). (See *Table of Instructions*) information on how to complete this form.)

Denominator: Monthly totals for resident-days, resident admissions, and residents on *C.difficile* treatment at the time of admission are collected using the *Denominators for LTCF* form (CDC 57.142). (See *Table of Instructions*) for information on how to complete this form.)

CDI Data Analysis: Data are stratified by time (e.g., month, quarter, etc.), whether an episode is incident or recurrent, community-onset or LTCF-onset, and summarized for the entire facility.

Calculated CDI Rates and Metrics:
Line lists of CDI LabID Events and the measures and calculations listed below are available as part of the CDC-defined analysis outputs within the NHSN LTCF component.

Total CDI Rate/10,000 resident-days = Number of CDI LabID Events per month regardless of time spent in the facility (i.e., CO + LO) / Number of resident-days per month x 10,000.

CDI Treatment Prevalence on Admission = Admissions on *C. difficile* Treatment / Number of Admissions x 100.

CDI Long-term Care Facility-onset Incidence Rate/10,000 resident-days* = Number of all incident LO CDI LabID Events per month / Number of resident-days x 10,000.

*NOTE: This formula excludes recurrent CDI events.

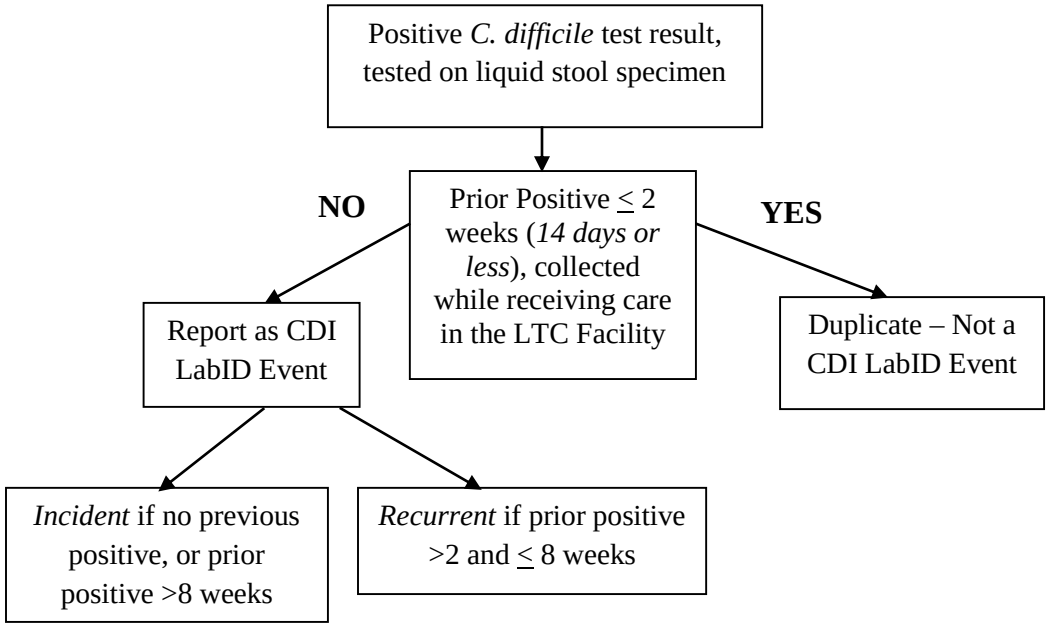
Percent that is Community-onset = Number of CDI LabID Events that are CO / Total number of CDI LabID Events x 100.

Percent that is Long-term Care Facility-onset = Number of CDI LabID Events that are LO / Total number of CDI LabID Events x 100.

Percent of LO that is Acute Care Transfer-Long-term Care Facility-onset = Number of ACT-LO CDI LabID Events / Total number of LO CDI LabID Events x 100.

Percent that is Recurrent CDI = Number of CDI LabID Events that are recurrent / Total number of CDI LabID Events x 100.

Figure 1. *C. difficile* Test Result Algorithm for Laboratory-identified (LabID) Events.



II. MDRO Surveillance by Laboratory-identified (LabID) Event

Methods: Facilities may choose to monitor one or more of the following MDROs: *Staphylococcus aureus*, both methicillin-resistant (MRSA) and methicillin-susceptible (MSSA), vancomycin-resistant *Enterococcus spp.* (VRE), cephalosporin-resistant *Klebsiella* spp., carbapenem-resistant *Enterobacteriaceae* (CRE), and multidrug-resistant *Acinetobacter* spp.

Laboratory-identified (LabID) Event reporting allows laboratory data to be used without clinical evaluation of the resident for signs or symptoms, creating a less labor intensive method to track MDROs. This method provides proxy measures of MDRO infections, and healthcare exposure based solely on laboratory data and limited resident admission/transfer data.

LabID Event reporting is ONLY for collecting and tracking isolates from positive cultures that are taken for "clinical" purposes (i.e., for diagnosis and treatment), which means that Active Surveillance Culture/Testing (e.g., nasal swabs for MRSA or perirectal swabs for VRE) results are not reported as LabID Events. Laboratory results available from other healthcare facilities before the resident was admitted to your facility should not be reported as LabID Events.

The data collected will enable participating facilities and CDC to calculate several measures, depending on which MDROs the facility chooses to track. NHSN forms should be used to collect all required data, using the definitions of each data field as indicated in the *Table of Instructions*.

Setting: MDRO LabID Event reporting is currently available for certified skilled nursing facilities/nursing homes (LTC:SKILLNURS) and intermediate/chronic care facilities for the developmentally disabled (LTC:DEVDIS). Events reported should include MDRO positive laboratory cultures obtained from any resident who is receiving care at the facility.

Requirements: Facilities must report LabID Events and denominators (number of resident admission and number of resident-days) for the entire facility, referred to as facility-wide inpatient (FacWideIN), each month for at least 6 consecutive months to provide meaningful measures. Report only one LabID Event organism (positive isolate) per form.

Facilities must indicate their reporting for the calendar month in the *Monthly Reporting Plan for LTCF* (CDC 57.141).

Definitions: The following MDROs can be selected for tracking in the LabID Event module:

Gram-stain positive organisms:

- MRSA: Any ***S. aureus*** testing resistant to oxacillin, methicillin, or cefoxitin, by standard susceptibility testing methods or by a positive result from an FDA-approved test for direct MRSA detection from that specimen source.

- MSSA: Any ***S. aureus*** testing intermediate or susceptible to oxacillin, methicillin, and cefoxitin by standard susceptibility testing methods; a positive result from an FDA-approved test for direct MSSA detection from that specimen source; or a negative result from an FDA-approved test for direct MRSA detection from a specimen source.

- VRE: Any ***Enterococcus*** **species** that is resistant to vancomycin, by standard susceptibility testing methods or by a positive result from an FDA-approved test for VRE detection from that specimen source.

Gram-stain negative organisms:

- CephR-*Klebsiella*: Any ***Klebsiella*** **species** testing non-susceptible (i.e., resistant or intermediate) to cephalosporin antibiotics like ceftazidime, cefotaxime, ceftriaxone, or cefepime.

- CRE- Any ***Escherichia coli (E. coli)***, ***Klebsiella*** **species, or** ***Enterobacter*** **species** testing resistant to imipenem, meropenem, doripenem, or ertapenem by standard susceptibility testing methods (i.e., minimum inhibitory concentrations of ≥4 mcg/mL for doripenem, imipenem and meropenem or ≥2 mcg/mL for ertapenem) OR by production of a carbapenemase (i.e., KPC, NDM, VIM, IMP, OXA-48) demonstrated using a recognized test (e.g., polymerase chain reaction, metallo-β-lactamase test, modified-Hodge test, Carba-NP). NOTE: CRE surveillance requires facilities to monitor for all three organisms (CRE-*E. coli*, CRE-*Klebsiella spp.*, ***and*** CRE-*Enterobacter spp.).*

- MDR-*Acinetobacter:* Any ***Acinetobacter*** **species** testing non-susceptible (i.e., resistant or intermediate) to at least one agent in at least 3 antimicrobial classes of the following 6 antimicrobial classes:

Antimicrobial Class	**Agents**
β-lactams and β-lactam/β-lactamase inhibitor combinations	Piperacillin, Piperacillin/tazobactam
Sulbactam	Ampicillin/sulbactam
Cephalosporins	Cefepime, Ceftazidime
Carbapenems	Imipenem, Meropenem, Doripenem, Ertapenem
Aminoglycosides	Amikacin, Gentamicin, Tobramycin
Fluoroquinolones	Ciprofloxacin, Levofloxacin

MDRO positive laboratory isolate: Any laboratory specimen source, from which a MDRO is identified, obtained for clinical decision making (as defined above) while a resident is receiving care in the facility. **Note**: Excludes tests related to active surveillance testing.

Duplicate MDRO laboratory isolate: Any MDRO isolate collected from the *same* resident while receiving care in the LTCF after an initial isolation of the same organism *during a calendar month*, regardless of the specimen source except when a unique blood source is identified (see definition below and Figure 2). **Note**: LabID event rules apply to specimens collected while the resident is receiving care in the LTCF. Specimens collected while the resident is receiving care outside of the LTCF are not taken into consideration for LabID Event reporting for the LTCF.

NOTE: A duplicate MDRO laboratory isolate should not be reported as a LabID Event.

Unique blood source MDRO laboratory isolate: A MDRO isolate identified in a blood culture from a resident with no prior isolation of the MDRO *in blood in the past 2 weeks, while receiving care in the LTCF, even across calendar months*. A unique blood source isolate should be reported even if the resident had this same MDRO previously isolated in a non-blood specimen earlier during the same calendar month (See Figure 2).

NOTE: As a general rule, at a **maximum,** there should be no more than 2 blood isolates (which would be very rare) and 1 other specimen source isolate per MDRO type reported for the same resident during a calendar month.

MDRO Laboratory-identified (LabID) Event: All non-duplicate MDRO positive laboratory isolates from any culture specimen, regardless of specimen source or MDRO unique blood source isolates obtained while a resident is receiving care in the facility.

NOTE: Laboratory data available from outside facilities, before a resident's admission, should not be entered as LabID Events.

Categorizations of MDRO LabID Events: All MDRO LabID Events will be categorized by NHSN into Community-onset vs. LTCF-onset based on date of current admission to facility and date of specimen collected. Because of variability in documenting time of admission to the LTCF, calendar days are used to categorize LabID Events.

Community-onset (CO) LabID Event: Date specimen collected ≤ 3 calendar days after resident admission to the facility (i.e., days 1, 2, or 3 of admission).

Long-term Care Facility-onset (LO) LabID Event: Date specimen collected > 3 calendar days after admission to the facility (i.e., on or after day 4).

LO can be further sub-classified as:

Acute Care Transfer-Long-term Care Facility-onset (ACT-LO): LTCF-onset (LO) LabID Event with date specimen collected ≤ 4 weeks following date of last transfer from an Acute Care Facility (Hospital, Long-term acute care hospital, or acute inpatient rehabilitation facility only).

Example: NHSN Classification of Lab ID Events as **Community-onset or LTCF-onset**

Admission date June 4th	June 5th	June 6th	June 7th	June 8th
day 1	day 2	day 3	day 4	day 5
Community-onset (CO)			**Long-term Care Facility-onset (LO)**	

Numerator and Denominator Data:

Numerator: Data on each MDRO LabID Event will be reported using the *Laboratory identified MDRO or CDI Event for LTCF* form (CDC 57.138). (See *Table of Instructions*) for information on how to complete this form.)

Denominator: Monthly totals for resident admissions and resident-days are collected using the *Denominators for LTCF* (CDC 57.142). (See *Table of Instructions*) for information on how to complete this form.)

MDRO Data Analysis: Data are stratified by time (e.g., month, quarter, etc.), whether an episode is community-onset or LTCF-onset and summarized for the entire facility.

Calculated MDRO Rates and Metrics*:

Line lists of MDRO LabID Events and the measures and calculations listed below are available as part of the CDC-defined analysis outputs within the NHSN LTCF component.

*NOTE: These calculations will be performed for each specific MDRO included in the reporting plan during a month (e.g., MRSA, VRE, etc.)

Total MDRO Rate/1,000 resident-days = Number of MDRO LabID Events per month (regardless of time spent in the facility i.e., CO + LO) / Number of resident-days per month x 1,000.

MDRO Long-term Care Facility-onset Incidence Rate/ 1,000 resident-days = Number of all LO MDRO LabID Events per month / Number of resident-days x 1,000.

Percent of MDRO LabID Events that is Community-onset = Number of MDRO LabID Events that are CO / Total number of MDRO LabID Events x 100.

Percent of MDRO LabID Events that is Long-term Care Facility-onset = Number of MDRO LabID Events that are LO / Total number of MDRO LabID Events x 100.

Percent of LO LabID Events that is Acute Care-Transfer-Long-term Care Facility-onset = Number of ACT-LO MDRO LabID Events / Total number of LO MDRO LabID Events x 100.

Figure 2. MDRO Test Result Algorithm for Laboratory-identified (LabID) Events.