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Artificial Intelligence Is Revolutionizing Controlled Substance Diversion Detection

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Artificial Intelligence Is Revolutionizing Controlled Substance Diversion Detection

AI is able to quickly analyze, identify, and route data for investigation.

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IN COMMUNITY AND institutional health care sectors, artificial intelligence (AI) use is expanding. AI is being tapped broadly in operations, customer service, and scheduling, with major pharmacy chains such as Kroger, CVS, and Walgreens, already starting to implement AI applications in their pharmacies. So far, Kroger has begun to use AI for employee onboarding and training processes, CVS is applying AI in negotiations with suppliers, and Walgreens is using it to streamline vaccine scheduling.[1]

With these advances in major pharmacy chains, the next extensive application for AI has become clearer: diversion monitoring. Diversion occurs in health care settings when a drug is redirected from its lawfully prescribed purpose to illicit use, regardless of criminal intent (eg, sharing medication with family or friends).[2] This dangerous practice challenges prescribers, health systems, and patients because of stock-outs, inaccurate records, potential contamination, and increased scrutiny.[3-5] Further, employees who divert medications often conceal their actions from coworkers, family, and friends, which can make these occurrences extremely difficult to detect.

Diversion detection traditionally relies on usage reports from dispensing systems, automated cabinets, and retrospective random administration audits, which often need to be more accurate to quickly identify cases.[3] Hospitals also often try to prevent diversion by implementing strict chain-of-custody policies requiring multiple witnesses for checkout, wasting, and administration. However, there is a growing need for more effective methods to detect and deter diversion; this is where AI can play a role.[6] AI is uniquely able to quickly analyze, identify, and route these data for further investigation.

To date, the opioid epidemic has significantly blurred efforts to curb drug diversion, whereas additional rising product costs, physician prescribing patterns, complex supply chains, and clinical workflows have exacerbated this challenge.[6] Empowering health care providers to prevent incidents proactively in an automated fashion is crucial to address these issues, and AI can and will play a significant role. Randomized audits, which most health care organizations rely on, focus on only a small subset of transactions. Alternatively, manual retrospective checks involve hundreds of pages of reports and time-consuming cross-referencing with an electronic medical record (EMR).[7] Often, the manual retrospective approach leads to the discovery of incidents long after the occurrence, resulting in significant monetary losses and regulatory liability. Massachusetts General Hospital, for instance, was fined $2.3 million after it was found that 20,000 medication inventory records were missing or incomplete and 16,000 oxycodone pills had been stolen.[8]

Through the use of AI, unsupervised learning allows for the analysis of structure and relationships between input features. Using this approach rather than predicting an output, AI improves the detection of emergent diseases, unknown effects of medication, and previously unknown drug diversion patterns. AI can also analyze data and identify suspicious trends by connecting with pharmacy automation, pharmacy information systems, and EMRs. AI is capable of processing substantial amounts of data quickly, including pain scales, notes, and reports, which support the

detection of potential patterns within days or weeks rather than months or years. AI can also alert health care providers if a nurse dispenses 2 oxycodone tablets but administers only 1 to the patient, as recorded in the EMR. If a nurse is discarding medication at a rate 3 times higher than colleagues per month, this can be flagged and the situation can be quickly and accurately investigated. Without AI, the drug diversion occurrence might not be identified and the evidence base may be less substantial during the investigation; with AI, the process by which outlier employees are identified is accelerated.

Notably, a statement from the American Society of Health-System Pharmacists (ASHP) expressed caution in using AI, explaining that a pharmacist should validate any clinical AI platform in health systems connected to medication use or monitoring before implementation. Additionally, ASHP recommends establishing ongoing contextual accuracy and interpretability evaluations from a pharmacist. When new methods and approaches are used, establishing the best practices for clinical validation and bias reduction remains crucial for optimization. Before using AI-enabled technology, pharmacists should create and uphold clinical validation criteria for AI at local and national levels, describing types of proof needed for safety and efficacy.[9]

There are few advanced vendors in controlled substance AI at this point. The KLAS *Drug Diversion Monitoring 2022* report noted that 1 AI developer, Protenus, is progressing quickly in the health care diversion compliance analytics surveillance space.[10] Pharmacists will likely see more from other vendors soon, with systems that can provide metrics and data visualizations and produce written, simple-to-understand descriptions to assist users in interpreting why specific metrics appear suspicious.[10] For example, if a user were to take an extended period to transition from dispensing to administering a product compared with peers, it would still be considered adequate if the time were within acceptable parameters. However, the tool's machine learning feature may detect a provider with a different usage pattern. AI then provides users simple statistics, such as standard deviations and mean and median values in their peer group, enabling real-time identification of policy violations and topics of particular concern regarding diversion and data quality issues.[11]

AI utilization is growing throughout retail and health care. Applications include inventory management, customer service, prescription verification, shelf monitoring, fraud detection, personalized marketing, and predictive analytics. AI capabilities continue to increase as faster, cheaper computer processing power is developed. AI is an emerging, superior method for detecting diversion compared with manual reviews, and its exceptional efficiency, quick execution, and streamlined workflow make it an unparalleled tool for improving drug handling. ■

REFERENCES

1. Orgel D. Artificial intelligence at retail. Drug Store News. July 6, 2023. Accessed July 11, 2023. https://drugstorenews.com/artificial-intelligence-retail

2. Drug diversion. CDC. Updated November 26, 2019. Accessed July 8, 2023. https://www.cdc.gov/injectionsafety/drugdiversion/index.html

3. Warner AE, Schaefer MK, Patel PR, et al. Outbreak of hepatitis C virus infection associated with narcotics diversion by an hepatitis C virus-infected surgical technician. *Am J Infect Control*. 2015;43(1):53-58. doi:10.1016/j.ajic.2014.09.012

4. Njuguna HN, Stinson D, Montgomery P, et al. Hepatitis C virus potentially transmitted by opioid drug diversion from a nurse - Washington, August 2017-March 2018. *MMWR Morb Mortal Wkly Rep*. 2019;68(16):374-376. doi:10.15585/mmwr.mm6816a3

5. Schuppener LM, Pop-Vicas AE, Brooks EG, et al. *Serratia marcescens* bacteremia: nosocomial cluster following narcotic diversion. *Infect Control Hosp Epidemiol*. 2017;38(9):1027-1031. doi:10.1017/ice.2017.137

6. Clark J, Fera T, Fortier C, et al. ASHP guidelines on preventing diversion of controlled substances. *Am J Health Syst Pharm*. 2022;79(24):2279-2306. doi:10.1093/ajhp/zxac246

7. Knight T, May B, Tyson D, McAuley S, Letzkus P, Enright SM. Detecting drug diversion in health-system data using machine learning and advanced analytics. *Am J Health Syst Pharm*. 2022;79(16):1345-1354. doi:10.1093/ajhp/zxac035

8. MGH to pay $2.3 million to resolve drug diversion allegations. News release. US Attorney's Office, District of Massachusetts. September 28, 2015. Accessed July 8, 2023. https://www.justice.gov/usao-ma/pr/mgh-pay-23-million-resolve-drug-diversion-allegations

9. Schutz N, Olsen CA, McLaughlin AJ, et al. ASHP statement on the use of artificial intelligence in pharmacy. *Am J Health Syst Pharm*. 2020;77(23):2015-2018. doi:10.1093/ajhp/zxaa249

10. Tate J, Hickenlooper J. Drug diversion monitoring 2022: what outcomes are provider organizations achieving? KLAS Research. June 21, 2022. Accessed July 12, 2023. https://klasresearch.com/report/drug-diversion-monitoring-2022-what-outcomes-are-provider-organizations-achieving/1930

11. Protenus is top-performing solution in KLAS Drug Diversion Monitoring 2022 report. News release. Protenus. June 24, 2022. Accessed July 8, 2023. https://www.globenewswire.com/news-release/2022/06/24/2468851/0/en/Protenus-is-Top-Performing-Solution-in-KLAS-Drug-Diversion-Monitoring-2022-Report.html