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REVIEW- ROLES OF PHARMACIST IN EMERGENCY CASES OF TOXICOLOGY

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Abstract:
In many industrialized countries, pharmacists' roles have changed from the conventional practice of dispensing drugs to directly or indirectly contributing to improved patient health outcomes. They provide hospital services and patient care, including emergency department (ED) services.
By assisting in the early diagnosis of toxic exposures and instructing emergency workers on the right storage, selection, and use of antidotal therapies, pharmacists can play a critical role in decreasing poisoning and overdose injuries and deaths. Patients are often new to emergency care personnel, may be unable to disclose critical medical information, and may require time-sensitive interventions.

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INTRODUCTION:

Globally, the pharmacist's function as a health care practitioner is evolving. Pharmacists are involved in both their traditional functions of dispensing and counseling about drugs, as well as decision-making tasks with other health professionals as the clinical context requires. By integrating pharmacists in comprehensive patient care activities, the incidence of adverse drug events and medication mistakes has decreased, and health outcomes have improved [1]. The emergency department (ED) is distinct and complex among the hospital's different departments. An ED is a high-risk, fast-paced environment that is regularly overburdened [2]. The absence of pharmacy services at the hospital's emergency department (ED) could be detrimental, given the high-risk environment of the ED, where prescription errors are widespread [3].

Poisoning is a prominent source of morbidity and mortality in the United States [4], and it is the second highest cause of injury-related mortality. The National Poison Data System of the American Association of Poison Control Centers gets reports of about 2.4 million human poison exposures and roughly 1300 poisoning-related deaths each year [5]. However, it is likely that the related mortality is substantially greater than those numbers show, given only around 5% of poisoning deaths in the United States are reported to poison control centers [6]. Antidotes are essential in the treatment of poisoned or overdosed patients. Recently announced national consensus standards include a recommended list as well as the quantity of antidotes that should be readily available in emergency care hospitals. Some antidotes should be available for immediate administration upon a patient's arrival, which necessitates stocking in the ED at most hospitals; other antidotes should be available within 60 minutes and can be stocked in the hospital pharmacy as long as prompt delivery to the ED is guaranteed [6]. Adverse drug events (ADEs) are defined as any injury that occurs to patients as a result of medication management that is caused by appropriate care, improper treatment, or care deficit [7]. Injuries (signs, symptoms, or laboratory abnormalities) caused by adverse drug reactions (ADRs) or noncompliance with medicine prescriptions are included in this classification [8]. ADEs are currently a substantial public health problem due to their human and medicoeconomic consequences, as well as their role in poor clinical progression [9]. According to the literature, the ADE incidence in inpatients ranges from 2 to 21% and in outpatients from 5 to 35% [8]. ADEs are the major cause of unnecessary hospital hospitalizations and deaths [10]. According to the longitudinal, prospective study on ADE incidence (ENEIS-3) completed in France in 2019, ADEs cause between 176,000 and 372,000 stays per year, with 93,000 to 197,000 stays being avoidable ADEs [11]. In EDs in France and overseas, numerous teams trained to detect ADEs discovered up to 25% of patients with ADEs [11]. It is crucial to detect these ADEs and assess medication therapies in order to limit readmissions. However, ADEs are difficult to diagnose in the emergency department. The majority of ED physicians have little to no success in diagnosing ADEs. One of the key reasons for this is that medication histories are often inadequate or missing. According to the research, the vast majority of medication histories, particularly in EDs, contain at least one inaccuracy [12]. The main cause of these errors is a loss of knowledge about drug treatment between health providers and transition points in the patient's care pathway, such as an outpatient's admittance to the ED or the transfer of a patient from the ED to a hospital unit [13].

A clinical pharmacist on the medical team has been linked to fewer drug errors and increased error interception [14]. To assist in the management of poisoned patients, such as those with acetaminophen poisoning, several institutions have adopted a pharmacist-based toxicology consult service. Although the literature has explored a range of techniques to prevent prescription errors related with most medicines for acetaminophen toxicity, it is unknown if a pharmacist-based toxicology consult service has an impact on these errors [15].

Review:

Pharmacists are specially qualified to check prescription orders for appropriateness, including the indication, dose intervals, and adjustments for patient-specific characteristics like weight, organ function, allergies, and drug interactions. Furthermore, pharmacists can quickly access documentation on medication resistance patterns, current therapeutic guidelines, and local hospital antibiograms to optimize antimicrobial therapy selection [16]. In other cases, reviewing post-discharge cultures by an ED pharmacist allows for regimen changes while also reducing return visits and further admissions [17]. Furthermore, ED pharmacists often prescribe pharmacotherapy regimen optimization, particularly for high-risk therapeutic classes such as central nervous system and cardiovascular medicines, opioids, insulin, anticoagulants, and thrombolytics [18]. For chronic conditions such as asthma, chronic obstructive pulmonary disease, and congestive heart failure, pharmacists in the ED can discuss discharge scripts with patients and doctors to ensure appropriate

management [19] and increased compliance. To manage patients with toxic exposures, ED pharmacists collaborate with emergency physicians and nurses, hospital pharmacists, medical toxicologists, and regional poison centers [21]. Pharmacists can offer measures that increase medication utilization and adherence to evidence-based medicine and national quality standards as members of the care team [22]. This is especially crucial given the growing occurrence of critical drug shortages, including antidotes.

Toxicology services provided by pharmacists are rarely recorded in the literature. However, ED pharmacist involvement in poisoned patient management is frequent in clinical practice and is encouraged by national physician and pharmacist organizations [23]. The formalization of these services, along with the documentation of joint suggestions from the regional PCC, may enable an organized method to ensuring suitable recommendations and monitoring plans are executed. A house-wide PTT may also serve as a continuous point of contact for the regional PCC, as well as a means of improving transitions and continuity of treatment for poisoned patients. Previous research has linked consultation with a PCC to lower healthcare expenses and hospital LOS [24]. While not statistically significant, patients in our study's postgroup had a numerically greater rate of PCC consultation, which could be a useful end point in future investigations. An mistake rate of 30% in the postgroup implies that the PTT consult service might be improved, and the findings of this study could be utilized to target future staff education on frequent types of errors detected with IV NAC therapy [24].

The use of ethanol or, preferable, fomepizole to inhibit alcohol dehydrogenase (ADH) is a cornerstone in the treatment of toxicity caused by methanol, ethylene glycol, or diethylene glycol intake [25]. The toxicity of methanol and ethylene glycol is widely documented, and each year in the United States, approximately 5000 exposures necessitate treatment, with 20-30 related deaths reported to poison control centers [26]. Methanol and ethylene glycol are generally harmless parent chemicals. However, ADH converts them to toxic metabolites that can induce end-organ damage and death. Methanol is converted to formic acid by ADH, resulting in anion-gap metabolic acidosis and eye damage. Methanol-induced retinal damage is usually irreversible [27].

Risk Factors Associated With Potential Toxins:

Age and gender are considerations to consider when assessing a child's or adolescent's risk of poisoning, and this can be discussed with parents and other caregivers in the drugstore. When educating caregivers, pharmacists should keep in mind that the developmental and environmental factors that contribute to the risk of a pediatric poisoning episode can be powerful presenters of the need for prevention. For starters, regular developmental milestones such as exploration of their environment put infants and toddlers at risk for a poisoning episode. As toddlers learn to crawl and walk, they begin to investigate their surroundings, including opening cupboards and inspecting what they find within [25,27].

Second, as a child grows older, developmental variables and stressors increase the danger of poisoning. The desire for independence, as well as the belief that they are indestructible, may lead adolescents to take unnecessary risks, such as experimenting with illicit drugs, other substances of abuse, or potentially dangerous trends that spread on a broader scale through social media (e.g., TikTok). Peer pressure and the desire to fit in can contribute to this issue. Furthermore, adolescents (more typically girls than boys) may attempt suicide or seek attention by taking an overdose of medication [28].

Third, the home and related environments may include a variety of potentially harmful compounds, particularly in the kitchen (e.g., dishwasher detergent packets/pods), bathroom, laundry room (e.g., laundry detergent pods), and garage. Cleaning supplies, for example, might be kept in low cabinets for convenient access. Some products are so ubiquitous and widely used that caretakers may be unaware of their toxicity (for example, drain cleaners and toilet-bowl cleaners can be severely hazardous if consumed). Another issue might develop when commonly used products or drugs are securely stored but are mistakenly left within the child's reach during or after usage [29].

Between 2001 and 2008, child self-exposure accounted for 95% of all visits to a healthcare facility for examination of exposure to a potentially hazardous dose of a pharmacological agent reported to the AAPCC. Look-alikes are often a concern for small children. Some pharmaceuticals may be mistaken for candy, and some cleaning chemicals may appear like or be housed in containers similar to those used for food or juice. The availability of pharmaceuticals, narcotics, or other substances of abuse at school or at home may put vulnerable children and adolescents at danger. This was especially problematic during the COVID-19 pandemic due to the widespread

availability and use of hand sanitizers, several of which were recalled due to hazardous quantities of methanol. Ingestion of methanol (a hazardous alcohol) in small doses can result in major health consequences such as metabolic acidosis and visual loss. This example emphasizes the significance of constantly directing caregivers to a poison-control center, as these organizations are best prepared with toxicology expertise to appropriately diagnose and manage suspected ingestions [30].

Antidotes for calcium-channelblocker and b-blocker toxicities:

Calcium-channel blocker (CCB) or b-blocker toxicity causes severe morbidity and death [31]. Toxicity signs include commonly hypotension, bradycardia, conduction block, and cardiac depression [32], and are generally extensions of the medications' pharmacologic and therapeutic effects. Depending on the amount of the offending substance consumed and the patient's underlying cardiovascular health, the patient may stay asymptomatic or collapse. Subtle differences in presenting symptoms can help distinguish CCB from b-blocker toxicity. Patients who have taken a CCB overdose tend to be awake and alert, even if they have severe hypotension and bradycardia, whereas patients who have taken a b-blocker are more likely to have changed mental status and respiratory depression [32]. Because CCBs limit insulin release from pancreatic b-cells via a calcium-dependent route, the severity of the CCB overdose increases the likelihood of hyperglycemia [33].

Antidotes for toxic-alcohol poisoning:

The use of ethanol or, preferable, fomepizole for alcohol dehydrogenase (ADH) inhibition is a cornerstone in the treatment of toxicity caused by consumption of methanol, ethylene glycol, or diethylene glycol [30,34]. The toxicity of methanol and ethylene glycol is widely documented, and each year in the United States, approximately 5000 exposures require treatment, with 20-30 related deaths reported to poison control centers [29]. Methanol and ethylene glycol, as parent molecules, are relatively harmless. They are, however, converted by ADH into toxic metabolites that can induce end-organ damage and death. Methanol is converted to formic acid by ADH, resulting in anion-gap metabolic acidosis and eye damage. Retinal damage caused by methanol intoxication is usually irreversible [30]. Ethylene glycol is converted by ADH to glycolic acid, which causes anion-gap metabolic acidosis, and oxalic acid, which causes kidney damage chiefly due to the development of calcium oxalate crystals. Both can cause irreversible CNS damage. Poisoning from diethylene glycol (historically and tragically used as a glycerin alternative and also in household items such as wallpaper stripper and Sterno brand heating fuel) is less prevalent but associated with extremely high morbidity and mortality [35]. Diethylene glycol is converted by ADH to hydroxyethoxyacetic acid and diglycolic acid, resulting in anion-gap metabolic acidosis, bilateral cortical necrosis, and sensory polyneuropathy.16-20 Ethanol. For many years, ethanol has been utilized to block ADH and limit the metabolism of methanol and ethylene glycol to their respective metabolites [36]. The amount of ethanol required to competitively block ADH is determined by the relative affinity of the specific hazardous alcohol for ADH. Most sources recommend taking an ethanol dose adequate to achieve and maintain a serum ethanol concentration of 100-150 mg/dL. In the presence of ethanol, the half-lives of ethylene glycol (in patients with normal renal function) and methanol are approximately 17.5 and 45 hours, respectively [36].

CONCLUSION:

By evaluating prescription medications, pharmacists can minimize errors and perhaps lower the risk of serious adverse drug reactions. Several studies conducted throughout the world have demonstrated that pharmacists may greatly contribute to improving patient care. Doctors and nurses who followed an Ph's advice and suggestions saw an improvement in the quality of patient care, medication adherence, patient satisfaction, a decrease in drug-related difficulties, and a drop in the cost of patient care. Furthermore, studies have indicated that a pharmacist's drug history in the ED can be more detailed than a physician's.

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