A Technician's Role in Preventing Adverse Drug Events

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What is a medication error?

A medication error is defined by the Nation Coordinating Council for Medication Error and Prevention (NCCMERP)

"A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use."

Adverse Drug Events

Medicines are generally safe when used as prescribed or as directed by the label, but there are risks in taking any medicine. An adverse drug event is when someone is harmed by a medicine. Certain types of adverse drug events are more common for specific medication classes, such as insulin, antibiotics, and opioids.

Why Reports of Serious Adverse Drug Events Continue to Grow?

The last four years have seen a 90% increase in the number of serious adverse drug reports received by the Food and Drug Administration (FDA). Investigating the reasons for the four-year trend, we concluded that they could be divided into three groups. Reports for the new drugs not widely used in 2008 accounted for 23% of the growth; increasing reports for drugs seen in all four years accounted for 40%. The substantial remainder (37%) was due to special circumstances involving a few suspect drugs that resulted in greatly increased numbers of reports (ISMP, 2012).

ISMP: Four Identified, Distinctive, and Severe (ADEs) Categories:

1. Rhabdomyolysis: the destruction of skeletal muscle cells accompanied by the release of cellular proteins into the blood, with a substantial risk of causing acute renal failure.

2. Serotonin syndrome (SS) and neuroleptic malignant syndrome (NMS): neurologic disorders caused by drugs that trigger abnormal serotonin levels (with SS) or block dopamine (with NMS), which results in aberrant behavior and thought, muscle spasms, and compromises to the autonomic nervous system.

3. Stevens-Johnson syndrome/toxic epidermal necrolysis (SJS/TEN): a disorder in which the body's immune system attacks and destroys the skin, producing a condition similar to severe burns.

4. Progressive multifocal leukoencephalopathy (PML): an often fatal viral infection of the brain that occurs when immunosuppressive drugs or human immunodeficiency virus (HIV) compromise the body's ability to hold a prevalent virus in check.

Cases Reported to FDA for Four Severe Adverse Drug Events in 2017

Adverse Drug Events	Number of Cases	Mortality Rate (%)
Rhabdomyolysis	1,549	12%
Serotonin and Neuroleptic Malignant Syndromes	1,485	11%
Stevens-Johnson Syndrome/Toxic Epidermal Necrolysis	1,178	18%
Progressive Multifocal Leukoencephalopathy	419	29%

Suspect Drugs	Cases	Suspect Drugs	Cases
Statins:	264	Analgesics:	86
Atorvastatin	114	Methadone	30
Simvastatin	97	Acetaminophen	24
Rosuvastatin	53	Pregabilin	17
*Antipsychotics:	184	Gabapentin	15
Aripiprazole	83	Anticonvulsants:	77
Quetiapine	23	Levetiracetam	64
Risperidone	19	Lamotrigine	13
Olanzapine	19	Other:	68
Paliperidone	18	Metformin	20
Clozzapine	12	Daptomycin	15
Haloperidol	10	Furosemide	12
Antidepressant:	25	Amlodipine	11
Sertraline	13	Sacubitril/Valsartan	10
Venlafaxine	12	*Most of these were secondary to Neuroleptic Malignant Syndrome (NMS)	
Antineoplastics:	40		
Nivolumab	25		
Trabectedin	15		

Adverse Event:
Strong Signals for Rhabdomyolysis

Adverse Event:
Strong Signals for Serotonin Syndrome

Suspect Drugs	Cases	Suspect Drugs	Cases
Antidepressant:	284	Antipsychotics:	82
Sertraline	63	Aripiprazole	37
Venlafaxine	50	Quetiapine	31
Fluoxetine	35	Olanzapine	14
Escitalopram	29	Other:	61
Duloxetine	26	Linezolid	17
Citalopram	22	Methylphenidate	12
Vortioxetine	21	Ondansetron	11
Paroxetine	20	Lithium	11
Bupropion	18	Sodium Oxybate	10
Opioids:	47		
Tramadol	37		
Tapentadol	10		

Adverse Event: Strong Signals for Stevens-Johnson Syndrome/Toxic Epidermal Necrolysis

Suspect Drugs	Cases	Suspect Drugs	Cases
Anticonvulsants	210	Antineoplastics	72
Lamotrigine	128	Nivolumab	23
Carbamazepine	34	Pembrolizumab	20
Phenytoin	22	Lenalidomide	17
Valproic Acid	13	Cobimetinib	12
Levetiracetam	13	Antipsychotics	16
Antibiotics/Antifungals	105	Aripiprazole	16
Sulfamethoxazole/ Trime-thoprim	50	Other	59
Vancomycin	18	Allopurinol	43
Ciprofloxacin	15	Omeprazole	16
Fluconazole	12	Ibuprofen	39
Clindamycin	10	Acetaminophen	39
Analgesics	91	Diclofenac	13

Adverse Event: Strong Signals for Progressive Multifocal Leukoencephalopathy

Suspect Drugs	Cases
Natalizumab	154
Rituximab	59
Fingolimod	20
Mycophenolate	10

Death Due to Pharmacy Compounding Error Reinforces Need for Safety Focus

Problem: As part of an ongoing collaboration with a provincial death investigation service, our sister organization, ISMP Canada, received a report regarding the death of a child who had ingested a prescribed, compounded oral liquid suspension that contained the wrong medication.

- **Case Description:** For about 18 months, a young child had been receiving a 3 gram dose of tryptophan 150 mg/mL suspension (20 mL) by mouth at bedtime to treat a complex sleep disorder. Tryptophan was available as a dietary supplement in capsule form, but for this child, it needed to be compounded in an appropriate dosage form, as an oral suspension. A refill of the tryptophan prescription was ordered and picked up from the compounding pharmacy that had prepared the suspension in the past. That night, the child was given the usual dose of medication; the next morning, the child was found lifeless in bed. Post-mortem toxicology identified lethal levels of the antispasticity agent baclofen, which had not been prescribed for the child.
- **Conclusion:** The selection error described above, with its tragic result, could have occurred in any community or hospital pharmacy or drug preparation facility that compounds medications. Compounding of medications is a high-risk activity that results in a final product for which ingredients cannot be verified through physical examination. Before compounding is undertaken, commercially available alternatives should be used if available, and there should be an evidence-based or otherwise appropriate clinical rationale for the use of the compounded product.

An Injustice Has Been Done: Jail Time Given to Pharmacist Who Made an Error (ISMP, 2009)

Eric Cropp, an Ohio hospital pharmacist involved in a tragic medication error, staff at the Institute for Safe Medication Practices (ISMP) have been deeply saddened and greatly troubled to learn that he received 6 months in jail, 6 months home confinement with an electronic sensor locked to his ankle after his release, 3 years probation, 400 hours of community service, a fine of $5,000, and payment of court costs. Eric made a human error that could have been made by others in healthcare given the inherent weaknesses in our manual checking systems: he failed to recognize that a pharmacy technician he was supervising had made a chemotherapy solution with far too much sodium chloride in it. The final solution was supposed to contain 0.9% sodium chloride but it was over 20%.

U.S. Emergency Department Visits for Outpatient Adverse Drug Events, 2013-2014

EMERGENCY DEPARTMENT (ED) VISITS CAUSED BY DRUG ADVERSE EVENTS (US ED VISITS FOR OUTPATIENT ADVERSE DRUG EVENTS, 2013-2014):

NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM-COOPERATIVE ADVERSE DRUG EVENT SURVEILLANCE, SAMPLED 60 U.S. HOSPITALS.

42,585 ED VISITS OCCURRED.

ADVERSE DRUG EVENTS WERE RESPONSIBLE FOR 4.0 ED VISITS PER 1,000 INDIVIDUALS ANNUALLY.

ADULTS AGE ≥65 YEARS FOR 9.7 ED VISITS PER 1,000 INDIVIDUALS ANNUALLY.

ADULTS AGE <65 YEARS FOR 3.1 ED VISITS PER 1,000 INDIVIDUALS ANNUALLY.

THE AUTHORS CONCLUDED THAT FOUR ED VISITS PER 1,000 INDIVIDUALS ANNUALLY WERE ATTRIBUTED TO ADVERSE DRUG EFFECTS, WHICH WAS AN INCREASE FROM 2005-2006.

Adverse Drug Events from Specific Medicines

- Antibiotics – Are one of the top medication classes resulting in emergency department visits for adverse drug events (ADEs, 2018):
- Overall, antibiotics are responsible for almost one in six (16%) estimated emergency department visits for ADEs (ADEs, 2018).
- Antibiotics are involved in more emergency department visits for ADEs than any other class of drugs in patients under 50 years of age (ADEs, 2018).
- In children 5 or younger, antibiotics cause more than half (56%) of estimated emergency department visits for ADEs (ADEs, 2018).
- About four in five (82 percent) emergency department visits for ADEs from antibiotics alone are due to allergic reactions (ADEs, 2018).

Adverse Drug Events from Specific Medicines Continued:

- Anticoagulants – Anticoagulants (blood thinners) are important for preventing and treating blood clots, but are associated with an increased risk for bleeding. Using anticoagulants safely requires a careful balance between risks and benefits (ADEs, 2018).
- 32% of of estimated emergency room visits for all ADEs among older adults (≥65 years of age), and 36% of estimated emergent hospitalizations for all ADEs among older adults (ADEs, 2018).
- Warfarin, rivaroxaban, and dabigatran were among the top 10 most common causes of ADEs resulting in emergency department visits among older adults (ADEs, 2018).
- Insulin – is an important part of diabetes treatment, but it can be difficult for some patients to manage and monitor (ADE's, 2018).Insulin can cause adverse drug events that lead to emergency room visits:From 2007 to 2011, nearly 100,000 estimated emergency department visits occurred each year in the U.S. for insulin-related low blood sugar (hypoglycemia) or errors when taking insulin. Of these emergency department visits, nearly two-thirds of the patients had symptoms of severe hypoglycemia, such as shock, seizures, or loss of consciousness (ADEs, 2018)

Adverse Drug Events from Specific Medicines Continued:

- Almost one-third of the emergency department visits resulted in hospitalization (ADEs, 2018).
- Older adults are most vulnerable to insulin-related hypoglycemia leading to emergency room visits (ADEs, 2018):
- One in every eight insulin-treated patients aged 80 years or older visited the emergency department for insulin-related hypoglycemia or errors. When compared to insulin-treated adults aged 45 to 64 years, those aged 80 years or older were (ADEs, 2018):
- More than twice as likely to visit the emergency department for insulin-related hypoglycemia or an error when taking insulin.
- Nearly five times more likely to be hospitalized.
- Meal-related mishaps and taking the wrong insulin product were the most common reasons for emergency room visits from insulin-related hypoglycemia or errors.
- Meal-planning is a well-recognized component of diabetes education. However, among the emergency department visits with information on what caused the visit, a meal-related mishap was the most common factor in nearly half of the cases. Common meal-related mishaps include (ADEs, 2018):

Adverse Drug Events from Opioid Analgesics

- In the United States, the use of opioid (narcotic) analgesics (pain-relievers) as part of pain management regimens has contributed to a poisoning epidemic (ADEs, 2018).
- The increase in drug poisoning coincides with an increase in the prescription of major types of opioid analgesics, as physicians were encouraged to prescribe stronger analgesics (i.e., opioids) for pain management (ADEs, 2018).
- In 2013, the rate of drug poisoning deaths involving opioid analgesics remained higher than the rate for deaths involving heroin, but the rate of deaths involving heroin had almost tripled from 2010 (ADEs, 2018).
- The overall goal should be to identify ways to reduce deaths from opioid analgesics without reducing the quality of care for patients who legitimately need pain management (ADEs, 2018).

A Technician's Role in Preventing ADE's

Question and Answer

A Technician's Role in Preventing ADE's Question

Which of the following statements is true regarding medication errors and adverse drug reactions?

a. All adverse drug reactions are preventable
b. All medication errors cause patient harm
c. All adverse drug reactions are caused by process errors
d. All medication errors are preventable
e. None of the above

A Technician's Role in Preventing ADE's

Correct Answer: D

Medication errors are a type of adverse drug event (ADE). ADE's include adverse drug reactions and medication errors. Medication errors can be viewed as process errors, while adverse reactions are negative clinical outcomes. All adverse drug reactions cause patient harm, but not all adverse drug reactions are preventable. All medication errors are preventable, but not all medication errors cause patient harm.

A Technician's Role in Preventing ADE's Question

According to studies, medication errors occur most frequently in which of the following patients populations?

a. Very young and very old patients
b. Female patients
c. Adolescent patients
d. Patients enrolled in medication reconciliation programs
e. Male patients
f. None of the above

A Technician's Role in Preventing ADE's

Correct Answer: A

Medication errors occur more frequently in very young and very old patients and the errors tend to me more serious in these populations.

A Technician's Role in Preventing ADE's Question

Approximately what percentage of individuals who use medications do so incorrectly or inappropriately?

a. 20%
b. 30%
c. 50%
d. 70%
e. 80%

A Technician's Role in Preventing ADE's

Correct Answer: C

It is estimated that one-half of individuals who use medications do so incorrectly or inappropriately.

A Technician's Role in Preventing ADE's Question

Which of the following errors occur during the prescribing step of the medication-use process?

a. Incorrectly preparing the medication
b. Affixing the wrong label to the prescription container
c. Duplicating existing drug therapy
d. Improperly storing a medication

A Technician's Role in Preventing ADE's

Correct Answer: C

Errors that occur during the prescribing stage of medication use include irrational, inappropriate, or ineffective choice of medication based on indication; prescribing a medication for a patient with a known allergy; duplicating existing drug therapy; choosing an incorrect dose (under-prescribing or overprescribing) or dosage form; providing incorrect instructions for use; and writing the prescription with illegible handwriting.

A Technician's Role in Preventing ADE's Question

According to the pharmacy technician survey mentioned in the activity, technicians indicated that the following factors were the most frequent cause of medication errors:

a. Too many technicians on duty and noise
b. Equipment malfunctions and phone calls
c. Illegible handwriting and poor lighting
d. Interruptions and inadequate staffing
e. None of the above

A Technician's Role in Preventing ADE's

Correct Answer: D

Rationale: Pharmacies across all care settings offer numerous opportunities for many types of medication errors. A survey of pharmacy technicians revealed that interruptions and inadequate staffing were the most frequent causes of medication errors. Other common sources of error in community pharmacy included handwritten prescriptions, similar packaging or naming conventions, and lack of control in the process of preparing and labeling prescriptions.

A Technician's Role in Preventing ADE's Question

According to the Institute for Safe Medication Practices (ISMP), which of the following medications (or group of medications) is considered high-risk?

a. Acetaminophen
b. Any combination product
c. Homeopathic agents
d. Insulin
e. Opioids

A Technician's Role in Preventing ADE's

Correct Answer: D

The list of high-alert medications in community settings includes carbamazepine, metformin, warfarin, all antiretroviral agents, all chemotherapeutic agents, insulin, opioids, pediatric medications that require measurement, and medications categorized as pregnancy category X. The entire list, as well as lists of high-alert medications in other settings, is available on the ISMP website.

A Technician's Role in Preventing ADE's Question

Which of the following prescriptions is written correctly, in terms of abbreviations, symbols, and designations?

a. APAP 1000 mg t.i.d.
b. Ciprodex 4gtts AU b.i.d.
c. Clonazepam 0.25 mg twice daily
d. Humalog SSRI per MD instructions

A Technician's Role in Preventing ADE's

Correct Answer: C

Unapproved abbreviations include "µg" for micrograms; AD, AS, and AU and OD, OS, and OU for right ear, left ear, and both ears and right eye, left eye, and both eyes, respectively; the abbreviation "cc" for cubic centimeters; the abbreviation "q.d." for daily; and the abbreviations "SSI" and "SSRI" for sliding scale insulin and sliding scale regular insulin, respectively. Drug names should not be abbreviated or written in shorthand. Trailing zeros should never be used after a decimal point and a zero should always precede a decimal point when the dose is less than a whole unit. When these symbols, abbreviations, or designations appear on prescriptions, pharmacy technicians should bring these to the attention of the pharmacist—this will help mitigate the chance of a medication error.

A Technician's Role in Preventing ADE's Question

Which of the following is a characteristic of a just culture?

a. Employees are encouraged to report errors and analyze why the errors occurred.
b. Each error is considered a stand-alone incident.
c. Errors are considered system failures, so no personal accountability is required.
d. Blame for an error is directly assigned to the person who made the mistake.

A Technician's Role in Preventing ADE's

Correct Answer: A

A "just culture" is crucial to successful monitoring and reporting of medication errors. This blame-free attitude focuses on the system failures that led to an error, rather than the person who made the error. This concept avoids punishment for the error, and, instead, uses the error as an opportunity to learn and improve the system. Negligent or reckless behaviors are still punishable, and, as such, a "just culture" still requires personal accountability. Employees are encouraged to report and document errors, but, more than that, they are encouraged to understand risk and improve systems to mitigate the risks.

A Technician's Role in Preventing ADE's Question

Which system would be used to report an ADE related to a cosmetic product?

a. HAMMERS
b. The Joint Commission
c. MedWatch
d. None of the Above

A Technician's Role in Preventing ADE's

Correct Answer: C

The Food and Drug Administration's MedWatch system is a voluntary surveillance program for adverse events related to marketed drugs and devices. Errors reported to MedWatch involve not only prescription and over-the-counter drug products, but also vitamins, nutritional supplements, infant formulas, and cosmetics.

A Technician's Role in Preventing ADE's Question

What steps can be taken to minimize the selection of the wrong medication stock bottle from the pharmacy shelf?

a. Use the barcode scanner
b. Rewrite the prescription using tall-man lettering
c. Obtain a verbal order from the physician's office
d. Perform a root cause analysis

A Technician's Role in Preventing ADE's

Correct Answer: A

During the filling of a prescription, it is easy to select the wrong stock bottle from a pharmacy shelf since many medications have names and packages that look and sound alike. Many pharmacies have systems in place, such as barcode scanning or National Drug Code verification, to decrease the likelihood of choosing the wrong drug product.

Questions

Thank you!

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