Antibiotic Stewardship in the Hospital Environment

# *Getting Started Guide*

*January 2011*

# Contents

This Getting Started Guide has been written as a basis for initiating an antibiotic stewardship programme within the hospital environment and to engage interdisciplinary teams in a dynamic approach for reducing micro-organism resistance whilst providing quality care.

The Guide represents the most current evidence, knowledge, recommendations and practical examples as of the date of publication. The contributors remain open to working consultatively on updating the content as more evidence and practical learning emerges of efforts to delay micro-organism resistance in South Africa.

# Acknowledgements

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# Best Care…Always

The "Best Care…Always" campaign is a collaborative effort amongst healthcare organisations and supporting stakeholders across South Africa. The mission is to support the implementation of best care for every patient, always.  The intention is to expand the reach of quality improvement initiatives throughout the country through learning and collaboration.

The Best Care…Always campaign is patterned after innovative and successful international programs such as the:
- Institute for Healthcare Improvement's (IHI) "100K lives" campaign in the USA
- "Saving Lives" programme in the UK
- Canadian "Safer Healthcare Now" initiative

- World Health Organisation's World Alliance for Patient Safety.

The Best Care…Always methodology uses the concept of grouping a small number of evidence-based interventions (known as "bundles") that, when reliably implemented, have been shown to be highly effective in reducing specific adverse events, such as infections. The campaign also emphasises measurement, iterative improvement cycles, teamwork and a supportive environment for patient safety. For further information visit www.bestcare.org.za

Healthcare-associated infections (HAIs) are among the most common and serious adverse events in hospitals across the world and, together with increasing antibiotic resistance, have a significant impact on patient morbidity and mortality. The following HAIs are being addressed in this campaign:
- Ventilator-associated pneumonia (VAP)
- Surgical site infection (SSI)
- Central line-associated bloodstream infections (CLABSI)
- Catheter-associated urinary tract infection (CAUTI)

Antibiotic stewardship is a pilot intervention because although there is an evolving evidence base there is not yet an evidence-based care bundle of interventions currently available.

# The Background – Antibiotic Resistance

The era of effective antibiotics is coming to a close. In just a few generations, many "miracle medicines" have been beaten into ineffectiveness by the bacteria they were intended to eradicate[7]. Bacteria quickly adapt to the presence of antibacterial agents in order to survive. The misuse of antibiotics, which is an international problem, only exacerbates the steady evolution of resistance. In August 2010, the journal Lancet Infectious Diseases posed the question "Is this the end of antibiotics?" documenting the rapid spread of multidrug-resistant bacteria and predicting that 10 years remain in the useful life of many agents.

We now battle to find antibiotics effective against certain bacterial infections. Clinicians should understand that we are in a race to stay a few steps ahead of antibiotic-resistant bacteria. Resistance has life-threatening consequences. For example, studies show that the chances of dying from pneumonia or septicaemia are twice as high if the bacteria are drug-resistant, rising from 20% to 40% in the case of pneumonia. Infections with multi-drug resistant organisms result in the death of an estimated 25,000 people a year in Europe and around 19,000 in the United States. Treatment costs are also escalating accordingly.

Drug-resistant bacterial strains initially appeared in hospitals, where utilisation of antibiotics is greatest. However, resistant bacteria have now become a serious problem in the community, in particular the appearance of ampicillin-resistant *Haemophilus influenzae* and *Neisseria gonorrhoeae.* Multidrug-resistant (MDR) bacteria (*Escherichia coli*, *Shigella*, and *Salmonella*) were first detected in the late 1950s and early 1960s. Ten years ago the so-called superbug

MRSA (*Methicillin-resistant Staphylococcus aureus*) caused front-page panic in the United Kingdom. Despite some advances in antibiotic therapy, less invasive treatment techniques and various infection prevention measures, certain organisms continue to complicate the recovery of many surgical and medical patients. Experts believe that the biggest threat now is from multi-drug-resistant Gram-negative bacteria.

Antibiotics are also used to treat infectious diseases in animals and plants and this widespread use further expands the environment in which bacteria are exposed to antibiotics. Additional factors that contribute to the development of resistance include unnecessary or extended antibiotic use in people, incorrect dosing regimens, and failure to complete antibiotic treatment courses[7].

There is a real need to conserve the antibiotics we have as the pipeline of new antibiotic agents is very small. Without active conservation measures, we will face a healthcare environment without effective antibiotics.

Health care providers should use antibiotics less often and more wisely to reduce the risk of antibiotic resistance. When antibiotic therapy is warranted, a narrow-spectrum agent should be prescribed at an optimal dose for an appropriate duration. Sub-inhibitory dosing of antibiotics, for even a short time period, is likely to induce resistance in pathogens as well as normal flora.

Bacteria are great survivors and humans can win in this battle for survival of the fittest only if we prudently use the antimicrobial resources we have, continue to innovate around new methods of treatment, and fully implement basic measures, in and out of hospital, to prevent infection in the first place.

The combination of effective antibiotic stewardship with a comprehensive infection control program in the hospital environment has been shown to limit the emergence and transmission of antibiotic-resistant bacteria. This is the strategy adopted by the participants in the Best Care Always antibiotic stewardship initiative.

## The Evidence in South Africa

Globally, there is growing resistance amongst gram-positive and gram-negative pathogens in hospital environments[15]. Treatment options are becoming increasingly limited and complicated due this resistance. South African hospitals are battling with the growing emergence of micro-organisms which are resistant to routine antibiotic therapy. Thus far, the following challenges are already being faced in certain areas of South Africa:

1. Vancomycin-resistant *Staphylococcus aureus* and *Enterococcus faecium*
2. Penicillin-resistant *Streptococcus pneumoniae*
3. *Methicillin-resistant Staphylococcus aureus* (MRSA)

4. Third-generation cephalosporin-resistant *E.coli* and *Klebsiella pneumoniae*
5. Carbapenem-resistant *Klebsiella pneumoniae,* Enterobacter spp*.* and *Pseudomonas aeruginosa*
6. Glycopeptide-resistant Enterococci
7. Multi-drug resistant *Mycobacterium tuberculosis*, *Acinetobacter baumannii*, *Escherichia coli* and *Pseudomonas aeruginosa*

# Antibiotic Stewardship Principles

Antibiotic stewardship is the responsible use of a critical and threatened health resource, namely the antibiotics we depend on to prevent and treat infectious disease. Stewardship implies not only appropriate clinical decision-making for individual patients, but a perspective that
- maximizes overall benefits,
- minimizes adverse events related to antibiotic therapy, but most importantly
- delays the onset of widespread microbial resistance to commonly used antibiotics.

Antibiotic stewardship is urgently needed because of rising rates of pathogen resistance; a limited pipeline of new antibiotics; and the morbidity and mortality burden associated with disease that is improperly treated. Antibiotic stewardship aims to raise awareness of antibiotic prescribing issues, both appropriate use and misuse. A set of interventions are suggested to support the prescriber and positively impact the current situation. Many local and international experts believe it is time to change antibiotic prescribing patterns towards optimal, evidence-based practice.

This Guide highlights antibiotic stewardship interventions featured in the literature and recommended by leading experts on antibiotic therapy in South Africa. The recommendations have been tested in some South African hospitals and are thus intended to assist healthcare facilities in prioritising and implementing various antibiotic stewardship efforts.

# Antibiotic Stewardship Objectives

**The ultimate goal is to optimise patient outcomes, while avoiding an increase in the number of antibiotic-resistant organisms encountered over time within each hospital and thus maintain the effectiveness of the antibiotics currently available.**

Each hospital should set goals in relation to their current data for:
- A reduction in organism resistance rates/ emergence of new resistant organisms
- Stability or a decrease in the number of resistant organisms encountered over time

The working goal is to administer an **appropriate antibiotic** of **sufficient dose** and **duration;** to eradicate the pathogen; and to prevent recurrence of the infection. If an *inappropriate* antibiotic is administered; or an *appropriate* antibiotic is administered, but is of insufficient dose or inappropriate duration - it results in the selection of pathogenic organisms and resistance can develop.

# Getting Started

Implementing antibiotic stewardship is not an overnight process and interventions should be introduced incrementally and systematically for success. A successful program involves careful planning and testing to determine if chosen interventions can be plausibly implemented, making modifications as needed, retesting and careful implementation.
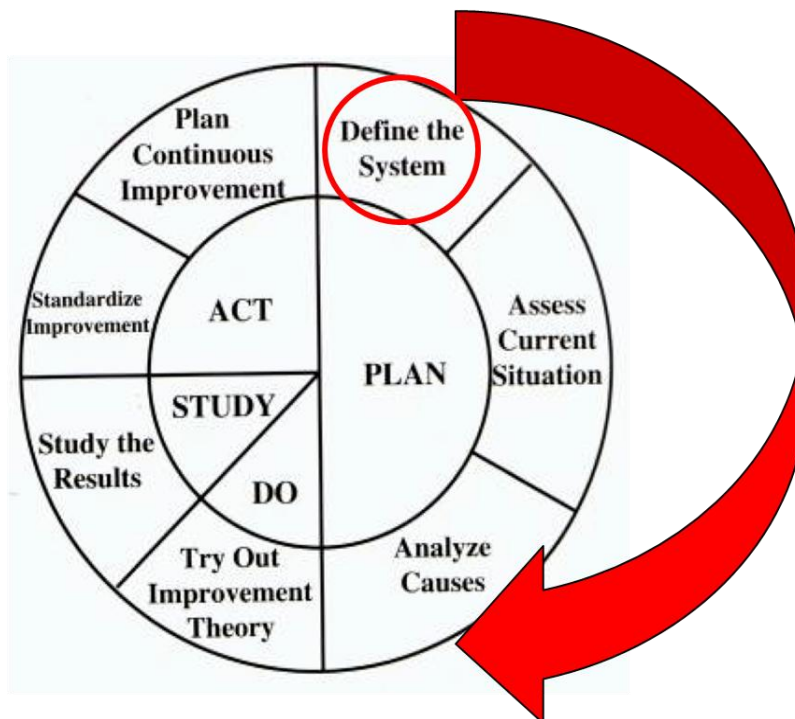
New interventions introduced for antibiotic stewardship can take up to one year to be effectively implemented and to show signs of improvement. These processes then have to be maintained whilst new challenges are addressed.

# The Model for improvement

The Institute for Healthcare Improvement (IHI) (www.IHI.org) recommends using The Model for Improvement.  This model described was initially described by Nolan and colleagues (Berwick, 1996).  It is intended to ensure that change is planned and tested, using objective measurement, to determine that improvement has actually resulted. The model involves answering three basic questions and then implementing a specific cycle for testing a chosen intervention/ innovation.

1.  **What are we trying to accomplish?**  Improvement requires setting aims.  The aims should be time-specific and measurable; and they should define the specific population that is being examined

2.  **How will we know if a change leads to improvement?**  Measurement is required to know if a specific intervention leads to improvement.

3.  **What changes (intervention/ innovation) can we make that we think will result in improvement?**  Not all interventions result in improvement; organisations need to select interventions that they think are most likely to result in improvement.

The process for testing the chosen intervention/ innovation is the plan-do-study-act (PDSA) cycle – a model for testing interventions/ innovations. It is a continuous cycle which is best summarised in the diagram on the following page:

The Plan-Do-Study-Act (PDSA) cycle
(Source: http://mes.massac.org/continuous-improvement)

## Antibiotic Stewardship Interventions

The consumption of antibiotics must be monitored <u>prospectively and retrospectively</u> in order to:

- o   Monitor their appropriate use
- o   Reduce the unnecessary exposure of organisms to these agents

It is proposed that each hospital adopt antibiotic interventions for acute treatment and surgical prophylaxis. The number of interventions introduced may depend on a variety of factors and should be tailored to the particular circumstances within each hospital.

**There are eight proposed principles of antibiotic therapy that must be respected:**
1. Antibiotics are prescribed only when there is clear rationale e.g. clinical signs of a bacterial or fungal infection are present
2. When empiric therapy is necessary (i.e. the organism has not been identified) reasonable, evidence-based prescribing guidelines are followed
3. Specimens are routinely sent for culture
4. Antibiotic treatment is tailored promptly according to the laboratory results
5. The appropriate dose is prescribed at the correct frequency of administration (including continuous infusion when necessary)
6. Antibiotic therapy is not prolonged unnecessarily

7. Antibiotics with overlapping spectrum of activity are avoided unless there is clear rationale
8. The change from IV to oral therapy is made as early as possible

**Three principles are proposed for surgical antibiotic prophylaxis:**
1. Appropriate antibiotic selection for the surgical procedure according to evidence-based guidelines
2. The initial dose is given 0-60 minutes before surgical incision
3. Prophylaxis is not continued for more than 24 hours (in most cases a single dose is sufficient)

Note: Refer to literature on preventing surgical site infections & the care bundles inherent to that programme

# The Antibiotic Stewardship Bundle

All the principles noted above are essential, however there is evidence from other patient safety/improvement campaigns that focusing initially on a smaller number of high impact, measurable interventions can facilitate progress. Pilot BCA hospitals will therefore test versions of a care bundle. Refer to the BCA website or contact the lead BCA person in your hospital or hospital group for more information about the bundle.

# The Stages of Antibiotic Stewardship 1- 8

The following description of stages in the process of implementing antibiotic stewardship should be read along with the diagrams which summarise the key elements. Some stages clearly precede others, while others can occur concurrently.

# Antibiotic Stewardship Stage 1:

# Environmental Scan and Initial Planning

Adequate planning is critical to the establishment of a successful programme:
1. Obtain data to identify the problem/s:
    a. what the infection rates are in the hospital & specific units
    b. identify units with a high occurrence of resistant organisms
    c. the recent prevalence of alert organisms in the hospital & specific units
    d. determine current antibiotic prescribing behaviour
    e. identify areas of inappropriate antibiotic usage

2. Understand the type and size of the hospital and the patient profiles as this could influence the interventions considered.
3. Identify the major role-players:
    a. All doctors admitting or treating patients in the hospital
    b. Microbiologist/s who can be consulted regarding organism profiles and make recommendations regarding antibiotic prescribing
    c. Pharmacist/s who can monitor antibiotic prescribing and usage , and provide feedback and recommendations to doctors, nursing staff and patients
    d. An Infection Prevention Control (IPC) Practitioner who is doing active surveillance, monitoring adherence to IPC principles and providing feedback to the unit and the team
    e. Nursing staff in various units who will comply with IPC principles; correctly administer prescribed antibiotics; correctly interpret microbiological reports; and implement chosen interventions together with effective communication with prescribing doctors.
4. Identify the training needs of all major role players; facilitate appropriate training to enhance their knowledge and equip them with the necessary knowledge and tools.

# Recommendations:

1. It is desirable that antibiotic stewardship programs function under the auspices of ethics, quality assurance and patient safety. Antibiotic cost discussions might hinder progress by distracting healthcare professionals from the antibiotic stewardship principles.
2. Education and training of all healthcare professionals is extremely important and needs to be maintained as new data becomes available. However, one mustn't wait to feel 'sufficiently trained' before embarking on this venture because this will result in delays during which organism resistance can increase.
3. An example of a hospital roll-out plan is available

## Antibiotic Stewardship Stage 2:

## Creating Awareness and Preparing the Ground

1. Obtain agreement for establishing an antibiotic stewardship programme within the hospital. The support and collaboration of hospital management, medical professionals, other leadership and local providers in the development and maintenance of an antibiotic stewardship programme is essential.

2. Plan the initial communication strategy carefully to create awareness and obtain support for an antibiotic stewardship programme:
    a. Create awareness about the global problem of antibiotic resistance and the South African context
    b. Use antibiotic prescribing data from the hospital and case studies to define the real problem/s
    c. Introduce the evidence and rationale for certain interventions to the hospital management team and relevant doctor committees (e.g. medical advisory/ ethics/ drug review committee within the hospital)
    d. The communication method is important – a meeting, CPD event, notes to all doctors etc. If a clinical doctor forum exists, this might be a good starting point.
3. Communicate the intent to establish a programme within the hospital to all doctors. Request comments and suggestions for the programme as well as volunteers and nominations for a team or committee.
4. Organize an educational program on appropriate antibiotic use. Teaching the core principles will encourage the change process.

# Recommendations:

1. Use respected opinion leaders and actual hospital data to provide evidence of concerns to the doctors.
2. Always encourage suggestions and request feedback when communicating.
3. A fully inclusive, consultative approach is extremely important. All the stakeholders must be included and given the option to participate at any point.
4. Find doctor champions within the hospital who are of sufficiently high profile and visible to lend credibility to the programme.
5. Work with those who want to work on the project rather than trying to convince those who do not.
6. Refer to an example of a letter to doctors

## Antibiotic Stewardship Stage 3:

## Establishing a Team

1. Identify key individuals in each hospital based on their expertise, influence and willingness to be part of an antibiotic stewardship team:
    a. Microbiologist/s
    b. Physicians/ Doctors
    c. Infection prevention staff

  d. Pharmacist/s
  e. Nursing staff

2. Establish an antibiotic advisory committee/ working group within the hospital or across related hospitals/ clinics and communicate the members to all stakeholders.

3. Have the initial meeting and:
  a. Analyse and interpret the data to establish the extent of the problem
  b. Identify areas within the hospital to test interventions. ICU and High Care units can be ideal.
  c. Agree on the necessary interventions to be made
  d. Prioritise interventions
  e. Agree on communication methods to all stakeholders

4. Decide upon the frequency of appropriate educational sessions for all health professionals

5. Establish empiric guidelines for antibiotic prescribing in certain areas. The team must endorse the use of antibiotic policies and guidelines within the hospital, whether already available or requiring compilation:
  a. Guidelines on diagnosis, treatment and prophylaxis of infection
  b. Antibiotic avoidance in certain instances for example colonization or certain viral infections
  c. Early removal of devices (catheters etc.)
  d. Surgical drainage of purulent infections
  e. Make recommendations regarding the introduction of new antibiotics and review the older agents
  f. Possible restriction of certain antibiotics

6. Meet on a monthly basis to review the results and re-prioritise focus areas

# Recommendations:

1. The support and collaboration of hospital management, medical professionals, other leadership and local providers in the development and maintenance of an antibiotic stewardship programme is essential.

2. It is desirable that antibiotic stewardship programs function under the auspices of ethics, quality assurance and patient safety.

3. Antibiotic cost discussions might hinder progress by distracting healthcare professionals from the antibiotic stewardship principles or they may be beneficial depending on your hospital and it's Doctor body

4. The microbiologist needs to be someone the doctors trust and who has a good relationship with the doctors

5. The clinical microbiology laboratory plays a critical role in antibiotic stewardship by providing patient-specific culture and susceptibility data to optimize individual antibiotic management and by assisting infection control efforts in the surveillance of resistant organisms and in the molecular epidemiologic investigation of outbreaks.

6. Pharmacists do not have to be clinically trained but need a clinical interest to participate
7. The Infection prevention staff need to be an active part of the team as she/ he will be required to supply the surveillance data.
8. The Infectious disease specialist or doctor is probably the easiest one to sell the idea of antibiotic stewardship to – this person's buy in will be helpful when addressing inappropriate prescribing issues with the colleagues.
9. The nursing staff are also core to the implementation as they are in direct contact with the patient as well as the doctors.
10. Education and training of all healthcare professionals is extremely important and needs to be maintained as new data becomes available. However, one mustn't wait to feel 'sufficiently trained' before embarking on this venture because this will result in delays during which organism resistance can increase.
11. In quantifying your hospital's antibiotic prescribing issues, it may be beneficial to talk to the doctors admitting to your chosen area, before you start. Many of them are fully aware of the issues and will be glad that someone is taking the initiative. You may begin the stewardship process without having to spend a month collating data and presenting it to them.
12. If, however, you wish to undertake an evidence-based approach, then decide if data collation for two or four weeks will be sufficient to cover your needs. You only need sufficient data to show there is a problem and the potential exists to change the prescribing for the good of the patients. If you have no reporting mechanism available the process can be quite labor intensive. Both Netcare and Life Healthcare have daily reports of antimicrobial usage per patient based on the billing to the patient account. The report identifies antibiotics prescribed for longer than 7 days and gives an overview of the antibiotic prescribing for the whole patient stay, including the area the patient was in at the time of administration.
13. You also need to consider your reporting and what sort of data you need to collect. A retrospective review may require you to read patient files for a period and check the antibiotic prescribing versus the pathology and the current hazardous biological agent data. This will enlighten you as to whether a specimen was sent in, the empiric prescribing appropriateness, duration, frequency, dosage and escalation / de-escalation when pathology is available. If the patient files are not easily available, one can conduct a concurrent assessment of the patients in the chosen area and report on the prescribing as above for a set period of time. This would require a resource such as a Pharmacist to review the patient charts daily. If you have the report mentioned above this speeds up the process considerably.
14. This team needs to provide the basic guidelines for empiric prescribing in the chosen area based on the alert organism profile
15. Some of the tools you will need to develop to focus future meetings include:
    a. an antimicrobial report
    b. a daily checklist for the ward round
    c. a method of communicating with the prescribing Doctor should an intervention be required e.g. SMS, note on separate sheet or note on chart or a phone call
    d. a record of whether the suggested interventions are accepted or rejected

    e.  a reconciliation report where the prescribed antibiotic is assessed relative to the found pathogen

    f.  the Hazardous Biological Agent report given to the Department of Health monthly

    g.  Empiric prescribing guidelines for the area

16. The meeting proceedings of this committee should be transparent to all stakeholders and any conflicts of interest declared.

## Antibiotic Stewardship Stage 4:

## Establishing the Extent of the Problem

Assess the antibiotic prescribing data specific to the particular hospital in order to identify areas of concern such as:

1. Appropriate specimen taking for microbiology testing:
   a. Are appropriate specimens taken?
   b. Are cultures taken before antibiotics are commenced?
   c. Is this done for all patients with an infection?
   d. How quickly are specimens sent to the lab?
   e. How soon are the results (organism identification and antibiotic susceptibility) received?
2. Are antibiotics being prescribed for documented colonization?
3. Are antibiotics being prescribed for viral infections (e.g: influenza) where a secondary infection is not evident?
4. Are the local patterns of sensitivity and resistance readily available from the Microbiologists <u>and</u> available to all doctors within all areas of the hospital?
5. Are there defined local guidelines for empiric therapy for the most frequently encountered infections? Are the guidelines readily available within the hospital?
6. Is there excessive duration antibiotic therapy?
7. Is the antibiotic treatment tailored (de-escalated to narrow spectrum) in accordance with the microbiology results and local treatment guidelines to target the pathogen? How quickly does this occur?  Is the start date of the new therapy and the expected duration of therapy recorded?
8. Are the antibiotic doses and frequency of administration within recommendations to remain above MIC?
9. Are combinations of antibiotic therapy frequently prescribed? Is there any duplication of cover?
10. Are Microbiologists contactable for treatment advice?
11. Is there appropriate surgical prophylaxis?
    a. Are surgical prophylaxis guidelines readily available in the theatre complex?
    b. Is the prophylactic antibiotic selected for the surgical procedure in accordance with local guidelines?

     c. Is the first prophylactic dose given within one hour of the surgical incision? (refer to Surgical Site Infection bundle)

     d. Are all prophylactic antibiotics stopped after 24 hours?

12. Can a pharmacist perform a daily consideration of antibiotic therapy for in-patients (based on review of clinical picture and laboratory results) and look for the following trends:

     a. Have specimens been sent to the Microbiology laboratory?

     b. Have the results been received and noted by the doctor?

     c. Has the antibiotic changed (if necessary) in accordance with the results?

     d. What is the duration of therapy? It is usually appropriate to question the continuation of therapy for longer than 7 days

     e. Are there any adverse event concerns (including toxicity)?

     f. Can there be a change from intravenous to oral therapy, when the patient's condition allows?

# Recommendations:

1. The goals should be prioritised based on the areas of concern identified in stage one from the retrospective antibiotic utilisation data.

2. Don't try to address too many concerns at first. Work through one or two interventions initially in one unit, learn as you progress and complete all the recommended stages in this Guide. Once successful, move on to other interventions whilst maintaining the good work done on the first interventions.

## Antibiotic Stewardship Stage 5 :

## Set goals and Prioritise Interventions

Once the areas of concern have been identified and prioritised for action, the team needs to communicate these concerns and the recommended improvement steps to all healthcare professionals in the hospital. The questions in stage four are supported by clinical evidence (see suggested reading section at the end of this Guide) and should be asked where relevant to the concerns identified in the antibiotic utilisation data. The team needs to apply appropriate measures to the applicable interventions.

Once a team has prepared the way for change, the next step is to begin testing interventions within your institution. The team must communicate which units within the hospital will apply the changes and that monthly measurement will occur to determine the success of the

intervention. Feedback from healthcare professionals must be encouraged so that this is a stage of learning.

# Antibiotic Stewardship Stage 6:

# Measurement

Measurement is the only way to know whether a change represents an improvement. Retrospective infection surveillance must occur regularly in terms of:
1. The prominent organisms in the facility
2. Resistance data (local area) and noticeable changes to the incidence of alert organisms i.e. MRSA, ESBL

Retrospective surveillance of antibiotic consumption data should be performed with regular benchmarking and this should be discussed with prescribers, pharmacists and infection specialists. Standard reports should be designed to allow for regular and consistent comparisons of antibiotic utilisation.

Dr Adrian Brink has recommended the following measures of inappropriate antibiotic use:

| Problem | Measure |
|---|---|
| Empiric therapy without confirmation | Antibiotics without microbiology cultures |
| Inappropriate agent combinations | ≥3 agents at a time<br>Double coverage:<br>Gram negative agents<br>Gram positive agents<br>Antifungals |
| Failure to de-escalate therapy | |
| Excessive duration of treatment | >7 days |
| Inappropriate surgical prophylaxis (agent/timing/duration) | >24 hrs, inappropriate agent (e.g. "high level" antibiotic) |

A daily antibiotic report is suggested which should allow the pharmacist or nurse to determine whether:
1. Antibiotic therapy has continued for more than seven days
2. More than three agents are given at one time and any possible duplication in cover as a result
3. Whether microbiology results have been obtained
4. Whether therapy has been tailored in accordance with the microbiology results

Pharmacist ward rounds are very useful to assess the antibiotics prescribed to the patients still within the hospital. These assessments can result in a reduction of the inappropriate use of antibiotics due to direct interaction with the prescriber. These rounds should ideally occur daily in the relevant wards or at least once or twice a week if resources are limited.

Surgical prophylaxis measures:
1. Percentage of surgical patients whose prophylactic antibiotics exceed 24 hours post-surgery.
2. Monitor the use of inappropriate surgical prophylaxis with high level agents such as: Piperacillin/Tazobactam; Cefepime; Imipenem; Meropenem; Linezolid; Teicoplanin; Voriconazole; Caspofungin
3. Start with certain types of surgery (eg: orthopaedic, gynaecological, cardiovascular) and monitor antibiotics used which deviate from the guidelines.

A process for addressing concerns must be agreed to with doctors in the hospital. Well-researched notes which are left on the patient chart by the pharmacist for the doctor's consideration seem to be well accepted and useful. This method improves communication to doctors despite differing daily workload schedules. These evidence-based notes should always be treated as suggestions and offers of assistance, not instructive. The pharmacist should use available reference tools to research medicine information. It is critical to build up a level of trust between doctors and pharmacists for this work. Eventually new information (from journals/ interesting articles/ conferences) will be widely shared for the benefit of all healthcare professionals.

The pharmacists should report the type/s of intervention suggestion for each patient on a monthly basis in order to determine the value of the pharmaceutical service offered and whether there is improvement over time with regards to antibiotic stewardship principles. For example:
1. Number of patients on therapy different to guidelines
2. Number of patients receiving antibiotics with a duplicate spectrum
3. Number of patients on therapy longer than 7 days
4. Number of patients where Microbiology results were prompted
5. Number of dosage alterations suggested
6. Advice sought for side-effects

Refer to the example of a pharmacist intervention report.

# Recommendations:

1. Whenever possible, use measures you are already collecting for other programs.

2. Evaluate your choice of measures in terms of the usefulness of the results and the resources required to obtain those results. Try to maximize the former while minimizing the latter.
3. Try to include both process and outcome measures in your measurements.
4. Make the measurements and progress results visible within the hospital to keep teams motivated and aware of progress.
5. Encourage process feedback and suggestions for improvement.
6. Microbiology and Pharmacy departments should ensure that regular audits and education programmes can be carried out. The two departments should communicate freely and cooperate to ensure the best use of antibiotics.
7. Review the data as a team regularly (at least monthly).
8. When measures are not improving, the champion or leader needs to re-address the problems with all healthcare professionals and must help to keep everybody on track toward the aims and goals.
9. Ensure there is a daily care plan to assess the antibiotics prescribed – immediate changes are easier to make than changes based on retrospective data.
10. Daily visits by a pharmacist to the ward to review the antibiotic selection, dose and duration of therapy. Pharmacists, in conjunction with medical microbiologists or infectious disease physicians, are well placed to monitor adherence to antibiotic policies and stewardship goals.
11. Suggested interventions must be well researched and validated by available literature, then communicated to prescribers either verbally or in writing. Written communication is typically accomplished by using forms or notes that are placed in the medical record or chart. Each suggested intervention requires confirmation or correspondence from the prescriber as this provides the opportunity for mutual education.
12. An antibiotic report which can be updated daily and sent to all units (particularly ICU) detailing the entire antibiotic picture in each patient is extremely valuable. The report should provide information from the time of the patient's admission so that the whole clinical picture and antibiotic history can be viewed. This report will allow pharmacists and nursing staff to easily identify when antibiotics have been issued for longer than 7 days so that a note can be made on the prescription chart. The report can be used to confirm (with pathology results) that the appropriate antibiotic has been ordered and whether de-escalation can occur.
13. In hospitals where a daily review of antibiotic use is not feasible because of limited resources, a scaled-down model can still have a significant impact. Pharmacist visits once, twice or three times a week to review patients receiving multiple, prolonged, or high-level courses of antibiotic therapy can still result in alterations to therapy.
14. Sepsis parameters such as temperature, respiratory rate, pulse, blood pressure, white blood cell count and C-reactive protein are easily measured. Results should be documented for audit purposes and easy chart review to enable streamlined, rationalization of therapy at the earliest opportunity. A one-page summary report is very useful. Refer to the example provided.

# Antibiotic Stewardship Stage 7:
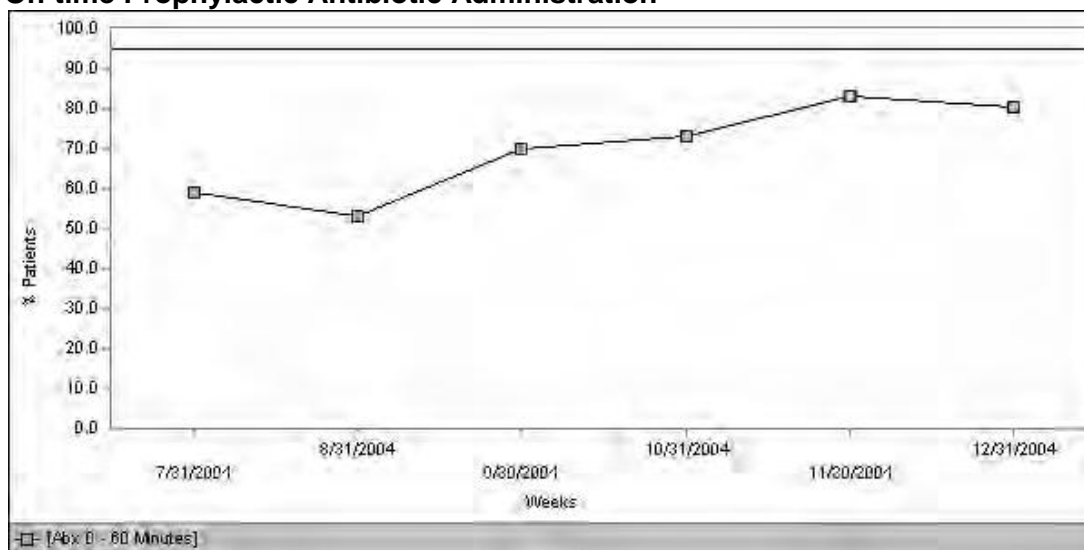
# Review of Effectiveness

Both process and outcome measures are useful to determine the impact of antibiotic stewardship on antibiotic use and resistance patterns.
**Process measures:** did the intervention result in the desired change in antibiotic use? **Outcome measures**: did the process reduce resistance?

To determine if improvement has really happened and if it is lasting, observe patterns over time. Charts of data over time are an important tool in tracking improvement. Run charts have a few benefits:

- Interpretation
- Feedback to those implementing the interventions to maintain motivation
- They help improvement teams formulate aims by depicting how well (or poorly) a process is performing.
- They help to determine when changes are truly improvements

**On-time Prophylactic Antibiotic Administration**



Decide what processes work, how they should continue and the relevant timeframe for reassessment.

Identify what processes didn't work and why. If they can be altered, determine how, communicate and try again.

## Antibiotic Stewardship Stage 8:

## Spread

After testing a change on a small scale (in one area perhaps), learning from each test and refining the change through several PDSA cycles, the team can implement the change on a broader scale to other units in the hospital where antibiotics are used.

Eventually, the changes that are introduced become established practice. Over time, new evidence might require revisiting the processes that have been developed.

Identifying a "process owner" helps to maintain the long-term integrity of the effort.

## References and Suggested Reading:

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