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# Establishment of a Novel Approach for Drug Abuse Monitoring and Its Application in Medical Institutions

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**Background:** Drug abuse is a global public health concern with substantial medical, psychological, and social consequences. Drug abuse monitoring (DAM) systems help identify patterns of substance misuse and support regulatory interventions. Current monitoring systems mainly rely on fixed-point reporting from addiction treatment centers, detention facilities, and compulsory detoxification institutions, which can lead to delayed detection and incomplete data coverage. Additionally, there is increasing misuse of prescription medications, over-the-counter drugs, and emerging psychoactive substances in medical settings. Therefore, establishment of a structured DAM approach within medical institutions is important to improve early detection and reporting of drug abuse.

**Material/Methods:** A single-center retrospective observational study was conducted at Wuxi Mental Health Centre to monitor patients diagnosed with drug/substance abuse between September 2020 and December 2024. A DAM research group was established to standardize reporting procedures, define staff responsibilities, and implement monitoring protocols linked to the national reporting system.

**Results:** In total, 146 patients with drug/substance abuse were monitored: 41 male individuals (28.08%) and 105 female individuals (71.92%). Nineteen drugs or substances across 5 categories were identified. Sedative-hypnotic drugs represented the largest proportion of cases (98.63%). Antipyretic and analgesic drugs containing caffeine were abused in 4.11% of cases; dextromethorphan or Yumei tablets were involved in 3.42% of cases. Nitrous oxide abuse was identified in 2.05% of all monitored cases; affected patients were aged 17 to 25 years.

**Conclusions:** The proposed DAM approach was successfully implemented in a hospital setting and demonstrated feasibility for systematic monitoring of drug abuse in medical institutions.

**Keywords:** **Drug Monitoring • Medical Institutions • Program Development • Standard Operating Procedures • Substance Abuse Detection • Psychoactive Drugs**

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## Introduction

Drug abuse (substance abuse) refers to the repeated and excessive use of drugs or substances with dependence potential for non-medical purposes, in which users become dependent on these substances and compulsively pursue their psychotropic effects [1,2]. Drug abuse (substance abuse) can cause serious personal, public health, and social problems [3].

Drug abuse monitoring (DAM) can identify abuse patterns involving narcotic and psychotropic drugs via long-term surveillance [4]. Through the investigation and collection of relevant data, DAM can analyze the dynamic distribution, demographic characteristics of abusers, and trends in drug abuse. Therefore, by dynamically acquiring information on drug abuse, DAM enables regulatory authorities to implement preventive measures in a timely manner and plays an important role in maintaining public safety and social stability.

However, DAM systems mainly rely on fixed-point reporting from addiction treatment centers, detention centers, compulsory detoxification institutions, and other designated facilities [5]. This post-feedback monitoring approach is passive and does not provide comprehensive data collection, leading to delayed early warning of drug abuse. Additionally, iatrogenic drug abuse has become increasingly prominent worldwide in recent years. Among newly identified drug abusers, the proportion of individuals abusing medications has increased year by year [6]. Importantly, the variety and scale of medication-related drug abuse in the general population are difficult to assess through the fixed-point reporting system; data from the existing monitoring network cannot accurately reflect overall drug abuse conditions at a population level. Consequently, dependence resulting from the medical use of narcotic and psychotropic substances remains a weak point in current DAM systems.

If medical institutions can proactively implement DAM, they can not only compensate for the limitations of passive monitoring but also address the abuse of narcotic and prescription drugs, over-the-counter (OTC) medications, and non-regulated substances. Huang et al [7] reported that more than 83.8% of respondents considered it necessary to implement DAM in medical institutions. Among the surveyed samples, 44.4% of medical institutions in China had conducted DAM. To date, the structured workflow for DAM in medical institutions remains in the exploratory stage. According to summary data from 2017 [8], approximately half of the monitoring institutions failed to collect data effectively. These problems may be related to differences among provinces in judgment criteria, monitoring models, organizational methods, and assessment measures for DAM [7]. Therefore, the establishment of a DAM system and novel monitoring approach within medical

institutions is essential to comprehensively and accurately reflect the trends and risks of drug abuse.

This paper presents a novel DAM approach and its application, which may promote the development of DAM in medical institutions. Through this approach, active reporting and hospital-level monitoring were achieved, and a structured DAM workflow was clearly defined. By implementing the system in psychiatric institutions, the abuse of psychotropic substances and new psychoactive substances could be monitored directly. Compared with previous reports [4,9], this study further clarified the structured review process of the drug abuse monitoring research group (DAMRG), linkage with the National Drug Abuse Monitoring Network (NDAMN), and the inclusion of OTC medications and emerging substances.

## Material and Methods

### Participants

This study utilized a single-center retrospective observational design. The protocol was approved by the Ethics Committee of Wuxi Mental Health Centre, and all participants provided written informed consent. The novel approach was applied in daily DAM practice, and reports were submitted to the NDAMN.

All patients who met the diagnostic criteria for drug (substance) abuse or drug (substance) dependence at our hospital between September 2020 and December 2024 were consecutively included in the study. The demographic characteristics of abusers and the types of abused drugs/substances (eg, number of cases, distribution of drug categories, and demographic structure) were recorded and evaluated. Exclusion criteria encompassed tobacco abuse, alcohol abuse, and antibiotic abuse.

### Statistical Analysis

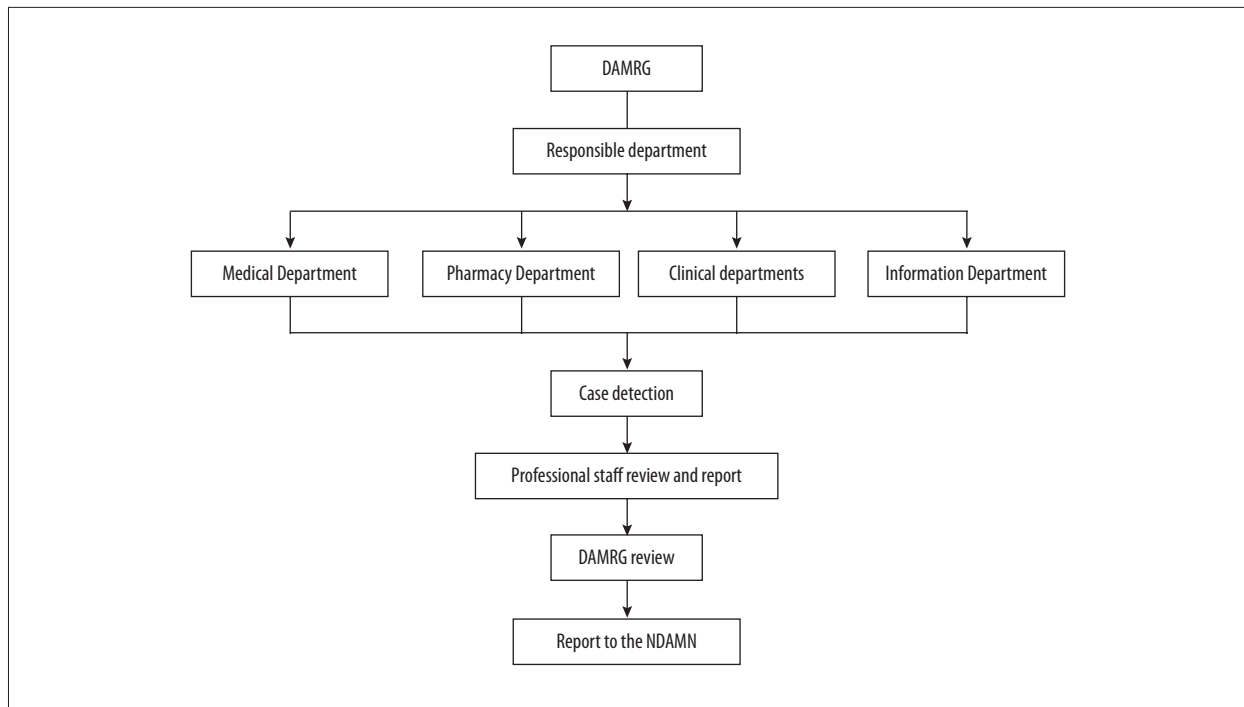
Monitoring information was recorded in Excel in a timely manner. SPSS version 25.0 statistical software was used for data analysis. Categorical data are presented as n (%); continuous data are expressed as mean±standard deviation. Descriptive analysis was performed for the monitored outcomes.

## Results

### Establishment of a Novel DAM Approach

#### *Leading Group for DAM Evaluation*

Medical institutions should establish a leading group for DAM and clearly define its responsibilities. The leading group is



**Figure 1.** Framework of the leading group for drug abuse monitoring evaluation. Abbreviations: DAMRG, drug abuse monitoring research group; NDAMN, National Drug Abuse Monitoring Network.

responsible not only for coordinating DAM activities among medical, clinical, pharmaceutical, and other relevant departments, but also for cooperating with regulatory authorities and monitoring institutions to conduct DAM-related activities (Figure 1).

#### *Responsible Department for DAM Evaluation*

The leading group should designate a department with DAM and evaluation capabilities (eg, Pharmacy Department) as the responsible department. This department should organize and oversee DAM activities throughout the hospital. The medical department should coordinate DAM activities among all relevant hospital departments.

#### *Responsibilities of the Responsible Department*

The responsible department should establish and implement the hospital DAM reporting and management system. Its responsibilities include detecting, collecting, reviewing, and reporting drug abuse cases to the NDAMN; organizing DAM activities and conducting awareness and training programs related to DAM; cooperating with regulatory authorities and monitoring agencies to investigate and analyze drug abuse incidents, implement corresponding measures, and provide relevant data; establishing and maintaining DAM reports and monitoring records to form standardized files; and regularly reporting the implementation status of monitoring activities to the leading group.

#### *Personnel and Their Responsibilities*

The person in charge of the responsible department should hold an intermediate professional title or above and have a professional background in psychiatry, psychology, or pharmacy. The head of the monitoring department should oversee the monitoring and evaluation of drug abuse, organize publicity and training activities related to drug abuse monitoring, and cooperate with regulatory authorities and monitoring agencies during drug abuse surveillance investigations.

The institution should designate 1 medical staff member to undertake the detection, collection, review, reporting, and evaluation of DAM cases, then submit monitoring information to the NDAMN. Additionally, the monitoring staff member is responsible for the collation, preservation, and utilization of DAM files, as well as promotion of knowledge related to drug abuse surveillance. Monitoring personnel should have a professional background in psychiatry, psychology, pharmacy, or nursing and should actively participate in DAM training. All relevant staff should receive regular training.

#### *Defining the Responsibilities of Monitoring Professionals*

The DAMRG and monitoring system were established, involving the principal clinical departments, including the Pharmacy Department, Drug Dependence Department, Psychology Department, and Emergency Department. The DAM reporting

process was developed as follows: doctors, nurses, or pharmacists identified and reported suspected drug abuse cases. Subsequently, demographic characteristics, diagnostic criteria, duration of abuse, purpose of use, frequency, route of administration, and other relevant information were reviewed by the DAMRG before submission to the NDAMN. The Pharmacy Department was responsible for overall management; pharmaceutical professionals were responsible for the review, reporting, and data analysis of monitoring reports.

### Establishing the List of Monitored Drugs

Based on the characteristics of psychiatric hospitals, the primary monitored substances included psychoactive drugs [including class I and class II psychotropic drugs], narcotic drugs, illicit drugs, and new psychoactive substances [9]. During application and implementation of the novel approach, antipyretic and analgesic medications containing caffeine, dextromethorphan, nitrous oxide, and Yumei tablets were also monitored and included in the monitoring catalog.

### Diagnostic Criteria

Drug (substance) abuse [10] was defined as persistent or intermittent excessive use of at least 1 medication/substance for purposes unrelated to or inconsistent with reasonable medical use, which could result in serious personal and public health problems. Drug (substance) dependence [11] was defined as a condition in which a patient exhibited impaired control over substance use and continued repeated use despite harmful consequences, including physical or mental health impairment.

According to the World Health Organization, drug dependence can be categorized into mental dependence and physical dependence [12]. Mental dependence, also known as psychological dependence, refers to a state in which users experience pleasurable satisfaction or euphoria that drives repeated drug use and produces craving. Physical dependence, also known as physiological dependence, refers to a pathological adaptation caused by repeated drug use and is mainly characterized by tolerance and withdrawal symptoms.

### Diagnostic Outline of Drug Abuse

The diagnosis of drug abuse should consider multiple aspects of medication/substance use behavior [13]. These include the frequency of use, specifically whether the patient uses the medication consistently or repeatedly rather than occasionally or moderately; the purpose of use, including non-medical motivations such as pleasure seeking, anxiety relief, or escapism; and the dose used, particularly whether the patient exceeds the recommended dosage or uses the medication in a non-medical manner. The duration of use should also be evaluated

to determine whether the patient continues using the medication and is unable to discontinue or reduce consumption.

Additionally, clinicians should assess whether the patient has developed social, occupational, academic, or legal problems related to substance abuse. Tolerance should also be considered, including whether the patient requires increasing doses to achieve the same effect. Withdrawal symptoms (eg, anxiety, depression, insomnia, fatigue, and related manifestations after discontinuation or dose reduction) should also be evaluated.

The diagnosis of drug abuse generally requires comprehensive consideration of all the above factors, together with clinical evaluation based on the individual patient's condition. Differential diagnosis from other psychological disorders, physical illnesses, or other drug-related conditions is also necessary to ensure accurate diagnosis and appropriate treatment.

### Diagnostic Outline of Drug Dependence

Drug (substance) dependence is characterized by difficulty controlling medication/substance use behavior, a strong desire or craving for the medication/substance, and impaired control over medication/substance use [14]. A diagnosis of drug/substance dependence can be established when a patient presents with at least 2 of these core symptoms.

### DAM Program

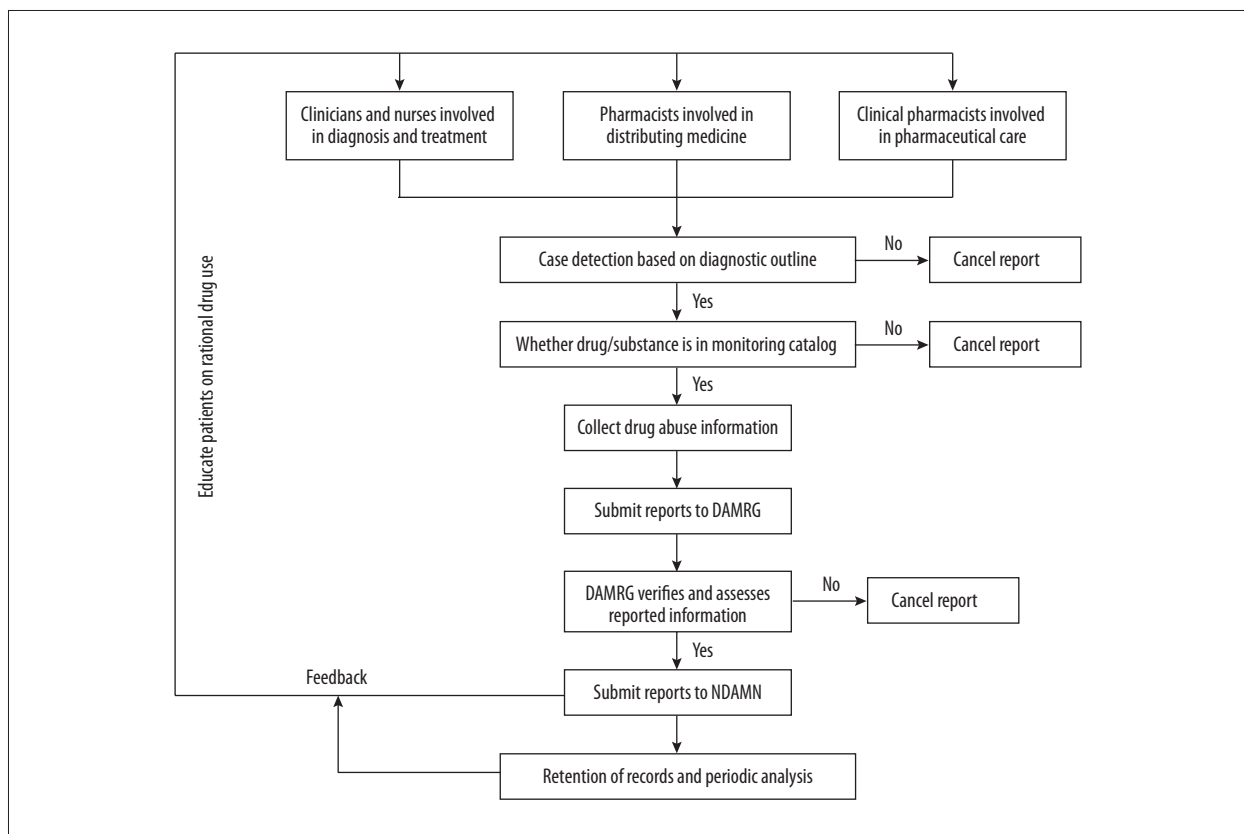
The DAM program consisted of 3 pathways. First, doctors or nurses identified patients with suspected drug (substance) abuse/dependence during routine diagnosis and treatment activities. Monitored patients were diagnosed according to the diagnostic criteria for drug abuse/dependence by clinicians. Clinicians collected patient information and drug abuse data using standardized forms from the NDAMN, after which the DAMRG conducted double review, quality control, and verification. Confirmed cases were then reported to the NDAMN.

Second, during the review and dispensing of narcotic drugs, prescription drugs, and non-prescription drugs, pharmacists conducted detailed inquiries regarding the drug use patterns of suspected patients [15]. In pharmacy clinics, clinical pharmacists interviewed suspected patients during medication counseling or medication reconciliation using a structured interview outline (Table 1). Abuse-related information was collected by pharmacists or clinical pharmacists; after double review, quality control, and verification by the DAMRG, the cases were reported to the NDAMN.

Third, doctors, nurses, and pharmacists provided education concerning rational drug use and guided patients in the safe and appropriate use of medications (Figure 2).

**Table 1.** Structured interview outline.

Structured interview items	
1	Clarify the purpose of medication use
2	Determine whether the patient is using the medication as prescribed by the physician
3	Determine whether the patient has developed drug tolerance or loss of control over drug use
4	Determine whether the patient has cravings for the drug
5	Determine whether the patient experiences withdrawal symptoms
6	Determine the types of dependent drugs used by the patient and whether multiple drugs are used in combination
7	Determine whether the patient has experienced adverse consequences related to drug use



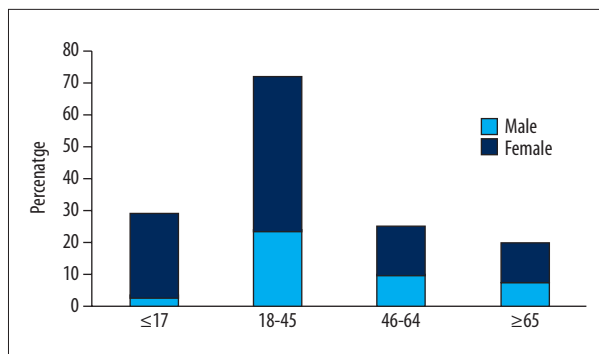
**Figure 2.** Program and workflow diagram of drug abuse monitoring. Abbreviations: DAMRG, drug abuse monitoring research group; NDAMN, National Drug Abuse Monitoring Network

### Application of the Approach

This study included 146 patients monitored for drug/substance abuse (41 male patients [28.08%] and 105 female patients [71.92%]; mean age, 36.03±20.45 years [range: 12-87 years]). As shown in **Figure 3**, the proportion of female patients was higher than that of male patients across all age groups (≤17, 18-45, 46-64, and ≥65 years).

According to marital status, 50.68% of the monitored patients were unmarried, 6.16% were divorced, and 5.48% were widowed. Regarding employment status, 28.08% of the patients were students, 26.17% were unemployed, 16.54% were retired, and 8.90% were employees/workers. In terms of educational level, 39.04% of the patients had a junior high school education, 34.25% had a high school or technical secondary school education, 17.12% had a university/college education, and 7.53% had a primary school education.

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**Figure 3.** Age and sex distribution of the monitored patients.

The most common primary diagnoses among the monitored patients were depressive disorder (47.95%), bipolar affective disorder (8.90%), schizophrenia (6.85%), childhood mood disorders (6.85%), dysphrenia (6.85%), and sleep disorders (5.48%) (Table 2).

The total number of abused drugs/substances (n=163) exceeded the number of patients (n=146) because many individuals reported use of 2 or more drugs/substances. Nineteen drugs/substances across 5 categories were identified among the monitored patients. Sedative-hypnotic drugs constituted the largest proportion of monitored substances (98.63%); class II psychotropic drugs represented the majority within this category (97.95%). The proportion of patients abusing antipyretic and analgesic drugs containing caffeine (caffeine-containing OTC medications) was 4.11% among the monitored cases. The proportion of patients aged 18 to 25 years who abused dextromethorphan or Yumei tablets containing dextromethorphan was 3.42%. Three patients aged 17 to 25 years abused nitrous oxide, comprising 2.05% of the monitored cases, which subsequently induced mental disorders.

**Table 2.** Proportion of primary diseases among monitored patients.

Disease	n (%)
Depressive disorder	70 (47.95%)
Bipolar affective disorder	13 (8.90%)
Schizophrenia	10 (6.85%)
Childhood mood disorders	10 (6.85%)
Dysphrenia	10 (6.85%)
Sleep disorders	8 (5.48%)
Anxious depression	6 (4.11%)
Drug/substance-induced mental disorders	4 (2.74%)
Cerebrovascular-disease-induced mental disorders	3 (2.05%)

## Discussion

DAM is a key component of the “prevention-control-treatment” framework in medical institutions. It protects patient health and reduces social harm while providing scientific support to improve medical quality and optimize public health policies. Thus far, few studies have reported methods for establishing DAM systems in medical institutions.

In the present study, a novel DAM approach was successfully established and applied in a medical institution setting. The approach standardized the reporting process and ensured accurate and comprehensive case reporting. Using this approach, demographic data and the characteristics of drug/substance abuse were recorded in detail. Its implementation enabled timely identification of drug abuse risks and provided evidence for national regulatory authorities. Furthermore, it helped standardize hospital prescribing practices and improve medical quality. Compared with previous reports [9,16], this study further clarified the responsibilities of team members, diagnostic criteria for drug/substance abuse, and monitoring procedures, thus providing greater guidance for the collection of relevant clinical data. Additionally, through rational drug use education provided by the DAMRG, the abusers discontinued substance misuse and achieved favorable outcomes.

The proportion of drug abuse was significantly higher among women than among men in the study population. Several hypotheses may explain this phenomenon. First, the prevalences of anxiety, depression, and other emotional disorders are generally higher among women, which may increase the likelihood of self-medication and subsequent drug abuse. Second, fluctuations in estrogen levels during menstruation, pregnancy, and menopause might enhance the rewarding effects of drugs. Third, women generally have a higher body fat percentage and

Disease	n (%)
Mood disorder	2 (1.37%)
Alzheimer disease	2 (1.37%)
Anxiety disorder	2 (1.37%)
Alcohol dependence syndrome	2 (1.37%)
Parkinson disease dementia	1 (0.68%)
Obsessive-compulsive disorder	1 (0.68%)
Transsexualism	1 (0.68%)
Delirium	1 (0.68%)
Total	146 (100.0%)

**Table 3.** Drugs/substances among the monitored patients.

	n	Drugs/substances	n (%)
Sedative-hypnotic drugs	144 (98.63%)	Clonazepam	35 (23.97%)
		Estazolam	30 (20.55%)
		Oxazepam	28 (19.18%)
		Lorazepam	19 (13.01%)
		Zolpidem	12 (8.22%)
		Zopiclone	10 (6.85%)
		Alprazolam	4 (2.74%)
		-Eszopiclone	4 (2.74%)
		Diazepam	1 (0.68%)
		Phenobarbital	1 (0.68%)
Antipyretic and analgesic drugs (caffeinated)	6 (4.11%)	Compound paracetamol and amantadine	4 (2.74%)
		Compound acetaminophen	1 (0.68%)
		Paracetamol, pseudoephedrine, dextromethorphan, and chlorpheniramine tablets	1 (0.68%)
Hard drugs	5 (3.42%)	Amphetamine hydrochloride	2 (1.37%)
		Heroin	2 (1.37%)
		Ketamine ("K powder")	1 (0.68%)
Antitussive drugs	5 (3.42%)	Dextromethorphan	4 (2.74%)
		Yumei tablets	1 (0.68%)
Other substances	3 (2.05%)	Nitrous oxide	3 (2.05%)

lower average body weight, which can slow the metabolism of lipid-soluble drugs (eg, sedative-hypnotic agents), prolong drug effects, and increase the risk of dependence.

Data presented in **Table 3** demonstrate the prevalence of various drugs and substances among the monitored patients. Sedative-hypnotic drugs constituted the largest proportion, particularly class II psychotropic drugs, which were widely used among patients with depressive disorders, insomnia, and anxiety disorders. The high proportion of these drugs (reported in **Table 3**) is consistent with the high prevalence of depressive disorders shown in **Table 2**. Such drugs are commonly prescribed because of their rapid onset and effective sedative-hypnotic properties; however, they also carry a risk of abuse. Long-term use may lead to dependence and tolerance, thereby increasing the likelihood of misuse. Furthermore, the high frequency of certain drugs, such as clonazepam and estazolam, in the study population may indicate potential misuse and warrants further investigation.

In recent years, nitrous oxide ("laughing gas") has emerged as a substance of abuse, particularly among adolescents and young adults [17]. Nitrous oxide abuse can lead to serious health complications, including neurological damage and hypoxia [18]. Driven by curiosity and limited awareness of its potential harms, nitrous oxide abuse has increased worldwide. Therefore, public awareness enhancement through educational programs in schools and communities should be implemented urgently to reduce nitrous oxide abuse.

Several patients in this study abused antipyretic analgesics containing caffeine. Possible reasons for this misuse include stimulant effects of caffeine on the central nervous system, which can increase alertness and reduce fatigue. Its psychoactive properties may contribute to physical dependence when consumed regularly, even at moderate doses (100-400 mg/day) [19]. In analgesic formulations, caffeine is typically included at doses of 30 to 100 mg per tablet. Animal studies have suggested that caffeine can enhance the rewarding effects of analgesics, potentially increasing abuse liability [20]. Adolescents

and individuals with a history of substance use disorders display greater risk of misusing caffeine-containing OTC medications for stimulant effects [21]. Relative to opioid misuse, dependence associated with caffeine-containing analgesics is less frequently reported. Therefore, patients should receive clear education regarding caffeine content and the risks associated with prolonged use.

At therapeutic doses, dextromethorphan acts as an antitussive (cough suppressant); at higher doses, it can produce dissociative and hallucinogenic effects, leading to abuse [22]. Dextromethorphan has attracted increasing attention because of its potential for misuse, particularly among adolescents and young adults, given its accessibility and low cost before July 2024. The abuse of dextromethorphan was also monitored by our DAM team. Through the continuous efforts of monitoring programs, dextromethorphan was regulated as a class II psychotropic substance in July 2024. Despite this regulatory upgrade, continued monitoring of dextromethorphan abuse remains necessary.

This study had some limitations. First, it used a single-center framework, and multicenter studies are needed in the future. Second, the lack of pre-implementation baseline data

and reliance on clinician-based case identification may have led to underreporting. Third, the retrospective design and lack of outcome validation may have introduced information bias and hindered evaluation of long-term effectiveness and clinical impact concerning the DAM approach.

## Conclusions

A novel DAM approach for medical institutions was successfully established and implemented in our hospital. This model demonstrated the feasibility of conducting DAM in medical institutions and provided descriptive epidemiological insights into drug abuse patterns. Class II psychotropic drugs constituted the majority of monitored substances, indicating the need for continued supervision and monitoring within medical institutions.

## Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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