



Bedside Evaluation of Adverse Drug Events (ADEs) by Medical Toxicologists

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Introduction:

ADEs are defined as untoward outcomes associated with the use of a drug, including adverse reactions and medication errors.¹

•An **adverse drug reaction (ADR)** is an adverse effect produced by a medication when used in the recommended manner and is considered not preventable. It is also known as a **drug side effect**.¹

•A **medication error** is defined as “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.”¹ It is also known as a **preventable ADE**.

ADEs contribute significantly to iatrogenic morbidity and mortality and are generally preventable.

Medical toxicologists (MTs) may be consulted in the care of patients with ADEs due to severity of symptoms and their expertise in pharmacology, drug interactions, care of poisoned patients, and antidote use.

We sought to describe the clinical characteristics of ADEs leading to bedside toxicology consultation.

Methods:

The ToxIC registry from January 2010 to October 2013 was examined to identify ADEs as the primary reason for consultation.

These cases were analyzed for:

- Patient demographics
- Drug or classes of drugs involved
- Number of drugs identified related to ADE
- Presence of clinical effects
- Presence of toxidromes

Results:

Total cases in ToxIC: **24,661**

309 ADEs were identified

166 women (54%)

143 men (46%)

Patients were:

Age <18 years old = 37 (12%)

Ages of 19-65 = 206 (67%)

Age >65 years old = 64 (21%)

420 drugs/drug classes involved

285 cases (92%) developed clinical effects

90 cases (29%) experienced toxidromes

6 cases with more than 1 toxidrome

Number of Drugs/Drug Classes	# Cases
Drug not identified	15
1	240
Total > 1	54
2	23
3	15
4	12
5	2
6	1
10	1
Total cases	309

Most Common Drugs/Classes of Drugs Involved	# of cases
Sedative-Hypnotics	71
Opioids	62
Antidepressants	48
Cardiovascular drugs	36
Anticholinergics/Antihistamines	33
Antipsychotics	32
Anticonvulsants	24
Analgesics	22
Lithium	17
Local Anesthetics	6
Antibiotics	5
Stimulants	5
Diabetic Medications	4
Nutritional Supplements	4
Chemotherapeutics	3
Antidotes	3
Antivirals	2
Other	28
No drug listed	15
Total	420

Toxidromes	# Cases
Serotonin Syndrome	26
Sedative-Hypnotic	24
Anticholinergic	24
Opioid	8
Sedative-hypnotic Withdrawal	7
Sympathomimetic	3
Cholinergic	2
Neuroleptic Malignant Syndrome	2
Total	96

Cardiovascular	Pulmonary	Neurologic	Metabolic	GI or Hepatic	Renal
Multiple 34	Multiple 7	Multiple 49	Multiple 1		
Bradycardia/ AV blocks 12	Respiration depression/Apnea 19	AMS/Lethargy/ Coma/CNS depression 55	Metabolic acidosis 12	Nausea/Vomiting /Diarrhea 14	Acute kidney injury 28
Tachycardia 11	Aspiration pneumonitis/ pneumonia 4	Psychosis/Delirium 43	Wide-gap metabolic acidosis 4	AST/ALT abnormalities 14	Rhabdomyolysis 3
QT/QRS prolongation 10	Hypoxia 1	Tremor/clonus/ hyperreflexia 12	Hypoglycemia 4	Vomiting + AST/ALT abnormalities 2	Both AKI and Rhabdo 1
Hypotension 14		Seizures 11	Electrolyte derangements 3	Pancreatitis 1	Hematuria 1
Hypertension 7		Agitation 6	Diabetes Insipidus 1		UTI 1
		EPS/Dystonia/ Rigidity 4			
Other 3	Other 3	Other 10	Other 1		
Total = 91	Total = 34	Total = 196	Total = 26	Total = 31	Total = 34

Discussion:

The ToxIC registry was established in January 2010 to collect prospective information about bedside consultations performed by MTs.

•All patients are seen at the bedside by a MT.

•Unique when compared to other national poison databases.

ToxIC included 24,661 cases (October 2013); however, only 309 cases (1.2%) were identified as ADEs. The low percentage may be due to multiple factors:

- MTs may not be consulted on every patient with an ADE at their medical center
- MTs may not perform bedside consultation for every patient with an ADE
- Other practitioners may be comfortable caring for more common ADEs
- Inaccurate coding of the ADE cases during data entry
- ADEs with single organ involvement may lead to consultation from an organ-specific consultation service (e.g. nephrologists for renal failure) instead of MTs

Most ADE cases seen by MTs had some type of clinical effect (285/309, 92%):

- Organ-specific:
- Cardiovascular (91/309) 29%
- Pulmonary (34/309) 11%
- Neurologic (196/309) 63%
- Metabolic (26/309) 8%
- GI/Hepatic (31/309) 10%
- Renal: (34/309) 11%
- Toxidrome (90/309) 29%

MTs should be consulted on ADEs:

- To assist in providing optimal care
- To review other medications and potential exposures
- To ensure no concerning drug interactions
- To ensure appropriate reporting of the ADE

Limitations:

- ToxIC data is blinded when entered into the database, by the user, so that the patient, hospital, and MT fellowship program cannot be identified.
- Multiple users enter the data, and although all are MTs they may:
 - Differ in their knowledge and abilities for data collection and entry.
 - Have a personal style or preference for data coding.
- The ToxIC database does not include definitions for ADE, ADRs, or medication errors.

Conclusion:

- MTs consult on a wide range of ADEs in patients of all ages.
- Toxidromes or organ-specific findings are often present and likely lead clinicians to seek expert advice.
- Further analysis of this and similar cohorts may generate ADE prevention strategies.
- The addition of definitions in ToxIC to the case categorization may improve the identification of ADEs and utility of the data collected.

