DRUG THERAPY MONITORING

Therapeutic drug monitoring (TDM) refers to the measurement and interpretation of principally blood pr plasma drug concentration measurements with the purpose of optimising a patients drug therapy and clinical outcome while minimising the risk of drug-induced toxicity.

TDM involves tailoring a dose regimen to an individual patient by maintaining the plasma or blood concentration within a particular range.

To achieve optimal drug therapy 3 objectives should be met:

- To attain desired pharmacological effect of the drug.
- To reach the maximal effect in shortest possible time.
- To decrease the risk of toxicity.

TDM is useful in drugs:

- With a narrow therapeutic index.
- Which are highly protein bound.
- Which are liable to interact.
- In which the metabolite might be toxic.

ROLE OF PHARMACIST.

A reliable and responsive TDM service depends on team work between nurses, doctors, pharmacist, scientist and technical staff. The clinical pharmacist should provide advice to medical staff on the appropriate use and timing of TDM and assist with the interpretation of results. In addition the pharmacist maybe involved in :

- Initial selection of drug regimen.this may involve decisions about drug choice, dose, dosing interval, route of administration and dosage form of the drug, taking into account factors such as sex, age, body weight, race, metabolism status, renal function, plasma albumin concentration, use of other drugs and laboratory results.
- Adjustment of the dosage regimen based on TDM results and the patients clinical response,.
- Assessment of possible causes for unexpected results, such as non- compliance, bioavailability problems, medication errors, drug interactions or pharmacogenetic variability.
- Dose adjustment for patients on haemodialysis or peritoneal dialysis.
- Provision of poisons information.

MEDICATION CHART REVIEW.

- It is a fundamental responsibility of a pharmacist to ensure the appropriateness of medication orders.
- It serves as starting point for other clinical pharmacy activities (medication counselling, TDM, DI, and ADR).
- Organising information according to medical problems (example disease) helps breakdown a complex situation into its individual parts.

GOALS:

1. *To optimise the patients drug therapy.*
2. *To prevent or minimise drug related problems/medication errors.*

PROCEDURE:

The patients medical record should be reviewed in conjugation with the medication administration record.

Recent consultations, treatment plans and daily progress should be taken into accout when determining the appropriateness of current medication orders and planning each patient's care.

All current and recent medication orders should be reviewed.

COMPONENTS OF MEDICATION ORDER REVIEW include:

1. Checking that medication order is written in accordance with legal and local requirements.
2. Ensuring that the medication order is comprehensible and unambiguous, that appropriate terminology is used and that drug name are not abbreviated. Annotate the chart to provide clarification as required.
3. Detecting orders for medication to which the patient may be hypersensitive/intolerant.
4. Ensuring that medication order is appropriate with respect to:
    a) The patient's previous medication order.
    b) Patient's specific considerations e.g disease state, pregnancy.
    c) Drug dose and dosage schedule, especially with respect to age, renal function, liver function.
    d) Route, dosage form and method of administration.
5. Checking complete drug profile for medication duplication, interactions or incompatibilities.
6. Ensuring that administration times are appropriate e.g. with respect to food , other drugs and procedures.
7. Checking the medication administration record to ensure that all ordered have been administered.
8. Ensuring that the drug administration order clearly indicates the time at which drug administration is to commence.

9. special considerations should be given especially in short course therapy as in antibiotics and analgesics.
10. Ensuring that the order is cancelled in all sections of medication administration record when the drug therap is intended to cease.
11. If appropriate follow up of any non-formulary drug orders, recommending a formulary equivalent if required.
12. Ensuring appropriate therapy monitoring is implemented.
13. Ensuring that all necessary medication is ordered. E.g. premedication, prophylaxis.
14. Reviewing medication for cost effectiveness.
15. Identification of drug related problems.
    - Untreated indication.
    - Inappropriate drug selection.
    - Sub therapeutic dose.
    - Adverse drug reaction.
    - Failure to receive drug.
    - Drug interactions.
    - Drug use without indication.
    - Overdosage.

Medication chart Endorsement.

Another important goal of treatment char review is to minimise the risk of medication errors that might occur at the level of prescribing and / or drug administration.

A medication error is any preventable error that may lead to inappropriate medication use or patient harm.

To prevent potential morbidity and mortality associated with these errors, pharmacists should systematically review the medication chart and write annotations on the chart where the medication orders are unclear.

CLINICAL REVIEW:

Clinical review is one of the integral components of medication review and should preferably be performed on a daily basis. It is the review of the patients' progress for the purpose of assessing the therapeutic outcome.

The therapeutic goal for the specific disease should be clearly identified before the review.

GOALS:

The primary aims of the clinical review are to:

- Assess the response to drug treatment.

- Evaluate the safety of the treatment regimen.
- Assess the progress of the disease and the need for any change in therapy.
- Assess the need for monitoring, if any.
- Assess the convenience of therapy(to improve compliance).

Ward round participation

A ward round is a visit made by a medical practitioner, alone or with a team of health professionals and medical students, to hospital inpatients at their bedside to review and follow up the progress in their health. Usually at least one ward round is conducted every day to review the progress of each inpatient, though more than one is not uncommon. In certain practice settings such as psychiatry, the “ward round” may be conducted away from the patient’s bedside in a non-traditional fashion, where the team meets elsewhere to review each case.

Goals and objectives for clinical pharmacists on ward rounds:

As an important member of the healthcare team, pharmacists should attend ward rounds and clinical meetings whenever possible. This enables pharmacists to contribute prospectively to patient care through the provision of drug therapy. The goals of a clinical pharmacists participation in ward rounds are to:

- Gain an improved understanding of patient’s clinical status and progress, current planned investigations and therapeutic goals.
- Provide relevant information on various aspects of the patient’s drug therapy such as pharmacology, pharmacokinetics, drug availability, cost, drug interactions and adverse reactions.
- Optimize therapeutic management by influencing drug therapy selection, implementation, monitoring and follow-up.
- Investigate unusual drug orders or doses.
- Assimilate additional information about the patient such as co-morbidities, medication compliance or alternative medicine use that might be relevant to their management.
- Detect adverse drug reactions and drug interactions.
- Participate in patient discharge planning.

Ward round participation also provides many learning opportunities for pharmacists. It allows pharmacists to see firsthand how drugs are used and prescribed and to see the effects of these drugs on patients. With time, pharmacists develop an appreciation of how the patient’s own wishes and their social, cultural and economic circumstances may influence therapeutic choices. Even for experienced clinical pharmacists in teaching hospitals, it is very rare to finish a ward round without gaining new perspectives on some aspect of therapeutics or patient care. For those involved in academia and research, ward rounds allow identification of cases for clinical teaching and publication. Not the least, ward round participation strengthens the inter-professional relationship among various health professionals, leading to better healthcare practice and research.

ROLE OF PHARMACIST IN THE MANAGEMENT OF ADR

- Monitoring the patients who are at greater risk of developing ADR's
- Monitoring the patients who are prescribed with drugs highly susceptible to cause ADR's
- Assessing and documenting the patient's previous allergic status
- Assessing the patient's drug therapy for its appropriateness
- Assessing possible drug interactions in case of multiple therapies
- Assessing health care professionals in detection and assessment of ADR's
- Encouraging/ stimulating healthcare professionals in reporting on ADR
- Documentation of suspected reported reactions for future reference
- Follow up of patients to assess the outcome of the reaction and management
- Obtaining feedback about the reported reaction
- Educating healthcare professionals about the importance of an ADR
- Educating patients

Patient counseling

Providing information to patients and their representatives regarding disease, drug therapy, and duration of therapy, side effects, and life style modifications.

Outcomes of patient counseling:

- Patient recognizes the importance of their well being.
- It encourages the patient to establish a working relationship with a pharmacist & foundation for continual interaction and consultation.
- Improves the coping strategies to deal with medication side effects and drug interactions.
- Motivates the patient to take medicine for improvement of his/her health status.
- The patient becomes an informed, efficient and active participant in disease treatment and self care management.
- Develops the ability in patient to take appropriate medication related decision concerning the compliance or adherence to their medication regimen.

Stages in patient counseling:

- Introduction.
- Content.
- Process.
- Conclusion.

Introduction:

- Review the patient record prior to counseling.
- Conduct an appropriate patient counseling introduction by self and patient.
- Explain the purpose of counseling session.

- Obtain pertinent initial drug related information. E.g.: drug allergies, and other medications.
- Warn the patient about taking other medications including OTC drugs, herbals, or botanical drugs and alcohol which could inhibit or interact into the prescribed medication.
- Asses the patient understandings of reason for therapy.
- Assess any actual or problems of importance to the patient.

Counseling contents item:

- Discuss the name and indication of the medication.
- Explain the dosage regimen including duration of therapy when appropriate.
- Assist the patient in developing a plan to incorporate the medication regimen into his/her daily routine.
- Explain how long it will take for the drug to show its effect.
- Discuss storage and refilling information.
- Emphasize the benefits of completing the medication as prescribed.
- Discuss the potential side effect.
- Discuss how to prevent or manage the side effects of the drug.
- Discuss the precautions.
- Discuss the significant drug-drug, drug-food, and drug-disease interaction.
- Explain precisely what to do if the patient misses the dose.
- Explore the potential potential problems of the patient.

Counseling process items:

- Use the language the patient can understand.
- Use the appropriate counseling aids to support counseling.
- Present the fact and order in a logical order.
- Use open-ended question.
- Use both verbal and non-verbal behavior.

Counseling conclusion steps:

- Verify the patient understanding via feedback.
- Summaries by acknowledging or emphasizing key points of information.
- Provide an opportunity for final concerns or questions.
- Help the patient to plan, follow up and next consecutive steps.

Barriers to patient counseling:

The barriers that come in the way of conducting patient counseling are:

- Environment
  - ✓ A busy pharmacy
  - ✓ Lack of privacy
  - ✓ Noise

- ✓ Physical barrier

❖ Patient factors
- ✓ Physical disabilities
- ✓ Comprehensive difficulties
- ✓ Illiteracy

❖ The pharmacist

❖ Time

Environment:

- Community pharmacy, hospital OP pharmacy and hospital ward are all areas where pharmacist uses their communication skills in a professional capacity.
- None of these areas are ideal but an awareness of the limitation of the environment goes part the way to resolving some of the problems.

➢ A busy pharmacy:

- This may create the impression there appears to be little time to discuss personnel matter with the patients.
- The pharmacist is supervising number of difficult activities at the same time and is unable to devote his/her full attention to an individual matter.
- It is important that pharmacist organize their patterns in such a way as to minimize their impression.

➢ Lack of privacy:

- Both community and hospital outpatient departments have counseling rooms/ areas but may have not, many hospital wards could be linked to a busy thorough fare.
- For good communication to be it is often necessary for the consultation to take place in a quite environment, free of interruptions.
- The above mentioned condition in which pharmacist frequently work require additional skills to overcome the lack of ideal facilities.

➢ Noise:

- Noise levels within the working environment are an obvious barrier to good communication.
- People strain to hear what is said. Comprehension is made more difficult, particularly problem exist for hearing impaired patients.

➢ Physical barriers:

- The distance between people where communication occurs is significant.
- Pharmacy counters and OP dispensing hatches are physical barriers. This in turn can create problems in developing effective communication.

Patient factors:

- One of the main barriers to good communication in a pharmacy can be patient expectations.

- In many cases, they have become used to seeing a good pharmacy as one where their prescription is dispensed quickly.
- They are not expecting time t be spent with them for checking, understanding of medicines or health related matters.
- Once the purpose of communication is explained most patients realize its importance.

➢ Physical disabilities:

- Dealing with patients who have sight or hearing impairments will require the pharmacist to use additional communication skills.

➢ Comprehensive difficulties:

- Not all people come from the same educational background and care must be taken to assess patient's level of understanding and choose appropriate language.
- In many cases, the lack of ability to comprehend may be because English is not the patient's first language.
- Pharmacist working in areas where there is high proportion of non-English speakers may find it useful to stop / develop their own information leaflet in appropriate language.

➢ Illiteracy:

- High proportion of people in India is illiterate. Obviously for these patients any written materials will be meaningless. As well as, it is not always easy to identify illiterate patient because patient may feel ashamed and are unlikely to admit it.
- However, if pharmacist identifies any patient who have reading difficulties, pictorial labels can be used and additional verbal advice can be given.

Pharmacist:

➢ Not all pharmacists are natural good communicators but identifying their strength or weakness will assist in improving our communication skills.
➢ Some of the weakness which can be barrier to good communication are listed below:

- Lack of confidence.
- Lack of interest
- Laziness
- A pharmacist who is not prone to delicate responsibilities.

If any of these characteristics is present, the reason for it should be identified and resolved if possible.

Time:

➢ In many instances, time or lack of it can be major problem for good communication.
➢ Try developing a meaningful conversation with someone who constantly looks at his watch.
➢ Similarly, a patient who is worried about missing a bus or concerned that a car is parked on double yellow lights is unlikely to give undivided attention.

Drug use evaluation (DUE) (drug utilization review)

Drug use evaluation (DUE) is a system of ongoing, systematic, criteria-based evaluation of drug use that will help ensure that medicines are used appropriately (at the individual patient level). If therapy is deemed to be inappropriate, interventions with providers or patients will be necessary to optimize drug therapy. A DUE is drug- or disease-specific and can be structured so that it will assess the actual process of prescribing, dispensing or administering a drug (indications, dose, drug interactions, etc.). DUE is the same as **drug utilization review** (DUR) and terms are used synonymously.

Medication use evaluation (MUE) is similar to DUE but emphasizes improving patient outcomes and individual quality of life; it is, therefore, highly dependent on a multidisciplinary approach involving all professionals dealing with drug therapy. An MUE will assess clinical outcomes (cured infections, decreased lipid levels, etc.).

The goal of a DUE or MUE is **to promote optimal medication therapy** and ensure that drug therapy meets current standards of care. Additional objectives may include:

• creating guidelines (criteria) for appropriate drug utilization

• evaluating the effectiveness of medication therapy

• enhancing responsibility/accountability in the medicine use process

• controlling medicine cost

• preventing medication related problems, for example adverse drug reactions, treatment failures, over-use, under-use, incorrect doses and non-formulary medicine use

• identifying areas in which further information and education may be needed by health-care providers.

Once the main problem areas have been identified, (from aggregate data, health facility indicators, qualitative studies, other DUE studies, or even

recommendations from DTC members), a DUE system can be established relatively quickly.

The steps of a DUE

The steps of a DUE are as follows.

■ **STEP 1 Establish responsibility**

It is the responsibility of the DTC to establish procedures for the implementation of a DUE programme; this includes appointing a responsible member of the DTC or a subcommittee to monitor and supervise the DUE process in the hospital or clinics. Ideally the DTC should establish annual plans, outlining which medicines or clinical conditions will be a part of the DUE process.

■ STEP 2 Develop the scope of activities and define the objectives

The DTC should decide upon the objectives of the DUE and the scope of the activities necessary. The scope can be very extensive or it can focus on a single aspect of drug therapy and will depend upon the type of problem identified, for example:

• overuse of a more expensive medicine when a cheaper equivalent is available, as revealed in aggregate data

• incorrect use (indication, dosage, administration) of a particular drug, as revealed in patient charts, medication error reports, ADR reports

• inappropriate choices of antibiotic, as revealed in antibiotic sensitivity reports

• a poor dispensing process, as revealed by patient complaints or feedback.

Due to the large number of medicines available at a hospital or clinic, the DTC must concentrate on those medicines with the highest potential for problems in order to get the most return on the work involved. These high-priority areas include:

• high-volume drugs

• expensive drugs

• drugs with a narrow therapeutic index

• drugs with a high incidence of ADRs

• critically important therapeutic categories, for example cardiovascular, emergency, toxicology, intravenous drugs, chemotherapy and narcotic analgesics

• antimicrobial drugs, prophylactic and therapeutic

• drugs undergoing evaluation for addition to the formulary

• drugs used for non-labelled indications

• drugs used in high-risk patients

• common clinical conditions often poorly treated.

■ STEP 3 Establish criteria for review of the medicine

Establishing DUE criteria is extremely important, and is the responsibility of the DTC. DUE criteria are statements that define correct drug usage with regard to various components, as shown in box 6.6. Criteria for the use of any medicine should be established using the hospital's STGs (assuming that they have been correctly developed). In the absence of hospital STGs, criteria may be based on recommendations from national or other locally available satisfactory drug use protocols, other relevant literature sources, and/or recognized international and local experts. Credibility, and staff acceptance, of the DUE relies on using criteria that have been developed from reading established evidence-based medicine information from reputable sources and that have been discussed with prescribers.

components of drug use for DUE criteria

- **uses:** appropriate indication for drug, absence of contraindications
- **selection:** appropriate drug for clinical condition
- **dosing:** indication-specific dosing, intervals and duration of treatment
- **interactions:** absence of interactions - drug-drug, drug-food, drug-laboratory
- **preparation:** steps involved with preparing a drug for administration
- **administration:** steps involved in administration, quantity dispensed
- **patient education:** drug and disease-specific instructions given to patients
- **monitoring:** clinical and laboratory
- **outcome, for example:** decreased blood pressure, blood glucose, asthma attacks

■ STEP 4 Data collection

Data may be collected **retrospectively**, from patient charts and other records, or **prospectively**, at the time a medicine is prepared or dispensed. Retrospective data collection may be quicker and is best accomplished away from the patient care areas and distractions. The advantage of a prospective review is that the reviewer can intervene at the time the medicine is dispensed to prevent errors in dosage, indications, interactions or other mistakes. A particular example of this is the computerized systems used in some pharmacies; here the computer warns the pharmacist if patient data being entered into the computer fails to meet established criteria and requires them to correct the problem(s) noted. Such a system can also provide a large database for use retrospectively.

Data must be collected from a suitable random sample of charts or prescription records from the health-care facility, usually selected by pharmacy personnel, but also by nurses or medical records personnel. The treatment of at least 30 patients, or 100 patients for common clinical conditions, should be reviewed per health facility or hospital. The larger the facility and the more practitioners, the larger the number of records needed for review and analysis. Data collection forms based on the criteria can be

configured into simple 'yes/no' questions or may involve the filling in of open questions (see annex 6.2). Sources of data include patient charts, dispensing records, medication administration records, laboratory reports,

ADR reports, medication error reports, antimicrobial sensitivity reports, and documented staff and patient complaints.

■ STEP 5 Data analysis

Data are tabulated in a form that corresponds to the criteria chosen for the DUE. The percentages of cases that meet the threshold for each criteria should be calculated and summarized for presentation to the DTC. A report of all DUE programmes that are being conducted should be prepared on a quarterly basis.

■ STEP 6 Feedback to the prescribers and making a plan of action

After information is presented (for example on inappropriate drug use or unacceptable patient outcome), the DTC should develop conclusions about the differences between actual and desired results. In other words, how do the actual results vary from the desired benchmark or threshold levels? The DTC should then decide what follow-up action is necessary and whether to continue, discontinue or expand the functions of the DUE in question. Recommendations should include specific steps to correct any drug use problem that is evident from performing the DUE. For example, if a specific medicine is being prescribed at too high a dose, the recommendations need to specify in detail how the dosing of this medicine can be improved. Interventions to improve drug use would include feedback to the prescribers and may also include:

• education, for example letters, in-service education, workshops, newsletters, face-to-face discussions

• institution of drug order forms

• institution of prescribing restrictions

• changing the formulary list and/or manual

• changing the standard treatment guidelines

• using another DUE or continuing the present one.

■ STEP 7 Follow-up

In every DUE, follow-up is critical to ensure appropriate resolution of any problems. Did an intervention achieve its objective? If an intervention is not evaluated, or drug use problems are not resolved, then the DUE will have been of no use. As a part of a follow-up plan the DTC must assess the need to continue, modify or discontinue the DUE. Thus, DUE activities should be evaluated regularly (at least annually) and those that do not have a significant impact on drug use should be redesigned in order to provide measurable improvements. Common problems associated with DUEs include unclear responsibilities for different activities, poor prioritization of problems, lack of documentation, lack of personnel and inadequate follow-up. If follow-up is adequate, prescribers are likely to improve their performance in all areas knowing that they may be reviewed in the future!

DRUG UTILIZATION REVIEW

Drug utilization review (DUR) is defined as an authorized, structured, ongoing review of prescribing, dispensing and use of medication. DUR encompasses a drug review against predetermined criteria that results in changes to drug therapy when these criteria are not met. It involves a comprehensive review of patients' prescription and medication data before, during and after dispensing to ensure appropriate medication decision-making and positive patient outcomes. As a quality assurance measure, DUR programs provide corrective action, prescriber
feedback and further evaluations.

WHY DUR IS IMPORTANT:

DUR programs play a key role in helping managed health care systems understand, interpret, evaluate and improve the prescribing, administration and use of medications. Employers and health plans find DUR programs valuable since the results are used to foster more efficient use of scarce health care resources. Pharmacists play a key role in this process because of their expertise in the area of medication therapy management. DUR affords the managed care pharmacist the opportunity to identify trends in prescribing within groups of patients whether by disease-state such as those with asthma, diabetes or high blood pressure, or by drug-specific criteria. Pharmacists can then, in collaboration with prescribers and other members of the health care team, initiate action to improve drug therapy for patients.

DUR is classified in three categories:

- *Prospective* - evaluation of a patient's drug therapy before medication is dispensed
- *Concurrent* - ongoing monitoring of drug therapy during the course of treatment
- *Retrospective* - review of drug therapy after the patient has received the medication

1. Prospective DUR: Prospective review involves evaluating a patient's planned drug therapy before a medication is dispensed. This process allows the pharmacist to identify and resolve problems before the patient has received the medication. Pharmacists routinely perform prospective reviews in their daily practice by assessing a prescription medications dosage and directions while reviewing patient information for possible drug interactions or duplicate therapy. When part of an online claims adjudication process, prospective DUR often relies on computerized algorithms to perform key checks including drug interactions, duplications or contraindications with the patient’s disease state or condition.

Issues Commonly Addressed by Prospective DUR:

- Clinical abuse/misuse
- Drug-disease contraindications (when a prescribed drug should not be used with certain diseases)
- Drug dosage modification
- Drug-drug interactions (when two or more different drugs interact and alter their intended effects, often causing adverse events)
- Drug-patient precautions (due to age, allergies, gender, pregnancy, etc.)

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- Formulary substitutions (e.g., therapeutic interchange, generic substitution)
- Inappropriate duration of drug treatment

Example: Identification of drug-drug interactions are a common outcome of a prospective DUR. For example, a patient being treated with warfarin to prevent blood clots may be prescribed a new drug by another specialist to treat arthritis. If taken together, the patient could experience internal bleeding. Upon reviewing the patient's prescriptions, the pharmacist would note the potential drug interaction and contact the prescriber to alert him/her to the problem.

2. Concurrent DUR: Concurrent review is performed during the course of treatment and involves the ongoing monitoring of drug therapy to foster positive patient outcomes. It presents pharmacists with the opportunity to alert prescribers to potential problems and intervene in areas such as drug-drug interactions, duplicate therapy, over or underutilization and excessive or insufficient dosing. This type of review allows therapy for a patient to be altered if necessary.

As electronic prescribing becomes more widely adopted, the concurrent DUR process may be performed by the prescriber at the time of prescription transmission to the pharmacy, allowing interventions before the drug is dispensed. An important component of DUR will require complete and current drug and allergy records for the patient, as well as knowledge of appropriate therapeutic interchanges for individuals. As a safety net, pharmacists will perform a similar role as prescribers on the dispensing side of these transactions.

Issues Commonly Addressed by Concurrent DUR:

- Drug-disease interactions
- Drug-drug interactions
- Drug dosage modifications
- Drug-patient precautions (age, gender, pregnancy, etc.)
- Over and underutilization
- Therapeutic Interchange

Example: Concurrent DUR often occurs in institutional settings, where patients often receive multiple medications. Periodic review of patient records can detect actual or potential drug-drug interactions or duplicate therapy. It can also alert the pharmacist to the need for changes in medications, such as antibiotics, or the need for dosage adjustments based on laboratory test results. The key prescriber(s) must then be alerted to the situation so corrective action can be taken.

3. Retrospective DUR: A retrospective DUR reviews drug therapy after the patient has received the medication. A retrospective review aims to detect patterns in prescribing, dispensing or administering drugs. Based on current patterns of medication use, prospective standards and target interventions can be developed to prevent recurrence of inappropriate medication use or abuse. Outcomes of this review may aid prescribers in improving the care of their patients, either individually or within a certain target population (e.g., patients with diabetes, asthma, or high blood pressure).

Issues Commonly Addressed by Retrospective DUR:

- Appropriate generic use
- Clinical abuse/misuse
- Drug-disease contraindications
- Drug-drug interactions
- Inappropriate duration of treatment
- Incorrect drug dosage

- Use of formulary medications whenever appropriate
- Over and underutilization
- Therapeutic appropriateness and/or duplication