Narcotic Analgesics and Common Drugs of Abuse

Clinical Correlations and Laboratory Assessment

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KEYWORDS

• Drugs • Toxicology • Addiction • Pain • Clinical • Laboratory • Abuse • Analgesia

KEY POINTS

- Pain management is an evolving discipline; new formulations of narcotic analgesics mature to the marketplace with the promises of availing improved pain control, better dosing, and fewer side effects.
- These agents also avail an equal risk for abuse, which may mature as a result of physiologic tolerance, polypharmacy, metabolic factors, phramacogenomics, and economic concerns.
- Street chemists are adept at manipulating current and evolving drugs to more potent versions and creating new compositions of matter for consumption in the medical and illicit marketplaces.
- Clinical assessment is paramount to developing an index of suspicion of overdose, toxicity, or illicit drug use; the laboratory can support such investigations and guide therapy.
- As new agents pervade the health care system, the clinical toxicology laboratory keeps in step with adapting its technology and methodology to facilitate detection.

EXTENT OF USE OF DRUGS OF ABUSE

Over the last decade, there has been a general increase in the use of all drugs of abuse in the US population aged 12 years and over. The reported difference in illicit drug use from 2013 to 2014 has demonstrated an increase from 41.6 million users to 44.2 million, representing a greater than 6% increase, or 2.6 million new drug abusers, over 1 year alone. These agents include common illicit drugs including heroin, cocaine, and hallucinogens as well as nonmedical use of prescription drugs, sedatives, tranquilizers, pain relievers, and other agents.[1] The highest number of drug

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abusers occurs in the 15- to 39-year-age range, at almost 75%. Interestingly, individuals in the 40- to 59-year bracket comprise most of the remainder, comprising more than 20% of the overall number of drug abusers, a sizable fraction. Drug abuse does spare any age, race, gender, socioeconomic, employment, or educational status. In fact, illicit drug use in 13-year-old children increased by approximately 30% from 2013 to 2014 (275,000 to >350,000 nationwide), and persons aged 26 and older have a 20% to 25% lifetime probability of using cocaine no matter whether they be full time, part time, or unemployed.[1] Because all persons are at risk for drug abuse, including prescribed, nonprescribed, and illicit substances, understanding the general and specific biological and physiologic effects of such pharmacopeia, in addition to absorption, distribution, metabolism, and excretion can help health care providers to select appropriate medications, either alone or in concert with other agents, as well as use appropriate ancillary clinical toxicology laboratory testing approaches to manage their patient populations.

APPLICATION OF THE CLINICAL TOXICOLOGY LABORATORY

The role of the clinical toxicology laboratory provides substantial support to patient pain management. It can facilitate objective information on whether the patient is (1) taking what the physician prescribed and (2) if he or she is taking something else. However, the laboratory results are not to be considered the be all and end all of whether a patient is adhering to clinical instruction or compliant with medication prescribing habits. As with most drugs, it is important to understand that the results of routine urine drug testing are not intended for use to diagnose, manage, treat, cure, or prevent any disease as a sole independent ancillary support application in lieu of the patient–physician relationship nor for application to forensic, employment, or court proceedings unless orchestrated through appropriate channels (www.samhsa.gov). Appropriate clinical management resides solely with the patient's primary care provider. However, laboratory results are intended and appropriately situated to provide laboratory supplemental data for discretionary use, in conjunction with other clinical patient profiles, presentations, signs, symptoms, history, and physical findings obtained by the patient's primary care provider. Furthermore, to this end, parent drug or metabolite concentrations are subject to many metabolic factors, including but not limited to hydration, kidney and liver function, time and dose of drug ingestion, and pharmacogenomics. For example, it is plausible that a patient who was prescribed codeine for pain management resulted in a urine test negative for codeine but positive for hydromorphone. It could be that this patient, who is a "rapid metabolizer" ingested codeine as prescribed, and catabolized codeine to morphine by *O*-demethylation, which also exerts its effects on its congeners—dihydrocodeine, ethylmorphine, hydrocodone, or oxycodone—but carried the polymorphically variant CYP2D6 allele or multiple alleles thereof, thereby fostering rapid conversion to hydromorphone, which is what was resulted in the patient's urine test.[2] In such an instance, varying the time of last ingestion to collection, in addition to being mindful of the other factors listed above, could shed light on identifying personalized testing that should be considered in performing urine drug testing. Understanding the results of such tests, which can differ from one patient from another, are necessary even when both are prescribed the same drug regimen. To this end, studies by Smith and colleagues[3] demonstrated that volunteers who ingested opiates and were assessed for urine parent drug and their metabolites (hydrocodone, hydromorphone, oxycodone, and oxymorphone) differed considerably from one another based on dose, time of collection, and analysis method used.