Overview of Clinical Toxicology

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Scope of the lecture:
This presentation will discuss the practice of clinical toxicology, from the perspective of a large clinical reference lab in the United States. Areas of testing include drug exposure testing, therapeutic drug monitoring, elemental testing, emergency room support and pharmacogenomics. The overall goals of clinical toxicology testing are to detect exposure to drugs and common toxicants; guide selection, monitoring, and optimization of drug therapy; and to assure abstinence from drugs in select clinical management scenarios.

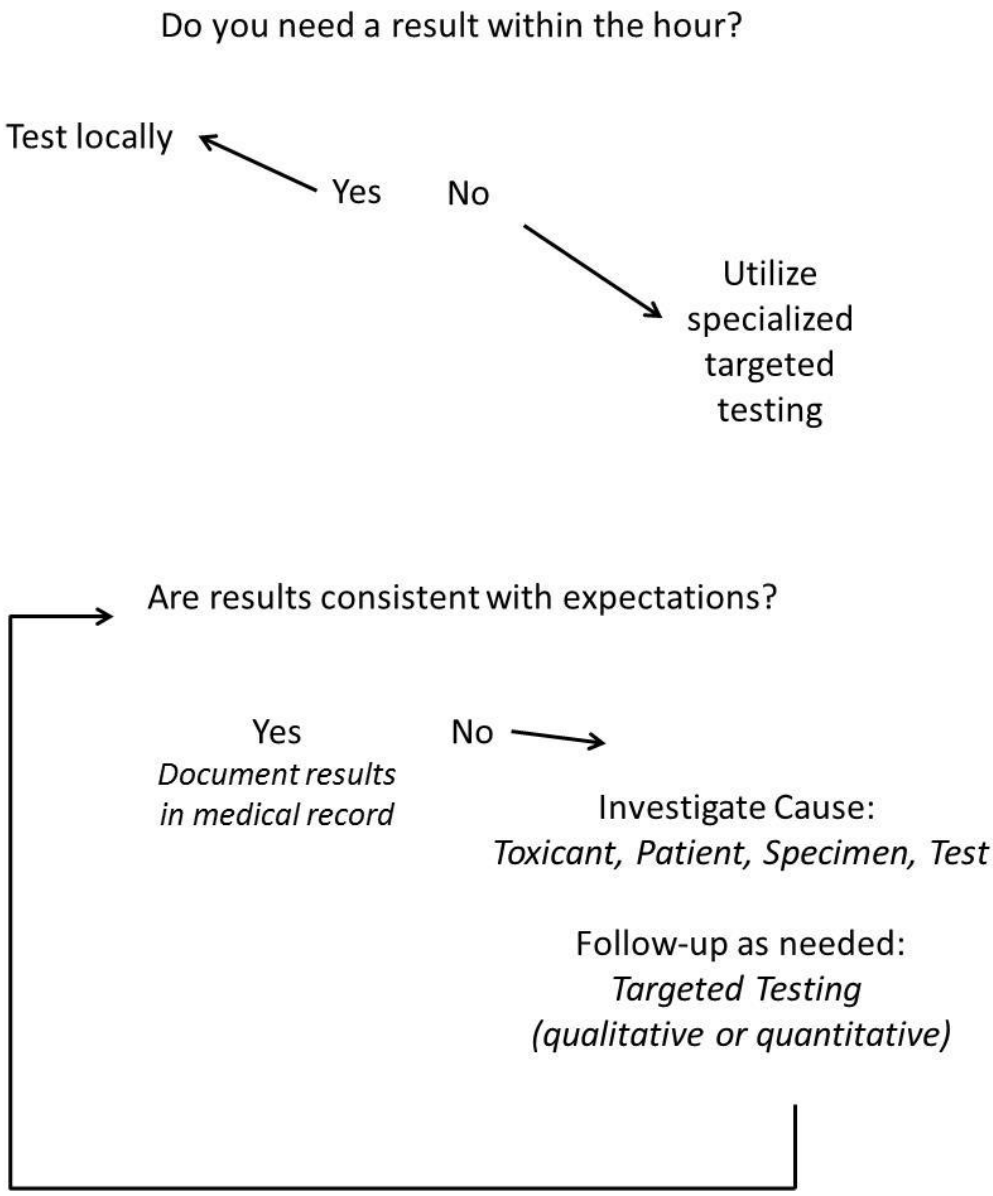
Learning objectives:
1. List common tests that are offered to support clinical toxicology applications
2. Compare and contrast the traditional screen with reflex approach to testing versus targeted testing in clinical toxicology
3. Describe how pharmacogenomics is complementary to clinical toxicology

Extended abstract:

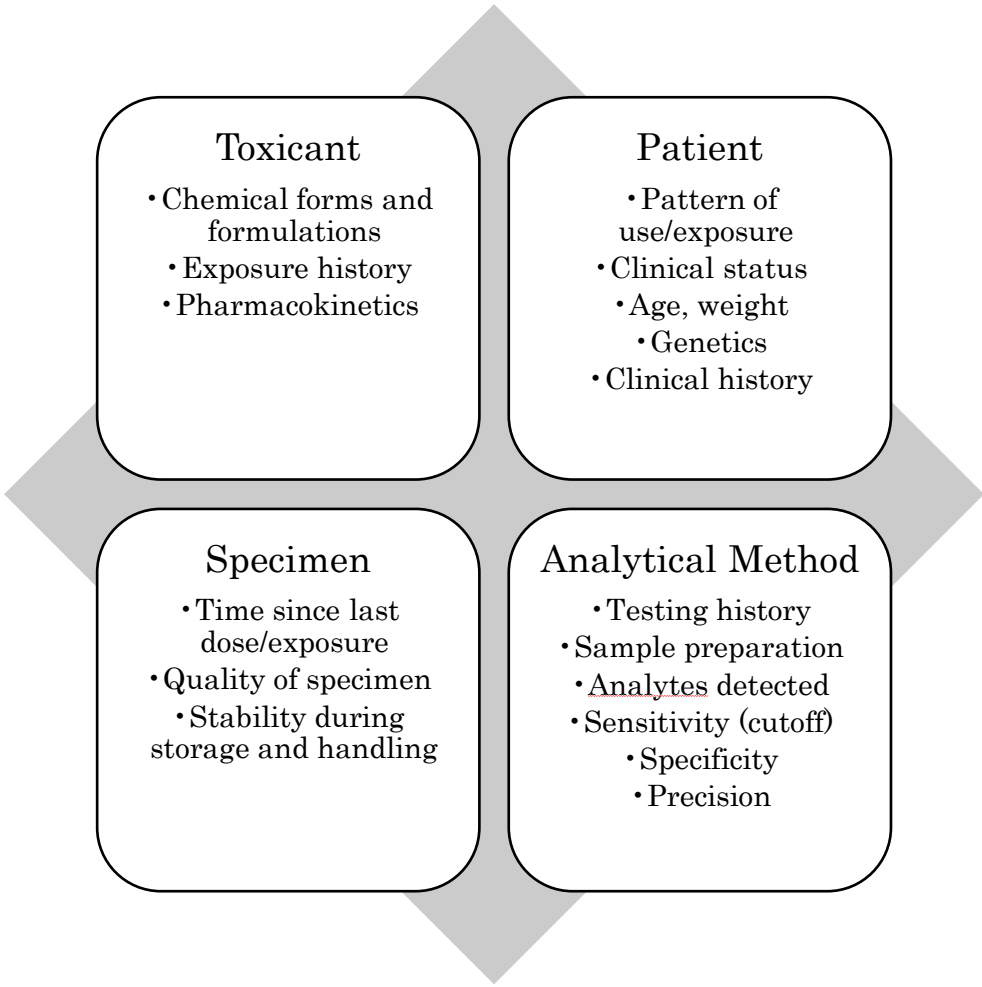
Clinical toxicology is distinct from forensic toxicology because this discipline is focused on management of medical decisions rather than investigation or management of criminal/civil decisions. At the center of clinical toxicology testing is the toxicant – be it an over the counter medication, prescription medications, illicit substances, legal herbals or synthetic substances, trace and toxic elements, volatiles, or other substances that could produce a change in mental status or physiology and ultimately lead to signs and symptoms of toxicity or death. The specific choice of testing depends on pre-test expectations, often based on clinical presentation and history, availability of biological specimen(s), and availability of testing.

The site for clinical toxicology testing might include the personal residence, schools, employment sites, outpatient clinics, hospitals, pharmacies, local laboratories, regional laboratories, or larger national/international laboratories. The choice of testing site depends on factors such as regulatory implications of testing, required time to result, complexity of technology used for testing, consistency of testing result for a specific technology, stability of

analytes/specimens, need for testing and interpretation required. Several examples of tests, specimens and possible testing sites for specific clinical applications will be discussed. A simplified algorithm for selection of testing is shown below:



Some of the common factors to consider when investigating the cause of an unexpected result and making decisions for subsequent testing will be discussed but are summarized in the following illustration:


Toxicant
• Chemical forms and formulations
• Exposure history
• Pharmacokinetics
Patient
• Pattern of use/exposure
• Clinical status
• Age, weight
• Genetics
• Clinical history
Specimen
• Time since last dose/exposure
• Quality of specimen
• Stability during storage and handling
Analytical Method
• Testing history
• Sample preparation
• Analytes detected
• Sensitivity (cutoff)
• Specificity
• Precision