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Content available at www.cognixpress.in Online ISSN: XXXX-XXXX**DRUG UTILIZATION EVALUATION: AN ESSENTIAL TOOL FOR OPTIMIZING MEDICATION USE AND IMPROVING PATIENT OUTCOMES****NAGA SUBRAHMANYAM S***Department of Pharmacy Practice, Vishwa Bharathi College of Pharmaceutical Sciences, Guntur.*

ARTICLE HISTORY	ABSTRACT
Received: 09.03.2026 Revised: 16.04.2026 Accepted: 13.05.2026	Drug Utilization Evaluation (DUE) is an important quality-assurance and quality-improvement strategy designed to promote rational, safe, effective, and economical medication use. It involves systematic assessment of prescribing and medication-use practices against established clinical, therapeutic, and evidence-based criteria. DUE can identify inappropriate drug selection, incorrect dosage, unnecessary polypharmacy, prolonged treatment, drug interactions, inadequate monitoring, and deviations from standard treatment guidelines. Depending on the timing of assessment, DUE may be prospective, concurrent, or retrospective, allowing medication-related problems to be prevented, corrected during therapy, or evaluated after treatment. The process generally includes selection of a specific medicine or therapeutic area, establishment of evaluation criteria, collection of relevant clinical and medication-use data, assessment of adherence to standards, implementation of appropriate interventions, and follow-up evaluation. Standardized measurement systems, including the Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) methodology and World Health Organization prescribing indicators, provide useful tools for evaluating medication utilization patterns. DUE is particularly valuable for promoting antimicrobial stewardship, controlling inappropriate polypharmacy, improving the use of high-risk medicines, reducing medication-related problems, and supporting cost-effective pharmacotherapy. By identifying gaps between recommended and actual clinical practice, DUE can guide educational interventions, prescribing policies, clinical decision-support systems, and institutional treatment protocols. Successful DUE programs require active participation from physicians, pharmacists, nurses, clinical pharmacologists, microbiologists, and healthcare administrators. Integration of DUE with pharmacovigilance, medication reconciliation, antimicrobial stewardship, and electronic health-record systems can further enhance medication safety and therapeutic outcomes. Therefore, DUE should be regarded as a continuous multidisciplinary process that supports evidence-based prescribing, optimizes medication use, improves patient safety, and contributes to better clinical outcomes and efficient utilization of healthcare resources.
Keywords: Drug Utilization Evaluation; Medication-Use Evaluation; Rational Drug Use; Prescription Audit; Patient Safety; Quality Improvement.	
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INTRODUCTION

Medicines are fundamental components of modern healthcare, providing substantial benefits in the prevention, diagnosis, and treatment of disease. However, inappropriate medication use can result in therapeutic failure, adverse drug reactions, drug interactions, antimicrobial resistance, unnecessary polypharmacy, increased healthcare expenditure, and preventable morbidity. Rational use of medicines requires that patients receive medications appropriate to their clinical needs, in individualized doses, for an adequate duration, and at the lowest possible cost to both the patient and the community [1]. Consequently, systematic assessment of medication utilization has become an important component of healthcare quality improvement.

Drug Utilization Evaluation (DUE), also referred to as Drug Use Evaluation (DUE), Drug Utilization Review (DUR), or Medication-Use Evaluation (MUE), is a structured process for evaluating medication utilization against predetermined, evidence-based criteria. The principal purpose of DUE is to ensure that medications are used appropriately, safely,

effectively, and economically while improving patient outcomes. Contemporary medication-use evaluation emphasizes interdisciplinary performance improvement and the continuous assessment of medication-related processes and outcomes [2].

Drug utilization research is a broader discipline concerned with the prescribing, distribution, dispensing, and use of medicines and their associated medical, social, and economic consequences [3]. DUE applies these principles within healthcare organizations to identify inappropriate medication practices and develop interventions to improve the quality of pharmacotherapy.

CONCEPT OF DRUG UTILIZATION EVALUATION

DUE is an ongoing, systematic, criteria-based evaluation of medication use. It may be directed toward a particular medicine, therapeutic class, disease state, patient population, or stage of the medication-use process. The evaluation generally involves establishing explicit criteria, collecting relevant patient and medication data, comparing actual practice with established standards, identifying deficiencies, implementing corrective interventions, and reassessing medication use.

The major objective of DUE is not simply to determine how frequently medicines are prescribed. Rather, it aims to determine whether medications are being used appropriately in relation to indication, drug selection, dosage, route of administration, frequency, duration, monitoring, contraindications, drug interactions, and therapeutic outcomes.

DUE can therefore serve as an important bridge between evidence-based clinical guidelines and actual prescribing practice. It enables healthcare institutions to recognize variations in medication use and establish targeted quality-improvement interventions.

OBJECTIVES OF DRUG UTILIZATION EVALUATION

The principal objectives of DUE include ensuring appropriate drug selection, optimizing dosage and duration, reducing medication-related problems, improving adherence to clinical guidelines, promoting patient safety, and controlling unnecessary healthcare expenditure.

Specific objectives include:

- Assessing whether medications are prescribed for appropriate clinical indications.
- Evaluating the appropriateness of drug selection.
- Assessing dosage, frequency, route, and duration of treatment.
- Identifying contraindications and clinically significant drug interactions.
- Detecting therapeutic duplication and inappropriate polypharmacy.
- Monitoring the use of high-risk, high-cost, and high-utilization medicines.
- Promoting rational antimicrobial use.
- Evaluating adherence to hospital formularies and treatment guidelines.
- Reducing medication errors and preventable adverse drug events.
- Improving clinical outcomes and quality of care.
- Providing feedback to healthcare professionals.
- Identifying opportunities for cost-effective pharmacotherapy [2,4].

The objectives should be clearly defined before beginning a DUE study because the study design, population, data sources, and outcome measures depend on the questions being investigated [5].

TYPES OF DRUG UTILIZATION EVALUATION

DUE can be classified according to the timing of evaluation.

Prospective DUE

Prospective DUE occurs before medication therapy is initiated or before a medication is dispensed. Pharmacists and other healthcare professionals evaluate prescriptions for appropriateness based on predefined criteria. Parameters may include indication, allergy status, contraindications, dosage, drug interactions, therapeutic duplication, and patient-specific factors.

Prospective evaluation has the advantage of identifying inappropriate medication use before it reaches the patient. It is therefore particularly useful for high-alert medications, restricted antimicrobials, drugs with narrow therapeutic indices, and expensive therapies.

Concurrent DUE

Concurrent DUE is performed while the patient is receiving medication therapy. The patient's clinical response, laboratory results, adverse effects, dosage, duration, and continued need for therapy can be assessed during treatment.

This approach provides an opportunity for timely intervention. For example, a pharmacist may identify inappropriate antimicrobial therapy, recommend dose adjustment based on renal function, or suggest discontinuation of unnecessary medications.

Retrospective DUE

Retrospective DUE evaluates medication use after therapy has occurred. Medical records, prescriptions, pharmacy records, laboratory data, and medication administration records are reviewed and compared with predetermined criteria.

Although retrospective evaluation cannot prevent the medication-related problem during the original treatment episode, it can identify prescribing trends and system-level deficiencies. Findings can subsequently be used for education, policy development, guideline modification, and future prospective or concurrent interventions.

DUE Process

A successful DUE program follows a systematic process. The first step is to identify and prioritize a medication-use problem. Medicines may be selected because they are frequently prescribed, expensive, associated with significant adverse effects, classified as high-alert medications, or important from an antimicrobial-resistance perspective.

The second step is the development of explicit evaluation criteria. Criteria should be based on current clinical practice guidelines, systematic evidence, institutional protocols, drug information resources, and expert consensus.

The third step involves defining the study population and collecting appropriate data. Data may be obtained from electronic health records, medication administration records, pharmacy databases, laboratory systems, prescriptions, patient interviews, and clinical documentation.

The collected data are then compared with predefined standards. Deviations from the criteria are identified and categorized. Depending on the findings, interventions may include prescriber education, pharmacist recommendations, clinical decision-support alerts, formulary restrictions, development of treatment protocols, or audit-and-feedback strategies.

The final and essential component is reassessment. Medication-use evaluation should be regarded as a continuous quality-improvement process rather than a single audit. The effect of an intervention should be evaluated using predefined clinical, process, and economic outcomes.

MEASUREMENT OF DRUG UTILIZATION

Reliable measurement is essential for understanding patterns of medicine use. The WHO Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) methodology is an internationally recognized system for measuring and comparing drug utilization.

The ATC system classifies medicines according to the organ or system on which they act and their therapeutic, pharmacological, and chemical characteristics. The Defined Daily Dose is the assumed average maintenance dose per day for a medicine when used for its main indication in adults [2, 5,6].

ATC/DDD methodology facilitates comparisons of medicine consumption between countries, regions, institutions, and different periods, even when pharmaceutical products differ in strength, package size, price, and brand name. It can therefore be used to assess trends in medicine utilization and evaluate the effect of interventions.

However, DDD should not be interpreted as the recommended dose for an individual patient. The actual prescribed daily dose may differ considerably depending on age, body weight, disease severity, indication, renal or hepatic function, and other patient-specific characteristics [7].

WHO PRESCRIBING INDICATORS

WHO prescribing indicators are useful tools for evaluating prescribing practices in healthcare facilities. Common indicators include the average number of medicines prescribed per patient encounter, percentage of medicines prescribed by generic name, percentage of encounters involving an antibiotic, percentage involving an injection, and percentage of medicines prescribed from an essential medicines list or formulary.

These indicators provide a standardized method for identifying potential problems in prescribing practices. Excessive numbers of medicines per encounter may indicate polypharmacy, while low generic prescribing may indicate missed opportunities for cost-effective therapy.

High antibiotic or injection prescribing rates may also require further investigation. However, indicators should not be interpreted independently of clinical circumstances because variations in disease patterns and patient characteristics may influence prescribing practices.

ROLE OF DUE IN RATIONAL DRUG USE

Rational medicine use is an essential objective of healthcare systems. Inappropriate medicine use can cause unnecessary expenditure, adverse drug reactions, drug interactions, antimicrobial resistance, and poor treatment outcomes.

DUE provides a practical mechanism for identifying inappropriate medication utilization and promoting adherence to evidence-based treatment recommendations. For example, a DUE study may identify excessive use of antibiotics for viral

respiratory infections, inappropriate proton-pump inhibitor continuation, unnecessary injectable medications, or inappropriate use of multiple drugs from the same therapeutic class.

Drug utilization studies can also identify areas where medicine availability is inadequate, where potentially harmful prescribing patterns occur, or where substantial economic waste exists [1, 5, 8]. Such information can assist healthcare organizations and policymakers in developing targeted interventions.

DUE AND PATIENT SAFETY

Medication-related problems represent an important and potentially preventable source of patient harm. Medication errors may occur during prescribing, transcription, dispensing, administration, monitoring, or discontinuation.

DUE can identify inappropriate doses, contraindications, drug interactions, therapeutic duplication, unnecessary medications, and inadequate monitoring. Systematic medication-use evaluation can therefore contribute to medication safety and quality improvement.

Pharmacists are particularly important in this process because they possess specialized knowledge of pharmacotherapy, medication interactions, dosage adjustment, medication monitoring, and medication-related risks. Integration of pharmacists into DUE programs can facilitate identification and correction of medication-related problems.

DUE AND ANTIMICROBIAL STEWARDSHIP

Antimicrobial use represents one of the most important applications of DUE. Inappropriate antibiotic prescribing contributes to antimicrobial resistance, adverse drug reactions, unnecessary costs, and treatment failure.

Antimicrobial DUE can evaluate whether antibiotic therapy is clinically indicated, whether the selected antimicrobial is appropriate for the suspected or confirmed infection, whether the dose and route are suitable, whether treatment duration is appropriate, and whether therapy should be modified according to microbiological results.

DUE can therefore support antimicrobial stewardship by identifying inappropriate prescribing and providing feedback to prescribers. Continuous monitoring of antimicrobial utilization can also help institutions evaluate the effectiveness of stewardship interventions.

DUE AND POLYPHARMACY

Polypharmacy is another important area for medication-use evaluation. Although multiple medications may be clinically necessary in patients with several chronic diseases, unnecessary polypharmacy can increase the risk of adverse drug reactions, drug interactions, medication errors, poor adherence, and treatment burden.

DUE can identify potentially unnecessary medications, duplicate therapies, inappropriate combinations, and medications that lack a current indication. Medication review should consider the patient's diagnosis, prognosis, treatment goals, renal and hepatic function, potential drug interactions, and expected benefit.

Deprescribing strategies may subsequently be considered when the potential risks of continued therapy outweigh the expected benefits.

ECONOMIC IMPORTANCE OF DUE

Medication expenditure represents a substantial component of healthcare costs. DUE can identify inappropriate utilization of expensive medicines and opportunities for more cost-effective treatment without compromising patient safety or therapeutic effectiveness.

Economic evaluation should not be based solely on acquisition cost. The total cost of therapy may include administration, laboratory monitoring, adverse drug reactions, treatment failure, hospitalization, and follow-up care.

Therefore, an inexpensive medicine may not necessarily represent the most economical option if it results in poor therapeutic outcomes or increased adverse effects. DUE should integrate clinical effectiveness, safety, and economic considerations when evaluating medication use.

ROLE OF THE MULTIDISCIPLINARY TEAM

DUE is most effective when implemented through a multidisciplinary team. Physicians, pharmacists, nurses, clinical pharmacologists, microbiologists, epidemiologists, hospital administrators, and members of pharmacy and therapeutics committees may contribute to different stages of the process [2, 9].

Physicians contribute clinical expertise and assist in developing appropriate therapeutic criteria. Pharmacists provide expertise in medication therapy, utilization review, drug interactions, and medication safety. Nurses provide information regarding administration and patient response. Clinical pharmacologists and epidemiologists can assist with study design, data analysis, and interpretation.

The multidisciplinary approach also improves acceptance of DUE interventions because healthcare professionals participate in developing the criteria and interpreting the results.

ROLE OF PHARMACISTS IN DUE

Clinical pharmacists have a central role in medication-use evaluation. Their responsibilities may include selecting medications for evaluation, developing criteria, reviewing prescriptions and medical records, identifying medication-related problems, providing recommendations, educating healthcare professionals, and monitoring the effects of interventions.

Pharmacists can also contribute to prospective and concurrent DUE activities by reviewing prescriptions before dispensing and monitoring patients during therapy. Their involvement can improve communication between prescribers and other members of the healthcare team.

Integration of DUE with clinical pharmacy services can therefore strengthen medication safety and promote evidence-based prescribing.

CHALLENGES AND LIMITATIONS

Despite its benefits, DUE faces several challenges. Development of appropriate evaluation criteria can be difficult when clinical guidelines are unavailable, inconsistent, or rapidly changing. Data collection may also be time-consuming, particularly in healthcare settings with limited electronic medical records.

Another important limitation is that utilization data alone cannot establish whether a medicine was clinically appropriate. For example, a high rate of antibiotic use may reflect a high burden of bacterial infection rather than inappropriate prescribing. Consequently, drug utilization indicators should be interpreted in conjunction with clinical information [7, 10]. Healthcare professionals may also perceive DUE as an auditing or punitive activity if its objectives are not clearly communicated. Programs should therefore emphasize quality improvement, patient safety, education, and collaborative problem-solving rather than individual blame.

FUTURE PERSPECTIVES

Advances in electronic health records, computerized physician-order-entry systems, clinical decision-support systems, artificial intelligence, and real-world data analytics are creating new opportunities for DUE.

Automated systems can identify inappropriate doses, drug interactions, therapeutic duplication, prolonged antimicrobial therapy, and deviations from treatment protocols. Real-time alerts may allow healthcare professionals to intervene before medication-related harm occurs.

However, excessive computerized alerts may contribute to alert fatigue. Therefore, electronic DUE systems should be designed to provide clinically relevant and appropriately prioritized information.

Integration of DUE with pharmacovigilance, antimicrobial stewardship, medication reconciliation, clinical decision support, and health-economic evaluation may further strengthen medication-use quality.

CONCLUSION

Drug Utilization Evaluation is an essential tool for improving the quality, safety, effectiveness, and efficiency of medication use. It provides a systematic framework for evaluating medication utilization against evidence-based criteria and identifying opportunities for improvement. Prospective, concurrent, and retrospective approaches enable healthcare professionals to identify inappropriate prescribing, dispensing, administration, monitoring, and continuation of therapy. Standardized methodologies such as ATC/DDD facilitate measurement and comparison of medicine utilization, while WHO prescribing indicators provide practical measures for evaluating prescribing practices. DUE is particularly valuable in areas such as antimicrobial stewardship, polypharmacy management, high-risk medication monitoring, medication safety, and cost-effective pharmacotherapy. Its effectiveness is greatest when implemented as a continuous, multidisciplinary quality-improvement process involving physicians, pharmacists, nurses, clinical pharmacologists, and healthcare administrators. Ultimately, the success of DUE should not be measured only by reductions in medication use or expenditure. The primary goal should be improved patient outcomes through appropriate, safe, evidence-based, and economically responsible medication therapy. Therefore, DUE should be considered an integral component of modern healthcare quality-improvement and medication-management programs.

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