Surveillance definitions for Multi-resistant Organisms (MROs)

Peter Collignon, David Looke, John Ferguson, Mary-Louise McLaws & Dolly Olesen
on behalf of the AICA National Advisory Board (NAB).

Draft definitions for surveillance of multi-resistant organisms were published in the journal last year for comment[1]. Following feedback, the modified definitions are now published below. Health care facilities are encouraged to adopt them as a method of monitoring and controlling the spread of MROs. Feedback on their utility is encouraged to allow additional refinement in the future.

Introduction

Infections with organisms resistant to standard antimicrobial therapy are an increasing problem for health care facilities. Resistant organisms can spread rapidly within facilities and cause serious infections, often in the most compromised patients. When these infections occur, therapy is often limited and in some cases no effective antibiotics are available.

MRSA is the most common multi-resistant organism (MRO) in most hospitals. However, VRE, extended spectrum beta-lactamase producing Gram-negative rods (e.g. ESBL *Klebsiella* spp.) and multiresistant *Acinetobacter* spp. are becoming increasing problems. Surveillance of MROs is essential to establish the extent of MRO infections. These data provide clinicians with information to review outcomes, evaluate current practices, implement protocols to control MROs, measure the success of our interventions and publish findings. As a minimum we recommend that every acute care institution perform surveillance for MRSA using the Primary MRO morbidity indicator described below.

The management of MROs does not just involve surveillance; we also need to promote strategies that minimise cross infection and induce behavioural change to achieve objectives such as:

- Effective containment of MROs through the appropriate use of standard and additional precautions.
- Prompt identification of colonised and infected individuals.
- Appropriate cleaning.
- Ensure outbreak management protocols are in place.
- Controls on the quantity and types of antimicrobial usage. The emergence and spread of these resistant bacteria occurs much more easily under the selective pressure of antimicrobial exposure.

The recently revised Communicable Diseases Network Australia publication entitled *Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting* provides the basis upon which to move towards a consistent national approach and practices to minimising the spread of infection.

Health care facilities will have varying rates of endemicity for particular MROs. These will be influenced by factors such as the presence of patients who are colonised with the MRO, casemix, patient demographics e.g. multiple admissions to hospital etc. and type and intensity of care offered. The definitions recommended below were developed by the AICA National Advisory Board to provide a reliable and practical approach to measuring health care associated infections resulting from multi-drug resistant organisms.

A glossary of terms is given opposite to help understand the meaning of some of these terms and definitions. The adoption of the definitions will enable institutions to measure their rates of colonisation and infection by MROs. Additionally, the information collected will facilitate the measurement of the effectiveness of prevention activities and the early detection of outbreaks.

Key points

- The purpose of the following surveillance indicator definitions is to monitor 'targeted MRO' and 'flag' problem areas requiring further detailed investigation.
- The definitions are not designed for diagnostic purposes.
- In accordance with the philosophy of total quality management, surveillance data should be used to monitor the performance of a facility. Comparison of rates (both infection and colonisation) between facilities is strongly discouraged as there will be marked differences in the types and numbers of patients admitted to different hospitals (e.g. casemix, types of

surgery, numbers of admissions etc.) and the extent of surveillance cultures undertaken. Should area authorities want to ascertain the scope of the problem across a number of facilities, they must ensure that all of the facilities in question are using the same methodology.

Surveillance indicator definitions

These surveillance indicators are designed for antibiotic resistant organisms that can spread amongst patients within hospitals and can colonise or cause invasive infections during health care procedures.

- Methicillin-resistant *Staphylococcus aureus* (MRSA).
- Vancomycin resistant *Enterococcus* spp (VRE).
- Extended-spectrum beta-lactamase (ESBL) producing *Klebsiella pneumoniae.*
- Multiple antibiotic resistant *Acinetobacter* spp.

Most of these resistant bacteria are readily identified in microbiology laboratories and on laboratory reports (e.g. MRSA). However, close liaison with the microbiology laboratory is of utmost importance as some of these bacteria can now be introduced into hospitals from the community (e.g. community strains of MRSA that are usually not multi-resistant and are causing community acquired infections). Surveillance across areas using multiple laboratories must ensure that each laboratory uses a common definition in their reports for these resistant bacteria.

Three indicators are described. The most important is the primary indicator which measures the Morbidity caused by a MRO (i.e. new infections). The other two are secondary indicators. They measure the estimated MRO Burden and MRO Acquisition rate (i.e. measure not only infection but also colonisation).

Primary MRO surveillance indicator

MRO morbidity

This indicator measures infection (i.e. does *not* include colonisation). It measures how much disease (i.e. infection) the MRO has caused. Occupied bed days (OBDs) are used as the denominator so that different time periods within the same hospital can be compared.

- Count all patients with new health care acquired infections attributed to the MRO of interest for the surveillance period (count only the first infection in each patient for each admission; colonisation is *not* counted).
- Use the following equation:

$$\frac{\textit{No. of patients with a new infection for the surveillance period}}{\textit{Total OBDs for surveillance period}} \times \frac{10{,}000}{1}$$

The top number is multiplied by 10,000 in order to reduce confusion as this removes decimal points in the final answer. The rate is now expressed as the number of patients with a new MRO infection per 10,000 OBDs.

Definition of terms/glossary

Colonised: Patient with a non-sterile site isolate (e.g. axilla) and not receiving MRO-specific antibiotic therapy.

Forty-eight hour rule: Health care associated events (i.e. those acquired during health care delivery and not present or incubating on admission) are defined as those that occur more than 48 hours after hospital admission or within 48 hours of discharge. For inpatient neonates, such events occur >48 hours after delivery.

Infection: An event associated with a sterile site isolate, or an event associated with a non-sterile site clinical isolate, where MRO specific antibiotic therapy was administered by a clinician (e.g. when vancomycin or fusidate/rifampicin are administered as therapy for pneumonia after MRSA has been isolated from sputum). Patients that are given empirical therapy for an MRO infection on the basis of clinical suspicion and no other evidence other than previous positive screening swabs should not be included.

New acquisitions: Patients who become colonised or infected for the first time in your institution during the period of surveillance. Note that some MROs can be community acquired. The 48 hour rule can be applied or the episode allocated as a health care associated event if in the judgement of the ICP this is likely to have been the case.

New infections: The number of patients who develop health care associated infections (i.e. become 'infected' not just colonised) during the period of surveillance. Previously colonised patients who develop infection are counted as events. Only the first infection event for an admission is counted.

Occupied Bed Days (OBDs): For each patient/client the number of OBDs is calculated as: separation date minus admission date; except for same-day inpatients who will be included as having one OBD.

OBDs (monthly) is the sum of all bed-days from the first day of the month to the last day of the month inclusive. It includes bed-days for the calendar period only. If a patient was either admitted or separated from the hospital during the period, the number of bed-days that will be included in the OBDs figure will be only those that were incurred during this period.

OBDs (separation) are the total number of bed-days attributable to patients who were separated from the hospital during the period regardless of the calendar period(s) of their stay.

Non same-day OBDs are calculated by subtracting from the total OBDs the number of same-day separations.

Sterile site isolate: A significant isolate obtained from the blood stream, a normally sterile body cavity (peritoneum, pleural or pericardial space or CSF) or a tissue sample collected by aseptic means.

Table 1. Core data set to be collected for each patient with an MRO.

This is a suggested example of a data sheet that will need to be collected for each patient with an MRO during a surveillance period

Field name

- Organism name
  Full organism name identifying type of MRO eg MRSA, or non multi-resistant MRSA, VRE etc)
- Patient's name
- Medical record number
- Same day patient? *(i.e. day only) – Yes or No*
- Specialty unit, service or ward where MRO was acquired (e.g. ICU)
- Admission date
- Discharge date
- Specimen date
  Date of first isolate associated with an infection or colonisation
- New acquisition
  i.e. have they ever had this MRO before – Yes or No
- Infection Status
  Infected or just colonised
- Infection or colonisation site
- Sterile site or non-sterile site?
  Plus record the actual site eg blood, sputum, groin etc
- Was this MRO acquired in a health-care institution or the community.
  If health-care associated, was it as an inpatient or as a non-inpatient?
- Laboratory name and laboratory specimen number or antibiotic sensitivity data (optional)

To better identify which MROs are causing more serious disease, these data can be stratified as to whether they involve sterile sites on not. To help identify and follow those areas within the hospital with a higher burden of problems with MROs, the data should also be stratified by ward areas (e.g. ICU). Individual MRO events should be identified as either sterile site (e.g. blood stream) or non-sterile site (e.g. wound) during surveillance.

Surveillance for non-sterile site infection events is inherently less accurate than detection of sterile site events. It is therefore useful to record the details of each MRO infection in terms of this parameter. If a patient with a non-sterile site MRO event later develops a sterile site MRO event during the same admission, this latter event should be counted rather than the existing non-sterile site event.

If 'same day' patients are not included in surveillance then the denominator (OBDs) should exclude them also. Non 'same day' OBDs are calculated by subtracting from the total OBDs the number of same-day separations (see glossary).

Primary indicator

- Collect data on all new health care associated infections caused by a MRO, even if the patient is previously known to be MRO colonised; a new episode of bacteremia due to MRSA in a patient previously with a MRSA wound infection during a previous admission is counted.
- Only one infection is to be counted in an individual patient during a single admission, even if multiple infections with the same organism occur at different sites during that same admission (e.g. an MRSA bacteraemia followed by a wound infection).
- For the purpose of stratification by wards, infections or colonisations that occur or are detected more than 48 hours after ICU admission or within 48 hours of discharge from ICU are deemed to be ICU acquired.

Secondary MRO surveillance indicators

These indicators measure both infection and colonisation combined. One measures the prevalence rate (or Burden) and the other the incidence rate (or Acquisition). They are not as important as the primary indicator and are subject to significant bias because they depend upon the intensity of surveillance culturing undertaken in the facility in question. This will effect how much colonisation is detected. Any attempt to make comparisons requires a uniform approach to screening and is therefore, in general, discouraged. However, they can at times be extremely useful and should be used as one of the surveillance tools in the infection control programme.

Estimated MRO burden (estimated prevalence)

- Count all known patients who are discharged during the surveillance period who had a positive culture for a MRO, regardless of whether it was infection or just colonisation. Also ignore whether the status of the carriage of the MRO is new or old. If the same patient with MRSA is discharged twice in a particular period, he/she is counted twice.
- Use this equation to estimate prevalence:

$$\frac{\text{No. of MRO+ve separations (old and new infection and colonisation) for the surveillance period} \times 10{,}000}{\text{Total OBD for the surveillance period} \quad 1}$$

- If possible, stratify this burden rate by ICU, service or ward (depending on the facility).

Estimated MRO acquisition (estimated incidence)

This is used to estimate how many times 'new' patients acquire or become colonised with the 'targeted' resistant bacteria (patients

are only to be counted once even if discharged multiple times during any particular time period – e.g. if over a 6 month surveillance period a dialysis patient with MRSA is admitted and discharged 4 times, they are only counted once).

- Count all MRO positive (i.e. those colonised as well as those with infections) where there is a new acquisition of the resistant bacterium during the surveillance period. This means that patients known to have been previously colonised or infected with the same resistant bacteria are excluded.
- Use the following equation to estimate the incidence of 'new' acquisition:

$$\frac{\textit{No. of new MRO+ve acquisitions (new infection and new colonisation) for the surveillance period} \quad x\ 10{,}000}{\textit{Total OBD for the surveillance period} \quad 1}$$

Where possible, stratify this acquisition rate by ICU or non intensive care. Non intensive care areas can be further subdivided as appropriate (e.g. by service or ward) to provide service-specific morbidity rates.

Secondary indicators

- For the estimate of 'new' MRO acquisition, only new health care associated MRO infections and colonisations should be counted (i.e. patients neither previously documented as colonised or infected).
- To determine whether an event is 'health-care associated' (either inpatient or non-inpatient), use the definitions previously determined by the AICA National Advisory Board because the allocation of a place (ward or other facility) for acquisition can be difficult and subject to bias. The 48 hour rule can usually be used for defining an inpatient associated health care infection; however, the infection control practitioner (ICP) may need to allocate the patient on a consistent 'best guess' basis on some occasions.
- MRO colonised patients should continue to be counted as colonised until they are formally 'cleared'. For the estimated MRO Burden indicator, a previously colonised patient is counted as colonised even if no screening sample was taken for that admission if they have not formally been 'cleared'. Draft guidelines on when patients are 'cleared' of MROs and when and where surveillance cultures should be collected are given in this edition of the journal (see article by Dr J. Ferguson page viii).
- In determining whether a patient has had previous colonisation or infection with an MRO, it is important to examine relevant pathology laboratory information from at least the previous 12 months.

General notes

Stratified rates and ICU

In most acute care settings, acquisition and morbidity rates for MROs are significantly higher in ICU patients than non-ICU patients. As such, it is important that the primary indicator be stratified by ICU status, with separate rates produced for each type of ICU service operating within the hospital.

Same day or day only patients

These patients can be included. However, if included, then same-day or single-day episodes of care will need to be also included in the denominator. For these patients, the wider definition of health care associated that includes non-inpatient associated events will also need to be used (that is not just the 48 hour rule). These patients will usually have a much lower rate of acquisition and infection with MROs compared to patients who are in hospital for more than 1 day.

Denominator

OBDs was chosen as the denominator as it is consistent with other similar indicators and preferred by hospital epidemiologists. It is preferable if OBDs that only included 'overnight' stays were used (i.e. exclude day only cases). If 'same day' patients are not included in surveillance then the denominator should exclude them also. An other denominator that can be used is the number of separations. The calculated rates will then be expressed per 10,000 separations.

In facilities where the numbers of patients admitted overnight are relatively stable, the ratio of MRO positive patients to the number of hospitalised patients is likely to be as accurate as a rate determination using OBDs.

Comparison of rates

Intra health care facility (within own facility) comparison

If health care facilities make comparisons, ensure that microbiological surveillance and definitions have remained consistent for the periods in question.

Inter health care facility (between facilities or hospitals) comparisons

If this is done, these should *not* include the estimated rates for burden or acquisition as both these rates include colonisation and methods of detection will very likely differ significantly from facility to facility (e.g. how often and from where are swabs collected to look for MRSA).

Analysis of data

Monthly, quarterly or annual rates can be calculated. The denominator will represent the chosen period chosen for the identification of MROs (i.e. MROs identified in one quarter will be divided by the number of OBDs for that quarter). Alternatively, control charts can be used to display both absolute numbers and rates, stratified by ward or service depending upon the organisational structure of the facility.

References

1. National Advisory Board, Australian Infection Control Association. Draft surveillance indicator definitions: multi-resistant organisms. Aust Infect Cont 2001; 6(4):136-139.