ANTIMICROBIAL STEWARDSHIP

–

STRATEGY AND SURVEILLANCE

Dr Rahul S Kamble

MBBS, MD Microbiology

Diploma Infectious Diseases (UNSW, Australia)

Infection Control course (Harvard Medical School, USA)

International Clinical Tropical Medicine course

(CMC Vellore|Haukeland university|McGill university)

International Vaccinology course (CMC Vellore)

Six Sigma Black Belt (Govt of India certified)

Auditor: JCI|NABH|NABL|CSSD|RBNQA|Texila university

PGDBA|PGDHM|PGDCR|PGDMR|PGDOM|

PGDMLS|PGDIM|PGDHI|PGDBI|PGDHA|CCDHHO

Consultant Clinical Microbiologist & Infectious Diseases

Project Lead - Antimicrobial Stewardship at Americares India Foundation

INTRODUCTION

Antibiotics have transformed the practice of medicine, making once lethal infections readily treatable and making other medical advances, like cancer chemotherapy and organ transplants, possible.
Like all medications, antibiotics have serious adverse effects, which occur in roughly 20% of hospitalized patients who receive them.

These are:

- **Treatment failures**
- ***C. difficile* infections**
- **Adverse effects**
- **Antibiotic resistance**
- **Hospital costs and lengths of stay**

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

INTRODUCTION

- In 2014, CDC called on all hospitals in the United States to implement antibiotic stewardship programs and released the *Core Elements of Hospital Antibiotic Stewardship Programs* (Core Elements) to help hospitals achieve this goal.

- The Core Elements outlines structural and procedural components that are associated with successful stewardship programs.

- The Core Elements are intended to be an adaptable framework that hospitals can use to guide efforts to improve antibiotic prescribing.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE-1 HOSPITAL LEADERSHIP COMMITTMENT

Priority leadership commitments include:

- Giving stewardship program leader(s) time to manage the program and conduct daily stewardship interventions.
- Providing resources, including staffing, to operate the program effectively.
- Having regular meetings with leaders of the stewardship program to assess the resources needed to accomplish the hospital's goals for improving antibiotic use.
- Appointing a senior executive leader to serve as a point of contact or "champion" for the stewardship program to help ensure that the program has resources and support to accomplish its mission.
- Reporting stewardship activities and outcomes (including key success stories) to senior leadership and the hospital board on a regular basis (e.g. including stewardship measures in hospital quality dashboard reports).

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE-1 HOSPITAL LEADERSHIP COMMITMENT

Other leadership commitments include:

- Integrating antibiotic stewardship activities into other quality improvement and patient safety efforts.
- Having clear expectations for the leaders of the program on responsibilities and outcomes.
- Making formal statements of support for efforts to improve and monitor antibiotic use.
- Outlining stewardship-related duties in job descriptions and annual performance reviews for program leads and key support staff.
- Supporting training and education for program leaders (e.g. attendance of stewardship training courses and meetings) and hospital staff.
- Supporting participation in local, state, and national antibiotic stewardship quality improvement collaboratives.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE- 1 HOSPITAL LEADERSHIP COMMITMENT

- Ensuring that staff from key support departments have sufficient time to contribute to stewardship activities.
- Clinicians
- Department heads
- Pharmacy or therapeutic committee if any
- Infection preventionist or epidemiologist
- Quality department Involved in patient safety and quality related activities.
- Microbiology
- Information technology
- Nurses

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE- 2 ACCOUNTABILITY

- The antibiotic stewardship program must have a designated leader or co-leaders who are accountable for program management and outcomes. Most hospitals have found a co-leadership model to be effective
- Programs with co-leaders should have a clear delineation of responsibilities and expectations especially important for physician leaders who do not work full time at the hospital.
- If a non-physician is the leader of the program, it is important that the hospital designate a physician who can serve as a point of contact and support for the non-physician program leader.
- Regular “stewardship rounds” for the co-leaders, or the non-physician lead and the supporting physician are must.
- Discussions with prescribers (also called “handshake stewardship”) has been shown to improve antibiotic use.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

What does an AMS team structure look like?

Physician or pharmacist ± specialized ID training (team leader)

Clinical pharmacist

Clinical microbiologist

Hospital administration

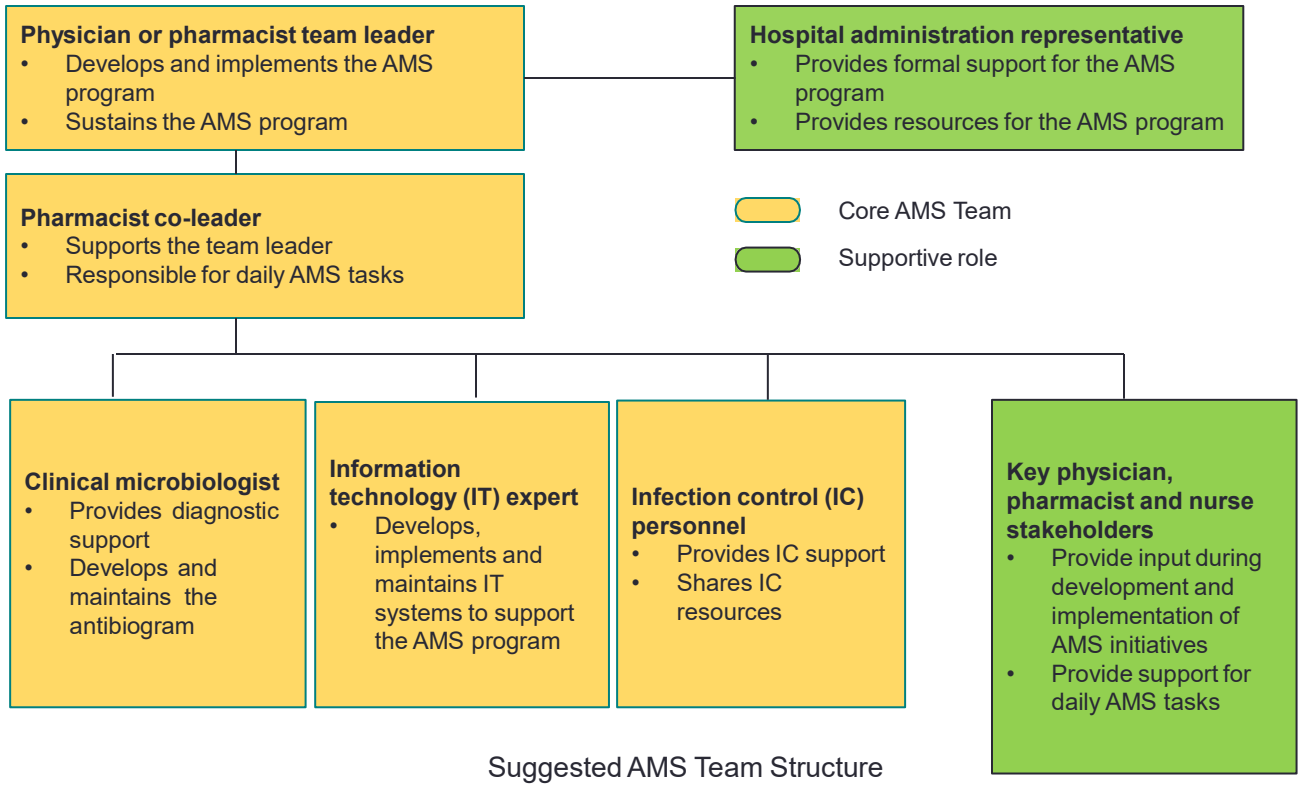
Infection control expert

Hospital epidemiologist

IT expert

Other physicians, pharmacists, nurses

Roles & Responsibilities of AMS Team Members



Suggested AMS Team Structure

1.Dellit HT, et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. Clin Infect Dis 2007;44:159-177
2. Centers for Disease Control and Prevention. Core elements of hospital antibiotic stewardship programs. Available at: The Core Elements of Hospital Antibiotic Stewardship Programs (cdc.gov) Accessed on 28th April 2021

CE-3 PHARMACY EXPERTISE

Highly effective hospital antibiotic stewardship programs have strong engagement of pharmacists, either as a leader or co-leader of the program.

It is important to identify a pharmacist who is empowered to lead implementation efforts to improve antibiotic use.

They can be either infectious disease trained pharmacists or general clinical pharmacists.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE- 4 ACTION

Antibiotic stewardship interventions improve patient outcomes . An initial assessment of antibiotic prescribing can help identify potential targets for interventions.

These can be :

1. Priority Interventions to Improve Antibiotic Use
2. Common Infections Based Interventions
3. Other Infection Based Interventions
4. Provider Based Interventions
5. Pharmacy Based Interventions
6. Microbiology Based Interventions
7. Nursing Based Interventions

Stewardship programs should choose interventions that will best address gaps in antibiotic prescribing.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

Assessment of seven core elements

LEADERSHIP SUPPORT	ESTABLISHED AT FACILITY
A. Does your facility have a formal, written statement of support from leadership that supports efforts to improve antibiotic use (antibiotic stewardship)?	❑ Yes ❑ No
B. Does your facility receive any budgeted financial support for antibiotic stewardship activities (e.g., support for salary, training, or IT support)?	❑ Yes ❑ No
ACCOUNTABILITY	
A. Is there a physician leader responsible for program outcomes of stewardship activities at your facility?	❑ Yes ❑ No
DRUG EXPERTISE	
A. Is there a pharmacist leader responsible for working to improve antibiotic use at your facility?	❑ Yes ❑ No
KEY SUPPORT FOR THE ANTIBIOTIC STEWARDSHIP PROGRAM *Does any of the staff below work with the stewardship leaders to improve antibiotic use?*	
B. Clinicians	❑ Yes ❑ No
C. Infection Prevention and Healthcare Epidemiology	❑ Yes ❑ No
D. Quality Improvement	❑ Yes ❑ No
E. Microbiology (Laboratory)	❑ Yes ❑ No
F. Information Technology (IT)	❑ Yes ❑ No
G. Nursing	❑ Yes ❑ No

https://www.cdc.gov/antibiotic-use/core-elements/hospital.html

CE- 4 ACTION

1. Priority Interventions to Improve Antibiotic Use

a. Prospective audit and feedback:

It is an external review of antibiotic therapy by an expert in antibiotic use, accompanied by suggestions to optimize use, at some point after the agent has been prescribed. Prospective audit and feedback is different from an antibiotic "timeout" because the stewardship program rather than the treating team conducts the audits.

b. Preauthorization

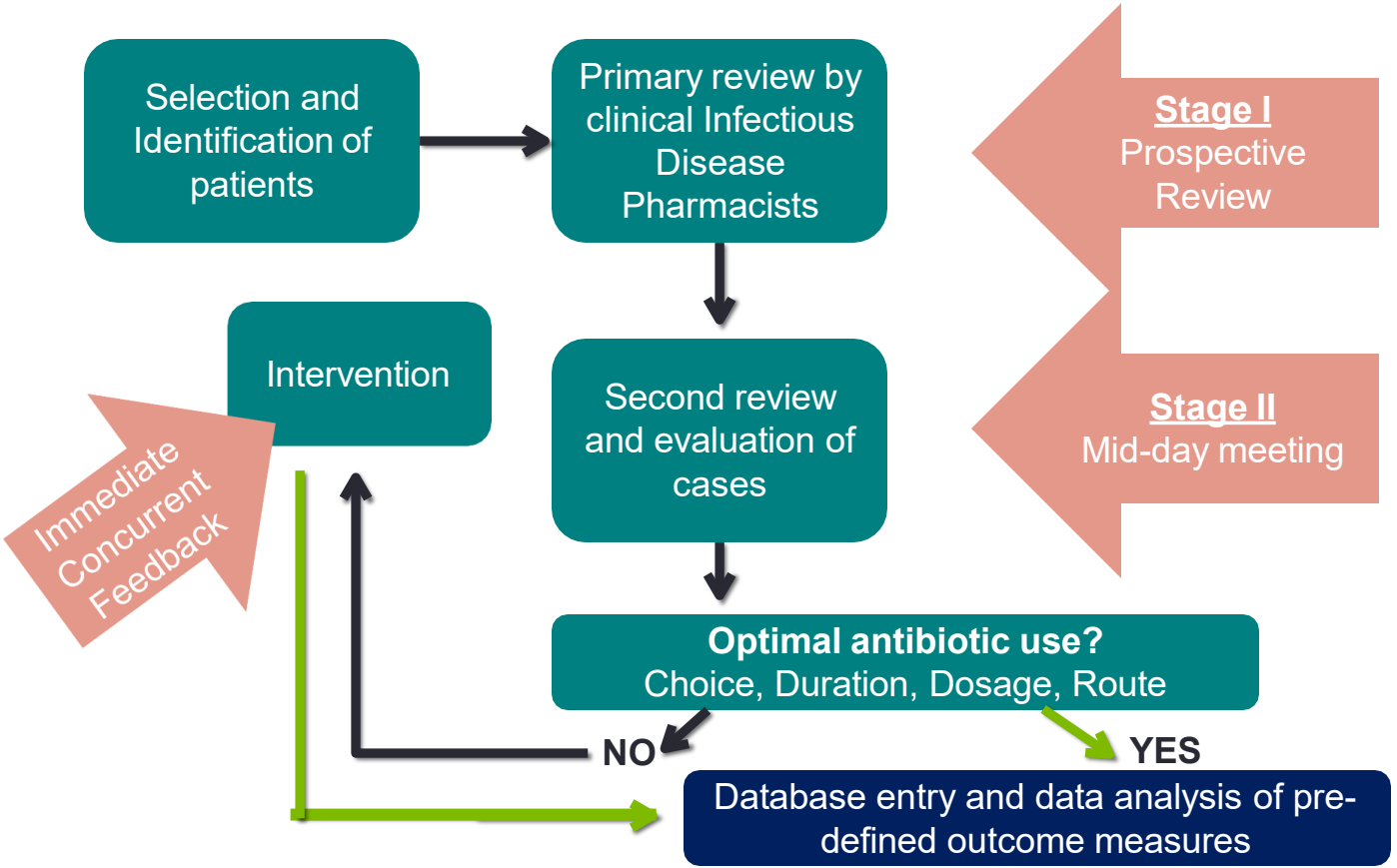
Requires prescribers to gain approval prior to the use of certain antibiotics.

c. Facility-specific treatment guidelines.

are also considered a priority because they
can greatly enhance the effectiveness of both prospective audit and feedback and preauthorization by establishing clear recommendations for optimal antibiotic use at the hospital.

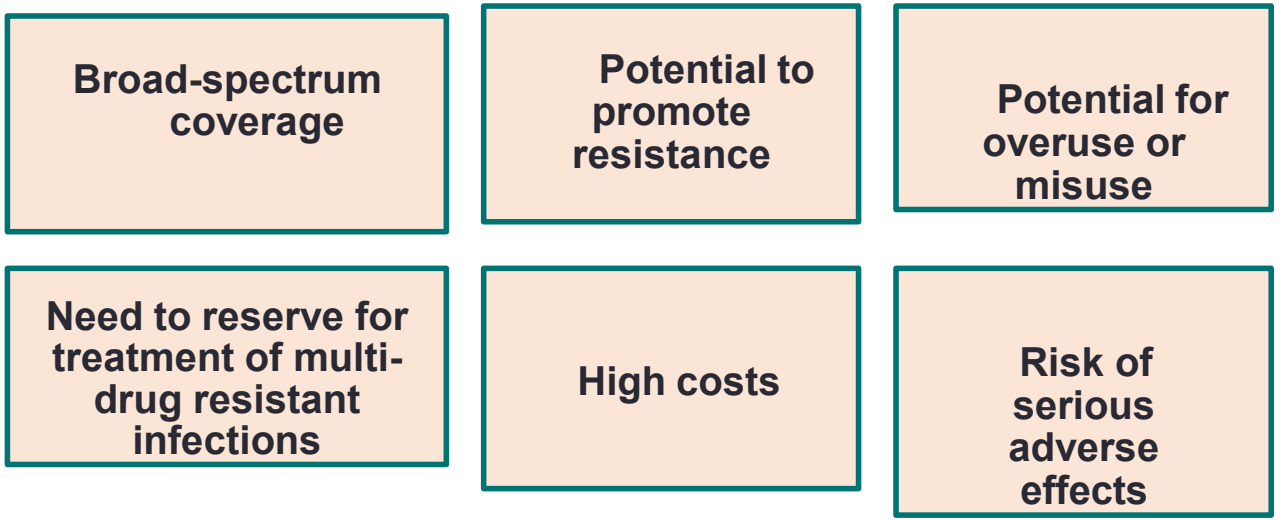
Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

Prospective audit and immediate feedback system



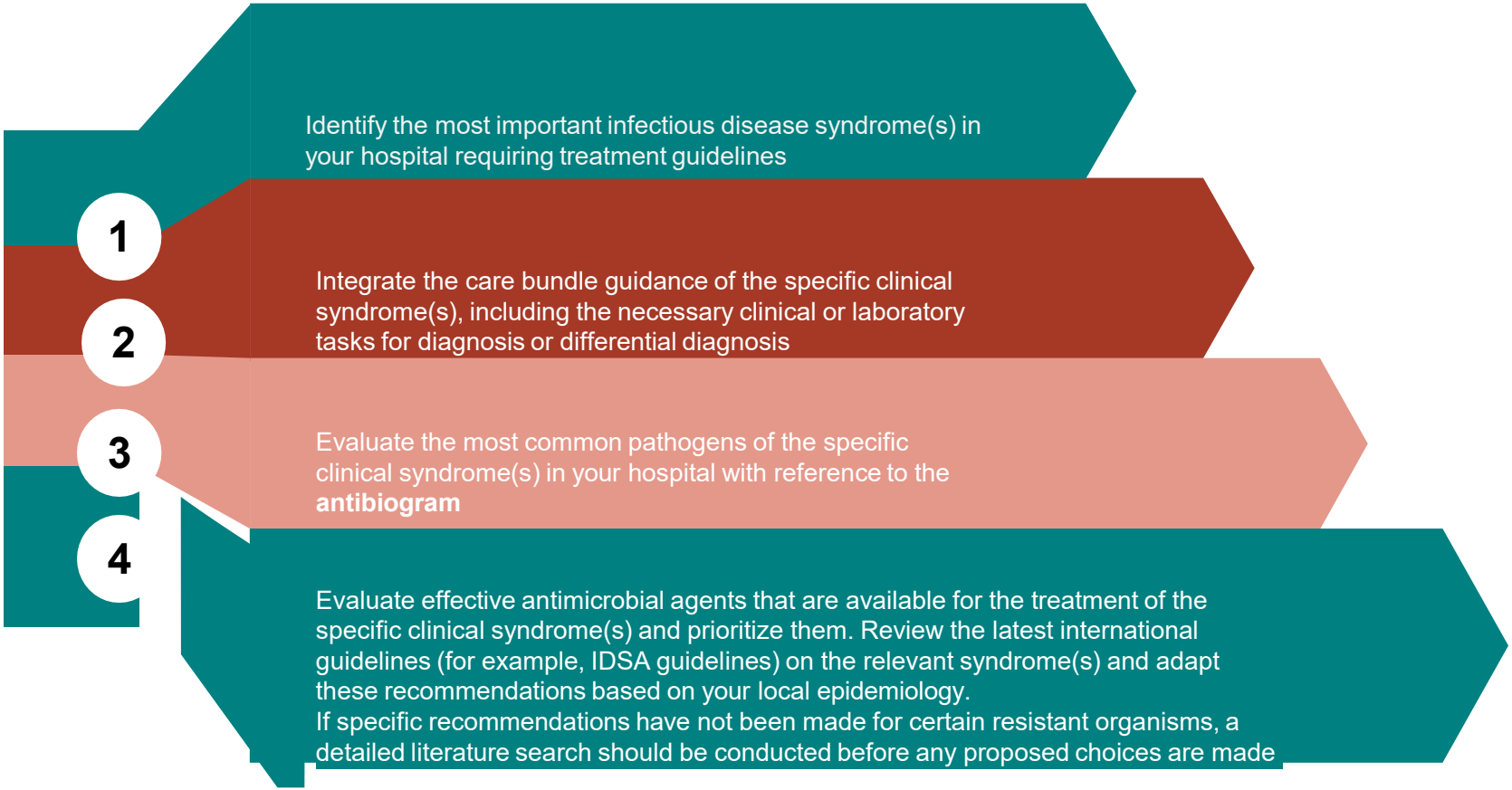
Pre-authorization

Antibiotics requiring pre-authorization or audit are carefully selected based on variables such as:

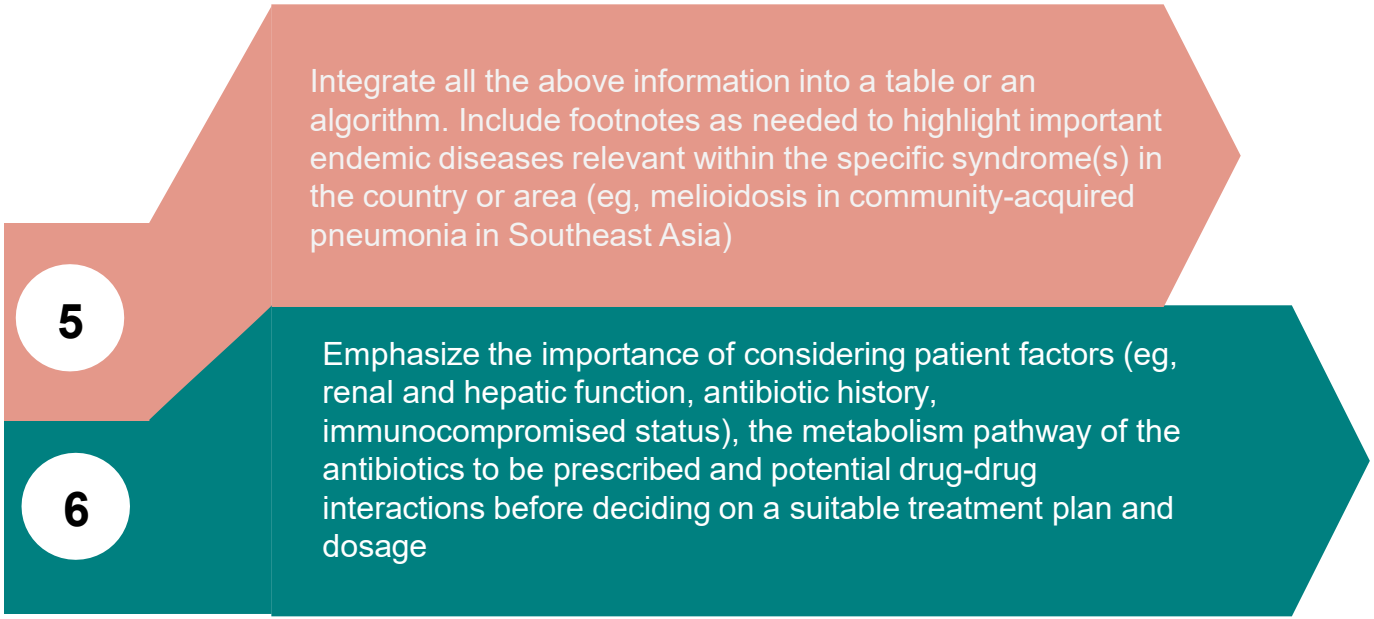


1.Teo J, et al. The effect of a whole-system approach in an antimicrobial stewardship programme at Singapore General Hospital. *Eur J Clin Microbiol Infect Dis* 2012;31:947-955
2.Public Health Ontario. Antimicrobial stewardship strategy: Formulary restriction. Available at: www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/AntimicrobialStewardshipProgram/Documents/ASP_Strategy_Formulary_Restricti_on.pdf. Accessed on 20th April 2021

Developing Hospital Specific Guidelines



Developing Hospital Specific Guidelines



General principles of antibiotic use in hospitalized patients

Answering the following key questions will help you to make the best use of empiric antibiotic treatment guidelines and select the most appropriate antibiotic for the initial treatment of your patient

- What is the diagnosis/most likely cause of infection?
- How severe is the infection?
- What is the risk of infection with drug-resistant organisms?
- Is the patient immunocompromised
- Does the patient have an antibiotic allergy?
- What is the status of the patient's renal and hepatic function? Is the patient taking any other medications?

References in Footnote

CE– 4.Action

2. Common Infection-Based Interventions

More than half of all antibiotics given to treat active infections in hospitals are prescribed for three infections where there are important opportunities to improve use: lower respiratory tract infection (e.g. community acquired pneumonia), urinary tract infection and skin and soft tissue infection)

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE-4 ACTION

INFECTIONS	DIAGNOSTIC CONSIDERATIONS	EMPIRIC THERAPY	DEFINITIVE THERAPY Tailor to culture results and define duration, including discharge prescription.
Community-acquired pneumonia[54]	Review cases after initiation of therapy to confirm pneumonia diagnosis versus non-infectious etiology.	Avoid empiric use of antipseudomonal beta-lactams and/or MRSA agents unless clinically indicated.	Guidelines suggest that in adults, most cases of uncomplicated pneumonia can be treated for 5 days when a patient has a timely clinical response [55, 56]. Data also suggest that negative results of MRSA nasal colonization testing can help guide decisions to discontinue empiric therapy for MRSA pneumonia[57]
Urinary tract infection (UTI)	Implement criteria for ordering urine cultures to ensure that positive cultures are more likely to represent infection than bladder colonization[58].	Establish criteria to distinguish between asymptomatic and symptomatic bacteriuria. Avoid antibiotic therapy for	Use the shortest duration of antibiotic therapy that is clinically appropriate.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE- 4 ACTION

3. Other Infection - Based Interventions

- Sepsis
- *Staphylococcus aureus* infection
- *C.difficile* infection
- Culture proven invasive infection
- Review of planned outpatient parenteral antibiotic therapy (OPAT)

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE- 4 ACTION

4. Provider Based Interventions

a. Antibiotic Time out:

Provider-led reviews of antibiotics can focus on four key questions :

- Does this patient have an infection that will respond to antibiotics?
- Have proper cultures and diagnostic tests been performed?
- Can antibiotics be stopped or improved by narrowing the spectrum (also referred to as “de-escalation”) or changing from intravenous to oral?
- How long should the patient receive the antibiotic(s), considering both the hospital stay and any post-discharge therapy?

b. Assessing penicillin allergy

Serious penicillin allergy would preclude treatment with a beta-lactam antibiotics

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE- 4 ACTION

5. Pharmacy Based Interventions

- Documentation of indications for antibiotics
- Automatic changes from intravenous to oral antibiotic therapy
- Dose adjustments
- Dose optimization
- Duplicative therapy alerts
- Time-sensitive automatic stop orders
- Detection and prevention of antibiotic-related drug-drug interactions

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

If the hospital's empiric antibiotic treatment guidelines have not been followed without a valid reason, the pharmacist should recommend that broad-spectrum empiric therapy be de-escalated in clinically stable patients

During empiric therapy, a narrower spectrum antibiotic should be chosen in accordance with hospital treatment guidelines

Once microbiology results are available, the pharmacist should encourage the change to definitive therapy with as narrow a spectrum pathogen-directed treatment as possible based on culture and susceptibility results

1. Lew KY, et al. Safety and clinical outcomes of carbapenem deescalation as part of an antimicrobial stewardship programme in an ESBL-endemic setting. *J Antimicrob Chemother* 2015;70:1219-1225
2.Levy Hara G, et al. Ten key points for the appropriate use of antibiotics in hospitalised patients: a consensus from the Antimicrobial Stewardship and Resistance Working Groups of th
3.e International Society of Chemotherapy. *Int J Antimicrob Agents* 2016;48:239-246
4. Leekha S, et al. General Principles of Antimicrobial Therapy. *Mayo Clin Proc* 2011;86:156-167
5. Liew YX, et al. Prospective audit and feedback in antimicrobial stewardship: Is there value in early reviewing within 48 h of antibiotic prescription? Int J Antimicrob Agents 2015;45:168-173.

Criteria for the de-escalation of broad-spectrum antibiotics

	Empiric Therapy	Definitive Therapy
Criteria for de-escalation via switching to narrower spectrum antibiotics	• Temperature <38°C for 24 hours • Not on inotropes • Systolic blood pressure returned to baseline or ≥100 mmHg • Not mechanically ventilated or fraction of inspired oxygen ≤0.4 • Respiratory rate <25 breaths per minute and saturation of oxygen ≥92% on room air	• De-escalation to narrower spectrum antibiotics based on culture and susceptibility results, in the absence of contraindications
Criteria for de-escalation via dis-continuation	• Completed course of therapy • No indication or infectious causes identified	

1. Lew KY, et al. Safety and clinical outcomes of carbapenem de-escalation as part of an antimicrobial stewardship programme in an ESBL-endemic setting. *J Antimicrob Chemother* 2015;70:1219-1225

IV-to-oral conversion

- IV-to-oral conversion of the same antibiotic is a relatively simple intervention, and pharmacists should routinely encourage IV-to-oral conversion of antibiotics with good bioavailability in eligible patients
- For example, fluoroquinolones are highly bioavailable drugs that can easily be converted from the IV to the oral route of administration
- Advantages of oral therapy include ease of administration, early discharge opportunities, decreased IV-related adverse events and drug cost savings

1.Barlam TF, et al. Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clin Infect Dis* 2016;62:e51-77
2.Levy Hara G, et al. Ten key points for the appropriate use of antibiotics in hospitalised patients: a consensus from the Antimicrobial Stewardship and Resistance Working Groups of the International Society of Chemotherapy. *Int J Antimicrob Agents* 2016;48:239-246
3.Park SM, et al. Impact of intervention by an antimicrobial stewardship team on conversion from intravenous to oral fluoroquinolones. *Infect Chemother* 2017;49:31-37

Dose optimization

Pharmacist expertise in relation to **pharmacokinetic and pharmacodynamic principles** is particularly beneficial when reviewing antibiotic regimens for dose optimization[1,2]

Dose optimization can be implemented by pharmacists on the basis of **identifying deviations** from recommended dosing schedules, and **making recommendations** to optimize dosing[3]

However, in **critically ill patients**, dose-optimization via **therapeutic drug monitoring** will help ensure adequacy of treatment[4]

1.American Society of Health-System Pharmacists. A Hospital Pharmacist's Guide to Antimicrobial Stewardship Programs. Available at: www.ashpadvantage.com/docs/stewardship-white-paper.pdf. Accessed on 10th March 2019
2. Doron S, Davidson L. Antimicrobial stewardship. *Mayo Clin Proc* 2011;86:1113-1123
3.Teo J, et al. The effect of a whole-system approach in an antimicrobial stewardship programme at the Singapore General Hospital.
4. *Eur J Clin Microbiol Infect Dis* 2012;31:947-955
5. Cotta MO, et al. Antibiotic dose optimization in critically ill patients. *Med Intensiva* 2015;39:563-572

CE– 4 ACTION

6. Microbiology Based Interventions

- Selective reporting of antimicrobial susceptibility testing results
- Comments in microbiology reports

7. Nursing Based Interventions

- Optimizing microbiology cultures
- Intravenous to oral transitions
- Prompting antibiotic reviews (“timeouts”)

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE– 5 TRACKING

Introduction

Measurement is critical to identify opportunities for improvement and to assess the impact of interventions.

Measurement of antibiotic stewardship interventions may involve evaluation of both processes and outcomes.

For example, a program will need to evaluate if policies and guidelines are being followed as expected (processes) and if interventions have improved patient outcomes and antibiotic use (outcomes).

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

Most commonly used KPIs* for AMS programs

Process Measures

Antibiotic Consumption

- Defined Daily Dose (DDD)
- Days of Therapy (DOT)
- Length of Therapy (LOT)

Appropriateness of Antibiotic Use

- Adherence to hospital guidelines
- Rate of acceptance of interventions

Outcome Measures

Microbiological

- AMR Rates
- *Clostridium difficile* infection rate

Clinical

- Length of Stay (LOS)
- Unexpected readmission rate

Financial

- Antibiotic expenditure

*Collected for a defined population, over a specified time usually standardized to 1,000 patient-days

1. Akpan MR, et al. A review of quality measures for assessing the impact of antimicrobial stewardship programs in hospitals. *Antibiotics (Basel)* 2016;5:5
2. Morris AM. Antimicrobial stewardship programs: Appropriate measures and metrics to study their Impact. *Curr Treat Options Infect Dis* 2014;6:101-112

Key Performance Indicators

Days of Therapy (DOT)[1]

- DOT denotes the number of days that a patient receives atleast one dose of an antibiotic summed for each antibiotic
- DOT requires patient- level data from electronic health records

Defined Daily Doses (DDD)[2,3]

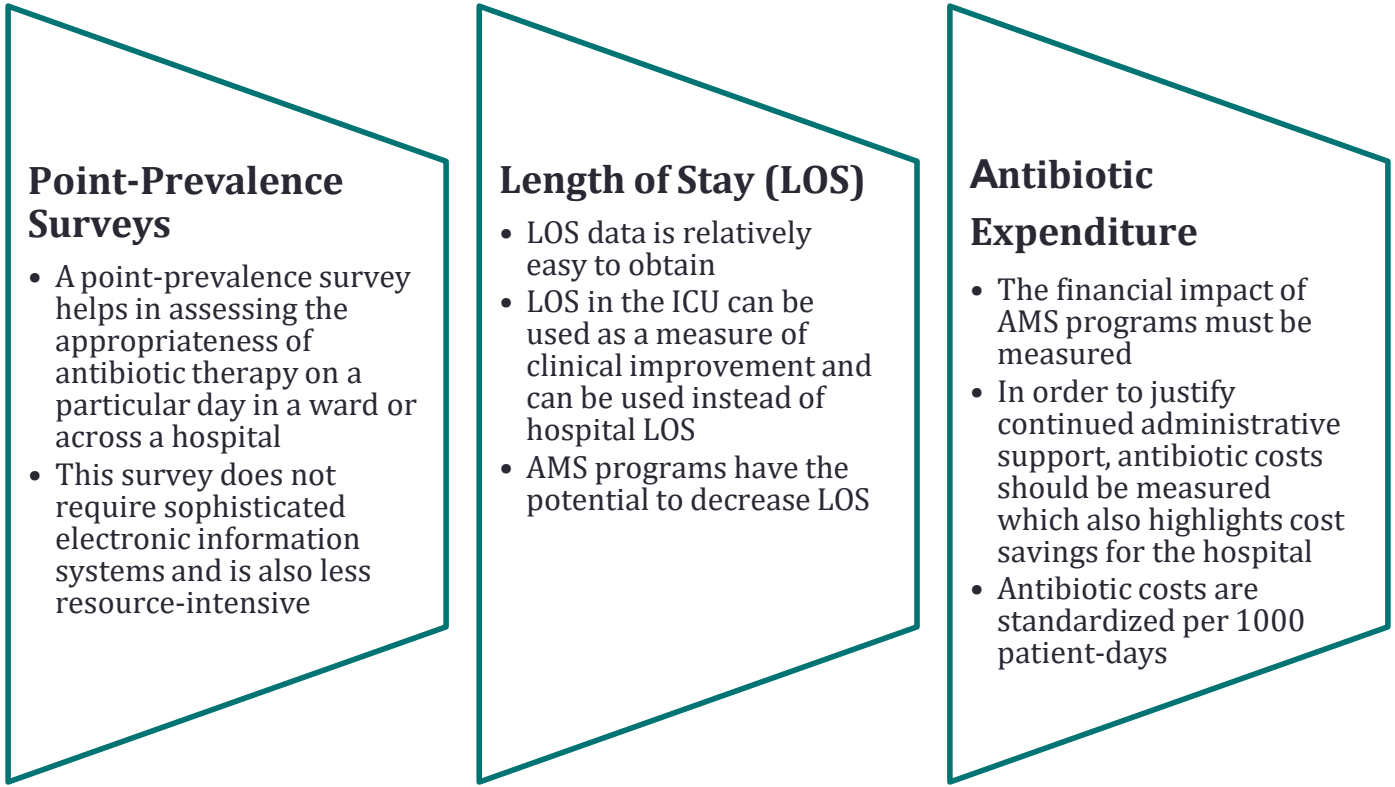
- DDD takes the total number of grams of an antibiotic purchased, dispensed or administered and defines it by the WHO-defined DDD
- DDD is a viable alternative to DOT

Length of Therapy (LOT)[4]

- LOT denotes the number of days a patient receives antibiotic therapy irrespective of the number of antibiotics administered
- LOT provides the true duration of antibiotic therapy per discharge

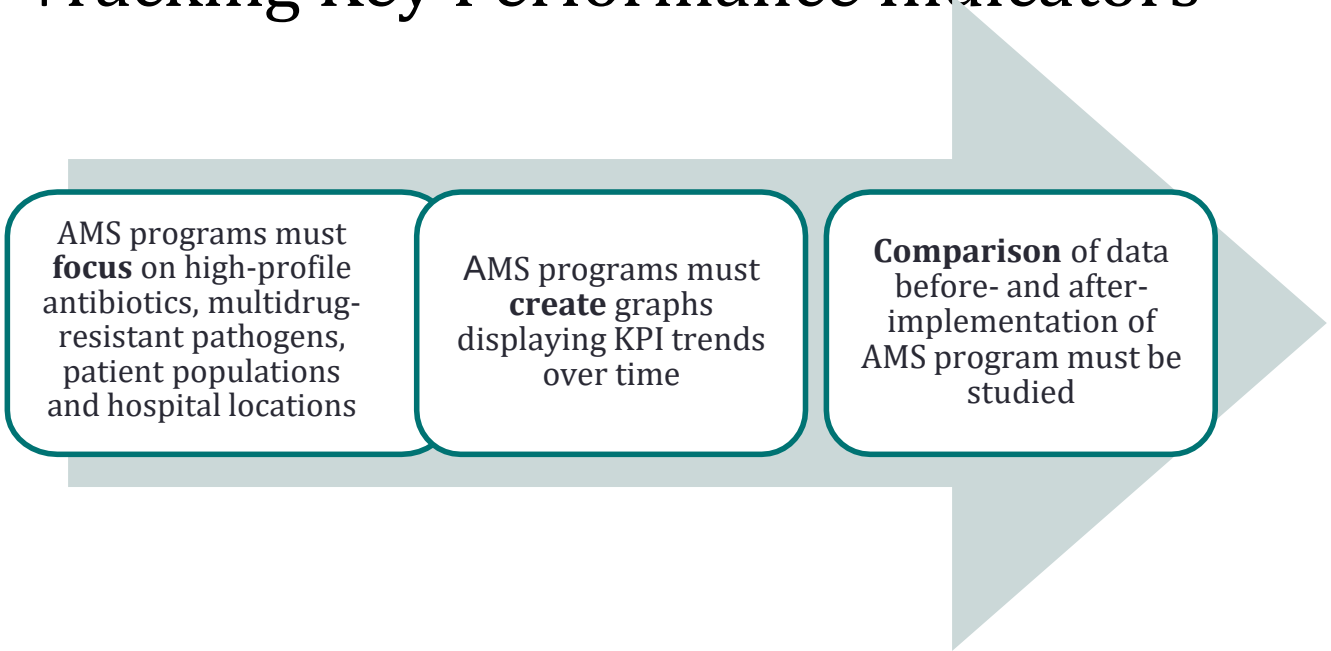
References in footnotes

Key Performance Indicators



1. Morris AM. Antimicrobial stewardship programs: Appropriate measures and metrics to study their Impact. *Curr Treat Options Infect Dis* 2014;6:101-112
2.Centers for Disease Control and Prevention. Core elements of hospital antibiotic stewardship programs. Available at: The Core Elements of Hospital Antibiotic Stewardship Programs (cdc.gov) Accessed on 28th April 2021
3..Barlam TF, et al. Implementing an antibiotic stewardship program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clin Infect Dis* 2016;62:e51-e77

Tracking Key Performance Indicators



1. Centers for Disease Control and Prevention. Core elements of hospital antibiotic stewardship programs. Available at: The Core Elements of Hospital Antibiotic Stewardship Programs (cdc.gov) Accessed on 28th April 2021
2. The Joint Commission. Antimicrobial stewardship toolkit. 2013. Available at: www.jcrinc.com/antimicrobial-stewardship-toolkit. Accessed in 20th April 2021

CE– 5 TRACKING

Process Measures for Quality Improvement

Process measures can focus on the specific interventions being implemented at the hospital.

Priority process measures include:

- Tracking the types and acceptance of recommendations from prospective audit and feedback interventions, which can identify areas where more education or additional focused interventions might be useful.
- Monitoring of preauthorization interventions by tracking agents that are being requested for certain conditions and ensuring that preauthorization is not creating delays in therapy.
- Monitoring adherence to facility-specific treatment guidelines. If feasible, consider tracking adherence by each prescriber.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE– 5 TRACKING

Additional process measures for quality improvement include:

- Monitoring the performance of antibiotic timeouts to assess how often they are performed and if opportunities to improve use are being identified and acted on.
- Performing a medication use evaluation to assess courses of therapy for select antibiotics or infections to identify opportunities to improve use.
- Monitoring how often patients are converted from intravenous to oral therapy to identify missed opportunities to convert.
- Assessing how often patients are prescribed unnecessary duplicate therapy, for example if a patient is prescribed two antibiotics to treat anaerobes.
- Assessing how often patients are discharged on the correct antibiotics for the recommended duration.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE– 6 REPORTING

Antibiotic stewardship programs should provide regular updates to prescribers, pharmacists, nurses, and leadership on process and outcome measures.
This includes:

- Antibiotic resistance
- Key issues that arise during prospective audit and feedback reviews and preauthorization requests
- Findings from medication use evaluations along with summaries

Antibiotic resistance information should be prepared in collaboration with the hospital's microbiology lab and infection control department.

Summary information on antibiotic use and resistance along with antibiotic stewardship program work should be shared regularly with hospital leadership and the hospital board.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

CE– 7 EDUCATION

Education is a key component of comprehensive efforts to improve hospital antibiotic use.

There are many options for providing education on antibiotic use such as :

- Didactic presentations, which can be done in formal and informal settings,
- Messaging through posters, flyers and newsletters
- Electronic communication to staff groups

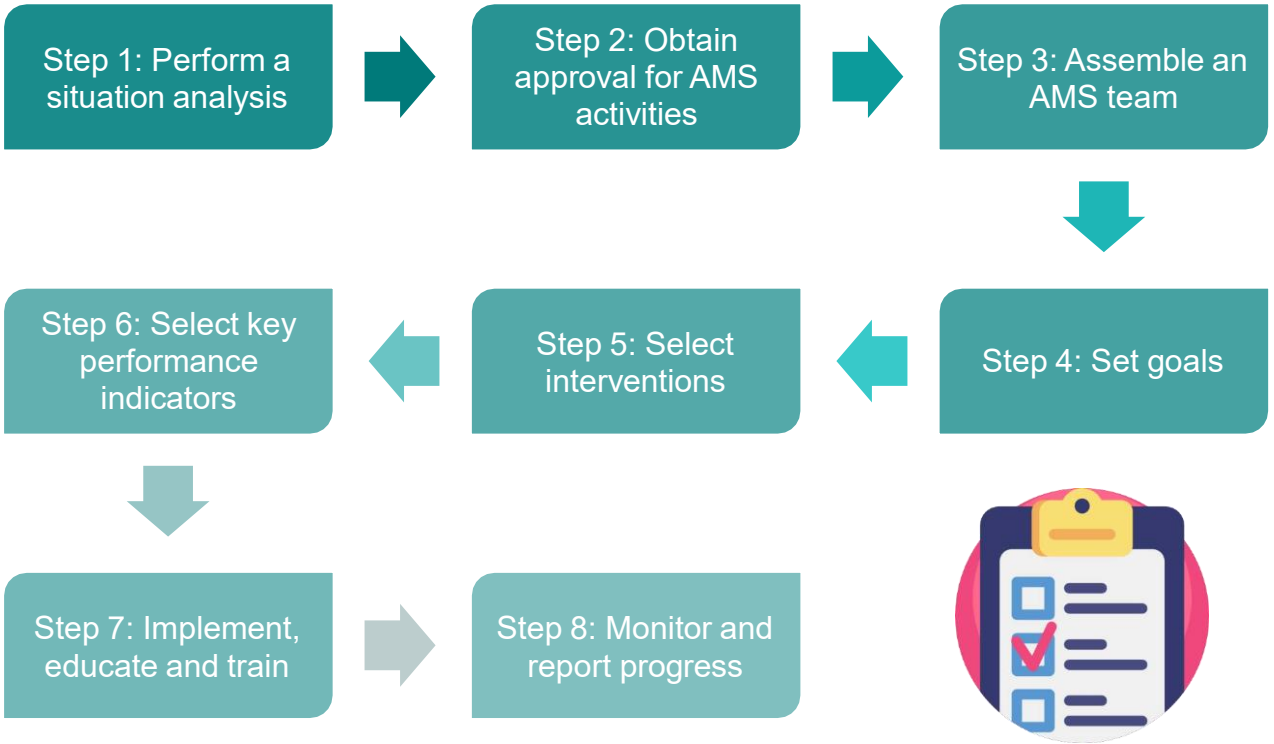
Education is most effective when paired with:

- Interventions and measurement of outcomes
- Case-based education
- Discussions on prospective audit with feedback and preauthorization

This can be especially effective when the feedback is provided in person, for example through handshake stewardship.

Centers for Disease Control and Prevention: The core elements of Hospital Antibiotic Stewardship Programs :2019

Overview of Key Steps



Adapted from

1. Centers for Disease Control and Prevention. Core elements of hospital antibiotic stewardship programs. Available at: The Core Elements of Hospital Antibiotic Stewardship Programs (cdc.gov) Accessed on 28th April 2021

Implementation of AMS

Step 1: Situation Analysis

- Determine what policies, resources and systems are already in place to optimize antibiotic use and support AMS activities[1]
- Assess the hospital's situation in relation to areas of antibiotic use that are most in need of improvement, and the most prevalent multi-drug resistant organisms[1,2]

Step 2: Obtain approval for AMS activities

- Obtaining a formal statement of support and securing funding for AMS activities from hospital administration is a crucial step but may be difficult to obtain because of competition for resources[3]

Step 3: Assemble an AMS team [1,2,4,5]

- Work within the hospital's budget and personnel constraints to create the most effective multidisciplinary AMS team available
- Although there is no set AMS team structure, the team will need a committed and influential leader with the authority to effect change

Implementation of AMS

Step 4: Set goals

- Set manageable goals based on findings from the situation analysis
- Goals can be focused on specific hospital units, infection syndromes, use of specific classes of antibiotics and resistant bacteria, and certain IV antibiotics[1,2]

Step 5: Select interventions

- There are many potential AMS interventions, any combination of which can be selected for use in AMS programs
- Decide which interventions will achieve AMS program goals, are most supported by clinical staff and can be implemented using available resources[3,4]

Step 6: Select key performance indicators

- Before implementing the program, select measures to evaluate the effectiveness of the AMS program in relation to its goals and interventions
- Also consider assessing outcome measures, such as length of hospital stay (clinical), AMR trends (microbiological) and antibiotic expenditure (financial)[3,4]

Reference at the footnote

Implementation of AMS

Step 7: Implement, educate and train[1,2,3]

- Strategize the rollout of interventions
- Make sure treatment guidelines and hospital antibiograms are easily accessible
- Consider using the intranet, printed pocket guides, ward posters and providing electronic summaries at workstations

Step 8: Monitor and communicate AMS program progress and success[2]

- After implementing chosen interventions, begin monitoring AMS program processes and outcomes to assess the impact of the implemented interventions and identify opportunities for improvement
- Instead of continuous surveillance, consider less resource-intensive point prevalence surveys to monitor antibiotic consumption and AMR

SUSTAINABLE MANAGEMENT OF AMS

How to sustain the AMS program?

AMS team leaders are responsible for long-term management of the program

This involves the following steps:

- Monitoring and assessing AMS program performance
- Reporting AMS program performance
- Modifying and adapting the AMS program
- Continuing AMS education

Pre-specified process and outcome measures should be tracked to assess the performance of the AMS program

For a sustainable AMS program, long-term trends are as important as initial changes

Modifying and adapting the AMS program

- AMS team members must stay up-to-date with the **latest AMS guidelines and treatment guideline** recommendations by relevant professional societies
- The AMS team must also agree to modify and/or add AMS program strategies as appropriate

- The AMS team leader should work with the microbiologist and pharmacist to add **rapid diagnostic testing to conventional culture-guided review** whenever feasible
- Regular meetings should be scheduled with the AMS team and clinical staff in areas of the hospital most affected by the AMS program to review AMS program interventions and KPI data, and to make changes to the program as required

Common Challenges to Implementing Stewardship Programs

- Personnel Shortages (55%)
- Financial Considerations (36%)
- **Prescriber Opposition (27%)**
- Resistance from Administration (14%)
- Others:
  - No standard for performance measures
  - Programs to be hospital specific (lots of work to get started)
  - Lack of training programs
  - Difficulty in providing further cost savings once stewardship has been effective

Why physicians are reluctant to stick on to AMS?

- Concerned about the outcome.
- Concern about the coverage of antibiotic.
- Confidence on the level of Microbiology department results.
- Comfort zone of covering all the possible microorganism.
- Fear of litigation.
- Knowledge gap.
- Relying on experience rather than evidence.

The issues can be divided into the following verticals

- Faculty Related
  - Confidence building measures
  - Competency Development
  - Closing the Knowledge Gap
- Patient Related
  - Realistic expectation
  - Reasoning judicious
- Facility related
  - Leadership commitment
  - Patient safety Priority
  - Departmental standardization
  - Strong AMS program

Overreaching Objective and Overall Perspective

- The **health-care facility AMS action plan** provides an overview of the facility AMS programme with overall goals, how they will be reached and by whom, and how progress will be measured. However, having a plan is not enough it has to be implemented.
- Behaviour change in antibiotic prescribing practices, leading to more responsible use of antibiotics. Implementing AMS programmes is a strategy for changing this behaviour over time.
- AMS interventions should be implemented in a stepwise approach, build on existing structures and reporting, maximize teamwork, and encourage champions and clinical staff – including prescribers – to participate.
- Start small and keep it simple and doable.

Bottom Line

- Using evidence-based interventions is no guarantee of success, because success depends on implementing the interventions.

- Two ways of tailoring AMS interventions are:
  - To involve clinical staff in identifying local targets for improving antibiotic use.
  - To have a systematic approach to implementing AMS interventions, review progress over time and make changes when appropriate.

Questions to address when applying the quality improvement model for AMS interventions

What are you trying to achieve ?	**Set a goal for change in antibiotic use that is SMART (i.e. specific, measurable, achievable, relevant and time-bound).**
How will you know that the change is an improvement?	**Determine what quantitative measures to use to show improvement (measurements).**
What changes can you make that will result in improvement?	**Not all changes are an improvement.** **Identify the behaviour changes that will result in improvement (AMS interventions).**

Key Steps to Establishing AMS Programme

- SWOT analysis
- Establish a sustainable AMS governance structure based on existing structures
- Prioritize the health-care facility core elements based on the situational analysis
- Identify the immediate priorities/Identify the resources required
- Identify AMS interventions starting with the low-hanging fruit
- Implement , Monitor and Evaluate AMS interventions
- Offer basic and continued educational resources and training on optimized antibiotic prescribing

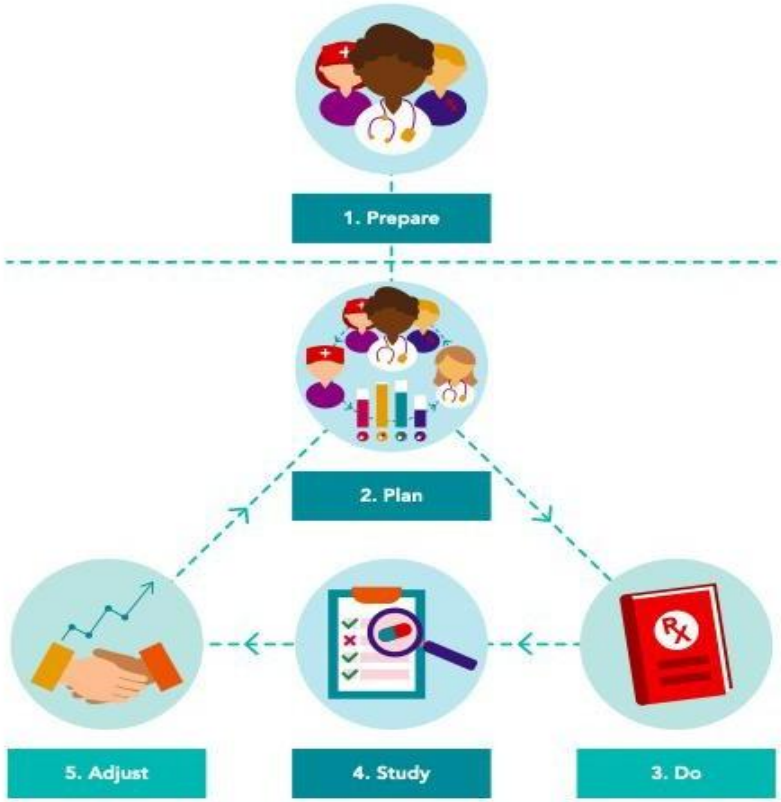
Basic Requirements of Programme

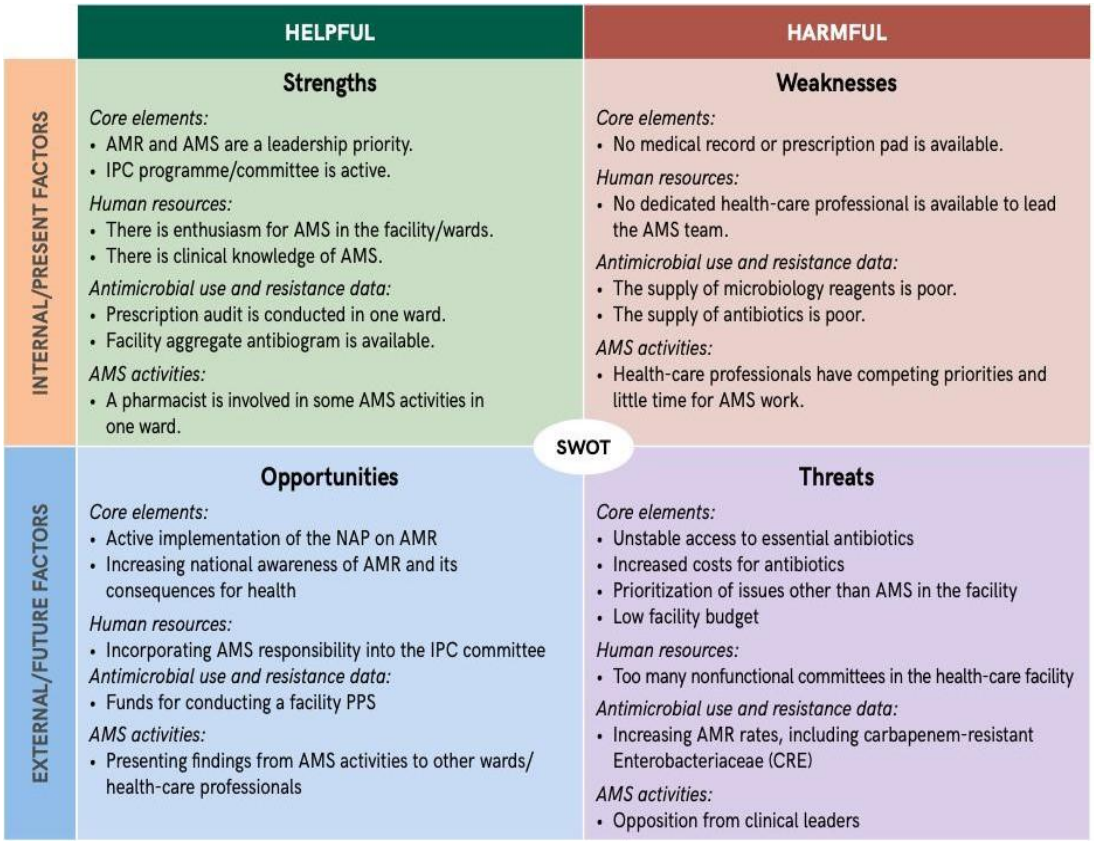
- Educate prescribers and health personnel involved in antibiotic use.
- Develop and update a standardized medical record and medical chart to ensure that information on patients' medicines is all in one place.
- Review whether patients who receive antibiotic treatment have written indications.
- Review antibiotic treatment for patients prescribed 3/> broad spectrum antibiotics.
- Review the dose of antibiotics prescribed.
- Review surgical antibiotic prophylaxis where it is prescribed for >24 hours and where a single dose is appropriate.

Basic Requirements of Programme

- Develop local guidelines for surgical prophylaxis and treatment of common clinical conditions such as community- acquired pneumonia, UTIs, skin and soft tissue infection (SSTIs), as well as common health-care-associated infections such as pneumonia, UTIs and catheter-related infections.
- Work to ensure leadership and identify expertise in infection management.
- Improve the supply and management of medicines, including essential antibiotics, e.g. by establishing a drug and therapeutics committee.
- Work to establish basic microbiology laboratory facilities.
- Work to establish regular surveillance activities
  (e.g. AMR, AMC, health-care-associated infections).

The quality-improvement model following the continuous improvement cycle: Plan, Do, Study, Adjust




HELPFUL
HARMFUL
INTERNAL/PRESENT FACTORS
EXTERNAL/FUTURE FACTORS
Strengths
Core elements:
• AMR and AMS are a leadership priority.
• IPC programme/committee is active.
Human resources:
• There is enthusiasm for AMS in the facility/wards.
• There is clinical knowledge of AMS.
Antimicrobial use and resistance data:
• Prescription audit is conducted in one ward.
• Facility aggregate antibiogram is available.
AMS activities:
• A pharmacist is involved in some AMS activities in one ward.
Weaknesses
Core elements:
• No medical record or prescription pad is available.
Human resources:
• No dedicated health-care professional is available to lead the AMS team.
Antimicrobial use and resistance data:
• The supply of microbiology reagents is poor.
• The supply of antibiotics is poor.
AMS activities:
• Health-care professionals have competing priorities and little time for AMS work.
SWOT
Opportunities
Core elements:
• Active implementation of the NAP on AMR
• Increasing national awareness of AMR and its consequences for health
Human resources:
• Incorporating AMS responsibility into the IPC committee
Antimicrobial use and resistance data:
• Funds for conducting a facility PPS
AMS activities:
• Presenting findings from AMS activities to other wards/ health-care professionals
Threats
Core elements:
• Unstable access to essential antibiotics
• Increased costs for antibiotics
• Prioritization of issues other than AMS in the facility
• Low facility budget
Human resources:
• Too many nonfunctional committees in the health-care facility
Antimicrobial use and resistance data:
• Increasing AMR rates, including carbapenem-resistant Enterobacteriaceae (CRE)
AMS activities:
• Opposition from clinical leaders

Intrinsic Factors to Look for in Behavior Change Model

Perception that AMR is an immediate threat (lack of awareness and knowledge about AMR);

- Fear of losing a patient.
- Belief that broad-spectrum antibiotics are very effective and low risk.
- Influence of a senior physician's preferences on a junior physician's prescribing Physician autonomy in prescribing what he or she thinks is best.
- Uncertainty due to inadequate microbiology services.

Nine Common Areas for Improving Antibiotic Prescribing

PRESCRIPTIONS	WHAT TO IMPROVE
1. Overprescribing	Antibiotics are prescribed when not needed, e.g. fever without evidence of infection, asymptomatic urinary tract colonization, viral infections, malaria, inflammatory conditions.
2. Overly broad spectrum	More broad-spectrum antibiotics (WATCH and RESERVE antibiotics) are prescribed than are necessary (e.g. surgical prophylaxis).
3. Unnecessary combination therapy, including certain fixed-dose combinations	Multiple antibiotics are used, particularly with overlapping spectra and in combinations that have not been shown to improve clinical outcomes.
4. Wrong antibiotic choice	Wrong antibiotic(s) are prescribed for particular indications/infections.
5. Wrong dose	Antibiotics are prescribed with the wrong dose (over- or underdosing).
6. Wrong dose interval	Antibiotics are prescribed with the wrong dose interval (too much time between doses).
7. Wrong route	Antibiotics are prescribed by the wrong route (e.g. IV instead of oral).
8. Wrong duration	Duration of antibiotic treatment should be optimized (e.g. antibiotics prescribed for too long a period, prolonged surgical prophylaxis).
9. Delayed administration	Administration of the antibiotic(s) is delayed from the time of prescription. Repeat doses are not administered in a timely way, which is critical in the case of septic shock and other serious infections.

1 Prepare

- Map possible enablers (champions) and barriers in the unit.
- Obtain managers' and champions' commitment to change.
- Prepare to talk about AMR, the unit's antibiotic use and "what can be done" (AMS).

2 Plan

- Present the AMR problem, challenges in antibiotic use and discuss "what we can do".
- Set SMART goals for changing the unit's antibiotic use.
- Decide on AMS interventions, how to implement them and how to measure change.

3 Do

- Perform AMS interventions (e.g. education, ward rounds and audit) and measurements (AMS review form: see Annex IV).

4 Study

- Analyse the measures (process and outcome). What do they show?
- Evaluate AMS interventions and their implementation. To be continued or changed?
- Prepare to discuss the results, AMS interventions and implementation with the units.
- Review resource use and costs, and determine whether there have been savings.

5 Adjust

- Discuss the results and AMS interventions with the unit.
- Agree on any adjustments to the AMS interventions, implementation and measurements.
- Follow up with a continuous improvement cycle (Plan, Do, Study, Adjust).

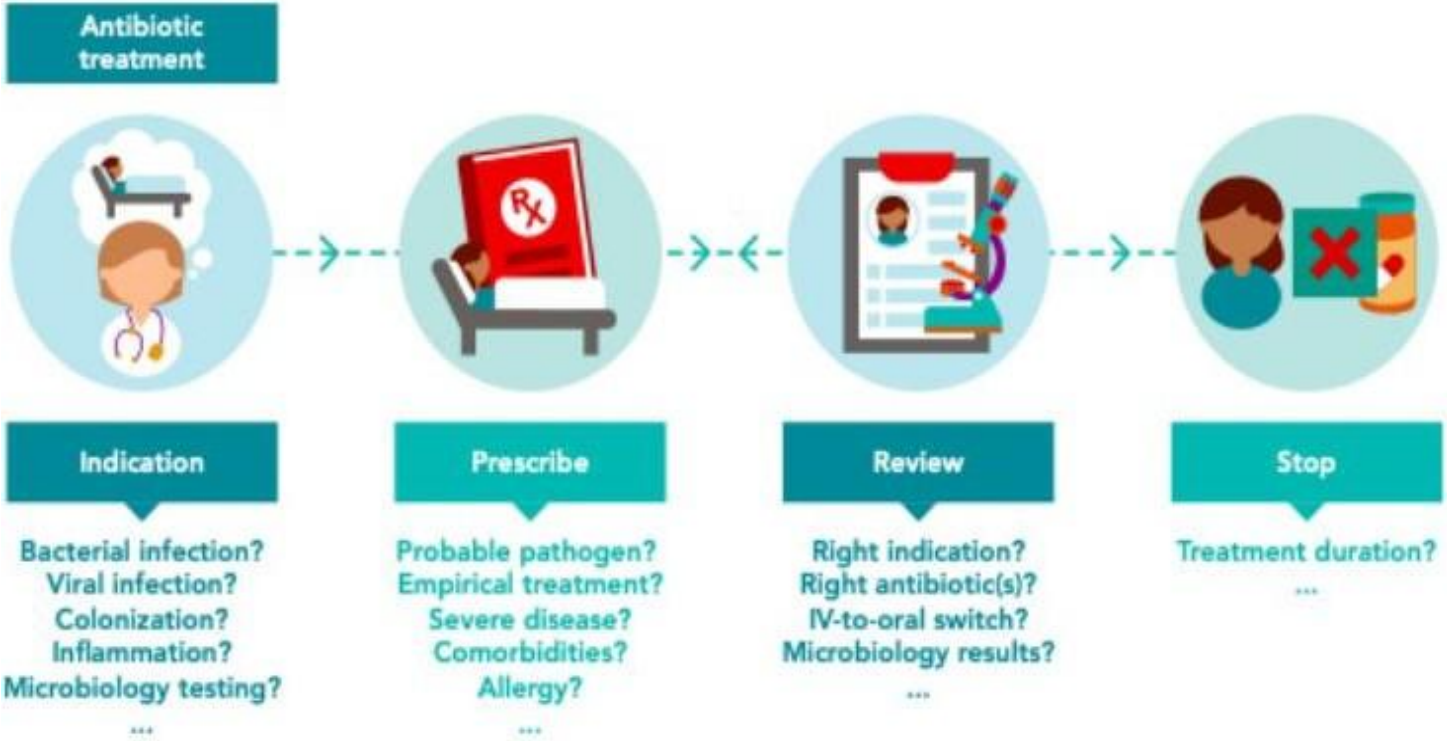
Types of AMS Interventions for Improving Antibiotic Prescribing Practices

PERSUASIVE (Educational)	PERSUASIVE	RESTRICTIVE	STRUCTURAL
▪ Educational ▪ Surgical Prophylaxis Guidelines ▪ Treatment guidelines	▪ Audit with feedback ▪ Ward rounds ▪ Antibiotic self revision by prescribers ▪ Reduntant therapy ▪ Review of prescribed antibiotics ▪ Dose optimization ▪ Iv to oral switch ▪ Duration	▪ Restrictions ▪ Automatic stop orders ▪ Computerised physican order entry ▪ Antibiotic allergy assessment	▪ Rapid laboratory testing ▪ Therapeutic drug monitoring

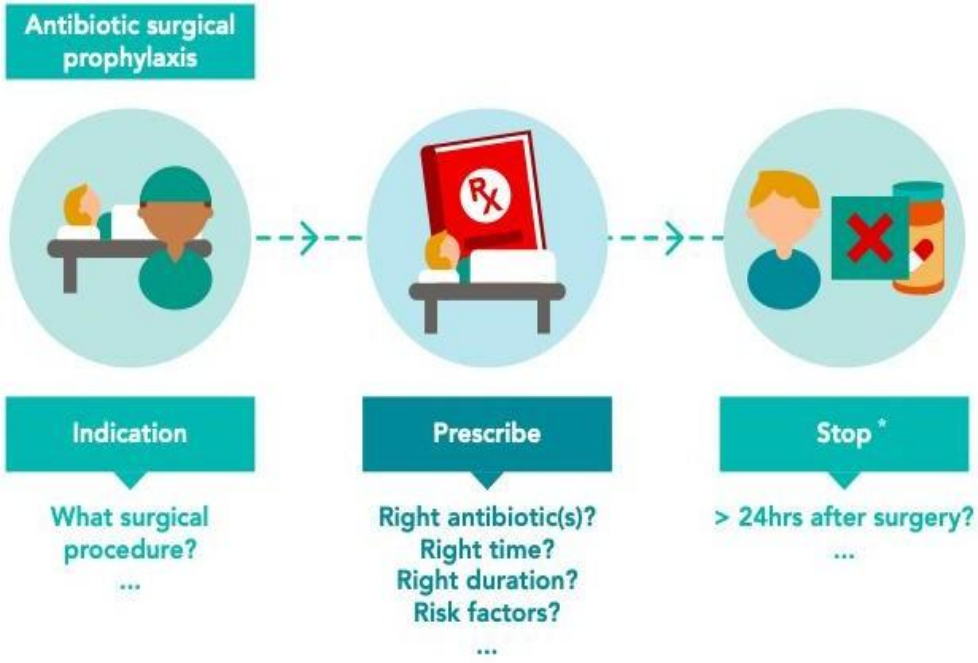
Low Hanging Fruits

- Consensus on disease with definitive treatment (Malaria, Leptospirosis,….)
- Increasing the yield of C/S report by correct sampling and efficient reporting
- Ready to interact with clinicians for guidance, support and clarification
- Pharmacotherapeutic committee efficiency
- Data driven approach and reliability on metrics
- Involvement of Clinicians in the AMS
- Defining the surgical prophylaxis

Appropriate antibiotic treatment – indication and prescribe, review and stop treatment



Appropriate antibiotic surgical prophylaxis – indication, and prescribe and stop prophylaxis



* Antibiotic prophylaxis should not be prescribed for more than 24 hours after surgery. Beyond that, evidence is lacking to show reduced rates of complications, including surgical site infections.

Areas where IT can benefit AMS Intervention

BASIC LEVEL	INTERMEDIATE LEVEL	ADVANCED LEVEL
Database on procurement and ward dispensing at the facility pharmacy level Database of AMR surveillance in different units	Calculation of antimicrobial consumption (e.g. in DDD/1000 inpatients/day) Alerts on specific antibiotic use Time-sensitive automatic stop orders for surgical prophylaxis Electronic guidelines (via electronic mailings to prescribers, intranet) Apps for doing a PPS	CPOE system Estimations of clinical outcomes related to antibiotic treatment Apps for national, regional or facility guidelines Point-of-care access to microbiological results from all units Clinical decision-support systems (commercial or self-developed) of different levels of complexity Computerized patient dispensing billing data Automatic submissions/reporting of computerized facility-level data to the national centre

Summary

- **AMS is-**

Set of activities designed to ‘promote the selection of the **optimal antibiotic, drug regimen** including dosing, duration of therapy, and route of administration

- **AMS is required to-**

Tackle the rising **antimicrobial resistance**, promoting **rationale antibiotic use**, and improve patient-outcomes

- **AMS can be established by-**

Following steps such as performing **situation analysis**, forming **team**, setting **KPIs**, selecting **interventions**, setting **goals**, **educating & monitoring**

- **AMS can be successfully sustained by-**

Monitoring and reporting through **development of antibiograms**, and **adhering to** various **KPIs** pertaining to antibiotic consumption, antibiotic appropriateness, and various microbiological, clinical and financial outcomes

- **AMS can be achieved by-**

Leadership support, team effort, and determined mind-set across the hospital

Thank You..