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Understanding Medicine Need Estimation within the Public Healthcare System in Iraq: A Review Article

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Abstract

The Iraqi medication management system comprises five key pillars: selection, need estimation, procurement, storage and distribution, and use. Despite the diligent efforts of pharmacists to accurately estimate medication needs, Iraqi public health institutions sometimes experience medication shortages due to inadequate budget allocations and procurement challenges. This review examines current practices, legislation, and challenges in the need estimation of medications. Indeed, there is significant collaboration among Iraqi health authorities responsible for medication approval, regulation, procurement, and dispensing. Key stakeholders, including the Directorate of Technical Affairs/Department of Need Estimation, Department of Pharmacy, KIMADIA, health directorates, and pharmacy and therapeutics committees in public health institutions collaborate to estimate annual medication needs. The methods for calculating needs include consumption, morbidity, and proxy methods, each with distinct advantages and limitations. The article highlights how morbidity data, medication consumption records, and medical employed protocols influence medication estimation processes. Obstacles hindering accurate estimation include inadequate electronic systems, inconsistent supply, expiring medications, population displacement, health crises (e.g., COVID-19), insurance implementation, and changes in prescribing practices. In conclusion, estimating medication needs in the public health sector is crucial for sustainable supply, but it is a complex task with multiple protocols and challenges. To enhance the effectiveness of medication, and need estimation in Iraq, the health system must prioritize electronic documentation and allocate sufficient budgets. By addressing these challenges, sustainable medication supply can be achieved in public healthcare settings.
Keywords: Iraq, Medication Need Estimation, public sector, review

Introduction

The medication management system in Iraq comprises four major components: selection, procurement, distribution, and use [(1–4)]. In order to prevent medication shortages (out of stock) in the public health sector, the requirement (quantification) or (need estimation) has been included as a fifth fundamental component in the management of medications in public healthcare settings [(3–5)].

Significance: According to the last report, medication supply to Iraqi public health institutions was inconsistent. Due to insufficient budget allocation, the State Company for Drugs and Medical Appliances (KIMADIA) procured 60% of essential medicines in 2019. The need estimation should be carefully calculated to prevent both underestimation, which can lead to medication shortages, and overestimation, which can result in resource loss [(2)]. It has been written by national experts in the field and previous health officials at the Department of Medication Need Estimation at the Ministry of Health, but it is not a governmental report.

Objective: This review aims to summarize and critically examine the processes, methodologies, and challenges associated with medication need estimation in Iraq's public healthcare system. It specifically addresses the following research question: How is medication need estimated in Iraqi public health institutions, and what are the key factors and challenges influencing its accuracy and effectiveness? The scope of this review is limited to Iraq's public sector, focusing on the roles of governmental health departments, the methods

employed (consumption, morbidity, and proxy), and systemic barriers such as infrastructure, budget constraints, and policy implementation.

The Selection of the Medicines

Medication selection includes reviewing prevalent health problems, identifying treatment options, and selecting specific medication and pharmaceutical dosage forms. Medication selection decisions for the public healthcare sector are categorized into primary, secondary, and tertiary healthcare [3,6,7]. The Ministry of Health (MOH) usually determines the medication selection process [2–4].

The MOH has established the National Committee of Medication Selection (NCDS), which includes specialist physicians and pharmacists with adequate experience in medication selection and scientific background [2]. This authority (NCDS) prepares lists of comprehensive and essential medicines in coordination with the Consulting committees in the Directorate of Technical Affairs (DTA) [2]. After that, public healthcare institutions have the authority to request any medication they need from those lists through the pharmacy and therapeutic committees in the primary healthcare sectors, hospitals, and specialized centers [8]. However, medication requests by the Pharmacy and Therapeutic Committee at each health institution need the approval of the Department of Pharmacy at the MOH headquarters [2,3].

Utilizing Scientific Names in Essential Medicine List (EML)

The medication's scientific name [3,4] is used when specifying the medications selected for the list of essential medications or the purpose of purchase. Using scientific names in the list of essential medications, or when purchasing, impacts the clarity of the quality and price of these medications [3–5].

National Drug Lists: Comprehensive vs. Essential

The NCDS prepared two official medication lists in Iraq; the comprehensive drug list, primarily intended for the private sector, and the essential medicines list, designated for public health institutions [2,3,9]. According to a previous Iraqi publication on pharmaceutical regulations, these lists serve to guide procurement and ensure rational medicine use within both sectors [2].

National Medication and KIMADIA Codes

Any treatment that does not have a national code cannot be ordered, purchased, or prescribed to patients in a public health institution. The national code is a fixed symbol for a specific medication with a particular concentration, regardless of the company or country of origin [10]. It facilitates electronic archiving in the need estimation list, submitting requests for an apology from KIMADIA, reporting excess medication, and transferring medication documents. It is easy to distinguish between the national code and the code used in processing documents issued by KIMADIA for the supply of the health directorates. The national code contains numbers, letters (8 to 10), and hyphens. In contrast, the KIMADIA code only consists of numbers (4 to 5) [3,10,11].

The Quantification or Need Estimation

Need estimation is a crucial part of the medication supply management cycle, calculating the required quantity of essential medicines to ensure adequate supply for health institutions. It considers disease cases and the medical staff's prescribing authority. For instance, certain medications like meropenem require specialist prescription, while others like romiplostim or ranibizumab require a subspecialist's prescription.

Estimating the need requires the adoption of scientific procedures and the preparation of work requirements. It depends effectively on the selection component, and health institutions cannot quantify a medication unless it is listed in the Essential Medication List. Checking the medicine warehouses (drug stores) is pivotal to see if there is an excess of some medications and their expiration date. For example, Ringer solution 100,000 pieces with expiration of December 2027 are available in the drugstore, and the annual consumption was 30,000 pieces. Consequently, the pharmacists in charge should put zero in the need Excel sheet cell regarding this item as there is enough quantity and no more will be required [3,4,12]. Otherwise, the results are a shortage or excess of medications, an increase in patient suffering due to difficulties in accessing health services, and a waste of health resources within health institutions [3].

Need estimation should not be considered a mere mathematical process, but the correct need estimation depends on specific data including accurate data related to morbidity data, medication uses and decisions about the type of medicines to be provided [1].

Objectives of Medication Need Estimation

The specific objective is to ensure the availability of the required medicines to treat the types and number of disease cases in health institutions [3]. Additionally, the general objective is to ensure the continuity of benefiting from medicines in a practical, therapeutic, and economical manner [3].

Methods for Calculating the Estimate of Need

First: The Consumption Method

The mechanism for calculating the need is based on the assessment of previous consumption. The method of medication consumption depends on the previous dispensing and is adjusted based on the periods in which the medication was unavailable. The method of consumption is more suitable for calculating the need when meeting the following conditions 1) availability of accurate data on past consumption and possible collection procedures; 2) Medicinal supplies are appropriate; 3) The storage conditions are appropriate; 4) The percentage of loss due to the expiration date is reasonable [3,4,12].

Second: Morbidity Method

This method depends on the number of patients, the type of diseases, and the medication protocols for the diseases (for example, medications used to treat hemophilia and thalassemia). In theory, the morbidity method provides us with actual numbers of needs compared to the consumption method. The method of morbidity is more appropriate in the following cases:

1- Accurate information about the morbidity rate, including the expected number of patients who need a specific treatment for each type of disease treated in governmental health institutions.

2- Adopting medication protocols in public hospitals.

3- Implementing medication protocols by doctors in the health institution to ensure that doctors adhere to protocols when prescribing medications [3,12].

Third: Adjusted or Proxy Consumption Method

This method is used for newly opened health institutions. In the modified consumption method, needs are calculated based on the number of medications used per 1000 patients in standard health institutions. It matches the needs of health institutions, which must be calculated in light of the number of cases that have been dealt with [3,12].

Criteria Approved for Choosing the Standard Health Institution

1. Typical in treating diseases and reviewing patients.
2. Acceptable in the accuracy of medication description.
3. Processing is done correctly.
4. Received complete and accurate data on inventory.
5. Having a low level of medication losses.
6. Having complete and accurate data about medicine inventory and patients' visits and admissions [3,12].

Comparative Analysis of Morbidity and Consumption Methods

The morbidity method is preferred in institutions that provide new health services or have irrational prescribing. Consumption is preferred for stable health systems, and the medication prescribing process is well done. The consumption method is preferred for large hospitals to treat many diseases. In practice, the most effective procedure is to use the two methods of consumption and morbidity. Initially, health institutions should rely on the morbidity method to lay the scientific basis. However, for subsequent years, the need is calculated by the method of consumption after providing the requirements of the consumption method [3]. The advantages and disadvantages of morbidity and consumption methods are illustrated in Tables 1 and 2 [3,4,12].

Special Instructions for Estimating the Need in the Iraqi Public Sector

According to official letters of the Ministry of Health, the Directorate of Technical Affairs-Department of Need Estimation on January 21, 2024, there are particular instructions for health directorates regarding annual need estimation:

1. Every year, a health institution, such as a hospital, estimates its medication needs two years in advance. For example, in 2024, the hospital will receive the medication estimated in 2022 while simultaneously estimating its needs for 2026.
2. Accuracy is taken to confirm the annual need for medicines, which will be approved by the KIMADIA and provided in total. The health institution will be obligated to receive all the needs established by it.
3. The NCDS confirms notes marked with the form (*), which means the lowest price rule, meaning the material is imported based on the lowest price.
4. The implicit need or one need means that the approved substance has the same concentration except for the different pharmaceutical forms, such as one capsule, a pill, a vial, and the other an ampoule.
5. Some materials mentioned in a note in which specific centers were identified, such as cancer or bone marrow centers and other centers, meaning that the need is established only for the centers that specified exchange outlets.
6. Some remarks mentioned a certain percentage in front of each subject; that is, it must be considered when establishing the need as if it is 33%, 50%, equal between the two subjects, or 75% of the total need [13,14].

Figure 1 illustrates the working mechanism of medication need estimation which is conducted in collaboration between the Department of Need Estimation, the Directorate of Technical Affairs, and provincial health directorates [13].

Factors Considered by the Pharmacy and Therapeutic Committee

After filling out the list by the need estimation, it should be presented to the Pharmacy and Therapeutic Committee at the hospital [3] to assess their conformity with reality and compare it with the annual expenditure for the last year: The Pharmacy and Therapeutic Committee relies on the following tactics in the assessment:

1) Monitoring the annual population increases. 2) Observing new changes, such as opening new health centers or lobbies or the arrival of doctors with new specializations. 3) Requesting the input/feedback of physicians specializing in each department (internal, surgical, fractures, gynecological, cardiac...etc.). 4) Certain items are specifically designed for use with particular devices in the laboratory. As specified in the laboratory materials list, kits should only be requested if a functioning device for those materials is available [13].

Indicators of Inappropriateness in the Need Estimation Process in Health Institutions

The following are the most prevalent manifestations in health institutions that give the impression of a shortfall in estimating the need, in addition to inadequacy in the rest of the supply system components: 1- The constant scarcity, particularly of common and life-saving medicines. 2- An excess of many medications with common uses or large quantities over more than a few types of medications, which gives evidence that they have been miscalculated. 3- Inequity in the supply of health institutions, specifically the bias in supply at the expense of primary health care centers and peripheral hospitals in favor of the central hospitals. 4- Failure to use low-cost and highly effective medications compared to high-cost medications, and this means relying on expensive medications with the possibility of treatment with less expensive medications [3].

Challenges Facing Current Need Estimation Protocol

1. Changing the medical staff (who prescribe specific medications). This happens in physicians' post-rotation.
2. Updating guidelines could affect the rate of consumption. For example, anti-scorpion was given in a single dose. Now, it is ten doses diluted in IV fluids like normal saline. Another example was third-generation cephalosporins, like cefotaxime and ceftriaxone, which were given slow IV in 10 ml. They are now diluted in 100 ml IV fluid like normal saline or glucose saline and given slow IV infusion. The previous examples showed an increased consumption rate of medication, IV fluids, or administration sets like a macro or micro drip.
3. Implementing the referral system impacts the distribution of patients among primary, secondary, and tertiary health institutions. The number of patients increased in primary health centers, but the opposite happened in secondary and tertiary health institutions.
4. KIMADIA provides inconsistent supply due to limited financial resource allocation [2].
5. Supplying medicines close to expiration [4,12] is uncommon but happens occasionally. Possible reasons include technical delays by pharmaceutical companies in supplying contract drugs, testing processes by the National Centre for Drug Control and Research, or differences in expiration dates. Some companies offer a two-year expiration date for a medication, while others provide a five-year expiration date for the same product.
6. Displacing the population from one province to another might affect the need estimation in these provinces [15].
7. Health crises such as COVID-19 impact the need of health institutions. They increase antimicrobial consumption and change health services or priorities [16,17].
8. The implementation of the health financing project in 2014 and its update in 2024, including exemption from paying fees for some categories such as patients holding social welfare ID or those with cancer, tuberculosis, and others, has an impact on determining the number and quality of services provided by government health institutions [18].
9. The recent implementation of national health insurance in Iraq may affect the distribution of patients between the public and private sectors and consequently impact the need in public health settings [19,20].
10. Urban residents have historically been more affected by dental caries than rural residents, primarily due to greater market availability and increased exposure to cariogenic foods. However, recent trends suggest a shift, with rural residents now experiencing a rising prevalence of dental caries. This is attributed to changing dietary habits, socioeconomic conditions, and limited access to dental care services in rural areas. Despite this increase, urban areas still report higher numbers of hospital visits for dental issues, which continues to influence overall caries statistics [21]. Therefore, need estimation should prioritize urban centers based on current service utilization while also considering future supply expansion in rural areas due to the growing burden of caries, even though rural demand may remain lower at present due to access limitations.

11. Factor VIII concentrate is better administered prophylactically than on-demand to patients with hemophilia. Prophylaxis requires regular, planned dosing, ensuring stable demand, while on-demand use leads to unpredictable spikes [22]. Need estimation should prioritize consistent supply for prophylaxis.

Common Non-intentional Technical Mistakes During the Preparation of the Medication Needs List

According to previous reports and official authorities, many challenges facing the process of medications need estimation in the Iraqi public healthcare sector. Here are some common non-intentional mistakes that public healthcare institutions could make while preparing the medication need list [4,11–13,23]. These are:

1- Underestimation when using the consumption method: When the consumption method is used, need estimation is often based solely on the quantities recorded in the KIMADIA system, overlooking other relevant quantities such as those from purchases, invoices, and aid records. This can lead to significant underestimation of the need. Overestimation may occur when a medication is considered consumed simply because it is out of stock in the drug store while the same item remains in excess at the outlets that received it [23].

2- Omitting specific materials from the need estimation list: Some essential medications may not be included in the official need estimation list. If health institutions fail to submit special requests for these items (e.g., IV IG immunoglobulin), supply gaps can result.

3- Non-adherence to medication lists: Health institutions, especially primary healthcare centers, often fail to adhere to approved medication lists, by requesting medications outside their list (more specialized medications) rather than selecting for their primary level of care.

4- Errors due to blank fields: Leaving fields empty in the estimation forms instead of marking them with a zero can lead to inaccurate need assessments as it could be understood as incomplete entering.

5- Field confusion during data entry: Mistakes by filling out the wrong fields can lead to inaccurate need estimations, causing two different materials to be requested incorrectly.

6- Errors in numerical estimations: Misplacing zeros or mistyping numbers during estimation can result in severe discrepancies, such as estimating 100,000 units when only 10,000 are required or vice versa.

7- Failure to account for packaging sizes: Institutions often underestimate or overestimate their needs by failing to account for packaging sizes. When the number of units per package is misunderstood or ignored, this results in excessive incorrect orders [4,11–13,23].

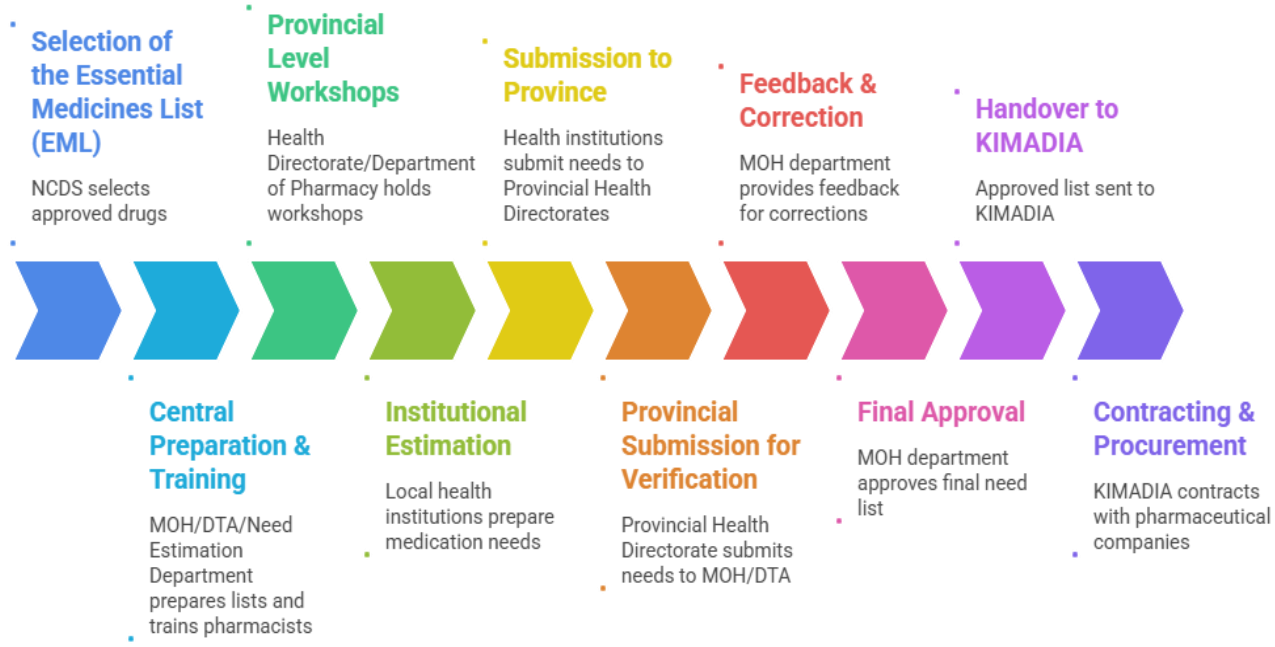

Figure 1: The Workflow Process of Medication Need Estimation within the Iraqi Ministry of Health

NCDS=the National Committee for Drug Selection; EML=Essential Medicine List; MOH=Ministry of Health; DTA=Directorate of Technical Affairs; KIMADIA = the State Company for Drugs and Medical Appliances.

Table 1. Advantages of Morbidity Vs. Consumption Method of Need Estimation [3,4,12]

Morbidity Method Advantages	Consumption Method Advantages
➢ It does not need data for medication consumption. ➢ It encourages valid satisfactory registration. ➢ It is based on the rational use of the medication, as it provides a systematic basis for reviewing the use of the medication.	➢ It does not need details of morbidity data or medication protocols. ➢ It needs fewer calculations. ➢ It is suitable for health institutions such as hospitals that treat many diseases. ➢ It identifies inventory control problems and works to improve them. ➢ It provides matching between the supplied medicines with the actual therapeutic reality, which prevents excess

Table 2. Disadvantages of Morbidity Vs. Consumption Method of Need Estimation [3,4,12]

Morbidity Method Disadvantages	Consumption Method Disadvantages
➢ Morbidity data and agreement on the use of pharmacological protocols face difficulties. ➢ It needs long accounts ➢ Results may differ from the actual medication supply ➢ Medication supply does not match reality in case of non-compliance with medication protocols.	➢ Annual consumption is difficult to obtain, especially in new health facilities ➢ It does not provide details about the therapeutic process if the medication is not dispensed in a rational manner, which leads to the continuation of this process by mistake ➢ It is not possible in case of unavailability of the medication for periods exceeding 3 months or in case of great loss ➢ It is not encouraged to record morbidity

Conclusion

Given the limited government budget, accurately estimating medication needs in the public health sector is crucial for ensuring sustainable drug supply to healthcare institutions. This task is complex, with responsibilities shared across various health authority levels. Multiple protocols, including consumption and morbidity methods, are used to estimate medication needs. However, several challenges can hinder the accuracy of these estimation processes. These challenges include limited adoption of electronic systems in pharmacies, inconsistent medication supply, near-expiration drugs, changes in prescribing staff, updated guidelines, the implementation of referral systems, population displacement, health crises, and health insurance implementation. To address these challenges and improve medication need estimation, the health system must invest in electronic documentation and allocate adequate budgets. Electronic systems should be adopted to facilitate the work and ensure accuracy. Estimations should rely on the consumption method are comprehensive, including materials listed in various health institution records. Public health institutions, particularly primary care

centers, should adhere strictly to their respective medication lists, avoiding requests for medications reserved for higher-level institutions. All fields in the estimation forms should be filled out appropriately to prevent errors, underestimation, overestimation, or data gaps, with a zero placed where applicable. Institutions must accurately account for package size when estimating needs, specifying whether quantities refer to individual units or entire packages to prevent excessive ordering.

Conflicts of Interest

With this declaration, the authors acknowledge no conflicts of interest.

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Ethics Statements

The Thi-Qar Health Directorate/Training and Human Department Center granted permission to authors to collect information from the Department of Pharmacy and Division of Medication Need

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Author Contribution

The authors confirm their contribution to the paper as follows: Study conception and design: Ali Azeez Al-Jumaili, Hasan A. Shubbar. Data collection: Hasan A. Shubbar. Analysis and interpretation of results: Hasan A. Shubbar, Mohammed Hameed Salih. Draft manuscript preparation: Hasan A. Shubbar, Ali Azeez Al-Jumaili, Fadhel Ali Shihab. Critical revision and supervision: Ali Azeez Al-Jumaili, Hadeer Akram Al-Anic. All authors reviewed and approved the final version of the manuscript.

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فهم تقدير احتياجات الأدوية ضمن نظام الرعاية الصحية العامة في العراق: مقالة مراجعة

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الخلاصة

يتألف نظام إدارة الأدوية العراقي من خمسة ركائز أساسية: الاختيار، وتقدير الاحتياج، التوريد، الخزن والتوزيع، والاستخدام. وعلى الرغم من الجهود الدؤوبة التي يبذلها الصيادلة لتقدير احتياج الأدوية بدقة، فإن المؤسسات الصحية العراقية تواجه أحيانًا نقصًا في الأدوية بسبب عدم كفاية مخصصات الميزانية وتحديات الشراء. وتفحص هذه المراجعة الممارسات والتشريعات والتحديات الحالية في تقدير احتياج الأدوية. والواقع أن هناك تعاونًا كبيرًا بين السلطات الصحية العراقية المسؤولة عن الموافقة على الأدوية وتنظيمها وشرائها وصرفها. ويتعاون أصحاب المصلحة الرئيسيون، بما في ذلك مديرية الشؤون الفنية/قسم تقدير الاحتياج، وقسم الصيدلة، والشركة العامة لتسويق الأدوية والمستلزمات الطبية (كيماديا)، ودوائر الصحة، ولجان الصيدلة والعلاج في المؤسسات الصحية لتقدير الاحتياج السنوي للأدوية. وتشمل طرق حساب الاحتياجات الاستهلاك والمراضة والاستهلاك المعدل، ولكل منها مزايا وقيود مميزة. وتسلط المقالة الضوء على كيفية تأثير بيانات المرض وسجلات استهلاك الأدوية والبروتوكولات الطبية المستخدمة على عمليات تقدير الأدوية. تشمل العوائق التي تعيق التقدير الدقيق الأنظمة الإلكترونية غير الكافية، والإمداد غير المتسق، وانتهاء صلاحية الأدوية، ونزوح السكان، والأزمات الصحية (على سبيل المثال، كوفيد-١٩)، وتنفيذ التأمين، والتغييرات في ممارسات وصف الأدوية. وفي الختام، فإن تقدير احتياج الأدوية في قطاع الصحة العامة أمر بالغ الأهمية للإمداد المستدام، لكنها مهمة معقدة مع بروتوكولات وتحديات متعددة. لتعزيز فعالية الأدوية وتقدير الاحتياجات في العراق، يجب على النظام الصحي إعطاء الأولوية للتوثيق الإلكتروني وتخصيص ميزانيات كافية. من خلال معالجة هذه التحديات، يمكن تحقيق إمدادات مستدامة من الأدوية في بيئات الرعاية الصحية العامة.

الكلمات المفتاحية: العراق، تقدير احتياجات الأدوية، القطاع العام، مراجعة