



Pharmaco Logical

The Newsletter of the Rational Use of Medicines Directorate
Ministry of Health, Sultanate of Oman

Volume 3 Number 2, September 2007

Name Change

The Directorate of Rational Drug Use (DRDU) has officially changed its name to the:

Directorate of Rational Use of Medicines

(DRUM) within the Ministry of Health. This name change is in line with current WHO policies and terminology. It was also felt that the name “drug” is often misused and is commonly associated with illegal drugs and has gathered a somewhat negative reputation because of wide reporting in the popular press and the media in general. Thus the word “medicine” seems more appropriate in a pharmaceutical and clinical context.

Contributors to this Issue

Ph Batool	Director DRUM
Dr Brian C Gunn	Sect Head Research DRUM
Dr Ahmed Abdo-Rabbo	Sect Head Public Education DRUM
Ph Manal Al-Ansari	Pharmacist DRUM
Ass Ph Rajendra Shankar	Ass Pharmacist Ismaiya HC
Edited by Dr Brian C Gunn	

Many of you will be aware that Oman was the first member state in WHO to establish a separate directorate devoted to rational use of medicines in 2000. Now the World Health Assembly (WHA 60.16) has adopted a resolution about “*progress in the rational use of medicines*”. One of the central points of the resolution is its emphasis on the need for a comprehensive, sustainable, national and sector-wide approach to promote the rational use of medicines in all member states. Piecemeal and ad hoc attempts at promotion of rational use of medicines have not been effective. Ph

Batool, Director DRUM, was invited to report on the Oman experience and show evidence of achievements before the WHA in May this year.

The pre-summer season has been a busy one in this directorate with several workshops on problem solving in rational use of medicines and research conducted on the use of specific medicines. Workshops were conducted in Adh Dakhliyah and Al Wusta regions in June & July and there was also a workshop on rational prescribing for medical interns from Sultan Qaboos University in July.

In this issue there is a very interesting article on the first national survey of patients knowledge attitudes and practice (a KAP survey) conducted by the DRUM team. Some unexpected findings have emerged. In addition, the results confirm some widely held suspicions about the way patients in Oman seek treatment and how they use medicines in general. This is the first time there have been actual measurable parameters to relate to. Now it should be relatively easy to design interventions in public education and be able to measure any changes in these parameters. The newsletter continues its series of articles on drug interactions with part 2 of this important series.

A new feature in this issue is the prize crossword on the back page. In this you have to fill the grid from the clues given across and down. **Five** all-correct entries will be drawn at random. A prize will be awarded to each of the winners. Good luck!

Public Knowledge, Attitudes and Practices towards Medicine Use in Oman

Ahmed Abdo-Rabbo, Manal Al-Ansari,
Brian C Gunn & Batoool Jaffer

Introduction

Public knowledge, attitudes and practices (KAP) regarding the use of medicines influence the decision to seek health care, to choose the provider, the use of medicines and ultimately the success of the treatment.

Despite many countries including public education on rational use of medicines as a core component in their National Medicine Policies (NMP), at the present time this remains political commitment rather than concrete action. Very few countries in the world have undertaken programmes targeting all members of the community. Many studies have documented medicine use problems in the community. To date this has not been well documented in Oman. Rational use of medicines (RUM) by health providers in Oman has received the attention it deserves, but only very little attention has been given to RUM in the community.

Research studies into medicines use in the community should be conducted in order to identify problems, design interventions and measure changes. Therefore this national KAP survey should help to identify the common medicine use problems by public and prioritise core problems as the focus for future intervention.

Methodology

A community baseline survey was conducted in the 10 health regions of Oman during the year 2006. A written questionnaire was designed, field tested and revised. The questionnaire covered the following aspects:

- Patient visits to the health facilities;
- Patient – health care provider communication;
- Patient compliance;
- Self-medication;
- Dosage forms and routes of administration;
- Storage and disposal of medicines; and
- The characteristics of the sample studied.

About 100 respondents from each of the conveniently selected 75 studied primary health care facilities were interviewed as they left the out-patient clinics. The respondents include patients who visited the health facility or the care takers who accompanied them. The total number of questionnaires was 6675. Details of the sample population and size are shown in *table 1* below. Data was processed and analysed manually and/or by SPSS¹ programme for the completed questionnaires from each health facility, Walayat, health region and the Sultanate.

Table 1. Health facilities (HF) and respondents

Health region	Number	
	HF	Respondents
Muscat	13	1134
Dhofar	8	800
Al-Dakhliyah	6	560
Musandam	5	500
North Sharqiyah	5	500
South Sharqiyah	4	400
North Batinah	7	687
South Batinah	8	800
Al-Dhahira	14	793
Al-Wusta	5	500
Total	75	6674

Results

The majority of the respondents were female, young adults and uneducated or with low education status. A high percentage of the respondents visit more than one health facility at the same time for the treatment of the same illness. About half of them do not return for follow up to the same health facility if they do not cure within the time expected. More than one third of the respondents mentioned that they will not accept it if medicines are not prescribed for them. About one third of the respondents prefer three or more drugs to be prescribed for them per consultation. A quarter of the respondents do not inform the prescriber or the dispenser about the medicines they are using currently including traditional medicines. More than two third of

¹ SPSS = Statistics Package for Social Sciences (Windows Version)

the respondents discontinue their treatment course when they feel that the symptoms disappear or if they feel better and they keep the remaining medicines at home for future use. About one quarter of the respondents do not know that all medicines have side effects and more than one third do not ask the prescriber or dispenser about the side effects of the prescribed and dispensed medicines. Almost half of the respondents are practicing self-medication and only about one third of them consult and seek help from dispensers in choosing the appropriate treatment, while more than one third choose their medicines on the basis of a previous experience. One third of those surveyed are sharing or exchanging medicines with others. About half of them do not ask where to store their medicines at home during medical consultation and dispensing and about one fifth are using medicines without checking their expiry dates. Almost half of the respondents get rid of any remaining quantities of prescribed medicines they have not used by throwing them away, while about two fifths keep the left-over medicines for future use by themselves or others and a very small number return unused medicines to the pharmacy. About two thirds of the respondents do not know that the injections are the most serious dosage form and about one sixth prefer to take their medicines in injectable form. More than a half of the respondents are influenced by the colour or taste of the medicine in their acceptance. Some of the respondents said that they do not ask the prescriber and the dispenser to explain about the instructions regarding the prescribed medicines, particularly how and when to take the medicines as well as the dosage schedule i.e. dose, frequency and duration.

A summary of the mean results for the whole country in the form of tables are illustrated in *tables 2-6*.

Table 2. Personal data of the respondents

Respondents' status	Mean (%)
Females	63
Young adults	59

Uneducated/low educational status	78
-----------------------------------	----

Table 3. Patient visits to health facilities (HF) and compliance

Respondents' answers	% Mean (range)
Visit more than one HF at the same time	66 (59-80)
Don't return to the same HF for follow-up	51 (46-64)
Don't accept non-drug therapy	39 (30-48)
Prefer 3 or more drugs/consultation	30 (23-41)
Discontinue treatment when they feel better or their symptoms disappear	70 (63-77)

Table 4. Patient-provider communication

Respondents' answers	% Mean (range)
Don't get told about the medicines they are using	26 (19-39)
Don't ask the providers about the side effects	34 (29-37)
Don't ask the providers how to take their medicines	16 (8-58)
Don't ask the providers when to take their medicines (before or after meal)	12 (6-19)
Don't ask the providers where to store their drugs at home	43 (39-49)

Table 5. Self-medication and perceptions

Respondents' answers	% Mean (range)
Practice self-medication	43 (35-51)
Don't consult the dispenser when practicing self-medication	68 (59-79)
Choose medicines according to previous experience	36 (25-46)
Exchange medication with others	33 (25-45)
Don't know that all medicines have side effects	26 (17-52)
Don't know that the injection is the most serious dosage form	61 (49-74)

Respondents' answers	% Mean (range)
Influenced by the colour or taste of the medicine	54 (45-65)

Table 6. storage and disposal of medications

Respondents' answers	% Mean (range)
Store their medicines in medicine's box	20 (11- 34)
Use medication without checking their expiry date	17 (10-46)
Return the left-over medicines to pharmacy	12 (7-17)
Keep the left-over medicines for future use	41 (35-52)
Throw out the left-over prescribed medicines	45 (38-57)

Discussion

Patients should not visit more than one health facility for treatment of the same illness. They should return to the same health facility if not cured or symptoms are not relieved within the time expected or for follow up. They should avoid going to another facility or switching doctors or attending traditional healers or even self-medicating. They should continue their treatment as instructed even if they feel better or the symptoms disappear.

Patients should not believe in “a pill for every ill” and should accept non-medicines therapy when only advice and assurance are decided by the provider and not insist on polypharmacy.

DEAR HEALTH CARE PROVIDERS :
IRRATIONAL USE OF MEDICINES IN THE COMMUNITY IS A SERIOUS HEALTH PROBLEM THAT NEEDS YOUR ATTENTION

Patients should communicate properly with the health provider. They should inform him/her about the Western and traditional medicines they are using currently. Also they should ask about how and when to take the prescribed medicines i.e. before or after meals and where to store them. They should know that all

medicines have side effects and injections are the most serious dosage forms and the colour or taste of the medicine has nothing to do with the efficacy and safety of medicines. Therefore, they should ask about the side effects and not insist on having injections. They must leave the health provider to choose the appropriate dosage form and not refuse a similar medicine of different colour or taste.

Patients should avoid practicing self-medication, if possible, but if unavoidable they should consult and seek help from the dispenser/pharmacist and not rely upon their own previous experience. Medicines should never be exchanged with others, friends or family as they may not be appropriate.

Patients should store most of the medicines in a medicines' box out of the reach of children. Not all medicines need to be stored in the fridge. It is very important to check the expiry date before using any medicine. Any left-over medicine should be returned to the pharmacy and neither thrown out nor kept for future use.

Conclusion and recommendations

The results point to an obvious lack of knowledge and information about the proper use of medicines by public and unsound medicine use behaviour and inappropriate practices. They may lead to serious health, economic and psycho-social consequences for individuals and the community at large.

There is a well-evidenced and compelling need for promoting RUM in the community to enable people to use medicines in an appropriate, safe and judicious way.

Public education campaigns could definitely make positive changes in knowledge, attitudes and practices regarding the use of medicines in the community. These campaigns should include patient instruction at time of illness in the appropriate use of prescribed / dispensed medicines and instruction of the public at large, or

specific target groups, in the principles and practical application of appropriate use of medicines, including non-medicine therapies. Therefore it is important to plan, develop, implement, monitor, evaluate and reassess effective public education programmes on RUM. The educational activities should be done in collaboration with the people whose medicine use patterns have been targeted for change, taking into account the cultural and social context in which beliefs and practices have developed. It is important to use multi-educational aid approach and allocate the necessary resources. The collaborating institutions such as a department of health education and information, Non Government Organisations (NGOs), professional associations, development agencies such as World Health Organization (WHO), United Nations Children’s Fund (UNICEF), religious groups and others have important role to play. They enhance visibility, potentially increase impact and promote rational medicine use concepts.

It is very important that public education should be accompanied by supportive legislation and regulation on promoting RUM in community along with appropriate enforcement.

Acknowledgement

We would like to express our high appreciation & deep gratitude to the directors general, directors and supervisors of pharmacy & medical supplies, data collectors and respondents from all the ten health regions of the Sultanate for their cooperation and contribution for the success of this work. Without them this study would not have been possible.

References

1. Abou-Auda HS. An economic assessment of the extent of medication use and wastage among families in Saudia Arabia and Arabian Gulf countries. *Clinical Therapeutics*, 2003; 25(4): 1276-92.
2. Al-Araimi MS. KAP survey on the community concepts of drug use at a local health centre in South Sharqiyah Region, Sultanate of Oman. *Pharmaco Logical* (the

Newsletter of the Rational Drug Use Directorate, MOH, Oman), 2005 Feb, 1(1): 10.

3. Ali SA. Role of pharmacist in community education. *Pharmaco Logical* (the Newsletter of the Rational Drug Use Directorate, MOH, Oman), 2005 Sept, 1(2): 10-11.
4. Al-Siyabi K and Al-Riyami K. Value and types of medicines-returned by patients to Sultan Qaboos University Hospital Pharmacy, Oman. *Sultan Qaboos University Medical Journal* 2006; 7(2): 39-45.
5. Gunn BC, Wyses A-R and Suleiman BJ. Rejection of prescription medicines at out-patient departments. *Pharmaco Logical* (the Newsletter of the Rational Drug Use Directorate, MOH, Oman), 2005 Feb, 1(1):4-5.
6. WHO/DAP (World Health Organization / Action Programme on Essential Drugs). 1994. Public education in rational drug use: Report of an informal consultation. WHO/DAP/94.1. Geneva: WHO/DAP



The above photos were taken at a workshop on problem solving for rational use of medicines conducted by DRUM in June 2007 in Adh Dakhliyah region

Drug Interactions. Part 2

The last issue (*V3 No 1*) carried part 1 of a series about drug interactions. The following is part 2.

Key Points Summary of Part 1

Interactions are of two main types: **pharmacodynamic** (based on a drug's mechanism of action in the body) and **pharmacokinetic** (based on a drug's absorption, distribution, metabolism and excretion – ADME).

Interactions can result in **antagonism** or **synergism**. Synergism can be additive or greater than additive (potentiated).

The main types of interactions are drug-drug; drug-food; and drug-laboratory test.

Most attention is paid to unpredictable and undesired drug-drug interactions which are usually pharmacokinetic, especially related to drug metabolism and result, mainly, in harmful effects. This is reflected in the large amount of reference material on these types of interactions. However, the pharmacist or assistant pharmacist should be aware of all types of interactions and their relative importance in therapeutics. Note that not all drug interactions are serious or life threatening.

Part 2 Drug Interactions

Sites of Action

Drug interactions can occur anywhere from outside the body to the last stage of elimination of the drug itself or its metabolites.

- Outside body (e.g. in the iv fluid bag or bottle)
- Site of entry (administration of a second iv drug to someone already receiving an infusion)
- Inside body after absorption
 - at transit or storage sites
 - at site of action or nearby
 - by interference with metabolism

- at site of excretion

Outside body:

1. Pharmaceutical interaction (rare) occurs when drugs interact as a result of poor formulation. Most drugs are properly formulated and thoroughly tested by the industry before release.
 2. Chemical interaction e.g. thiopentone and suxamethonium.
- Occurs most often in adding drugs to IV fluids or injections.**
3. Changes in pH often cause insolubility or other problems. Salts may react with each other to cause precipitation, etc.

Drugs should never be added to blood, amino acid solutions or fat emulsions.

In the absence of special knowledge a drug should only be added to simple solutions (dextrose, sodium chloride, or water for injection. Note: first two solutions are acidic pH 3.5 - 6.5)

Interaction could occur without any visible change.

All admixtures should be made immediately prior to use and not stored.

More than one drug added increases the possibility for interaction

Literature/reference materials should be consulted if in any doubt.

Site of entry

The complex environment of the gut offers extensive opportunities for interaction to occur.

Drug induced motility changes, e.g. gastric stasis could delay absorption of a second drug. Similarly, hypermotility could carry a drug through the lumen too quickly for absorption to occur.

The pH of gut contents will have different effects on certain drugs depending on the dissociation constant (pKa) of the drug concerned. An acid medium will favour absorption of acidic drugs and an alkaline

medium will favour absorption of alkaline drugs e.g. alkaloids

Direct interaction can occur causing precipitation or dissolution.

e.g. TCN² with Fe²⁺ or Mg²⁺ or Ca²⁺

liquid paraffin and fat soluble drugs

Alterations in gut flora can have a profound effect on certain drug absorption. Some drugs are activated in the GI tract by microorganisms.

Direct interference with absorption mechanisms can also occur as some drugs can interfere with active transport mechanisms.

Interactions after absorption

1. Transit and storage sites

- a) Directly in the plasma.
- b) Competition for plasma protein binding sites.

Most drugs are loosely bound to plasma proteins. Acidic drugs bind most tightly. Binding sites are non specific so that one drug can displace another dependent on the concentration gradient.. Therefore there is more of the displaced drug free to reach its site of action. Warfarin is commonly potentiated in this way e.g. by aspirin.

2. Metabolism

Occurs mainly by Cytochrome P450 system and Uranosyl glucuronate transferase (UGT) system in liver and gut wall.

Enzyme induction leads to a greater activity of liver microsomal enzymes which metabolise many types of drugs.

e.g. barbiturates, griseofulvin, many antiepileptics and rifampicin are all enzyme inducers

Enzyme inhibition leads to higher plasma concentrations of certain drugs

3. Site of action and nearby

Competition for receptor sites e.g.

α- adrenoceptor block

muscarinic receptor block

Indirect acting sympathomimetics

Sympathomimetic amines that are substrates for MAO

4. Site of Exit or Excretion

Interference with passive diffusion

Interference with active transport

pH plays a predominant role in excretion too. An alkaline urine will encourage the elimination of acidic drugs e.g. salicylates. An acid urine favours the elimination of basic drugs e.g. many psychotropic agents.

Update on the Cochrane Library

Ministry of Health is now a subscriber to this invaluable database of evidence based medicine and currently has the CD-ROM version. At the moment only a limited number of licences are available for personal use but access is possible by several routes.



Please contact Directorate of Rational Use of Medicine (DRUM) for details if you wish to use this facility

Medication Non-Adherence

*Rajendra Shankar Assistant Pharmacist
Ismaiya Health Centre North Sharqiyah.*

Poor adherence to chronic pharmacological therapies remains a major obstacle in the global fight against various diseases. The National Council on Patient Information & Education in the United States has aptly termed medication non-adherence "Americas other drug problem", The problem of medication non-adherence poses greater risk among elderly patients, among whom poor medication adherence is common, morbid, costly and difficult to treat. Even in a setting in which medications are free and medical care is accessible and of excellent quality, medication adherence is poor. Non-adherence leads to worsening disease severity and

² TCN = tetracycline

increased cost associated with higher hospital admission rates. A sustained high level of adherence identifies a pattern of healthy behaviours and allows medications to improve outcomes.



Reasons:

Despite its importance adherence to therapy is an individual patient behaviour that is difficult to objectively measure, monitor and improve. Patient characteristics that may lead to poor adherence

include advanced age, cognitive impairment and depression as well as attitudes and beliefs about the importance of the medication, the disease being treated and the potential for adverse effects. Barriers to target for optimal adherence include polypharmacy, frequent dosing, adverse effects and high costs. Health care systems & clinician barriers include insufficient access to physicians and lack of trust between clinician & patient. In some cases, physicians negative attitudes and inadequate knowledge about the disease and value of guideline-recommended care also contribute to the problem

Interventions:

Pharmacists are often involved in assessing adherence and offering advice to clinicians about simplifying and improving drug regimens. Interventions that successfully improve adherence generally involve patient education and structural support such as patient reminders, more frequent clinic visits or telephone calls from health care professionals. Attempts are often made to simplify the patient's drug regimen by reducing the number of pills consumed per day and by reducing medication costs. Decentralization of treatment involving community health workers and reinforced supervision activities of remote health centres reduces the proportion of patients interrupting treatment before completion and yields better treatment outcomes. Direct counselling of patients by pharmacists may be particularly promising because of pharmacist's

specialized training and knowledge of medications and availability to patients.

Summary:

<i>Categories of non-adherence</i>
<ul style="list-style-type: none"> • Not having a prescription dispensed • Not taking dose prescribed • Not taking medicine at prescribed time • Not taking medication • Not taking medication for required duration • Taking additional non-prescribed medication

Poor medication adherence diminishes the health benefits of pharmacotherapies. Because approaches to improve adherence can be complex and labour intensive, there are no accepted, fully effective strategies in widespread clinical use. Various clinical trials have concluded that a pharmacy care program leads to increases in medication adherence and medication persistence.

<i>Examples of factors that may contribute to poor adherence with a prescribed medication regimen</i>
<ul style="list-style-type: none"> • Breakdown in communication with health team • Lack of faith in doctor or medication prescribed • Dissatisfaction with the consultation • Little perception of the seriousness of the condition to be treated • Inadequate understanding of the medication regimen • Absence of long term support monitoring or follow-up • Occurrence of side effects • Packaging or presentation of the medicine

Multifaceted interventions that incorporate structural and counselling components and include appropriately skilled and motivated pharmacists may be useful to promote medication adherence and persistence. This underscores the value of pharmacists as key providers of patient counselling in correcting poor *patient adherence*.

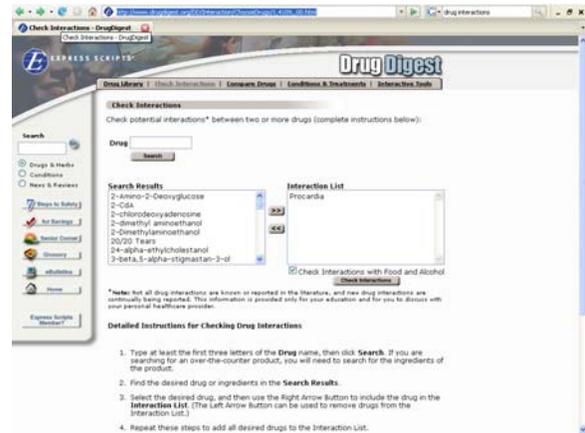


The above pictures were taken at a workshop for prescribers, pharmacists, assistant pharmacists and nurses at Haima Hospital in Al Wusta Region. The workshop was about problem solving in the rational use of medicines and similar issues.



The following pages contain screen shots of various useful websites that this directorate come across or uses from time to time. On this occasion there are several

dedicated to drug interactions as well as one with clinical pharmacy multiple choice questions



<http://www.drugdigest.org/DD/Interaction/ChooseDrugs/1,4109,,00.html>



http://www.drugs.com/drug_interactions.php



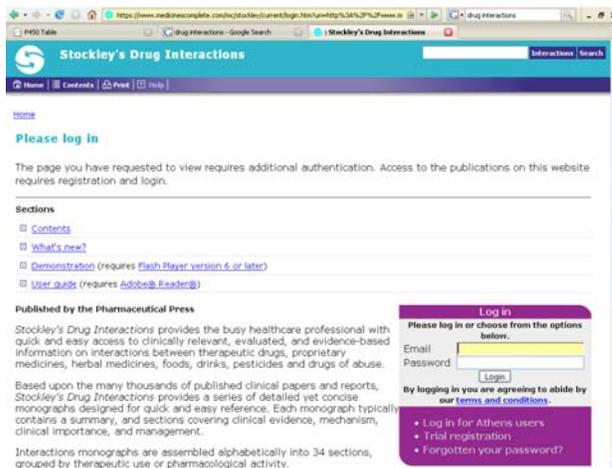
<http://www.medscape.com/druginfo/druginterchecker>

Site is free but registration required



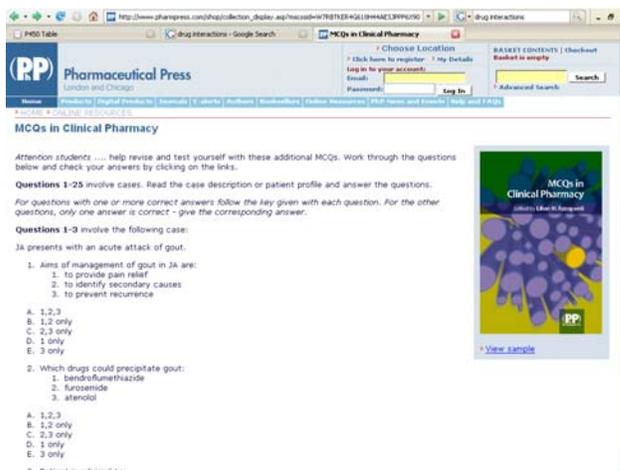
This site is very useful because in addition to drug interactions it also shows which drugs are metabolised by different Cytochrome P₄₅₀ subtypes. As these subtypes vary in activity within different ethnic groups the same drug can have greatly differing action and side effects due to different metabolic outcomes.

<http://medicine.iupui.edu/flockhart/>



Stockley's Drug Interactions was one of the first books published on the subject and is a highly respected source for drug interaction information. Registration is required and it may be that a subscription is also required.

<https://www.medicinescomplete.com/stockley/current/login.htm?>



The Pharmaceutical Press website turned up this interesting section on clinical pharmacy questions. This would be an excellent resource for revision and clinical knowledge self testing. It is free and registration is optional.

http://www.pharmpress.com/shop/collect_ion_display.asp?mcsid=W7RBTKER4G618H44AESJPPP6X90

A LIMITED LIST OF USEFUL MEDICINES IS BETTER THAN UNLIMITED LIST

- ◆ Contain only essential medicines
- ◆ Common health problems can be treated with small No. of medicines
- ◆ It is better to know and understand a few drugs well than to have a passing acquaintance with the whole range
- ◆ Nobody could reasonably claim that “the more medicines, the better”
- ◆ Health workers become more familiar with all information about the drug
- ◆ Following up the medicine therapy will become more possible
- ◆ Patients will benefit more from a better informed health profession
- ◆ Patients can be better informed about effective use of prescribed medicines
- ◆ Managing drug supply & dispensing can be carried out more economically and efficiently

FROM COMPLIANCE TO CONCORDANCE

Compliance, Adherence and Concordance:

- are the ability of the patient to comply with prescribed therapeutic regimen
- differ in the involvement of patients in discussing the drug therapy before prescribing it:

Compliance: The decision made by the practitioner without patient involvement

Adherence: The patient partially involved in the decision on therapeutic regimen

Concordance: Shared decision making and agreement on the selected therapeutic strategy, its outcome and how it may be achieved

*Dear prescriber and dispenser
“Before you prescribe & dispense a medicine, please talk about it”*

Information Capsules

By

Dr Ahmed Abdo-Rabbo & Ph Manal Al-Ansari

PRESCRIPTION WRITING FOR CHILDREN

- ◆ State the weight/age (or DOB) of the child
- ◆ State the strength of the medicine
- ◆ Carefully calculate the doses
- ◆ Choose the appropriate dosage form:
 - Involve the child and parents in choosing the formulation the child prefer
 - Tabs and caps are preferred if s(he) is able to swallow
 - Sugar-free medicines are preferred for long-term treatment with oral liquids (sugar-containing ones encourage dental decay)
- ◆ When the dose ordered is < 5 ml an oral syringe should be supplied
- ◆ Parents should be advised not to add any medicines to infant’s feed to avoid interactions
- ◆ Parents must be warned to keep medicines out of the reach of children

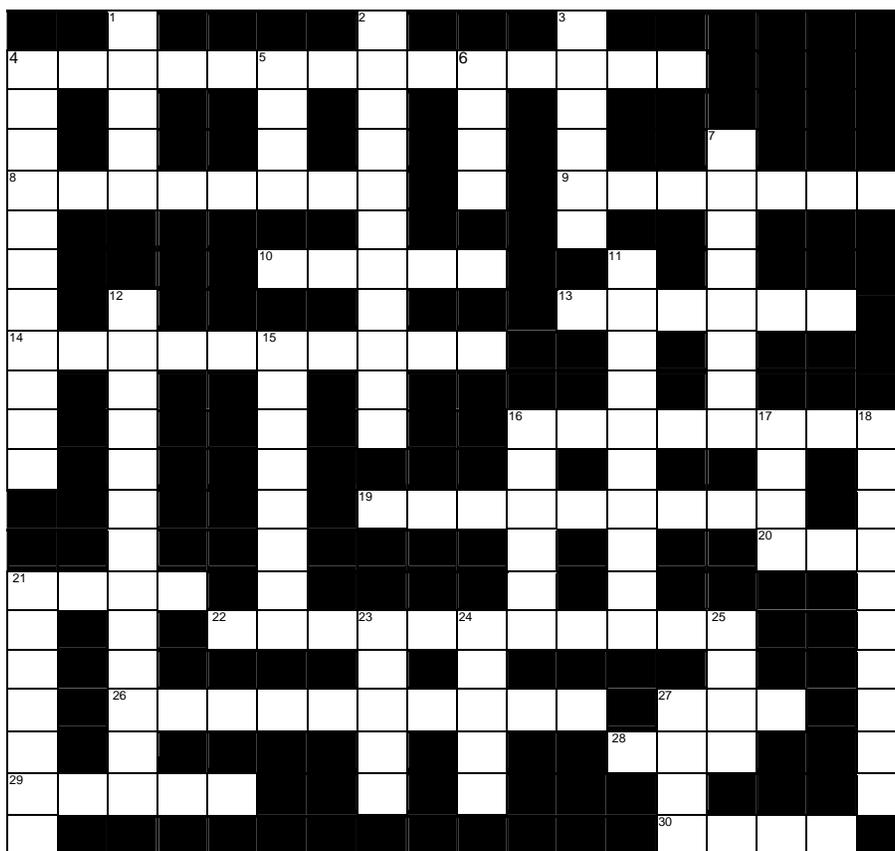
ADVANTAGES OF GENERIC NAMES

(Generic name in an International Non-proprietary Name = INN)

- ◆ More informative
- ◆ Much lower price
- ◆ Facilitate purchasing of products from multiple suppliers
- ◆ Allows for price competition
- ◆ Facilitate product substitution (whenever appropriate)
- ◆ Much easier for students & health care providers to learn & remember only one generic name rather than a host of different brand names
- ◆ Internationally recognized for any drug and not dependent on who makes or sells it
- ◆ Help to assure the proper adequate dose of the medicine
- ◆ Less likelihood of counterfeit products

Pharmaceutical Knowledge Crossword Competition

Fill in the appropriate answers to the numbered clues given below



Across

4. Used in Grand Mal epilepsy and as a sedative (14 letters)
8. A noble element found in an anticancer drug (8)
9. One type of contrast media (7)
10. Major pharmaceutical solvent (5)
13. You should never lose this (6)
14. Atypical antipsychotic (10)
16. Metabolic disorder (8)
19. These drugs have transformed the treatment of AIDS (19)
20. Short dosage form or often found on bottles (3)
21. Turns litmus red (4)
22. For the prophylactic treatment of gout (11)
26. Second generation cephalosporin (10)
27. Recommended for treatment of dehydration (3)
28. Four times a day (abbrev.) (3)
29. Many generics come from here (5)
30. Newer type of antidepressant (4)

Down

1. Used to relieve constipation (5)
2. Used in obstetrics (11)
3. Tetanus T..... (6)
4. Beta blocker with high lipid solubility (11)
5. The most nutritious part of the wheat plant (4)
6. Essential element for blood (4)
7. Fourth generation cephalosporin (10)
11. Aminoglycoside antibiotic (10)
12. Quinolone antibiotic (13)
15. Beta blocker with less side effects (8)
16. Lab test for thrombosis (esp DVT) (6)
17. Solid lubricant (4)
18. H₂SO₃ acid (10)
21. One a day will help to prevent strokes and thrombotic events (7)
23. The layer of atmosphere destroyed by CFCs (5)
24. Waste material with lots of diagnostic potential (5)
25. Saturated fat (4)
27. Can be essential in the diet (4)

For more information on any article in this publication or for submission of future articles please contact

Editor, Pharmacological
Directorate of Rational Use of Medicines
Ministry of Health, Box 393, Muscat PC113

Tel: +(968) 24692890/2469280 Fax +(968) 24692750 email: rdumoh@omantel.net.om web: <http://www.moh.gov.om>