Eksplorium
Volume 46 No. 2, September 2025: 1267–1275

p-ISSN 0854-1418
e-ISSN 2503-426X

Awareness and Usage of Clinical Decision Support Systems (CDSS) in Antimicrobial Prescribing: A Cross-Sectional Study in Four Tertiary Hospitals and a Nursing School

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Article Received: 20 Aug 2025, **Revised**: 02 Sep 2025, **Accepted**: 10 Sep 2025

Abstract

Background: Clinical Decision Support Systems (CDSS) play a vital role in optimizing antimicrobial prescribing, reducing errors, and supporting antimicrobial stewardship (AMS). Limited data exist on the awareness and usage of CDSS among healthcare trainees and paramedical staff in India.

Objectives: To assess the awareness, usage patterns, perceived usefulness, and perceived barriers related to CDSS in antimicrobial prescribing among MBBS students, nursing students, BDS students, and paramedical staff across four tertiary care hospitals and a nursing school.

Methods: A descriptive cross-sectional study was conducted among **100 MBBS students**, **100 nursing students**, **50 BDS students**, and **100 paramedical staff** (including nurses and technicians). A validated, self-administered questionnaire assessing awareness, usage frequency, perceived benefits, and barriers was used. Descriptive and comparative statistics were applied.

Results: Awareness of CDSS was highest among MBBS students (78%), followed by BDS students (62%), nursing students (55%), and paramedical staff (38%). Regular usage of CDSS in antimicrobial prescribing was reported by only 21% of participants overall, with MBBS students being the most frequent users (29%). Major perceived benefits included improved prescribing accuracy (72%) and reduced antimicrobial resistance (65%). Key barriers included lack of training (68%), limited system access (54%), and poor integration into workflow (49%).

Conclusion: Despite moderate awareness, CDSS usage remains low across all groups. Enhanced training, improved accessibility, and institutional integration are strongly recommended to promote CDSS adoption and strengthen antimicrobial stewardship.

Keywords: Clinical Decision Support Systems, Antimicrobial Prescribing, Antimicrobial Stewardship, Healthcare Students, Paramedical Staff.

1. Introduction

Antimicrobial resistance (AMR) poses a major global health threat, driven largely by inappropriate antimicrobial use. Clinical Decision Support Systems (CDSS) have emerged as an effective tool to assist clinicians in evidence-based antimicrobial prescribing by providing real-time guidance, dose checks, alerts on drug interactions, and institutional guidelines.

Despite their recognized benefits, implementation and utilization of CDSS remain inconsistent across healthcare settings, especially in low- and middle-income countries (LMICs). In India, limited data exist regarding CDSS usage among medical, dental, nursing, and paramedical trainees.

This study aims to assess awareness and use of CDSS in antimicrobial prescribing among healthcare trainees and staff in four tertiary care hospitals and a nursing school.

2. Specific objectives

Primary Objective

- To assess awareness and usage patterns of CDSS in antimicrobial prescribing.

Secondary Objectives

- To compare CDSS knowledge across different categories of healthcare trainees and staff.
- To identify perceived benefits and barriers to CDSS use.
- To provide recommendations for improving CDSS adoption in healthcare institutions.

3. Methodology

Study Design

A descriptive, cross-sectional questionnaire-based study conducted over 3 months

Study Setting

Four tertiary-level hospitals and one nursing college in India ((National Institute of Medical Sciences Jaipur 303121, Jaipur, Rajasthan, India; Government Institute of Medical Sciences, Gautam Buddha Nagar 201310, Uttar Pradesh, India; Fortis Hospital, Malviya Nagar, Jaipur 302017, Rajasthan, India; Dental College and Hospital, Bagru, Jaipur, Rajasthan; Rajasthan College of Nursing, Bagru, Jaipur, Rajasthan).

Duration: May–August 2025.

Sample Size and Participants

Group	Number of Participants
MBBS students & interns	100
Nursing students	100
BDS students	50
Technical & nursing staff	100
Total	350

Sampling Technique

Convenience sampling.

Study Tool

A 15-item structured questionnaire covering:

- Demographics
- Awareness of CDSS
- Frequency of use
- Perceived usefulness
- Barriers to usage
- Attitude toward adopting CDSS

15-Item Questionnaire (Likert Scale)

(1 = Strongly disagree, 5 = Strongly agree)

1. I am aware of the concept of Clinical Decision Support Systems (CDSS).
2. I know that CDSS can assist in antimicrobial prescribing.
3. CDSS improves the accuracy of antimicrobial choices.
4. CDSS helps reduce antimicrobial resistance.
5. I have received adequate training on CDSS.
6. I find CDSS easy to use.
7. CDSS is accessible in my institution.
8. CDSS integrates well with routine workflow.
9. Using CDSS saves time during prescribing.
10. I trust the recommendations provided by CDSS.
11. CDSS helps prevent medication errors.
12. I would like more training on CDSS.
13. CDSS alerts are useful in clinical decision-making.
14. CDSS should be implemented more widely in hospitals.

p-ISSN 0854-1418
e-ISSN 2503-426X

15. I am willing to adopt CDSS in my future practice.

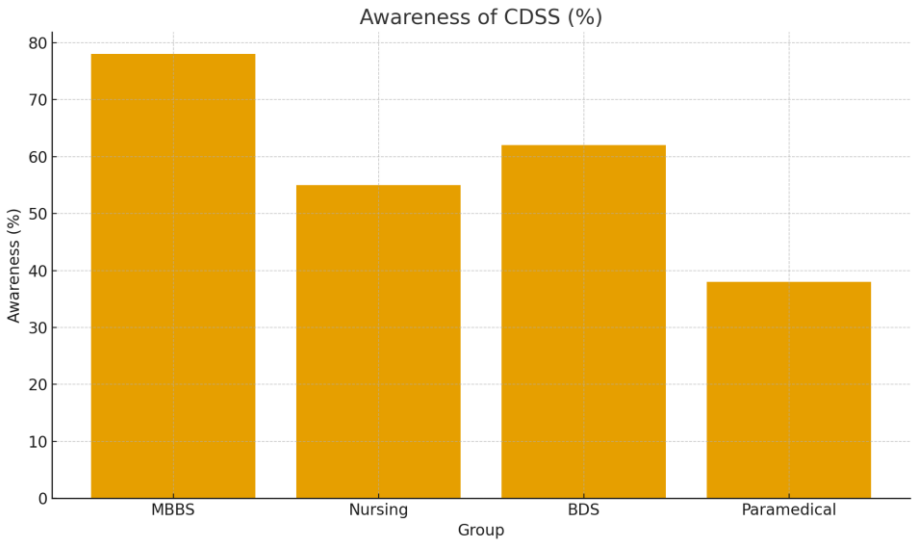
Data Collection

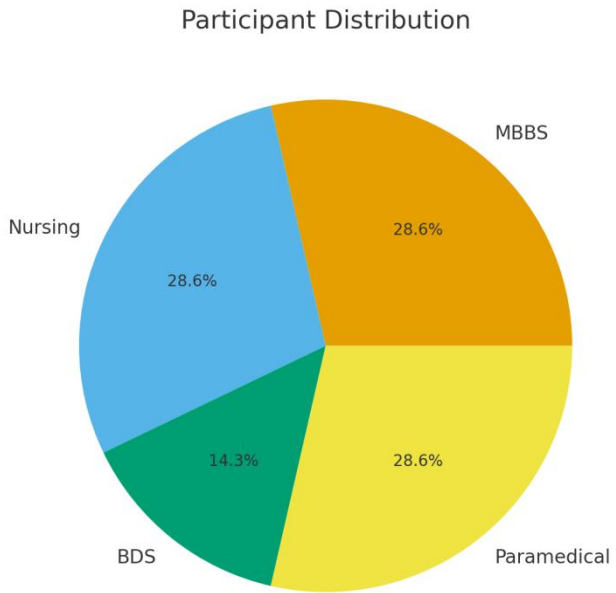
Administered onsite and online after obtaining informed consent.

Statistical Analysis

Data analyzed using descriptive statistics (frequency, percentage) and comparative analysis using chi-square tests. $P < 0.05$ considered statistically significant.

4. Results





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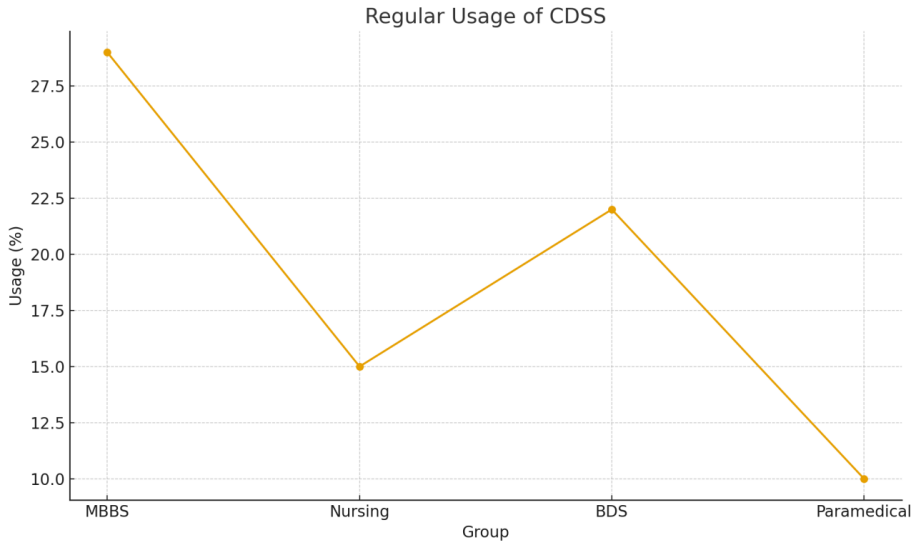
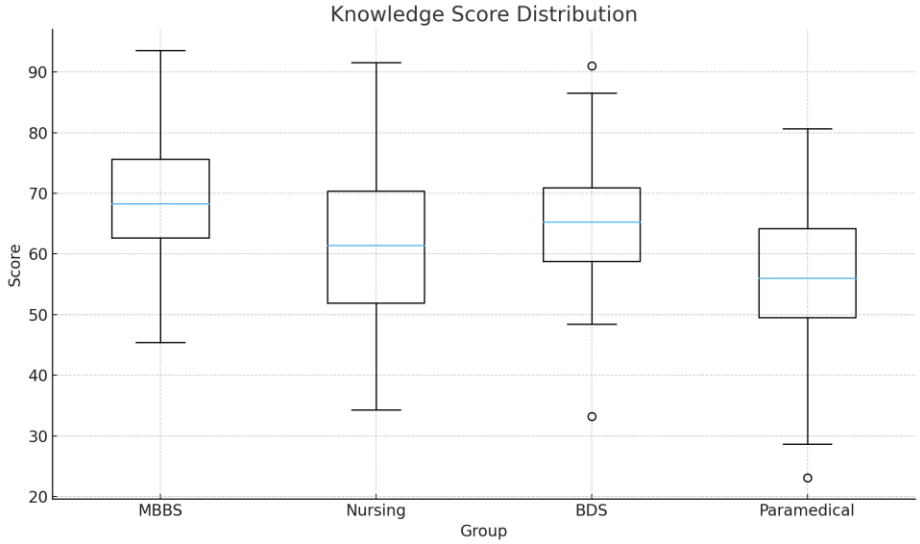
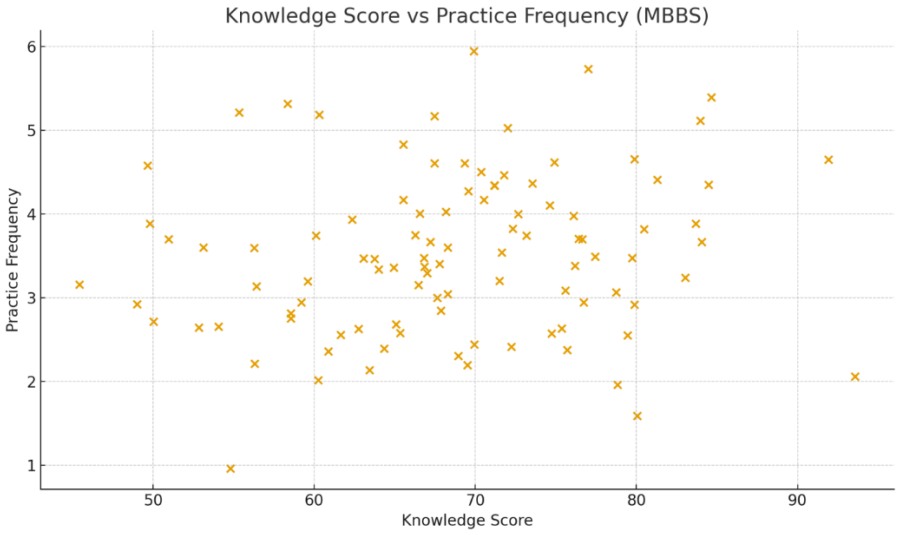
e-ISSN 2503-426X







Demographics

Group	Sample Size	Mean Age (years)	Gender (M/F ratio)
MBBS students	100	21.5	0.7
Nursing students	100	20.2	0.2
BDS students	50	21.8	0.5
Paramedical staff	100	29.1	0.3

4.2 Awareness of CDSS

- MBBS students: 78%
- BDS students: 62%
- Nursing students: 55%
- Paramedical staff: 38%

Overall awareness: **58%**

4.3 Usage of CDSS in Antimicrobial Prescribing

Group	Regular Users	Occasional Users	Never Used
MBBS	29%	44%	27%
BDS	22%	38%	40%
Nursing	15%	34%	51%
Paramedical staff	10%	28%	62%

Overall regular usage: **21%**

Perceived Benefits

- Improves prescribing accuracy: **72%**
- Reduces errors: **70%**
- Supports AMS: **65%**
- Saves time: **54%**

4.5 Barriers to CDSS Use

- Lack of training: **68%**
- Limited access: **54%**
- Poor digital infrastructure: **52%**
- Lack of awareness: **41%**
- Interrupts workflow: **49%**

5. Discussion

The study demonstrated a moderate level of awareness but low utilization of CDSS among healthcare trainees and staff. MBBS students had the highest familiarity and use, likely due to greater exposure to digital learning tools.

The gap between awareness and actual usage highlights barriers such as inadequate training, poor accessibility, and workflow disruptions. These findings are consistent with global studies indicating that CDSS implementation requires structured onboarding and institutional support.

Given the critical role of antimicrobial stewardship, institutions must prioritize integrating CDSS into daily clinical routines and training programs.

6. Conclusion

Although awareness of CDSS in antimicrobial prescribing is moderate, actual usage among students and paramedical staff remains limited. Addressing barriers and enhancing training can significantly improve adoption and contribute to responsible antimicrobial usage.

7. Recommendations

- Mandatory CDSS training modules in curricula
- Hospital-wide access to CDSS platforms
- Integration with electronic medical records (EMRs)
- Periodic audits and feedback
- Workshops on antimicrobial stewardship

8. Acknowledgements: The authors are express their gratitude to the authorities of National Institute of Medical Sciences Jaipur 303121, Jaipur, Rajasthan, India; Government Institute of Medical Sciences, Gautam Buddha Nagar 201310, Uttar Pradesh, Fortis Hospital, Malviya Nagar, Jaipur 302017, Rajasthan, India; Dental College and Hospital, Bagru, Jaipur, Rajasthan, Rajasthan; College of Nursing, Bagru, Jaipur Rajasthan for their permission to conduct study in their respective institutions.

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