AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

AURA Antimicrobial Use and Resistance in Australia

CARAlert THE NATIONAL ALERT SYSTEM FOR CRITICAL ANTIMICROBIAL RESISTANCE

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National Alert System for Critical Antimicrobial Resistances (CARAlert)

Standard Operating Procedures

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Introduction

The National Alert System for Critical Antimicrobial Resistances (CARAlert) was established by the Australian Commission on Safety and Quality in Health Care (the Commission) in March 2016, with funding from the Department of Health and Aged Care (the Department). CARAlert is part of the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System. It collects data on nationally agreed priority organisms with critical resistance to last-line antimicrobial agents. It is an important element of informing early response capability for states and territories.

While critical antimicrobial resistances (CARs) have historically occurred in low numbers in Australia, overseas experience has shown that they can result in significant morbidity in healthcare facilities and in the community. Since 2018, the most frequently reported CAR has been carbapenemase-producing *Enterobacterales* (CPE) which is an organism of concern as it poses a significant risk to patient safety given its high level of resistance.

CARAlert was established to provide:

- Timely advice to state and territory health authorities on the occurrence of CARs in their hospitals and communities
- A national picture of CARs, which are an important component of overall resistance in Australia
- Standardised guidance on processes for confirming CARs.

Some data on CARs are captured through local surveillance programs, where these exist, or through programs for nationally notifiable diseases. CARAlert supports both collection and communication of information on confirmed CARs and potential CAR outbreaks, as close as possible to the time of confirmation.

Each state and territory health authority has nominated staff who are authorised to access the CARAlert system, via a web portal, to review CAR records for their state or territory. In addition to this direct access, information on confirmed CARs reported to CARAlert is issued to authorised Department staff, state and territory health authority officers and confirming laboratory users via a Weekly Summary.

Scope of this document

This document provides an overview of the protocols and procedures relating to the operation of CARAlert and describes the roles and responsibilities of key stakeholders involved with the system.

Further detail about the CARAlert system can be found in the CARAlert Laboratory Handbook. Reports and analyses of data collected through the CARAlert system are provided on the Commission's website.

CARAlert processes

The CARAlert system is based on routine processes used by pathology laboratories for identifying and confirming potential CARs:

- Collection and routine testing – the specimen is collected from the patient and sent to the originating laboratory for routine testing. Isolates from routine culture considered to be pathogens undergo antimicrobial susceptibility testing
- Confirmation – if the originating laboratory considers that the isolate is a CAR, the isolate is sent to a confirming laboratory that has the capacity to confirm the CAR
- Reporting to clinicians in accordance with usual laboratory processes – the confirming laboratory reports back to the originating laboratory, which in turn reports to the clinician who initially requested the microbiological testing
- Submission to the CARAlert system – the confirming laboratory advises the originating laboratory of the result of the test, and the originating laboratory reports back to the health service that cared for the patient from whom the specimen was collected; the confirming laboratory then submits the details of the resistance and organism into the secure CARAlert web portal.

No patient-level data are submitted to, or held in the CARAlert system. Authorised officers in each state and territory health department can access the CARAlert web portal directly for further information about their jurisdiction, including the name of the public hospital where a patient with a confirmed CAR was cared for, and to extract reports on their data. Information about whether cases originated in aged care settings or in the community is also available.

Public and private pathology laboratories that have the capacity to confirm CARs have been identified through consultation with state and territory health authorities, the Public Health Laboratory Network (PHLN) and the Australian Group on Antimicrobial Resistance (AGAR). As at December 2022, there are 25 confirming laboratories participating in CARAlert (see Appendix 1).

The CARAlert system generates a weekly summary report on confirmed CARs, which is provided by email to nominated personnel in the states and territories, the Department and the confirming laboratories. The weekly summary includes the following information on confirmed CARs:

- State or territory of record*
- State or territory of patient residence
- CAR name
- CAR type
- Date of collection
- Facility type
- Patient age range
- Date of confirmation
- Confirming laboratory name.

* In the first instance, this refers to the state or territory in which the hospital is located. Where this information has not been entered, or if the source of the isolate is from the community, this refers to the patient's state or territory of residence.

Further detail about the CARAlert operational model is included in Appendix 2.

Critical antimicrobial resistances reported through CARAlert

The organisms reported through CARAlert are drawn from the Priority Organisms List for national reporting as part of the AURA Surveillance System. The scope of organisms and CARs are regularly reviewed, based on the latest evidence on CARs that emerge in Australia and overseas.

Reviews of CARs reported to CARAlert were conducted in 2016, 2018 and 2022. No changes were made after the 2016 review, which also considered operational processes and notifications.

The 2018 review considered CARs, and laboratory reporting processes including capacity to confirm and submit CARs. Four additional CAR were added – transferrable colistin resistance in *Enterobacterales*, carbapenemase-producing *Acinetobacter baumannii* complex, carbapenemase-producing *Pseudomonas aeruginosa* and *Candida auris*.

The most recent review, undertaken in 2022, resulted in two additional CARs reported to CARAlert – ciprofloxacin-nonsusceptible *Neisseria meningiditis* and gentamicin-resistant *N. gonorrhoeae*. Reporting of daptomycin-nonsusceptible *Staphylococcus aureus* was suspended and will be considered for reintroduction when more reliable phenotypic testing methods are available.

From 1 January 2023, the CARs listed in Table 1 are reported to CARAlert.

Table 1: Critical antimicrobial resistances for reporting to CARAlert

Species	Critical resistance
Acinetobacter baumannii complex	Carbapenemase-producing*
*Candida auris**	-
Enterobacterales	Carbapenemase-producing, and/or ribosomal methyltransferase-producing
	Transmissible colistin resistance*
Enterococcus species	Linezolid-resistant
Mycobacterium tuberculosis	Multidrug-resistant (resistant to at least rifampicin and isoniazid)
Neisseria gonorrhoeae	Ceftriaxone- or azithromycin[#]-nonsusceptible
	Gentamicin-resistant[†]
Neisseria meningiditis	Ciprofloxacin-nonsusceptible[†]
Salmonella species	Ceftriaxone-nonsusceptible
Shigella species	Multidrug-resistant
Staphylococcus aureus complex[§]	Vancomycin- or linezolid-nonsusceptible
Streptococcus pyogenes	Penicillin reduced susceptibility
Pseudomonas aeruginosa	Carbapenemase-producing*

* Reported to CARAlert from 1 July 2019
† Reported to CARAlert from 1 January 2023
§ For CARAlert, *S. aureus* complex includes *S. aureus, S. argenteus* and *S. schweitzeri*
# Low level-azithromycin-nonsusceptible *N. gonorrhoeae* excluded from the Weekly Summary following review in 2018

Intended use of data collected through CARAlert

The data generated through CARAlert are not intended for use in epidemiological analyses. Rather, the information collected through CARAlert allows health service providers, laboratories, public health units and policymakers at local, state and territory, and national levels to receive timely reports and analyses of national data that complement current local reporting to the providers of patient care. In addition, regular reports, with analyses, are made available on the Commission's website.

Since October 2016, secure access to the CARAlert system has enabled designated state and territory health personnel to view records for their own jurisdiction at any time. The available information includes the name of the public hospital where the patient who had the infection was being cared for, at the time the specimen was collected. This enables timely monitoring of the geographic distribution of CARs, and liaison with hospitals, as appropriate, to confirm that infection prevention and control action has been taken in the event of an outbreak. These authorities can also generate their own reports from CARAlert.

It is intended that states and territories will use this data to identify local issues, and respond to potential and proven multi-site outbreaks of CARs. Laboratory identification numbers are included in all reports submitted through CARAlert, providing designated state and territory users with an opportunity to contact confirming laboratories directly for further information and/or to discuss potential outbreaks in their jurisdiction. Primary responsibility for clinical response to CARs lies with local health organisations, and state and territory health departments. Some states have made CPE notifiable, and others have implemented local surveillance of this CAR – CARAlert complements this local data.

Roles and responsibilities of stakeholders who provide data to CARAlert

The effective operation of CARAlert relies on the cooperation and collaboration of a range of stakeholders. In order to ensure the effective operation of CARAlert, and the use of results from the system, the roles and responsibilities of stakeholders who provide data to CARAlert are outlined below.

Originating laboratories

The roles and responsibilities of originating laboratories relating to the CARAlert system are outlined below:

- Undertake the first routine testing of isolates
- Identify isolates that may have the potential to be a CAR
- Notify the requesting clinician of the test results, and the suspected CAR
- Send the suspected isolate to a confirming laboratory for confirmation, with the CARAlert Isolate Referral Form. Preliminary results generated during initial testing must also be provided to the confirming laboratory
- Include details for mandatory fields on the CARAlert Isolate Referral Form, as the confirming laboratory is required to enter this information into the CARAlert web portal if a CAR is confirmed:
    - name of originating laboratory (laboratory reporting on first isolation)
    - specimen identifier (accession number allocated by the originating laboratory, required for tracking purposes)
    - date of specimen collection
    - date specimen referred
    - organism name (genus and species)
    - clinical isolate or screen
    - specimen type (blood, urine, wound, screen, other)
    - facility type (hospital, aged care home, other, unknown), where the specimen was collected
    - if facility type is a hospital, name of hospital
    - patient demographic data – date of birth, sex and postcode of patient's residence (for an overseas patient, record as '9999'). Note: Date of birth is converted to an age range, prior to transmission to the CARAlert system.

In some cases, the originating laboratory may also be the confirming laboratory, where the necessary tests can be undertaken and the results entered into CARAlert. These laboratories are required to register with the Commission to gain access to CARAlert.

The information can be provided to the confirming laboratory by completing the CARAlert Isolate Referral Form and including it with the isolate.

Confirming laboratories

The roles and responsibilities of confirming laboratories relating to the CARAlert system are outlined below:

- Receive isolates from originating laboratories for confirmation of a CAR
- Undertake the necessary confirmatory tests for a CAR
- Notify the originating laboratory of test outcomes through the usual communication channels, regardless of whether a CAR is confirmed or not
- Once an isolate has been confirmed as a CAR, and after the originating laboratory has been notified, enter data into the CARAlert web portal. This includes data provided from the originating laboratory:
  - name of originating laboratory (laboratory reporting on first isolation)
  - specimen identifiers (accession numbers allocated by the originating laboratory and confirming laboratories, required for tracking purposes)
  - date of specimen collection
  - date specimen referred
  - organism name (genus and species)
  - clinical isolate or screen
  - specimen type (blood, urine, wound, screen, other)
  - facility type (hospital, residential aged care facility, other, unknown), where the specimen was collected
  - if facility type is a hospital, name of hospital
  - patient demographic data – date of birth, sex and postcode of patient's residence (for an overseas patient, record as '9999'). Note: Date of birth is converted to an age range prior to transmission to the CARAlert system
- Confirming laboratories must also enter the following additional information on CARs:
  - name of confirming laboratory (laboratory confirming CAR)
  - date of confirmation
  - CARs
  - type or subtype if known or relevant (e.g., IMP, IMP-4). Subtyping can occur outside the five working day window
- Store all confirmed CAR isolates according to usual standard operating protocol.

Confirming laboratory users should refer to the Quick Reference Guide for the CARAlert web portal.

Roles and responsibilities of state and territory contacts with designated access to data from the CARAlert system

The roles and responsibilities of the contacts from state and territory health departments with designated access to data from the CARAlert system include:

- Review of the detailed information available to designated officers through the CARAlert system web portal, and the information on confirmed CARs provided in the weekly summary reports
- Use this information to liaise with relevant personnel to obtain further detail, and if required, commence jurisdictional investigation. This will assist in guiding/supporting any actions that may be required in response to the CAR(s) identified in their jurisdiction. This may include informing relevant personnel in facilities where CARs have been identified, or providing them with targeted infection prevention and control information, or other supports to minimise risk of transmission
- Subject to jurisdictional governance arrangements, coordinate communication with health services within their jurisdiction and other jurisdictions where patient transfers are known to have occurred, to prevent further spread of infection
- Provide health services with additional information to assist in the monitoring and management of confirmed CARs within their facilities and to provide guidance on infection prevention and control strategies and antimicrobial responses where necessary
- Subject to jurisdictional governance arrangements, in the event of an outbreak, coordinate/support actions to identify transmission pathways and implement strategies to control the spread of the CAR(s)
- Provide information and advice to health services on infection prevention and control issues related to the specific CARs as required.

It is noted that a number of the states and territories have complementary reporting processes in place for some resistances (e.g., CPE) and may utilise the results available through CARAlert differently in those cases. However, the role of CARAlert in identifying potential outbreaks remains of national value.

Authorised jurisdictional users should refer to the Quick Reference Guide for the CARAlert web portal.

Roles and responsibilities of other users of data from the CARAlert system

Some of the roles and responsibilities of other stakeholders with access to data from the CARAlert system are outlined below.

Clinicians

- Receive timely information on confirmed CARs from the originating laboratory, through usual notification processes.
- Keep up to date with the findings of the latest CARAlert data updates and annual summary reports published on the Commission's website – and where appropriate, use this information to improve local knowledge and awareness of critical resistances and support appropriate antimicrobial prescribing.

Health services

- Monitor confirmed CARs in their facilities and, where necessary, implement infection prevention and control strategies, and antimicrobial stewardship programs to prevent and/or minimise the impact of CAR transmission.
- Keep up to date with the findings of the latest CARAlert data updates and annual summary reports published on the Commission's website – and where appropriate, use this information to improve local knowledge and awareness of critical resistances and support appropriate antimicrobial prescribing.

Roles and responsibilities of the Australian Commission on Safety and Quality in Health Care

The Commission developed the AURA Surveillance System and CARAlert, and is responsible for ongoing coordination and management of these systems. Key responsibilities include:

- Identifying priority organisms for inclusion in reporting to CARAlert
- Providing information technology (IT) and procedural support in relation to the CARAlert System to originating and confirming laboratories, state and territory health departments and private facilities where CARs are confirmed, as required
- Analysis of CARAlert data and communication of the results of analyses
- Providing regular reports on analyses of trends in CARs through data updates and annual reports on the Commission's website.

When a CAR is submitted to CARAlert by a confirming laboratory, an email with summary information is sent to designated Commission officers. The record is reviewed for any unusual patterns in the data. CAR records are downloaded on a weekly basis from the CARAlert web portal and added to a master database by the scientific advisor, and held securely by the Commission.

The Commission's scientific advisor regularly reviews the data for inconsistencies and possible duplicate entries. Records flagged for these reasons are checked directly with the confirming laboratory. If action is required, the Commission notifies the relevant contracted system hosts and IT support organisation of the corrections required. Changes are made on a weekly basis; the Commission manages this communication. Final checks are made by the Commission to ensure the changes were successful.

If upon reviewing the records submitted to CARAlert, a potential outbreak is suspected, the scientific advisor will notify the Stream Director and senior medical advisor at the Commission. Contact will then be made with the relevant jurisdiction to clarify the local circumstances and response, as needed.

Appendix 1 CARAlert confirming laboratories

The Commission thanks all originating and confirming laboratories for their support for CARAlert and the AURA Surveillance System. The following confirming laboratories contribute to CARAlert (as at December 2022):

State or Territory	Institution
Australian Capital Territory	ACT Pathology, Garran
New South Wales	NSW Health Pathology, Concord Hospital, Concord
	NSW Health Pathology, Liverpool Hospital, Liverpool
	NSW Health Pathology, John Hunter Hospital, New Lambton Heights
	NSW Health Pathology, Royal North Shore Hospital, St Leonards
	NSW Health Pathology, Royal Prince Alfred Hospital, Camperdown
	NSW Health Pathology, St George Hospital, Kogarah
	NSW Health Pathology, The Prince of Wales Hospital, Randwick
	NSW Health Pathology, Westmead Hospital, Westmead
	St Vincent's Pathology (SydPath), Darlinghurst
Northern Territory	Territory Pathology, Tiwi
Queensland	Pathology Queensland, Central laboratory, Royal Brisbane and Women's Hospital, Herston
	Pathology Queensland, Forensic & Scientific Services, Coopers Plains
	QML Pathology, Murarrie
	Sullivan Nicolaides Pathology, Bowen Hills
South Australia	SA Pathology, Royal Adelaide Hospital, Adelaide
Tasmania	Royal Hobart Hospital, Hobart
Victoria	Alfred Pathology Service, Melbourne
	Dorevitch Pathology, Heidelberg
	Microbiological Diagnostic Unit Public Health Laboratory, Melbourne
	Victorian Infectious Diseases Reference Laboratory (VIDRL), Melbourne
	Melbourne Pathology, Collingwood
	Monash Pathology, Clayton
Western Australia	PathWest Laboratory Medicine WA, Fiona Stanley Hospital, Murdoch
	PathWest Laboratory Medicine WA, QEII Medical Centre, Nedlands

Appendix 2 CARAlert alert process

Figure 1: CARAlert operational model process

STEP 1 – Detecting a possible CAR

- Possible CAR referred to confirming laboratory
- All isolates accompanied by information required by CARAlert in an appropriate request form

STEP 2 – Confirmation

- Molecular and/or phenotypic confirmation tests are done in a timely manner (no longer than five working days). Refer to Section 2*: Detection of CARs*
- If not a confirmed CAR, the originating laboratory will be notified through normal communication channels
- If a CAR is confirmed, the confirming laboratory will notify the originating laboratory and enter data items into the CARAlert web portal

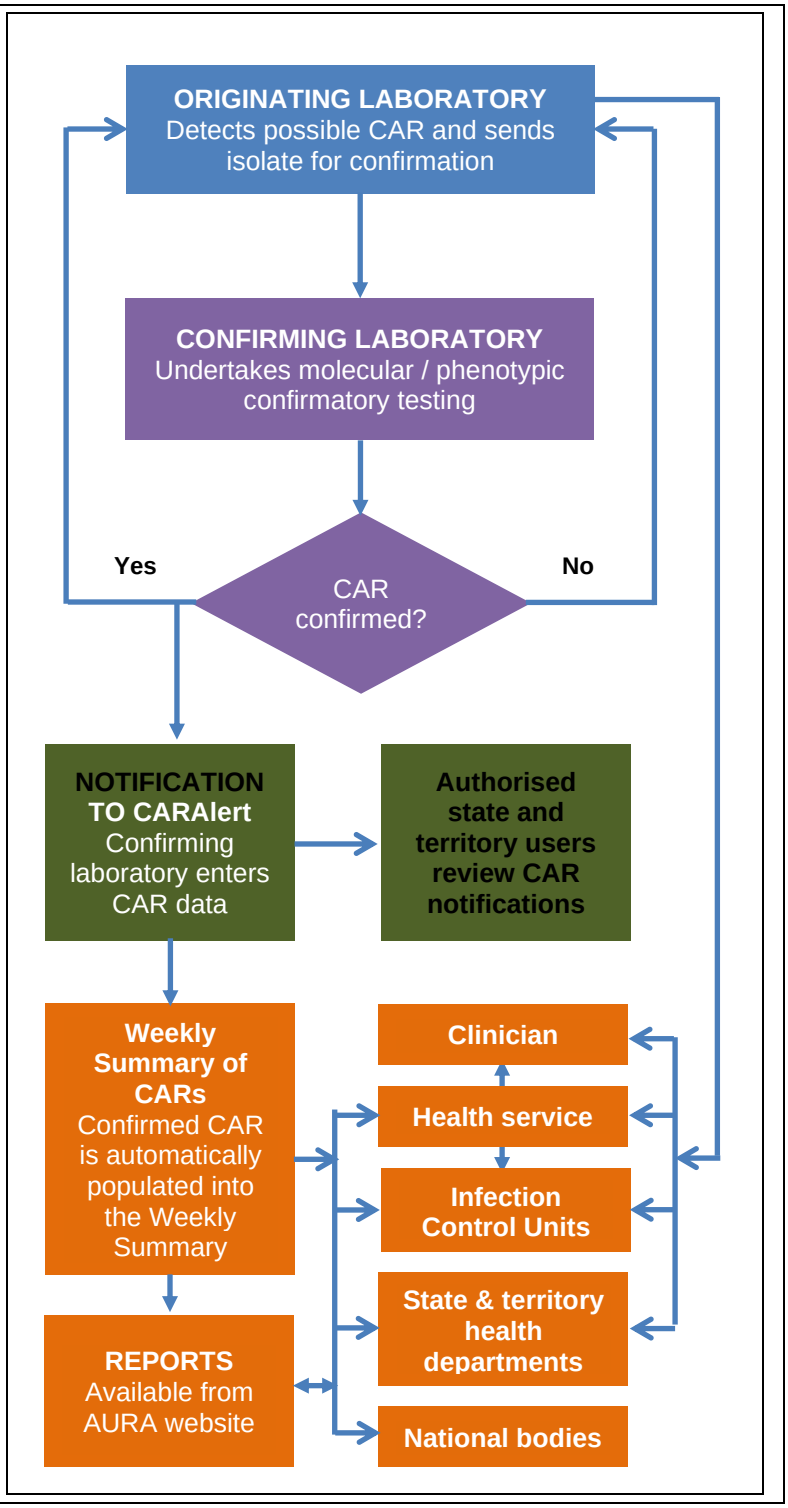
STEP 3 – Notification to CARAlert

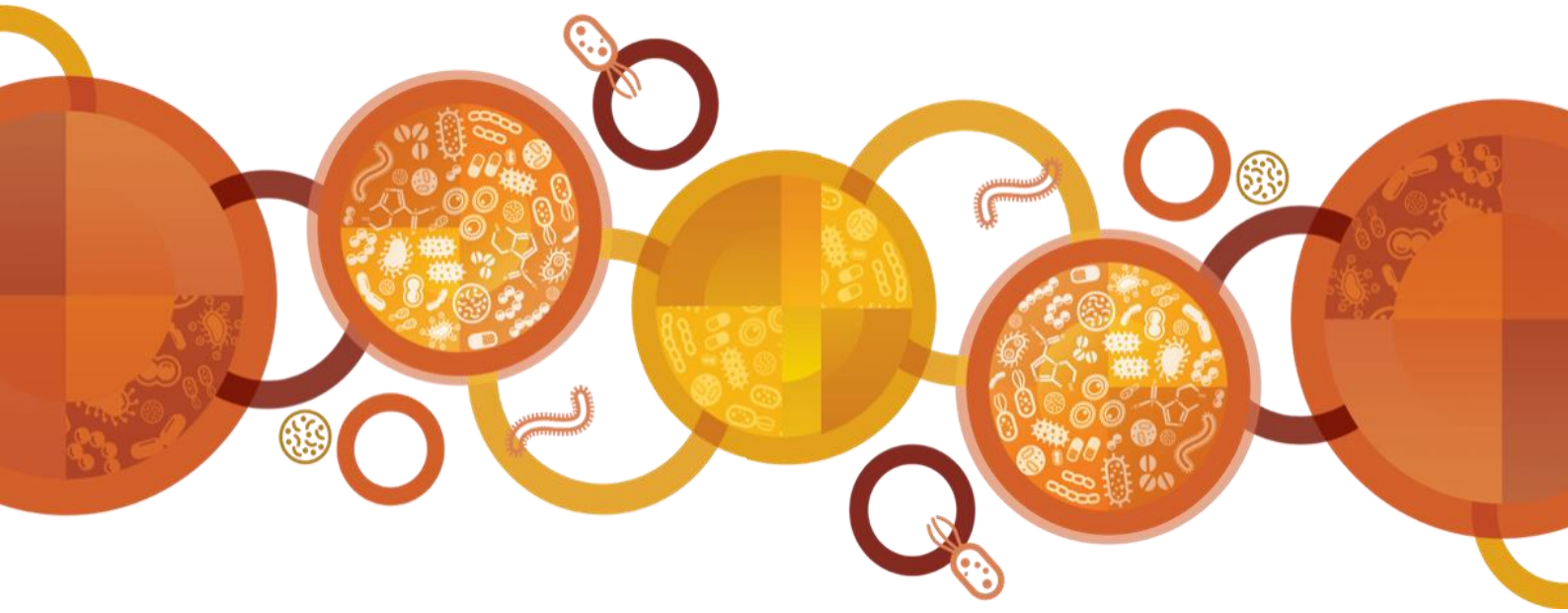
- Via secure access, a confirming laboratory enters confirmatory data items into CARAlert, as listed in Section 1.6: *Roles and responsibilities of confirming laboratories and authorised state and territory health department users*

STEP 4 – Weekly Summary of CARs

Following the completed entry of a CAR:

- Information automatically populates the weekly Summary of CARs which is circulated each Thursday to authorised Commission, state and territory health department and Australian Government Department of Health users, and all confirming laboratories
- Bimonthly data updates and annual reports are published on the Commission's website





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