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Drug Utilization Evaluation of Pantoprazole

Shubhangi Netaji Shindalkar[1], Dr. Prasad Katare[2], Giram Tushar Bankat[3], Salgar Omkar Navnath[4], Gayke Shankar Anil[5], Ashwini Goroba Kawale[6], Kadam Manjusha Ramesh[7], Mande Sandip Padmakar[8]

Students, Department of Pharmacy, Shivlingeshwar College of Pharmacy, Almala, India[1,3,4,5,6,7,8]

Assistant Professor, Pharmacy Practice, Shivlingeshwar College of Pharmacy, Almala, India[2]

Abstract: *Drug Utilization Review (DUR) is an ongoing and planned process of quality improvement to ensure the safe, effective, and appropriate use of drugs. It implies comprehensive review of a patient's drug and medical history prior to, during, and subsequent to dispensing the medication for optimal therapeutic results. DUR is an important tool in quality assurance, prescriber feedback, and correctiveactions, finally improving patient care and reducing adverse drug reactions. The process is further divided into retrospective, concurrent, and prospective reviews, enabling the healthcare professionals to evaluate drug treatment according to established criteria. Lack of compliance with these criteria mandates therapeutic adjustments in order to assure appropriate drug usage. Through promotion of rational prescription and reduction in inappropriate pharmaceutical cost, DUR helps in controlling overall healthcare cost while enhancing therapeutic effectiveness and safeguarding patients.*

Keywords: Drug Utilization Review

I. INTRODUCTION

Drug Utilization Review (DUR) is a continuous, systematic quality-improvement process designed to assure the effective and proper use of drugs.(1) It involves an in-depth review of a patient's drug and medical history prior to, during, and subsequent to dispensing medications to maximize patient outcomes. Consequently, it offers quality assurance, prescriber feedback, corrective action, and further assessments. Therefore, DURs conducted by pharmacists enhance patient care quality, increase therapeutic results, avoid undesired drug reactions, and minimize inappropriate pharmaceutical spending, decreasing total healthcare costs(1)

DUR involves drug review against set criteria that leads to drug therapy alteration when such criteria are not fulfilled(2). DUR as the most widely used term for the retrospective, concurrent, or prospective process of reviewing medication in the healthcare market.(1)

The aim of DUR is to ensure drugs are used correctly, effectively and safely to optimize patient health status. (1) The pre-set criteria for proper drug treatment is compared to a patient's or population's record. Non-compliance to criteria leads to drug treatment adjustments. Furthermore, ongoing improvement in the proper, safe and effective utilization of drugs has the potential to reduce the total cost of care.(3)

DUR is generally categorized into three various categories:

1. Prospective DUR

In a prospective study, assessment of a therapeutic intervention is planned and occurs prior to the dispensing of the medication.(1) It entails the assessment of a patient's intended drug therapy prior to the dispensing of a medication. Through this process, the pharmacist can detect and solve issues prior to the patient's receipt of the medication. Pharmacists automatically conduct prospective reviews on a day-to-day basis by checking a prescription medication's dosage and instructions while screening patient information for potential drug interactions or duplicate therapy.(2)

Prospective DUR addresses the following common problems:

- Clinical abuse/misuse
- Drug-disease contraindications (when a drug should not be administered in conjunction with some diseases)
- Modification of drug dosages

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- Drug-drug interactions (when two or more diverse drugs interact and modify their desired effects, sometimes producing harmful consequences)
- Drug-patient precautions (because of age, allergies, gender, pregnancy, etc.)
- Formulary substitutions (e.g., therapeutic interchange, generic substitution)
- Inappropriate length of drug treatment

2. Concurrent DUR

Concurrent review is an on-going process, where the review goes on simultaneously and the drug therapy is monitored while treating a patient. Concurrent review is carried out in the midst of treatment and is the monitoring of drug therapy on a continuous basis to promote positive patient outcomes.(2)

Issues Typically Handled by Concurrent DUR:

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

3. Retrospective DUR

a retrospective MUE, the assessment and review of the treatment are done after the patient has been administered the medication.[4] Retrospective DUR examines drug therapy following the time when the patient has been administered the medication. A retrospective review seeks to identify patterns of prescribing, dispensing or administering drugs. According to ongoing trends in medication utilization, future standards and target interventions can be formulated to avert recurrence of inappropriately used medication or abuse. Results of this review can help prescribers optimize the care of their patients, either as individuals or as part of a specific target population (e.g., diabetes, asthma, or hypertension patients)(2)

Problems Routinely Identified by Retrospective DUE

- Appropriate generic substitution
- Clinical misuse/abuse
- Drug-disease contraindications
- Drug-drug interactions
- Inappropriately prolonged treatment
- Incorrect dosage of the drug
- Use of formulary drugs wherever possible
- Over and underuse
- Therapeutic appropriateness and/or redundancy (2)

II. DRUG PROFILE OF PANTOPRAZOLE

What Is Pantoprazole?

Pantoprazole is proton pump inhibitor used for the treatment of certain problems of stomach and esophagus (like acid reflux). It functions by reducing the level of acid in stomach. (4) It is extensively employed in hospitals and clinics. Pantoprazole is approved by the Food and Drug Administration Agency (FDA) for the treatment of many diseases.(5)

Indications:

1. Gastroesophageal Reflux Disease (GERD) and erosive esophagitis
2. Duodenal ulcers
3. Gastric ulcers
4. Zollinger-Ellison syndrome

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5. Helicobacter pylori (H. pylori) infection
6. Symptomatic treatment of heartburn.(5)

Mechanism of Action

pantoprazole irreversibly blocks the H+/K+ ATP pumps. There is a higher rate of pantoprazole breakdown with lower environmental pH Thus, it is reasonable that this drug would be most effective in the stomach, where the H+/K+ ATP pumps are found (namely within the parietal cells lining the stomach) This step is the last step in gastric acid production.

Therefore, pantoprazole binding to these pumps inhibits acid secretion for a period of 24 hours. New pumps are formed after 24 hours, and hence another dose of pantoprazole has to be administered to block them. The action is rapid in onset, and the peak effect is between 2 and 6 hours after drug intake.

Pharmacokinetics of pantoprazole

- Absorption: Readily absorbed following oral dosage, with maximal plasma levels developed within 2-3 hours.
- Distribution: Distributed very widely throughout the body, as well as penetrating to therapeutic concentration in the mucous lining of the stomach.
- Onset of action: Time of onset of action is prompt, and peak effect is attained between 2 and 6 hours following medication.
- Metabolism: Pantoprazole is also metabolized in the liver, predominantly by CYP2C19 demethylation and sulfation. These metabolites are not known to be of any significance.
- Elimination: Excreted through the urine.
- DOSE: Oral-40 mg once daily up to 8 weeks (adult)
- NOTE: Do not crush, cut, or chew tablet.

SIDE EFFECTS

Common side effects of pantoprazole include:

- Abdominal pain
- Facial puffiness
- Generalized swelling (edema)
- Chest pain
- Diarrhea
- Constipation
- Itching
- Rash
- Gas
- High blood sugar (hyperglycemia)
- Nausea
- Vomiting
- Photosensitivity(4)

Other side effects of pantoprazole include:

- Skin swelling
- Atrophic gastritis
- Anterior ischemic optic neuropathy
- Hepatocellular damage leading to hepatic failure
- Interstitial nephritis
- Pancreatitis

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- tLow platelet, red blood cell, and white blood cell count
- Muscle wasting (rhabdomyolysis)
- Anaphylaxis risk of severe allergic reaction
- Fatal toxic epidermal necrolysis
- Stevens-Johnson syndrome

Long-term side effects of pantoprazole therapy involve diarrhea caused by Clostridium difficile or microscopic colitis, small-intestinal bacterial overgrowth, deficiency of vitamin B12, deficiency of iron, deficiency of calcium, deficiency of magnesium, demineralization of bones, interstitial nephritis, and impaired absorption of drugs like clopidogrel.(6)

INTERACTIONS

- Pantoprazole increases the action of warfarin, an anticoagulant, and thus the risk of bleeding.
- Pantoprazole can raise the level of methotrexate in the serum, especially at high doses.
- Pantoprazole can decrease the absorption of some HIV drugs that need an acidic environment for best absorption.
- Pantoprazole interacts moderately with at least 52 various drugs.
- Pantoprazole interacts mildly with at least 27 various drugs(4)

AIM & OBJECTIVE

AIM

To analyze prescribing pattern and evaluation of appropriateness of prescription of pantoprazole.

OBJECTIVE

1. Evaluating Appropriateness of Use
2. Ensuring Rational Drug Use.
3. Cost-effectiveness Analysis
4. Enhancing Patient Outcomes and Subsequently Quality of life.

Materials and methods utilized for study

1. Data Collection:

a. Electronic health records (EHRs) or paper medical records
b. Pharmacy claims data
c. Laboratory results
d. Patient demographics and medical history

2. Hand-held Electronic Devices:

a. Personal digital assistants (PDAs) or mobile devices
b. Used to gather data during routine patient care

3. Study Designs:

a. Retrospective reviews of patient health records
b. Prospective observational studies
c. Randomized controlled trials (RCTs) for assessing specific interventions

4. Minimization of Bias:

a. Utilization of standardized data collection forms
b. Data collector training
c. Blinded data abstraction and analysis

5. Statistics:

a. Descriptive statistics (e.g., means, medians, proportions)
b. Inferential statistics (e.g., t-tests, ANOVA, regression analysis)

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c. Statistical software application (e.g., SAS, R, SPSS)

6. Results and Analysis:

a. Presentation of findings in tables, figures, and text

b. Identification of trends, patterns, and outliers

c. Comparison of observed utilization with evidence-based guidelines

7. Discussion and Conclusion:

a. Interpretation of findings in the context of clinical practice

b. Identification of opportunities for improvement

c. Recommendations for optimal medication use

Plan Of Work

The DUE cycle must comprise the following seven key activities or stages:

1) Planning (step 1-4)

2) Collection of data (step 5)

3) Assessment (step 6)

4) Feedback in case of results (step 7)

5) Interventions (step 8)

6) Re-evaluation (step 9-10)

7) Feedback of results (step 11)(7)

METRICS USED IN DRUG UTILIZATION EVALUATION:

1) Defined daily dose (DDD): The DDD is the theoretical average daily maintenance dose of a drug for its main indication, in adults. It can be applied to only products which are approved and marketed in at least one country

2)Prescribed daily dose/consumed daily dose: it is an average dose prescribed based on a representative sample of prescriptions. This provides the data regarding average quantity of a drug that is actually prescribed on a daily basis.

3) BMI: It is defined as weight in kilograms divided by square of height in meters. It is a ratio of weight to height usually used to classify Individuals with overweight, underweight and obesity.

4) Creatinine clearance: Creatinine clearance is how much plasma or blood is cleared of creatinine this utilized as an instrument to determine the kidney function. This can be estimated by using Cockcroft-Gault equation.

STEPS INVOLVED IN UNDERTAKING A DUE CYCLE

STEP 1: IDENTIFY DRUGS OR THERAPEUTIC AREAS OF PRACTICE FOR POSSHILE INCLUSION IN THE PROGRAM

1) The DUE committee needs to identify priority drugs or therapeutic areas of practice where Improvement in use will have the maximum clinical Impact.

2) These regions can be determined using different sources of data like drug reports, ADR reports, prescriber or clinical pharmacist feedback, local microbiology data and medical and pharmaceutical literature

3) VEN or ABC analysis is another significant technique used to determine high priority or target drugs.

4) ABC analysis separates the drugs into three categories on the basis of annual usage:

Class A drugs account for 75-80% of the overall values of drugs bought or used and are the most expensive or highest volume items.

Class B items account for 15-20% of spending.

Class C consists of low volume or low cost items, which account for 5-10% of spending.

5) ABC analysis is usually performed to help in the choice of drugs to be added to the hospital formulary.

6) In VEN analysis the medicines are usually categorized as vital (V), essential (E) and non essential

7) Targets for DUE are:

Drugs with a narrow therapeutic index like digoxin, phenytoin, cyclosporine, theophylline, etc.

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Drugs employed in the treatment of frequent conditions like chronic pain, respiratory tract infection or urinary tract infection
New drugs
Frequently prescribed drugs like antibiotics and PPIs
Costly medicines like low molecular weight heparin, broad-spectrum cephalosporin, anti-HIV drugs.(6)

STEP 2: STUDY DESIGN

1) Research method:
Observational study method: used most frequently.
Experimental methods: Example: Randomized controlled trials.
Cross-sectional studies: Drug use is assessed at a single point, are helpful in problem identification.
2) Depending on study design, DUE studies can be classified as prospective, concurrent, retrospective based on the timing of data collection.

PROSPECTIVE STUDY

• It entails assessment of a patient's intended drug therapy prior to a drug administration.
• Depending on their design, interventions can be offered if there is a need prior to administering the prescribed medication.
• Detection of drug-drug interactions is one of the problems that are often resolved by a prospective DUE.
For instance, another doctor might prescribe a patient taking warfarin for atrial fibrillation on NSAID. This enhances the incidence of gastrointestinal bleeding in the patient. Therefore, a DUE of concomitant use of warfarin and NSAIDs should be created in a manner that enables the pharmacist to inform the prescribing physician of the hazards with this drug combination

RETROSPECTIVE STUDY

It entails examining prescribed medication once dispensed to the patient. Its main disadvantage is that there cannot be interventions made to enhance drug use among the patients whose files were examined. It can be employed to observe the same features of drug use enumerated for prospective DUF, as well as:

- Identifying frequency of prescribing a single medication or group of medications
- Comparing prescribing of drugs among doctors
- Standard treatment guideline comparison to prescribing
- Therapeutic use monitoring of high cost medicines

For instance, a hospital conducts a DUE on gentamicin with criteria that the use is contraindicated in renal failure. Patient records for patients discharged last month audited in the medical records department and the audit might indicate that there is a prescribing problem. The medical staff makes the decision to perform a more in-depth evaluation of all aminoglycosides, with the same findings. An education session is held for the entire medical staff regarding antibiotic therapy in renal failure(8).

STEP 3: DEFINE CRITERIA AND STANDARDS

1) Following the choice of DUE target, it is essential to carry out an extensive literature review.
2) The steps involved in literature review are:
Conduct a comprehensive literature search for the selected drug or therapeutic category through various search mechanisms including medical (Medline, Micromedex, Drugdex, Cochrane library. Embase) and pharmacy based systems (IOWA, drug information service, international pharmaceutical abstracts).
Gather full copies (not abstracts only) of all the pertinent original research articles
Assess critically the studies that are most relevant to the selected drug or therapeutic class. This involves determining strengths and weaknesses in study design and whether proper conclusions have been drawn from the data prescribed.

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Summarize briefly the literature review, listing the main papers in the selected area and the drug use criteria that can be extrapolated from the evidence- based literature

STEP 4: DESIGN THE DATA COLLECTION FORM

1) Since it is not possible to monitor and assess all the drugs prescribed in a hospital, it is also not possible to tackle all aspects of use for every drug.
2) It should be ensured that data collection is done only on the most significant and pertinent aspects of drug use and on factors which can affect these.
3) Some aspects of drug use that are normally asked in surveys during DUE are:

- Patient demographics
- Prescriber details.
- Severity of disease
- Comorbidities
- Indication for drug use
- Drug-disease contraindications
- Side or adverse effects
- Dosing information.
- Duration of drug treatment
- Drug or drug class duplication
- Therapeutic duplication
- Preparation and administration
- Drug-drug and drug food interactions
- Monitoring of drug therapy
- Patient education or instructions
- Cost of therapy
- Over or under utilization of drug.

STEP 5: DATA COLLECTION

1) Data collectors should be selected carefully and should know how information is organized in the patients case notes.
2) Familiarity with drug names, strength and the manner orders are written is also crucial.
3) Physicians, nurses and pharmacists depending on their availability make the best. data collectors.

STEP 6: EVALUATE RESULTS

1) Data analysis is the most vital step in a DUE.
2) Data collected should be gathered utilizing available means like spread sheeting, data basing and word processing.
3) Next is summarizing the broad categories of findings and determining where precisely the data indicates deviation ought to be analyzed.
4) Deviation causes could be:

- Drug usage for new uses.
- Adequate procedures outdated.
- Inadequate resources,
- Gaps in knowledge or misinformation or misunderstanding

STEP 7: PROVIDE FEEDBACK OF RESULTS

1) The success of any DUE strategy depends on feedback of the results to prescribes, other hospital staff involved in the study and to administrative heads.

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2) The presentation of any report is also very essential.
3) The report should be good-looking and well-reasoned document with no typographical or grammatical errors.
4) One should prepare a scientific explanation of the results instead of a value judgment.
5) The findings can also be distributed to hospital personnel in the form of newsletters. DUE meetings or the hospitals academic meetings.

STEP 8: DEVELOP AND IMPLEMENT INTERVENTIONS

1) If a drug use problem was identified, the next step is to think about how the problem. can be solved.
2) Improving drug use interventions may be educational sessions, academic detailing, distribution of protocols, return of study findings as feedback, letters to individual physicians, newsletters and other information materials like posters and guidelines.
3) Operational interventions are developing or changing drug other companies manual or computerized reminders, prescribing limits, formulary additions or deletions, automatic stop orders or staff reallocation.
4) Interventions to be chosen and developed need proper planning.

STEP 9: RE-EVALUATE TO DETERMINE IF DRUG USE HAS IMPROVED

1) Prescribing trends and drug use must be assessed to establish if interventions are being successful.
2) Re-assessment is undertaken 3-12 months from the implementation of intervention, and should include collection of the same data as that in the initial DUE assessment.

STEP 10: RE-ACCESS AND REVISE THE DUE PROGRAM

At the close of an evaluation cycle, the DUR Committee should conduct an evaluation. of the DUR program, and make policy and procedural changes if necessary, to reflect actual practices, or to allow desired changes. Other things to consider when evaluating the program are:

- Were drugs that were appropriate selected for inclusion?
- Did the program cover significant aspects of care?
- Were criteria established based on hospital policy?
- Were thresholds reasonable?
- Were problems clarified?
- Were interventions reasonable?
- Was drug use problems solved/did drug therapy improve?
- Did DUR have any effect on the rate of adverse drug reactions, drug-drug Interactions, or errors in medication administration (if a system already exists for tracking them)?
- Were results distributed in accordance with policy?
- Did the DUR program affect the hospital's finances?

STEP 11: FEEDBACK OF RESULTS

1) There is a need to distribute the findings of the DUE among clinicians and other hospital staff.
2) This is also a good time to hear their views regarding the success otherwise of the interventions and how they can be improved.

III. ADVANTAGES

1.Ensures Appropriate Indication for Use

Benefit: DUE assists in making sure omeprazole is prescribed for only FDA-approved uses or for valid off-label indications (if warranted). Through the assessment of clinical justification for omeprazole prescribing, inappropriate or excessive use can be determined and minimized.

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Example: For prescription of omeprazole for relief of mild heartburn on an as-needed basis without an adequate diagnosis of peptic ulcer disease or GERD, it would be inappropriate. DUE would assist in the identification of such prescriptions and their rectification.

2.Proper Dosage and Duration of Therapy

Benefit: DUE tracks the duration and dosage of omeprazole therapy to prevent overuse or underuse. Long-term or excessive use of omeprazole (particularly beyond the recommended period) may result in adverse effects such as deficiencies of nutrients (e.g., vitamin B12, magnesium, or calcium), fractures of bones, and higher risk of infections.

Example: Omeprazole is generally prescribed for short-term treatment in conditions such as gastric ulcers (4-8 weeks), and long-term therapy should be assessed for suitability. DUE can detect cases where patients are on unnecessary long-term treatment.

3. Minimizes Adverse Drug Events (ADEs)

Benefit: By determining the safety of omeprazole use in particular patient populations, DUE identifies and reduces the potential for adverse drug events (ADEs). These consist of drug interactions, side effects, and inappropriate dosing-related complications.

Example: Omeprazole interacts with some medications (e.g., clopidogrel, digoxin, warfarin) and may result in detrimental effects. DUE can flag such risks and ensure safer options or therapy adjustments.

4.Improves Medication Adherence

Advantage: DUE can ensure that patients are receiving the right regimen, improving treatment adherence. Proper management of omeprazole, such as counseling on when and how to take it, can result in improved outcomes.

Example: Patients can be advised to take omeprazole with meals for maximum absorption. DUE makes sure that patients are well informed on how to take the drug in order to enhance overall treatment success.

5. Optimizes Cost-Effectiveness

Benefit: DUE can be utilized to evaluate whether omeprazole is most cost-efficient over other therapeutic approaches for the identical condition. As an example, generic equivalents of omeprazole or various therapies (such as H2 blockers) would be cost-saving for other individuals.

Example: If a patient is prescribed omeprazole for a condition that might be treated as well with a less costly H2 receptor antagonist, DUE would recognize this potential cost savings opportunity.

6. Monitors for Drug Interactions and Contraindications

Advantage: Omeprazole is known to interact with numerous drugs, and inappropriate drug combinations might enhance the risk of side effects or diminish the effectiveness of one or both drugs. DUE can assist in pointing out possible drug-drug interactions or contraindications that might injure the patient.

Example: Omeprazole can decrease the absorption of some drugs, e.g., ketoconazole, and enhance the action of anticoagulants like warfarin. DUE ensures these interactions are identified and controlled properly.

7. Lowers the Risk of Unnecessary Polypharmacy

Benefit: Polypharmacy (use of more than one drug) might enhance the possibilities of drug-drug interactions, side effects, and non-adherence. With the assessment of the need of omeprazole in conjunction with other medications, DUE minimizes adding omeprazole unnecessarily if other drugs are adequate or can be simplified.

Example: In older patients who take multiple medications, DUE might determine whether omeprazole is being taken unnecessarily along with other acid-reducing drugs, which could be unnecessary.

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8. Increases Patient Education and Awareness

Benefit: Education of the patient is often part of the process in DUE. Having patients understand the rationale for their treatment with omeprazole as well as the proper use thereof can enhance patient outcomes and discourage misuse.

Example: If patients do not know that omeprazole is supposed to be taken on an empty stomach for optimal results, they might take it improperly, resulting in less-than-optimal outcomes. DUE can assist in revealing these knowledge gaps.

9. Facilitates Evidence-Based Practice

Benefit: DUE takes advantage of the latest clinical guidelines and evidence-based care to determine whether omeprazole use is appropriate. This way, patients are treated with the latest scientifically validated treatment.

Example: When there is a revision of clinical guidelines on treating GERD or peptic ulcers, DUE will ensure that omeprazole is utilized in accordance with current recommendations and prevents the application of outdated or ineffectual techniques.

10. Enhances Quality of Care

Benefit: DUE enhances the quality of care overall by ensuring that medications are used safely and effectively. This process assists the healthcare team in providing the best possible outcomes for patients while minimizing potential risks.

Example: If a patient with chronic kidney disease is inappropriately prescribed high doses of omeprazole, DUE would catch this and prevent the risk of renal complications, ensuring better long-term care for the patient.

IV. APPLICATIONS

1. Indication Review
2. Dose Appropriateness
3. Duration of Therapy
4. Drug Interactions and Contraindications
5. Adverse Drug Events (ADEs) Monitoring
6. Cost-Effectiveness and Formularies
7. Patient Adherence and Education
8. Documentation and Communication

V. FUTURE SCOPE

1. Personalized Medicine and Pharmacogenomics

Future Scope: Improvements in pharmacogenomics, which examines the impact of genes on an individual's reaction to drugs, may have a vital role in fine-tuning omeprazole's use. Genetic influences, including differences in the CYP2C19 gene (responsible for the metabolism of omeprazole), determine the rate at which the body metabolizes the drug.

Impact: Future DUE programs could include genetic testing to individualize omeprazole dosing according to the metabolic rate of the patient. This would maximize the efficacy of the drug and reduce side effects, including drug-drug interactions or adverse events.

Example. For patients with a variant of the CYP2C19 gene that leads to slow metabolism, a lower dose or alternative PPI might be suggested, which could decrease risk of long-term effects such as fractures or infections.

2. Improving Clinical Decision Support Systems (CDSS)

Future Scope: The future of CDSS will see integration with electronic health records (EHR). DUE systems can be incorporated into EHRs and directly send real-time alerts and recommendations while omeprazole is being prescribed.

Effect: CDSS may detect improper prescriptions, drug-drug interactions, and drug-related adverse events and provide clinicians with recommendations immediately. CDSS may notify physicians when patients receive inappropriate doses or long-term treatment with inadequate monitoring, enhancing patient safety.

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Illustrative example: If a patient receives omeprazole for greater than 8 weeks without reevaluation, the system could notify a review or recommend reassessment of the therapy plan, thus potentially lowering redundant prolonged therapy.

3. Long-Term Safety Monitoring and Risk Stratification

Future Scope: Future DUE programs can be more oriented towards the long-term safety of omeprazole use, particularly as evidence continues to mount regarding its possible side effects, including increased risk of fractures, kidney disease, or gastrointestinal infections (e.g., Clostridium difficile).

Impact: Future studies may follow with long-term outcomes in omeprazole-treated patients using data from large datasets, recognizing at-risk populations (e.g., elderly individuals, patients with chronic kidney disease) who may require more frequent monitoring or alternative treatments.

Example: A DUE program might employ machine learning to review patient data longitudinally and identify individuals at high risk for complications from long-term omeprazole use, enabling earlier intervention and tailored care plans.

4. Integration of Real-World Evidence (RWE)

Future Prospect: Real-world evidence (RWE) is data gathered outside of clinical trials, e.g., from electronic health records (EHRs), patient registries, and insurance claims. Incorporating RWE into DUE enables enhanced assessments of omeprazole's efficacy, safety, and cost-effectiveness across diverse real-world patients.

Impact: With the use of real-world data, DUE systems can more accurately capture variability in patient response to omeprazole and detect trends in drug use that may not be apparent in clinical trials.

Example: A DUE program using RWE could detect certain subpopulations (e.g., patients with comorbidities such as diabetes or cardiovascular disease) who would experience more frequent side effects of omeprazole, enabling more tailored treatment strategies.

5. Cost-Effectiveness and Health Economics

Future Scope: As healthcare expenditures continue to grow, there will be an even greater emphasis on assessing the cost-effectiveness of drugs such as omeprazole. Future DUE programs will look at not only the direct expense of omeprazole but also its effect on overall healthcare expenditure, such as hospitalization due to complications or long-term outcomes of treatment.

Impact: Economic assessments will direct health care systems to make cost-savvier decisions on omeprazole utilization, particularly when compared with generic PPIs, other treatments, and different therapies.

Example: A DUE program may determine whether initiating omeprazole plus lifestyle modifications (e.g., diet modification) could lower the costs of healthcare through prevention of higher-cost procedures such as surgery or multiple hospitalizations.

6. Emphasis on Patient-Centered Outcomes

Future Perspective: The future of DUE will have a greater focus on patient outcomes, such as the quality of life, symptom relief, and general satisfaction of the patient with omeprazole treatment.

Impact: Through the use of patient-reported outcomes (PROs), DUE can assess whether omeprazole treatment results in significant improvements in quality of life, symptom control, and compliance, in addition to clinical parameters (e.g., pH testing, endoscopic findings).

Example: Patient satisfaction with omeprazole could be evaluated through surveys or interviews, e.g., whether they receive relief from symptoms with little side effect, which would inform future prescribing behavior and result in more tailored therapies to the patient.

7. Telemedicine and Remote Monitoring

Future Scope: As telemedicine and remote monitoring technologies gain wider use, DUE systems can be extended to remotely monitor omeprazole use, regimen compliance, and watch for possible adverse effects.

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Impact: Remote monitoring devices might notify healthcare professionals if a patient is not complying with their treatment, or if adverse events (such as new symptoms or side effects) occur, allowing for earlier intervention.
Example: A telehealth platform may remind patients to take omeprazole or alert providers if a patient has adverse symptoms, like stomach discomfort or nausea, triggering a review of the treatment plan.

8. Artificial Intelligence and Machine Learning
Future Scope: The application of artificial intelligence (AI) and machine learning (ML) may transform DUE processes by using large datasets to forecast patient outcomes, tailor dosing regimens, and enhance treatment compliance.
Impact: AI-driven DUE systems might learn from patient data continuously, identifying patterns of drug use and risk, ultimately providing predictive recommendations to clinicians.
Example: Machine learning algorithms might review patterns of omeprazole use among patients with similar health profiles and suggest individualized changes to treatment, e.g., switching to an alternative PPI or changing dosage based on the patient's response.

9. Global Health and Epidemiological Studies
Future Scope: DUE expansion to worldwide healthcare systems, especially those of low- and middle-income countries, may contribute to making the most of omeprazole in various populations and health systems.
Impact: Performing epidemiological research around the world would assist in recognizing global patterns in the use of omeprazole and gaining knowledge of region-specific issues (e.g., availability of care, affordability, or cultural attitudes towards medicine).
Example: In areas where healthcare access is poor, DUE might assist in ensuring that omeprazole is utilized effectively and economically, perhaps even promoting generic forms or public health measures to decrease the incidence of diseases such as GERD.

10. Patient Education and Engagement Tools
Future Scope: Next-generation DUE systems may include patient education tools that deliver concise, individualized information regarding omeprazole therapy, side effects, and lifestyle changes that may enhance treatment outcomes.
Impact: Educating patients can enhance compliance, curtail abuse, and ensure improved results. Electronic systems and mobile applications may deliver customized reminders, symptom monitoring, and educational materials.
Example: An app attached to the patient's DUE system may include advice on how to properly take omeprazole, monitor symptoms, and notify the healthcare practitioner in case of difficulties, facilitating a more integrated way of treating such conditions as GERD.

VI. CONCLUSION

- The drug utilization review of pantoprazole underscores its central position in the treatment of gastroesophageal reflux disease (GERD), peptic ulcers, and other acid-related disorders.
- The literature indicates that pantoprazole is well-tolerated and effective in general, especially for short-term use.
- It raises concerns regarding long-term safety, e.g., bone fracture risks, and chronic kidney disease, Vitamin B12 d

REFERENCES

[1]. Drug Utilization Review _ AMCP.org.
[2]. Asl FN, Bharathi M. A Study on Drug Utilization Review of Pantoprazole in a Tertiary Care Hospital, Bangalore, India.
[3]. B N R, K DrP, Sunny Dr.S, Jain Dr.A. Study on Drug Utilization and Evaluation of Proton Pump Inhibitors in Surgery Unit of Tertiary Care Teaching Hospital. Int J Pharm Sci Rev Res. 2022 Sep 15;55–9.

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[4]. Pantoprazole_ Side Effects, Uses, Dosage, Interactions, Warnings.
[5]. Pantoprazole_ MedlinePlus Drug Information.
[6]. Ghorbani SF, Nagaraju K. Drug utilization evaluation of pantoprazole in Kempegowda Institute of Medical Sciences (KIMS) hospital and research centre, India. J Fam Med Prim Care. 2022 Jun;11(6):3138–42.
[7]. Drug Utilization Review - StatPearls - NCBI Bookshelf.
[8]. Moore T, Bykov A, Savelli T, Zagorski A. GUIDELINES FOR IMPLEMENTING DRUG UTILIZATION REVIEW PROGRAMS IN HOSPITALS.
[9]. The role of drug utilization evaluation in medical sciences - ScienceDirect.
[10]. Shahbazi Khamas S, Darvishi F, Taghvaye-Masoumi H, Rafiei E, Jafari A. The Utilization Evaluation of Intravenous Pantoprazole for Stress Ulcer Prophylaxis in a Major Teaching Hospital. J Pharm Care [Internet]. 2022 Oct 3 [cited 2024 Nov 19]; Available from: https://publish.kne-publishing.com/index.php/JPC/article/view/10793
[11]. National Formulary 2011 4th Edition, Page No. 21
[12]. Essentials of Medical Pharmacolgy 8th Edition Page No.700-701