K59 An Evaluation of a Presumptive Screen in Urine as a Rapid Method of Determining Fentanyl-Related Deaths

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Learning Overview: After attending this presentation, attendees will: (1) appreciate the challenges faced by coroner/medical examiner systems considering the recent opioid crisis, (2) learn the differences between presumptive immunoassay and confirmatory mass spectrometry, and (3) understand the relationship (or lack thereof) between drug concentrations in the blood and urine.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating the potential benefits and detriments of using presumptive screening to limit the number of autopsies performed in suspected overdose deaths.

Background/Introduction: The province of British Columbia, Canada, has seen an unprecedented increase in the number of opioid-related deaths in recent years. In 2017, there were 1,156 fentanyl-related deaths, which represent 81% of all illicit drug deaths in the province. The British Columbia Coroners Service stratifies decision-making on postmortem examination prior to autopsy and releases bodies in cases in which fatal drug findings are identified. In cases in which an immediate toxicological cause of death cannot be identified, decedents undergo full postmortem examination. There is a limited timeframe in which a body can be stored prior to autopsy. Toxicology results must therefore be performed within days of collection. To expedite fentanyl testing, the implementation of urine screen immunoassay has been proposed.

Objective: The purpose of this study is to evaluate the robustness of presumptive urine drug screening in suspected fentanyl-related deaths by establishing the relationship between fentanyl and norfentanyl in blood and urine.

Method: Suspected drug-related deaths that occurred within the Interior Health Region of the Province of British Columbia were included in this study if blood and urine were available for testing. One aliquot of urine was sent to clinical laboratories within the Interior Health region for presumptive testing using the SureStep™ urine fentanyl drug test (cutoff concentrations: >20ng/mL norfentanyl, >100ng/mL fentanyl). Blood and a second aliquot of urine were sent to the Provincial Toxicology Centre for complete toxicology testing by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). Concentrations of fentanyl and norfentanyl in blood and urine were then compared to the presumptive results. A concentration of 3ng/mL was the minimum concentration at which fentanyl could be associated with death.

Results: Preliminary results from 29 cases found that 72% of presumptive urine screen results coincided with blood fentanyl results. There were five false negatives, in which the presumptive screen did not detect fentanyl but the concentration in the blood exceeded 3ng/ml, and three false positives (Se=72%; Sp=73%; PPV=81%; NPV=62%). Urine fentanyl and norfentanyl concentrations determined by LC/MS/MS in acute overdose deaths did not strongly correlate to those of blood (correlation coefficient=0.12 and 0.65 for fentanyl and norfentanyl, respectively). All presumptive screen results in which fentanyl was detected contained norfentanyl; however, 25% of those cases were below the reported cutoff. In contrast, 8% of cases in which the presumptive screen did not detect fentanyl were above the reported cutoff. Urine carfentanil concentrations ranged from 0.2ng/mL to 2.0ng/mL. No carfentanil-only cases were detected by the presumptive screen.

Conclusion/Discussion: In the majority of cases, urine presumptive screening coincided with blood fentanyl concentrations of at least 3ng/mL. Comparison of urine concentrations to presumptive screen results suggest that the high false negative rate is related to the absence of norfentanyl in the urine following acute death, rather than a sensitivity issue associated with the presumptive screen. False negative results carry minimal risk as they are followed up by complete toxicology testing and postmortem examination. However, false positives would result in the release of a body prior to autopsy in cases in which no cause of death has been determined. Further investigation into this study will provide valuable insight into whether the false positive rates constitute an acceptable risk.

Fentanyl, Urine Screening, Postmortem Toxicology