CLINICAL AND LABORATORY STANDARDS INSTITUTE®

5th Edition

M39

Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data

This guideline describes methods for recording and analyzing antimicrobial susceptibility test data, consisting of cumulative and ongoing summaries of susceptibility patterns of clinically significant microorganisms.

A guideline for global application developed through the Clinical and Laboratory Standards Institute consensus process.

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Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data

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Abstract

Susceptibility statistical data, consisting of the cumulative and ongoing summary of the antimicrobial susceptibility patterns of clinically important microorganisms, are important to the practice of medicine on several levels. If the methods used to create, record, and analyze the data are not reliable and consistent, many of the most important applications and benefits of the data will not be realized. Clinical and Laboratory Standards Institute document M39—*Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data* provides guidelines for medical laboratories and data analysis software providers for the routine generation and storage of susceptibility data and for the compilation of susceptibility statistics. This guideline also provides suggestions for medical laboratories, clinicians, and others involved in antimicrobial stewardship on effective use of their cumulative susceptibility statistics when empirical antimicrobial therapy is selected.

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Foreword

Cumulative results from antimicrobial susceptibility tests performed on individual patients' microbial isolates can be useful when compiled and reported at regular intervals. For a cumulative report (eg, antibiogram) to be compared with reports from previous years or from other facilities, data need to be analyzed and presented in a clear and consistent manner.

The primary aim of M39 is to guide the preparation and use of antibiograms by clinicians for selecting the most appropriate antimicrobial agents for empirical therapy for initial infections when definitive antimicrobial susceptibility test results are not available. Various types of cumulative antimicrobial susceptibility test data reports are used to support antimicrobial stewardship and infection prevention efforts. In addition, cumulative antimicrobial susceptibility test data may be of value to researchers when antimicrobial resistance is assessed.

Since the last edition of this guideline, there have been many changes in public health and medical microbiology laboratories with the introduction of rapid diagnostic tools (eg, multiplex molecular panels) and advanced informatics. Furthermore, there has been an increased emphasis on antimicrobial stewardship and public health initiatives to help contend with the global health threat of antimicrobial resistant microorganisms. Therefore, many of the changes in this guideline reflect how the antibiogram and other types of cumulative antimicrobial susceptibility test data reports can support these needs.

Overview of Changes

This guideline replaces the previous edition of the approved guideline, M39-A4, published in 2014. Several changes were made in this edition, including:

- Adding definitions for "cumulative antimicrobial susceptibility test data report" and "antibiogram"
- Adding considerations for extracting data from different sources (eg, automated antimicrobial susceptibility testing instrument, LIS, electronic health record) for antibiogram preparation
- Combining results from rapid diagnostics and antimicrobial resistance marker testing with the antibiogram for empirical therapy selection
- Developing antibiograms for yeast and antifungal agents
- Developing antibiograms for multiple facilities, long-term care facilities, and veterinary practices
- Describing ways in which antimicrobial stewardship programs may use antibiogram data
- Adding considerations for preparing cumulative antimicrobial susceptibility test data for peer-reviewed publication
- Using statistical analysis techniques including the calculation of percentiles, interquartile ranges, minimal inhibitory concentration (MIC) required to inhibit the growth of 50% of the organisms (MIC_{50}), and MIC required to inhibit the growth of 90% of the organisms (MIC_{90})
- Adding general comment explaining the use of the "^" with intermediate breakpoints for applicable antimicrobial agents known to have the ability to concentrate in the urine
- Deleting recommendation to list percent intermediate in addition to percent susceptible for penicillin with viridans group streptococci

NOTE: The content of this guideline is supported by the CLSI consensus process and does not necessarily reflect the views of any single individual or organization.

KEY WORDS

Antibiogram

Antimicrobial agent

Antimicrobial resistance

Antimicrobial stewardship

Cumulative antibiogram

Epidemiology

Part I. Introduction and Data Acquisition

Chapter 1

Introduction

Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data

Part I. Introduction and Data Acquisition

1 Introduction

1.1 Scope

This guideline provides individuals involved with assessment of cumulative antimicrobial susceptibility test data with recommendations for the storage, analysis, and presentation of the data. The antimicrobial susceptibility test data from individual patient's isolates available for analysis are assumed to be final, accurate and in a usable format for health care providers. Recommendations cover the preparation of reports (eg, routine and enhanced antibiograms) to guide selection of empirical antimicrobial therapy. Reference to preparation of reports for other purposes is briefly discussed. This guideline is intended for use by individuals involved with:

- Analyzing and presenting cumulative antimicrobial susceptibility test data generated from testing microbial isolates from both humans and animals from single or multiple facilities (eg, clinical microbiologists, pharmacists, physicians, veterinarians, epidemiologists, infection prevention practitioners)
- Using antibiograms and other types of cumulative antimicrobial susceptibility test data to make clinical decisions, participate in antimicrobial stewardship programs, and/or participate in public health initiatives (eg, clinical microbiologists, infectious diseases specialists and other clinicians, infection prevention practitioners, pharmacists, epidemiologists, other health care personnel, and public health officials)
- Designing information systems for the storage and analysis of antimicrobial susceptibility test data (eg, LIS vendors, electronic health record [EHR] vendors, manufacturers of diagnostic products that include epidemiology analysis software, and manufacturers of epidemiology analysis or surveillance software)

This guideline does not include procedures for selecting isolates for antimicrobial susceptibility testing (AST), performing AST, interpreting AST results, nor confirming the accuracy of AST results.

1.2 Background

This guideline presents specific recommendations for collection, analysis, and presentation of cumulative antimicrobial susceptibility test data.

It is important to recognize that many of the specific recommendations presented for routine antibiogram development (eg, including only the first isolate of a given species from an individual patient during the analysis period) are made with the primary aim of guiding clinicians in the selection of empirical antimicrobial therapy for initial infections when definitive susceptibility results are not available. This report may not reveal some trends in emerging resistance, and thus cannot be used as a substitute for the careful analysis of all antimicrobial susceptibility test data derived from examining and/or analyzing all antimicrobial susceptibility test results obtained for individual patient management. For reports intended for purposes other than guiding empirical therapy (eg, identifying emergence of resistance, trending antimicrobial resistance for public health initiatives), alternative analyses may be more appropriate, and these are discussed briefly in this guideline, primarily in Subchapter 6.6.