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Message from WHO
Dear colleagues,

Welcome to the second issue of SJRUM.

The aim of this journal is to give a clear picture of rational use of medicines and to step forward into a better health care services. The Irrational Use of Medicines (IRUM) in Sudan has been increasing in recent years; many studies have shown irrational prescribing at different levels of health care facilities. Other studies have reported irrational dispensing and poor counseling on the part of the health care professionals, and improper behavior on the part of the patients. If we don’t change this irrational behavior, unfavorable consequences, ranging from inconvenience, such as prolonged hospitalization, adverse drug reaction, and antibiotic resistance to fatal conditions will inevitably occur. We call for collaboration from all partners (doctors, pharmacists, nurses) innovations to improve our conditions. This undoubtedly requires a set of strategic plans to reach our goal within a timeframe; otherwise we will lose the momentum.

In this issue we would like to welcome two new members who have joined the editorial team: Aimun Abdelgaffar, Assistant Prof. of pharmacology and Dr Sawsan Eltaher, medicine information pharmacist. With their experience and backgrounds, they will undoubtedly be good assets additions to the journal. We would also like to say goodbye to Dr Mohamed A. Zain and we are still looking forward to receive more of his valuable contributions.

Editor-in-chief
Dr. Habab K. Elkheir
Resistance as outcome of Irrational Use of Medicine (IRUM):

- High resistance: Shigella dysenteriae type I and enteropathogenic E. Coli showed high resistance rates against the commonly-used antimicrobial agents: ampicillin, amoxicillin, chloramphenicol, tetracycline, cotrimoxazole, nalidixic acid, sulfonamide and neomycin.

Antimicrobial Resistance (AMR)

It is commonly known that the irrational and extensive use of antimicrobials usually result in drug resistance\(^1\); which contributes to upsurge in the morbidity and mortality associated with infectious diseases as well as increasing the cost of treatment and prolonging the hospital stay compared with infections susceptible to treatment\(^2\,\,^3\,\,^4\). Consequently, there is a worldwide concern that in the not-too-distant future, we may be confronted with a growing number of potentially untreatable life-threatening infections that are difficult to manage because treatment options are limited.

A microorganism is classified as clinically resistant when the degree of resistance shown is associated with a high likelihood of therapeutic failure\(^5\). WHO defined Anti Micobial Resistance (AMR) as: resistance of a microorganism to an antimicrobial medicine to which it was previously sensitive. Resistant organisms (include; bacteria, viruses and some parasites) are able to withstand attack by antimicrobial medicines, such as antibiotics, antivirals, and antimalarial, so that standard treatments become ineffective and infections persist and may spread to others\(^6\). The emergence of antimicrobial-resistant pathogens is a major public health concern, particularly in hospitals and other health care settings. One of the main causes of AMR is the inappropriate and irrational use of medicines such as patients not completing the full course of a prescribed antimicrobial or when poor quality antimicrobials are used. As a result, resistant microorganisms may emerge and spread\(^5\,\,^6\) first within a hospital or a specific community and then may spread to a nation at large and across national boundaries\(^2\).

It is important, therefore, to promote the appropriate use of antimicrobial agents in both human and veterinary medicines\(^1\) and encourage healthcare providers to take the following remarks into consideration:

- Use of antimicrobials should be restricted to situations where a valid prescription has been obtained.
- Stop using/prescribing/dispersing antibiotics for viral infections such as cold, acute bronchitis, cough, or runny nose.
- The patients should be advised to take the full course of a prescribed antimicrobial for the recommended period and shouldn’t take leftover antibiotics or a prescription that was used by someone else in the household.
- The rational use of antibiotics should be encouraged while the overuse and misuse of antimicrobial agents should be discouraged.
- Performing of Antimicrobial Susceptibility Testing (AST) and diagnostic testing for rational antimicrobial before prescribing.
- Improve infections control methods to prevent infections transmission.

References:
Scenario
M. A., a 54 years old female, came to the hospital accompanied with family members, complaining of a tight chest, fever and hypotension. Examination revealed chest crepitation, low blood pressure, and fever (39.2 C\(^\circ\)).

The doctor ordered investigations of urine, complete haematogram and blood biochemistry. He diagnosed the condition as pneumonia and prescribed ceftriaxone 1 g intravenous (i.v.) and diclofenac sodium 75 mg intramuscular (i.m.) to be administered immediately before obtaining the results. Later results showed pus cells in urine, raised white blood count and blood glucose slightly below the normal limit.

The nurse administered ceftriaxone as a fast i.v. bolus instead of slow injection or infusion. None of the medical staff asked if the patient was allergic to any of the medicines prescribed. M. A. was allergic to penicillins and cephalosporins and subsequently she manifested shortness of breath, chest tightness and went into shock. The doctor diagnosed this as an anaphylactic reaction and tried to revive her but unfortunately she died.

Problems
- Failure to take medications history and failure to perform sensitivity test.
- Prescribing antibiotics before affirmative results.
- Not adhering to international treatment protocols and prescribing second line medication without need.
- Inappropriate use of intravenous antibiotics (third generation cephalosporins), as the patient was orally viable.
- Wrong administration of intravenous form of ceftriaxone.

Solution
- A proper medical and allergies history should be taken by healthcare providers for all patients admitted into hospitals.
- The Pharmacy and Therapeutic Committee (PTC) in each hospital should develop a formulary that includes the method of administration of antibiotics. For example, in this case injectable cephalosporin should be given by slow injection in 2 to 4 minutes.
- A small workshop should be conducted to emphasize rational antibiotic use and prescribing for the different members of the medical team. The PTC with help from Medicine Information Centre (MIC) should produce leaflets about the importance of taking medication and allergy history, with emphasis on rational antibiotics use.
- Antimicrobial prescribing should be restricted according to physician’s expertise. For example, junior doctors may only prescribe certain antibiotics such as third generation cephalosporins, and others are reserved for consultant prescription only.
Introduction

Early diagnosis and treatment of infections is critical in the care of patients. Excluding infections from the differential diagnosis avoids the unnecessary use of antibiotics and just as importantly clarifies the situation. Blood culture usually requires 24 hours or longer before results can be obtained. Physicians are therefore always on the alert for a method that promises to be either sensitive or specific for the detection of infection: one that would be helpful in the difficult decision whether to institute antibacterial therapy or not. C-Reactive Protein (CRP) is an acute phase protein that increases during acute phase of inflammation and infections. CRP is a strong predictor of lower chest infection and pneumonia1. CRP determination has been advocated as a replacement for Erythrocyte Sedimentation Rate (ESR) as a general screening test. Furthermore, it has the advantages of convenience and precision. The usefulness of CRP in these clinical situations depends on the diagnostic sensitivity and the corresponding negative predictive value.

Inappropriate prescribing patterns of antibiotics in health centers of Khartoum State, Sudan, are alarmingly high2. With many prescriptions written each year, inappropriate antibiotic use will promote resistance. In addition to antibiotics prescribed for upper respiratory tract infections with viral etiologies, broad-spectrum antibiotics are used too often when a narrow-spectrum antibiotic would have been just as effective3. This misuse of antibiotics has led to the development of antibiotic-resistant bacteria. This study aimed to highlight the importance of CRP measurement in rational prescribing of antimicrobial for respiratory tract infections in Sudanese settings.

Methods

Study design was interventional comparative study. Six Primary Health Care (PHCs), under the umbrella of the Khartoum Health Insurance System were selected for the study. Heavy duty centers were selected as interventional centers (Heavy duty centre is defined in the study as centre with patients’ frequency ≥ 7000/ month). Three control centers were selected. One control centre near each one of the interventional centers to eliminate the possibility of socio-demographic variation of patients. Study duration was from May 2011- June 2011. All patients with respiratory tract infections visiting the centers during the study period were included in the study. Data collectors worked in close contact with medical officers. Data of all patients with respiratory tract infections was recorded in pre-prepared collection forms. CRP test was requested for the patients in the intervention group. Interpretation of CRP test with the clinical findings was recorded and the final diagnosis was recorded. All antibiotics prescribed were recorded. All patients with CRP result 20-50 for whom antibiotics were not prescribed were advised to visit the centre after 72 hours or earlier if worsening of symptoms occur. For the control groups, data of all patients with RTI was recorded. Investigations if requested were recorded, all antibiotics prescribed for the patients were recorded. Data was analyzed using SPSS, v 16.

Results and Discussion

Of a total of 2,713 patients, 1,630 were in the intervention group and 1,083 in the control group. There were more females in both groups

1: University of Science and Technology
2: Epi lab.
3: Tropical Diseases Teaching Hospital
4: Health Insurance Corporation Khartoum State
5: University of Medical Sciences and Technology
Antibiotics were prescribed for only 16.9% of patients in the intervention group and for 83.4% in the control group (Figure 1). The difference in antibiotic prescription was highly significant with p value for Control 1 Intervention 1 (P. 0.007), Control 2 Intervention 2 (P. 0.00) and Control 3 Intervention 3 (P. 0.00).

### Conclusion and Recommendations
RTIs were more common among females. The use of CRP test has greatly reduced the rate of antibiotic prescription among the intervention group. It is recommended to apply this test on a larger scale, to validate its incorporation into national guidelines for antimicrobial use.

### References:
The misuse of antibiotics may have catastrophic implications for people living in developing countries. Two out of every three deaths among young people in the poorest countries of Africa and Asia continue to result from infectious diseases—nosocomial crossed out in error, especially those caused by antibiotic resistant pathogens, represent an important source of morbidity and mortality for hospitalized patients. Members of the genus staphylococcus are major human pathogens, causing a wide variety of hospital and community-acquired infections worldwide.

The aim of this study was to determine the incidence of resistant strains of isolated staphylococcus from three hospitals in Khartoum State against commonly used antimicrobial agents.

Materials and Method

Bacterial isolates

Twenty three isolates of S. aureus were obtained from patients in Khartoum Teaching Hospital, E.N.T Teaching Hospital and Omdurman Teaching Hospital. All samples were identified as S. aureus based on Gram stain, cultural and biochemical characteristics.

Susceptibility of isolated bacteria to different antibiotics

Sensitivity of the different isolates to a number of antibiotics used in hospitals and community was studied by using the Standard Disc Diffusion Method.

Molecular analysis by using PCR method

PCR technique was used to identify Staphylococcus aureus isolates.

Results and Discussion

It was found that 100% of S. aureus isolates were resistant to tetracycline (Figure 1). Regarding resistance to cephalosporins, the highest resistance rephrase to cefixime (100%) and ceftazidime (91.3%), while resistance to cephalexine was (56%), and resistance to ceftriaxone and cefuroxime was (47%) equally (Figure 1).

The overuse of third generation cephalosporins particularly ceftazidime and cefixime have been implicated in the emergence of multidrug-resistant gram positive and gram negative bacteria. This study showed that the S. aureus isolates were highly resistant to penicillin (91.3%) and also resistant to both amoxycillin, methicillin was (74%), with 69.6% of the isolates resistant to erythromycin. Relatively moderate resistance was seen against chloramphenicol (39.1%) while resistance to ciprofloxacin was (26%). In the present study, (26%) of S. aureus showed resistance to vancomycin, a glycopeptides frequently used for the treatment of infections caused by methicillin resistant S. aureus (MRSA). In this study, 17.4% of S. aureus isolates showed resistance to meropenem which is relatively low. This result may be explained by the fact that meropenem is not widely used in Sudan. Carbapenem resistance remains rarely documented and these beta-lactamase-stable agents appear to be an alternative treatment option for serious community-acquired or nosocomial infections in high risk patient population.

The study also showed that 17.4% of the S. aureus isolates were resistant to gentamycin S. aureus and 13% were resistant to amikacin. Aminoglycoside antibiotics play an important role in the therapy of serious staphylococcal infections despite reports of increased resistance to these drugs in Europe.

1: Ahfad University for Women
2: Tropical Medicine Research Institute, NCR
3: University of Khartoum
Conclusion and Recommendations
This study showed that S.aureus isolates were highly resistant to cephalosporins, penicillins, and tetracycline, while relatively sensitive to aminoglycosides and meropenem. Irrational antibiotics use may contribute to this problem and efforts should be instituted to promote rational use of antibiotics.

Acknowledgement
Special thanks are due to all members of the department of microbiology/ Tropical Medicine Research Institute, where this work was done.

References:
Introduction

Tuberculosis (TB) is the first global emergency declared by WHO in 1993\(^1\). One of the main parameters of successful treatment is the right diagnosis and the prompt treatment. Delay in diagnosis may result in treatment failure, development of drug resistance and greater possibility of TB transmission from infectious patients. Therefore the efforts of TB programs mainly concentrate on proper treatment of patients, to break the transmission cycle\(^2\). This study aimed at investigating the role of the patients and health care providers in delay of TB diagnosis.

Methods

This study was a cross-sectional design conducted in Gaziera State. A multistage random sampling technique was used; 5 of the 6 provinces in Gezira State were selected randomly, with a total of 34 TB management units (TBMU). The number of the TBMU that were included in the study was 11 TBMUs (with ≥30 newly diagnosed smear positive patients in 2003). Data was collected using a pre-tested semi-structured questionnaire. Written informed consent for those who wanted to participate and ethical clearance from state ministry of health were obtained. From July 2005 until January 2006, 216 new smear positive pulmonary TB patients; older than 15 years, (study population) were recruited. Knowledge of patient about TB symptoms, relating cough as the first symptom to the patient’s condition, was assessed. Definitions of different periods of delay are explained in figure (1). Analysis was done using Statistical Package for Social Sciences (SPSS) version 12.
Research Articles

Results and Discussion

The mean total diagnostic delay period was 69.7 days, (Figure2). These findings were in line with most other studies conducted in other countries like Ethiopia (64 days)³ and India (60 days)⁴, but longer than that were found in Khartoum (53 days)⁵. Patient’s delay period contributed by 52.6% to the total diagnostic delay period, while health system’s delay period contributed by 47.4%. This coincides with findings of other studies that described no significant difference between patient’s delay periods and health system’s delay periods contribution to the total diagnostic delay period e.g. Sudan⁵ and India⁴. Almost ninety percent (87.5%) of the study population had a total diagnostic delay of more than 42 days, compared to about sixty percent (59%) in Khartoum⁵. Difference in patient’s health seeking behavior and health system variation between Khartoum (urban) and rural areas could be an explanation. Having family monthly income more than 100 US$ (p=0.002), paying full fees for public health facility (p=0.008) and visiting more than other health provider before reaching TBMU (p=0.049) were associated with statistically significant longer total diagnostic period. The mean patient’s delay period was 36.6 ± 23.13 days. This result was lying within the range of 20 to 60 days reported in other studies³. Living more than 30 minutes walking distance from the TBMU (p=0.045) was associated with statistically significant longer patient’s period. The study revealed that 61.6% of the study subjects had delayed patient’s delay period of more than 28 days. This is higher than what was described for Khartoum (30.6%)⁵. The main risk factor for patient’s delay from the multivariate analysis was to pay full fees for public health facility. The mean total health system’s delay period was 33 ± 24.54 days which was far longer than in other international studies (6 days)⁴. Socioeconomic factors, living at a walking distance of 15 to 30 minutes to reach the TBMU (p=0.036), and visiting more than one health provider before the TBMU (p <0.001) were all associated with statistically significant longer total health system delay period. The mean TBMU delay period was 3.99 days ± 1.649. (85.2%) i.e. TBMU’s delay period was less than 5 days. Walking distance of less than 15 minutes to the TBMU (p= 0.005) was associated with statistically significant shorter delay period. The mean post referral delay period was 4.32 ± 6.87 days. Socio-economic factors (p < 0.001) were associated with statistically significant longer post referral periods.

Conclusion and Recommendations

Both patients behavior and health system contributed to delay of TB diagnosis. Patients’ delay periods in rural areas were significantly higher than in urban areas of Sudan. Raising awareness about TB among health care providers and the community is greatly needed.

References:

1. WHO, 1993
**New Tuberculosis Drug: A light of the multi drug resistance tunnel**


A new Chinese randomised controlled study was carried out on patients with Multidrug Resistant Tuberculosis (MDR-TB). Patients, on one arm of the study, received delamanid, a novel nitro-dihydro-imidazooxazole drug, in addition to a background combination of WHO recommended drugs whereas in the second arm, patients received the same combination in addition to a placebo. Sputum culture conversions, at two months were seen in 45.5% of the patients receiving the background combination plus delamanid as opposed to 29.6% in the group receiving the combination with the placebo. More research is under way to identify the long-term effects of this new drug. However, these findings bring hope to reversing the pattern of MDR-TB, which has become a worldwide problem.

**WHO warns: resistant gonorrhoea strains are spreading across the globe**

Reuters Health News, June 2012

Reports of cephalosporin resistant gonorrhoea from Australia, Sweden and Britain have prompted the WHO to issue warning against this public health hazard. Cephalosporin therapy is usually reserved as salvage treatment of gonorrhoea that has failed first line therapy. The WHO states that the irrational use of antibiotics has led to these global resistant strains. This issue is of particular concern, because gonorrhoea strains tend to retain resistance patterns even after stopping the use of antibiotics for a while. In fact, gonorrhoea is now becoming harder to detect because some strains present with hardly any symptoms leading to increased likelihood of the bacteria surviving. More work is warranted to promote the rational use of antibiotics in gonorrhoea and other infectious diseases, worldwide.

**Aspirin: good news for diabetics**

Berardis et al. JAMA. 2012; 307(21):2286-2294

A large Italian population based study, published in the Journal of the American Medical Association has identified that low dose aspirin (<300mg daily) use is linked to a higher risk of gastric and cerebral bleeding. This association was not found in patients who had diabetes, a subpopulation that benefits most from prophylactic aspirin, because of their high risk of developing cardiovascular disease (CVD). Low dose aspirin is recommended as primary prophylaxis for CVD in high risk patients, but the risk of bleeding has always been an issue of concern. The seemingly absent risk of bleeding in the diabetic subpopulation makes aspirin a relatively safe option for prevention of CVD.

**NSAIDs protect against cancer**


A study published in Cancer, presents data from a population based study that was collected from 1991-2009. That data was collected by researchers in Denmark to determine the association with non-steroidal anti-inflammatory drugs (NSAIDs) and cancer. They revealed that long term use of NSAIDs (> 7 years) was associated with reduced incidence of malignant melanoma and squamous cell carcinoma.
Medicines dispensing is the last station in the medicine provision process. It should be in accordance with good dispensing practices, follows standard operating procedures in addition to adoption of code of ethics. Pharmacists’ Professional code provides relevant guidance. This code obliges pharmacists to put the health needs of their patients first.

Sometimes pharmacists experience ethical problems in dispensing, when the pharmacy owner would like the pharmacist to sell Prescription Only Medicines (POM) without prescription to increase the sales. In such a case the pharmacist should adhere to the pharmacy law and notify the responsible authority.

Another ethical situation is when a customer whose employer pays for his healthcare would like the pharmacist to exchange prescription medicines for cosmetics, or wouldn’t like to have the medicines but to have an invoice for the reimbursement of the cost of the prescription medicines, an act which is also clearly prohibited by the code of ethics.

In conclusion the pharmacy law and code of ethics entail that pharmacist should be held accountable for adhering to the pharmacy law, act ethically and be up to professional responsibility.

References:
Dispensing of medicines is one of the major continuous roles of pharmacists. Appropriate dispensing is an important aspect in rational use of medicines. The pharmacy setting is friendly and less inhibiting to patients, the relationship between the pharmacist and patient is a friendly one with easy interaction. The pharmacist has a good opportunity to advise and counsel patients, and further explain the doctors' instructions.

**Steps of rational dispensing**

1. Accept prescription and establish good communication with client/patient.
2. Check prescription for medication related problems.
3. Revise the Patient Medication Record (PMR) or obtain medication history.
4. Retrieve items from shelves (dispense).
5. Inform and instruct.
6. Label the medications.

1. **Accept prescription**
   - Greet the patient/client and initiate good friendly communication.
   - Establish the identity of the patient, age and his/her gender. Many prescriptions are obtained on behalf of patients by family members or friends.

2. **Check prescription for medication related problems**
   1. Overdose (dose too high).
   2. Under dose (dose too low).
   3. Adverse drug reactions.
3. Revise The Patient Medication Record (PMR) or obtain medication history

To perform this step you need to obtain information from the patient/client. You need to know their age, gender, if female whether pregnant or lactating, if the patient has any co-existing diseases or health condition, if the patient is taking other medications (or home remedies). Remember; you must ask to obtain this information. Do not assume anything.

4. Retrieve the medication from the shelf

Make sure that you checked the generic name of the medicine to ensure that you have selected the correct items from the shelves. Check the expiry date and the total amount to be dispensed is correct.

5. Inform and instruct

This is a very important step, with good information and instruction you ensure that patients understand their medication/s and use them appropriately and so ensure benefits. Time spent to explain to patients is time well utilized.

What information should be given to the patient/client?
• How to use medicines: explain the method of administration. You may open the package and demonstrate use.
• Dosing regimen: when to take medicines, what amount, for how long, with meals or not and what to do if the patient misses a dose.
• The importance of medication in treatment. You may briefly explain about the disease.
• What effects will be seen, and when.
• What side effects will occur and how to manage them.
• When to consult pharmacist/doctor.
• Should certain foods be avoided e.g. grapefruit.
• Whether to refill prescription; what to do with the remainder of medication.
• Remember to summarize the given information and stress important parts

6. Label medication

To help patients to remember the important information, label the medication with clear writing.

The label should contain:
• The patient name.
• Dose and frequency of use.
• Route of administration.
• Duration of use.
• How to store.

Dispensing of POM must be supervised by the pharmacist.

No prescription should be dispensed without the pharmacist overseeing it, because this is the legal and professional obligation of the pharmacist in charge. Assisting staff can help with dispensing e.g. they can retrieve items and write labels (approved by pharmacist).
Advice on the Proper use of Nasal Drops

This is one of the commonly used dosage forms, which is used mistakenly by many patients. It is important to explain proper administration to ensure benefits. Hygiene is important; doctors and pharmacists should stress on hand washing and using clean tissues/handkerchief.

You can advise your patients/clients to follow these instructions:

1. Blow your nose gently.
2. Wash your hands thoroughly with soap and water.
3. Check the dropper tip to make sure that it is not chipped or cracked.
4. Avoid touching the dropper tip against your clean nose.
5. Tilt your head as far back as possible, or lie down on your back on a flat surface (such as a bed) and hang your head over the edge.
6. Place the correct number of drops into your nose.
7. Bend your head forward toward your knees and gently move it left and right.
8. Remain in this position for a few minutes.
9. Clean the dropper tip with warm water and cap the bottle right away.
10. Wash your hands to remove any medication.

http://www.safemedication.com
1. **What is Rational Use of Medicines (RUM)?**

   The WHO define RUM as when: “patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community”.

2. **Is irrational use of medicines a unique problem to Sudan?**

   No, irrational use of medicines is a global problem. The irrational use of medicines can result in unnecessary waste of medicines leading to loss of capital and damage to health.

3. **What are examples of Irrational Use of Medicines (IRUM)?**

   There are many examples of IRUM including:
   - Prescribing antibiotics for viral infections when there is no evidence for their efficacy.
   - Using injectable doses when oral formulations can be used.
   - Prescribing medicines using Trade Names rather than generic names.
   - The over use of vitamins in patients who are clearly well nourished.
   - Dispensing medicines without a prescription for major diseases.
   - Dispensing medicines without counselling the patient.
   - Inappropriate self medication using prescription only medicines.

4. **How can doctors promote RUM?**

   Doctors can prescribe medicines according to clinical guidelines using generic names. They can resist the influence of pharmaceutical companies who promote the inappropriate overuse of medicines. They can resist pressure from patients to prescribe unnecessary medicines by offering adequate explanation and reassurance to patients.

5. **How can pharmacists promote RUM?**

   Pharmacists can promote the use of necessary medicines for minor complaints and resist patients' pressure to purchase prescription only medicines (POM) without a prescription. They can provide counselling to patients on the appropriate use of prescribed medicines. Pharmacists in the hospital can establish a Medicines Information Centre (MIC) and with other health care professionals a Pharmacy and Therapeutics Committee (PTC) whose responsibility will be the development of Standard Treatment Guidelines (STGs).

6. **How can nurses promote RUM?**

   Nurses can promote the RUM by providing advice to patients and reassurance to avoid request for unnecessary medicines. Nurses can identify patients on injectable medicines who can be switched to the oral formulations. Nurses can monitor patients for efficacy and adverse effects associated with medicines.
WHO advocates 12 key interventions to promote more rational use of medicines (RUM):

- Establishment of a multidisciplinary national body to coordinate policies on medicine use.
- Use of clinical guidelines.
- Development and use of national essential medicines list.
- Establishment of drug and therapeutics committees in districts and hospitals.
- Inclusion of problem-based pharmacotherapy training in undergraduate curricula.
- Continuing in-service medical education as a licensure requirement.
- Supervision, audit and feedback.
- Use of independent information on medicines.
- Public education about medicines.
- Avoidance of perverse financial incentives.
- Use of appropriate and enforced regulation.
- Sufficient government expenditure to ensure availability of medicines and staff.

1. Establishment of a multi disciplinary national body to coordinate policies on medicine use:
Ensuring RUM requires many activities that need coordination among many stakeholders; therefore a national body is necessary to coordinate strategies and policy at the national level, in both the public and private sectors. This body should involve government, health professionals, academia, the pharmaceutical industry, consumer groups, and the national regulatory authority.

2. Implementing procedures for developing, using, and revising Standard Treatment Guidelines (STGs):
STGs (or clinical guidelines or prescribing policies) are systematically developed statements to help prescribers make decisions about appropriate treatments for specific clinical conditions. STGs are made more credible through the use of evidence based recommendations. They vary in complexity from simple algorithms to detailed protocols on diagnostic criteria, patient advice and costs.

3. Implementing procedures for developing and revising an essential medicines list (or hospital formulary) based on the treatment choice:
An Essential Medicines List makes pharmaceutical management easier at all levels. Procurement, storage and distribution are easier with fewer items. Prescribing and dispensing are made easier for professionals. A national essential medicines list should be based on national STGs and both should be revised regularly.

4. Establishing a drug and therapeutics committee in districts and hospitals, with defined responsibilities for monitoring and promoting rational use of medicines:
This committee, also called a pharmacy and therapeutic committee, is responsible for ensuring the safe and effective use of medicines in the facility or area under its jurisdiction. The committee should operate independently and members should represent all the major medical specialties and the administration. The primary tasks of the committee are to develop and revise institutional STGs (based on national guidelines) and to maintain an institutional essential medicines formulary.

5. Using problem based training in pharmacotherapy based on national STGs in undergraduate curricula:
The quality of basic pharmacotherapy training for undergraduate medical and paramedical students can significantly influence the future...
prescribing habits. Training is most successful when it is problem based, concentrates on common conditions, takes into account student’s level of knowledge, and is targeted to their future prescribing requirements. In most settings, rather than focusing on basic science, problem solving skills should be promoted and interdisciplinary problem based learning should be encouraged. If the existing focus is not on problem-based training in pharmacotherapeutics, national consultative workshops may help build awareness of the value of this approach.

6. Continuing in-service medical education as licensure requirements and targeted educational programs by professional societies, universities, and the government:
Unlike the developed countries, opportunities for continuing medical education in less developed countries are limited because continuing education is not required for licensure. Governments should support efforts by university departments and national professional associations to offer independent, unbiased continuing medical education courses to health professionals, including medicine dispensers. The most effective in-service training is likely to be problem based, repeated on multiple occasions, focused on practical skills, and linked to STGs.

7. Developing a strategic approach to improve prescribing in the private sector through regulation and collaborations with professional associations:
Most efforts in improving use of medicines have focused on the public sector, but the private sector often provides greater access to pharmaceuticals. Changing practices in the private sector requires an understanding of the motivations of the private prescribers. A range of strategies should be considered to improve RUM, including licensing regulations with appropriate enforcement, accreditation and continuing education through professional associations and financial incentives.

8. Monitoring, supervision and using group processes to promote RUM:
Supervision that is supportive, educational and face to face persuasive outreach will be more effective with prescribers than inspection and punishment. Effective forms of supervision include prescription audit and feedback, peer review, and group processes of self-identifying medicine-use problems and solutions in a group of prescribing professionals. Group process interventions with practitioners and patients to improve prescribing practices have been effectively used to change prescribing behavior.

9. Training pharmacists and drug sellers to offer useful advice to consumers, and supplying independent medicine information:
In many countries with shortages of trained health professionals, pharmacies and medicine shops are a major source of information for consumers. Interventions have shown that the skills of untrained prescribers and dispensers can be upgraded. In addition, sometimes the only information about medicines that prescribes receive is from the pharmaceutical industry, which may be biased. Medicine Information Centers and drug bulletins are two useful ways to disseminate independent, unbiased information. They may be administered by the government, a university teaching hospital, or a nongovernmental organization, under the supervision of a health professional.

10. Encouraging involvement of consumer organizations and devoting government resources to public education about medicines:
Governments have a responsibility to ensure the quality of information about medicines available to consumers. Without sufficient knowledge about the risks and benefits of medicine use, people will often fail to achieve
In their awesome power, modern medicines may be linked to nuclear weapons. Their discovery and application marks one of the most exciting chapters in the history of medicine. But we are prescribing them as if we were dealing with bows and arrows. (Silverman and Lee, 1974, Pills Profits and Politics). Medicines feature prominently in any discussion on health, and a stage has been reached where the plentitude of medicines is often equated with good health. Unfortunately, medicines are prescribed irrationally, the prescriptions are written inaccurately and the patients are not instructed properly. However, for such an outcome the prescribers alone cannot be singled out and blamed. The physician in this ordeal should be considerate for the ethical, economical and pharmacological issues. The physician is not functioning in a vacuum though: his/her decisions, portrayed as prescriptions, are the net result of different factors acting on him/her. In addition to his personal traits, these include the system of medicine, medical education, professionalism, health services etc. Then are the consumers, who had their expectations and characteristics, i.e. culture, beliefs, behavior, attitude and socio-economic background exhibited as self medication, demand for prescription, non compliance, and consultation with an unauthorized prescriber. The pharmaceutical industry could contribute to the irrational prescription by influencing the prescriber’s behavior and producing irrational medicines. The pharmacist, both dispensing and clinical, in this prescription barely stands at the crossroads of patient, industry and the physician. In addition to commenting on efficiency and dosage, pharmacists may contribute to avoiding irrational prescription by indicating in prescription factors like:

- Therapeutic duplication
- Contraindications
- No therapy for established diagnosis
- No established diagnosis but a drug is prescribed
- Adverse reaction or interaction between medicines

All medicines can be potentially dangerous. There is, virtually, no effective medicine which is devoid of adverse effects. It is therefore pertinent that all parties to prescription are adequately informed on the use of this armamentarium. The rational prescription requires a multidisciplinary approach and stipulates a clear, conscious and dedicated commitment by all involved parties.

Message from WHO

"In their awesome power, modern medicines may be linked to nuclear weapons. Their discovery and application marks one of the most exciting chapters in the history of medicine. But we are prescribing them as if we were dealing with bows and arrows". (Silverman and Lee. 1974, Pills Profits and Politics). Medicines feature prominently in any discussion on health, and a stage has been reached where the plentitude of medicines is often equated with good health. Unfortunately, medicines are prescribed irrationally, the prescriptions are written inaccurately and the patients are not instructed properly. However, for such an outcome the prescribers alone cannot be singled out and blamed. The physician in this ordeal should be considerate for the ethical, economical and pharmacological issues. The physician is not functioning in a vacuum though: his/her decisions, portrayed as prescriptions, are the net result of different factors acting on him/her. In addition to his personal traits, these include the system of medicine, medical education, professionalism, health services etc. Then are the consumers, who had their expectations and characteristics, i.e. culture, beliefs, behavior, attitude and socio-economic background exhibited as self medication, demand for prescription, non compliance, and consultation with an unauthorized prescriber. The pharmaceutical industry could contribute to the irrational prescription by influencing the prescriber’s behavior and producing irrational medicines. The pharmacist, both dispensing and clinical, in this prescription barely stands at the crossroads of patient, industry and the physician. In addition to commenting on efficiency and dosage, pharmacists may contribute to avoiding irrational prescription by indicating in prescription factors like:

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Instructions to authors
Scope of the Journal: Rational use of medicines related to health care providers and patients.

Suitability of publication:
All topics related to the different aspects of RUM will be evaluated by the editorial board. Prospective authors with a subject(s) or questions about the suitability of their papers or materials are invited to request an opinion from the Editorial Board. (nmicrl@gmail.com).

Avoid plagiarism

How to submit materials:
Manuscripts can be handed over directly to the editor-in-chief as soft copy or by e-mail (nmicrl@gmail.com).

Types of manuscripts:
1. Research papers
2. Case reports

Preparation of manuscripts
All manuscripts must be typed in Arial font size 12, with 1.5 line spacing. Manuscripts must be in Word. Page margins on all sides must be at least 2.5 cm wide. You can use either English or American spelling but not both on the same manuscript.

1. Research papers
Original research will have the priority of publications. Author(s) name and affiliations should be clearly written. Contact person, telephone number and e-mail address should be included. Total words count should not exceed 800 words including references, tables, table captions, figure legends, and footnotes. Maximum of three tables and figures are accepted.

The manuscript should be divided into sections. Each section should have a separate heading. Subheadings take the form of paragraph lead-ins (should be bold case), indented and run in with the text, separated by a period.

Introduction: This section should provide the reader with sufficient background information to evaluate the results of the research. An extensive review of the literature is not needed in this section. It should also give the rationale for and objectives of the study that is being reported.

Methods: Sufficient information must be provided so that the reader will understand the methodology and be able to repeat the experiment.

Results: The results section should be written in such a manner to provide information by means of text, tables and figures. Results and discussion may be combined or there may be a separate discussion section. If a discussion section is included, place extensive interpretations of results in this section. Do not repeat the results. Give numbers to figures and tables in the order in which they are mentioned in the text. All figures and tables must be cited in the text.

Conclusions and recommendations: Acknowledge personal, financial and institutional assistance at the end of this section.

References: Use the Vancouver reference system. Cite 6 references maximum.

2. Case reports
Any case that is related to RUM will be considered. The manuscript should include the following:

Setting, complete description of the case, consequences and outcome and finally follow up if applicable. Words count should not exceed 400 words.

NOTE: Ethical clearance is a requirement for all researches from 2012 onward.
Khartoum Medicine Information Centre

The Medicines Information Service is aimed mainly at healthcare professionals. **Khartoum Medicines Information Centre** was the first centre in Sudan established in April 2000, it is operated by pharmacists and support staff who perform a variety of functions which include:

- Enquiry answering
- Proactive work
- Education and training
- Quality assurance

**Contact Information and location:**

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Medicines Information Centre
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