A Visual Cue based Antibiotic Prescriber Software Application system to minimize the Prescription of Watch and Reserve Group Antibiotics in Hospitals

Aravind Reghukumar[a], Amogh B J[b], Mariyam Rajee Alex[c], Heera Hassan[d]

a. Department of Infectious Diseases, Government Medical College Thiruvananthapuram, Kerala, India;
b. Former Intern, Government Medical College Thiruvananthapuram, Kerala, India;
c. Former Senior Resident, Department of Community Medicine, Government Medical College Thiruvananthapuram, Kerala, India;
d. Department of Microbiology, Government Medical College Thiruvananthapuram, Kerala, India*

Published on 1st July 2024

ABSTRACT

AWaRe classification was introduced by World Health Organization [WHO] in 2017 for minimizing the further emergence and spread of antimicrobial resistance. AWaRe classifies antibiotics into three stewardship groups with traffic signal like colour codes: Access, Watch and Reserve to emphasize the importance of optimal use and potential for antimicrobial resistance. A visual cue based antibiotic prescriber software application system based on AWaRe colour codes will help in enhancing awareness, encourage judicious antibiotic use, and to mitigate the knowledge- behavior gap in antibiotic prescribing. This software will help to minimize the prescription of Watch and Reserve category antibiotics in hospitals and thereby promote the use of Access category antibiotics. Through this the project aims to contribute to the attainment of the WHO target of having 60% of total antibiotic prescriptions to be from the Access category.

Keywords: Antimicrobial Resistance, AWaRe Classification, Antibiotic Stewardship

*See End Note for complete author details

INTRODUCTION

Antimicrobial resistance threatens global health and is the harbinger of our return to a bygone age where even simple infections could turn out to be deadly due to lack of effective antibiotics. For minimizing the further emergence and spread of antimicrobial resistance, World Health Organization [WHO] in 2017 introduced the Access, Watch, Reserve [AWaRe] classification of antibiotics in the Essential Medicines List.[1] This classification is the cornerstone of antibiotic stewardship strategies at local, national and global levels with the aim of reducing the impact of antimicrobial resistance. AWaRe classifies antibiotics into three stewardship groups: Access, Watch and Reserve to emphasize the importance of optimal use and potential for antimicrobial resistance. Color codes have been given to these groups of antibiotics in line with traffic signals[1] **(Figure 1).**

Access Group Antibiotics [Green]: This group comprises of antibiotics with lower resistance potential with activity against a broad range of commonly encountered susceptible pathogens. The Access group includes 48 antibiotics, 19 of which are included on the WHO Model List of Essential Medicines as first- or second -choice empiric treatment options for specified infectious syndromes.

Figure 1. **Pictorial depiction of Traffic light colour codes given to Access, Watch and Reserve Antibiotics**

Cite this article as: Reghukumar A, Amogh BJ, Alex MR, Hassan H. A Visual Cue based Antibiotic Prescriber Software Application system to minimize the Prescription of Watch and Reserve Group Antibiotics in Hospitals. Kerala Medical Journal. 2024 Jul 1;17(2):88–91.

Corresponding Author:
Dr. Heera Hassan, Assistant Professor, Department of Microbiology. Government Medical College, Trivandrum, Kerala, India. Mobile: 9496817214 E-mail: drheerahassan@gmail.com

Watch Group Antibiotics [Amber]: This group comprises of antibiotics with higher resistance potential and includes most of the highest priority agents among the Critically Important Antimicrobials for Human Medicine. Antibiotics in Watch group should be prioritized as key targets of stewardship programs and monitoring.

Reserve Group Antibiotics [Red]: This group comprises of antibiotics that should be reserved for treatment of infections due to MDR organisms. Reserve group antibiotics are considered as "last resort" options and their use should be tailored to highly specific patients and settings, when all alternatives have failed or are not suitable. Reserve group antibiotics are protected and prioritized as key targets of stewardship programs.

WHO AWaRe Targets

1. **WHO has specified that by 2023, all countries should calculate antibiotic utilization metrics**
2. **60% of antimicrobial consumption in a country should be from the Access group.**

BACKGROUND

According to Indian national and WHO antimicrobial guidelines, the treatment of all infectious syndromes presenting to Outpatient department [OPD] should consist of drugs from the Access category. Despite the presence of these guidelines for optimizing antibiotic prescription in outpatient departments (OPDs), the high volume of patients in OPDs often makes it challenging to adhere/refer to these guidelines. The end result is that for OPD infections, many patients are prescribed antibiotics from "WATCH" group like azithromycin, cefixime, cefpodoxime and even antibiotics from "RESERVE" category like Linezolid. The misuse of Faropenem for OPD infections is not justifiable.

To optimize the use of antibiotics for OPD infections, Government of Kerala as part of Kerala Antimicrobial Resistance Strategic Action Plan [KARSAP] through two Government Orders [GO] issued the criteria for antibiotic smart hospitals at different tiers of health care.[2,3] As per the GO, in primary care more than 95% of antibiotics prescribed for OPD infections should be from Access category. In secondary and tertiary care Access category should account for more than 90% and 85% of total prescriptions from OPD respectively.[2,3] The prescription of antibiotics from the Watch and Reserve categories for common OPD infections is attributed also to a lack of awareness, which could be mitigated through the implementation of visual cues using a software solution for antibiotic prescription. We suggest the development of a visual cue-based antibiotic prescriber software to address this issue, aiming to decrease the prescription of "WATCH and RESERVE" antibiotics in OPDs across hospitals in Kerala. Additionally, this initiative seeks to encourage the utilization of Access group drugs when appropriate.

SOLUTION CONCEPT

Goals:

1. Enhance awareness regarding the prudent utilization of antibiotics with aim to meet the WHO objective of attaining 60% of all antibiotic prescriptions sourced from the Access category.[1]
2. Alleviate the burden of antimicrobial-resistant infections through concerted efforts.

Objective: Encourage judicious antibiotic use, enhance awareness thereof, and mitigate the knowledge-behavior gap in antibiotic prescribing.

Strategy: Our proposed antibiotic prescriber software to achieve the above goals is based on a four- pronged strategy represented below as in **Figure 2.**

Action plan: We propose to implement the strategy through a comprehensive software application, which will be accessible in both mobile and computer-based versions. The application will offer several key features:

- **AWARE-Based Antibiotic Visual Prompts**: Visual prompts based on the AWARE classification, incorporating existing guidelines, local antibiograms, and AWaRe classification, will guide antibiotic selection.
- **Three-Dimensional Antibiotic Prescription Section:**
  - Prescribers can prescribe the appropriate ACCESS drug and complete the prescription with suggested dosage and duration based on patient profiles. This will also include an option for observation without immediate antibiotic prescription.
  - An antibiotic prescription algorithm, based on established guidelines, will generate a prompt message alerting the physician if a WATCH or RESERVE antibiotic is entered with an option to change preference to ACCESS category if possible.

Figure 2. **Showing four pronged strategy based on AWARE**

- The dropdown list/hyperlink will be displayed on the same page to display available oral and parenteral antibiotics in a color- coded manner: green for Access, amber for Watch, and red for Reserve **(Figure 3)**

- **AWARE-Based Training Module:** An interactive teaching module will provide training to medical and paramedical staff, incorporating videos, visuals, and data representation aligned with the AWARE classification.
- **Central Database:** Data collected will be stored in a central database. This database will facilitate analysis and display of antibiotic utilization metrics categorized by AWaRe groups, enabling surveillance and auditing of antibiotic usage.
- **Feedback Portal:** The application will include a feedback portal to gather input from users, allowing for continuous improvement and refinement of the software.

This multifaceted software application aims to streamline antibiotic prescribing practices, enhance healthcare provider education, and facilitate data-driven decision-making to combat antimicrobial resistance effectively.

IMPLEMENTATION PLAN

The project can be executed in two distinct phases:

Phase 1:

- Implementation can commence in all Government and Private hospitals where OPD prescriptions are already computerized .
- In OPDs lacking computerized prescriptions, doctors can utilize a mobile application equipped with visual cues.

Phase 2:

- Subsequently, the project can be extended to encompass all hospitals in the State.

Novelty of the Proposed Project

The proposed project exhibits several novel features:

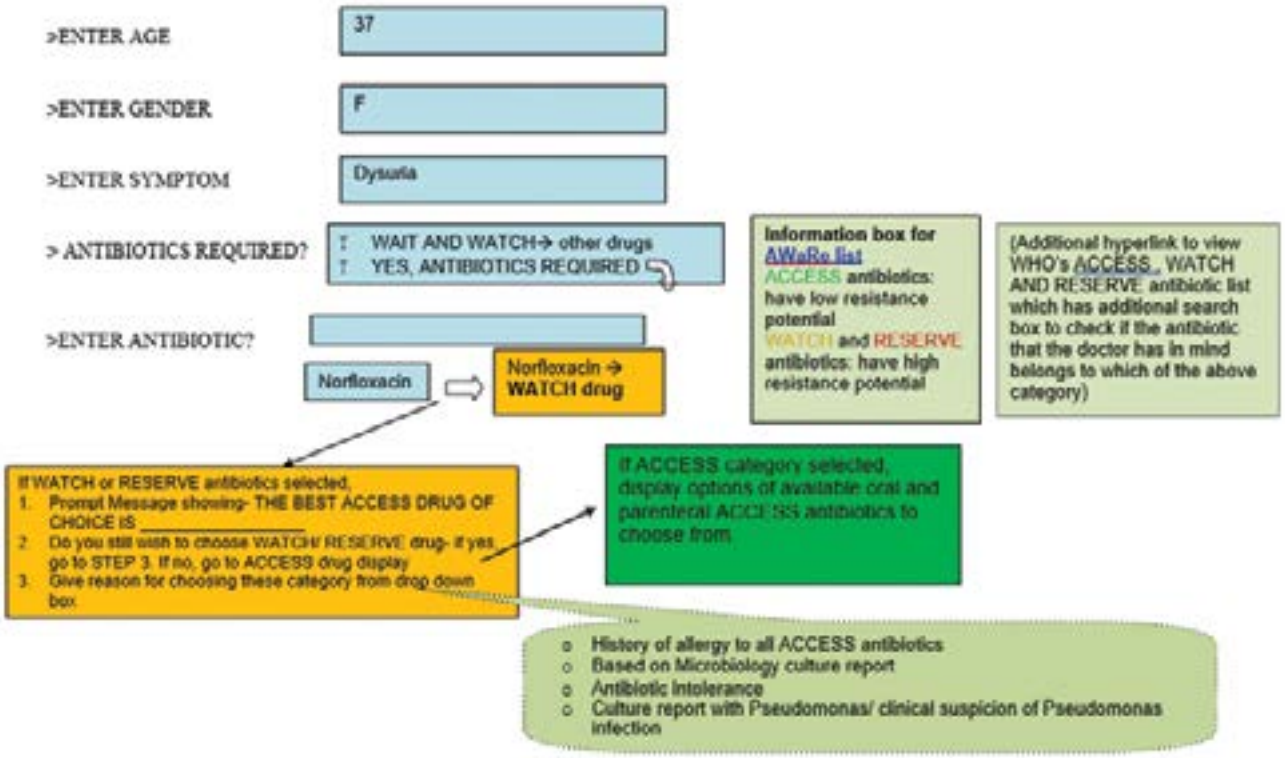

Figure 3. **Showing prototype for analyzing AWaRe drug use**

1. **Introduction of AWARE Classification:** The utilization of the AWARE classification is a recent development. Integrating this classification system into an application for behavioral change, particularly tailored for resource-limited settings, is unprecedented.
2. **Utilization of Visual Cues:** The incorporation of visual cues within the application represents an innovative approach to promote behavioral change in antibiotic prescription practices. This method has not been previously attempted in similar contexts.
3. **Four-Pronged Strategy:** The project adopts a unique and comprehensive four-pronged strategy, offering a holistic approach to antimicrobial stewardship. This multifaceted strategy addresses various aspects of antibiotic prescription practices, thereby enhancing its effectiveness and impact

THEORY OF CHANGE

The Theory of Change underlying this software implementation is as follows:

1. **Utilization of Access Group Drugs:** By providing prescribers with the option to select alternatives, the software encourages increased prescriptions from the Access group of antibiotics. This shift is facilitated by the color-coded spectrum chosen by the WHO, where green signifies progress and red indicates danger, reinforcing the notion of selecting safer options.
2. **Learning by Classical Conditioning:** Through repeated exposure to the color-coded system, prescribers undergo a process of classical conditioning. As they consistently associate certain colors with the status of commonly used antibiotics, they become more cognizant of their prescribing patterns. This heightened awareness bridges both the knowledge gap and the knowledge-behavioral gap among practitioners.
3. **Expected Outcome:** The anticipated outcome of this software intervention is a greater utilization of Access group antibiotics relative to other antibiotic categories. This shift in prescribing behavior aligns with the overarching goal of promoting judicious antibiotic use and combating antimicrobial resistance.

OUTCOME/IMPACT EXPECTED

The expected outcomes and impacts of the proposed project are as follows:

1. **Achievement of WHO Target:** By promoting the use of Access category antibiotics through the software, the project aims to contribute to the attainment of the WHO target of having 60% of antibiotic prescriptions sourced from the Access category .
2. **Establishment of Audit Framework:** The project will establish a framework for auditing antibiotic utilization metrics based on the AWaRe classification across the state. This framework will facilitate ongoing monitoring and evaluation of antibiotic prescribing practices, aiding in the identification of areas for improvement.
3. **Awareness and Reduction of Antimicrobial Resistance:** By imparting awareness regarding good antimicrobial prescription practices to healthcare workers, the project endeavors to reduce antimicrobial-resistant infections in the long run. Through improved prescribing practices and heightened awareness, the project aims to mitigate the development and spread of antimicrobial resistance within healthcare settings.

END NOTE

Author Information

1. Dr Aravind Reghukumar, Department of Infectious Diseases, Government Medical College Thiruvananthapuram, Kerala, India
2. Dr Amogh B J, Former Intern, Government Medical College Thiruvananthapuram, Kerala, India
3. Dr Mariyam Rajee Alex, Former Senior Resident, Department of Community Medicine, Government Medical College, Thiruvananthapuram, Kerala, India
4. Dr Heera Hassan, Department of Microbiology, Government Medical College Thiruvananthapuram, Kerala, India

Conflict of Interest: None declared

REFERENCES

1. AWaRe classification of antibiotics for evaluation and monitoring of use, 2023 [Internet]. [cited 2024 Jun 19].
2. Health & Family Welfare Department-Standard Operating Procedures For District Level AMR Committees in Kerala- Orders Issued: G.O.(Rt)No.726/2024/H&FWD Thiruvananthapuram. Dated, 11-03-2024
3. Health & Family Welfare Department-Standard Operating Procedures For Block Level AMR Committees in Kerala-Orders Issued.(Rt) No.2118/2023/H&FWD Dated, Thiruvananthapuram, 18-08-2023