

Clinical Utility of a High-Resolution Mass Spectrometry-Based Comprehensive Drug Screen Assay in the Emergency Medicine Setting

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Background:

The magnitude and complexity of the evolving overdose crisis – currently a poly-substance epidemic – is rendering classical approaches to drug testing and monitoring outdated and ineffective. With emerging threats in the form of drug supply adulterants and novel psychoactive substances, different tools and strategies for clinical drug testing are needed. Here we illustrate the clinical utility and feasibility of a high-resolution mass spectrometry-based comprehensive drug test in non-fatal overdose patients in the emergency department.

Methods:

76 overdose patients in the ED were consented to this study. Participants had blood and urine samples collected and tested. All testing was performed in the RIH Toxicology Laboratory via a LC-QTOF-MS comprehensive drug screen. Urine specimens were centrifuged, diluted with solvent, and injected onto a SCIEX X500R platform. Serum specimens were centrifuged, then subjected to protein precipitation with acetonitrile. The supernatant was evaporated and reconstituted in solvent prior to injection. The untargeted data collection was performed using a positive-ion mode TOF-MS survey scan with IDA-triggered collection of high-resolution product ion spectra (20 dependent scans). The data was analyzed using an in-house validated library of 318 drugs and metabolites spanning multiple drug classes. Results were rapidly disseminated back to participants. Participants completed surveys post-delivery of results.

Results:

Polysubstance exposure was observed in 100% of patients. Blood and urine testing revealed complementary findings, indicating clinical utility for both. Fentanyl was found in 87% of consented overdose patients, typically alongside multiple other substances, including adulterants such as xylazine. In post survey respondents, 81% reported “yes, definitely” that they would use the service again. Immediately after overdose 46% reported that they were “very concerned” about drug supply safety; after receiving testing results that number rose to 61%.

Conclusions:

Comprehensive drug testing in overdose patients reveals trends in substance use and the inherent poly-substance nature of the drug supply due to contamination and adulteration. Timely communication of results to participants enables harm reduction measures. Incorporating comprehensive toxicology testing in clinical management can impact both individuals (patients) and public health by providing data that can inform local biosurveillance and harm reduction initiatives.

Key words: overdose testing, LC-QTOF, HRMS, comprehensive screening, polysubstance use