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Middlesex Health Case Study

Reducing Waste and Ensuring Accountability: A Case Study with Simplist and RxAuditor Analytics

Case Study Results

85%

Reduction in overall Hydromorphone waste events*

55%

Reduction in overall Fentanyl waste events*

410

Nursing hours saved annualized*

The Challenges

- Identifying and investigating potential drug diversion incidents
- Inefficient clinician workflows related to dispensing and wasting controlled substances

The Solution

- More closely match clinical practice for commonly used opioid medications
- Utilize AI diversion software to identify potential drug diversion events through pattern recognition

The Impact

- Decreased hydromorphone and fentanyl waste by 85% and 55%, respectively, resulting in fewer opportunities for diversion
- Reduced the time nurses spend counting and wasting controlled substances
- Reduce the time required for pharmacy staff to investigate discrepancies and potential diversion events

**Data provided by Bluesight on behalf of Middlesex Health and analyzed by Fresenius Kabi's Simplist Support Team.*

Dilaudid® (HYDROmorphone HCl) Injection, USP

WARNING: ADDICTION, ABUSE, AND MISUSE; LIFE-THREATENING RESPIRATORY DEPRESSION; NEONATAL OPIOID WITHDRAWAL SYNDROME; and RISKS FROM CONCOMITANT USE WITH BENZODIAZEPINES OR OTHER CNS DEPRESSANTS

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Please see full Important Safety Information, including Boxed Warning, on pages 6–7. Also available at www.simplist-us.com.

Introduction

Middlesex Health, a Mayo Clinic Care Network member, is a fully connected, comprehensive network of expert health care providers in Middletown, Connecticut, serving Middlesex County and the Connecticut state shoreline. At the heart of this network is **Middlesex Hospital**, with 275 licensed beds, which provides inpatient medical, surgical, and emergency services, as well as vital outpatient care, including diagnostic, rehabilitation, behavioral health, disease management, radiology, laboratory, cancer care, home care, wound and ostomy care, surgical services, urgent care, and an extensive network of primary care practices.

Through its suite of medication intelligence solutions, **Bluesight** enables healthcare organizations to proactively identify drug diversion in automated dispensing systems with pinpoint precision and control. RxAuditor Analytics, **recently acquired by Bluesight**, is a web-enabled drug auditing system that provides customers with the ability to proactively measure, monitor, and manage key automated dispensing system metrics in real-time. Powered by AI and a machine-learning engine, RxAuditor Analytics eliminates the need to search reports manually. The platform autonomously investigates diversion cases, which in turn brings back valuable work hours to critical responsibilities, such as delivering the highest level of patient care possible. This technology will become part of ControlCheck in the near future due to the recent acquisition.

Fresenius Kabi USA is a global, integrated pharmaceutical company dedicated to bringing lifesaving medications and solutions to clinicians. For more than 100 years, the company has been a leader in providing high-quality, affordable medications for chronically and critically ill patients. Fresenius Kabi produces **Simplist**, a single unit dose prefilled syringe platform. Designed for efficient medication delivery and ease of use, Simplist may help reduce waste potential and eliminates steps where errors can occur.[1,2]

The Challenge

> *"In every organization, drug diversion is a potential threat to patient safety. Risks to patients include inadequate pain relief and exposure to infectious diseases from contaminated needles and drugs, compounded by impaired performance. Furthermore, diversion may cause undue suffering to patients who don't receive analgesic relief, can be costly to an organization by damaging its reputation, and may lead to major civil and criminal monetary penalties."*
>
> Drug Diversion and Impaired Health Care Workers: April 2019[3]

In response to the opioid crisis, hospitals across the country are taking a more strategic approach to opioid stewardship. Doing so better ensures the safe and effective use of opioid drugs—not only reducing potential patient safety issues but also potential opportunities for drug diversion.

While pain management remains an important part of treating patients, the use of narcotics presents a number of operational challenges. Research studies indicate that roughly 10 percent of American healthcare workers abuse controlled substances, a number that matches the abuse rate within the general population.[4] Several high-profile cases of drug diversion at U.S. hospitals have resulted in costs adding up to millions of dollars. As a result, an increasing number of hospitals

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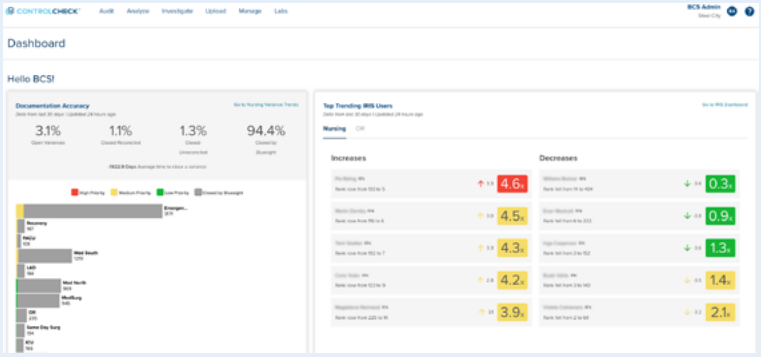
are now implementing narcotic diversion platforms, leveraging the power of analytics, to identify potential diversion patterns in the ordering, dispensing, and wasting of narcotics within the institution. The goal is simple: to ensure that controlled substances are being used appropriately—and, equally as important, quickly identify potential diversion events.

Programs like the Bluesight's RxAuditor Analytics diversion analytics suite solution scours narcotic use records to quickly identify drug diversion through pattern recognition based on actual diversion event data, reducing the need for pharmacy staff and nursing supervisors to manually search reports. The platform also includes key data and insights about the volume of narcotic waste—a data point that is often a risk factor for drug diversion.



Bluesight's Analytics dashboard.

> *"One of the biggest challenges we face is reconciliation of opioid waste. We work hard to make sure that we're checking all the boxes and investing in high impact projects that can help support our opioid stewardship. But we were spending a lot of time looking for discrepancies in waste reporting that could be better spent elsewhere."*
>
> Jason Zybert – Director of Pharmacy at Middlesex Hospital

Zybert also noted that controlled substance waste at Middlesex Hospital required significant nursing hours. Two nurses are required to be present to document any waste—but, even so, it's well known that such wasting events can increase opportunities for diversion.[3]

The Solution

As noted in the *ASHP Guidelines on Preventing Diversion of Controlled Substances, August 2022*,[5] "Policies and procedures should define how waste will be accounted for, tracked, and disposed of to prevent unauthorized access. To minimize waste, when possible, controlled substances are [recommended to be] stocked in ready-to-use form and in the lowest commercially available units for doses frequently prescribed for patients."

Middlesex Hospital already had Bluesight's RxAuditor Analytics diversion analytics suite in place when they decided to add Simplist ready-to-administer syringes from Fresenius Kabi in smaller narcotic presentations that closely match product size to their clinical practice and, consequently, reduce waste. In 2018, Middlesex Hospital introduced Dilaudid® (HYDROmorphone HCl) Injection, USP 0.5 mg per 0.5 mL Simplist syringes. When Simplist Fentanyl Citrate Injection, USP 50 mcg per 1 mL was released in 2021, Middlesex Hospital also switched to these syringes to support their efforts to curtail narcotic waste.

"We wanted to implement solutions that could help us better match our clinical practice while also helping to reduce waste, reduce nursing time, and reducing our overall diversion risk," said Zybert.

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The Results

After implementing the new Simplist ready-to-administer syringes, in concert with their existing Bluesight's RxAuditor Analytics diversion analytics suite solution, Middlesex Hospital was able to reduce narcotic waste across the facility, as well as make key system-wide opioid stewardship performance improvements.

Adding ready-to-administer syringe products that more closely aligned with clinical practice reduced hydromorphone and fentanyl waste by 85% and 55%, respectively. Utilizing the financial framework as demonstrated in *A Continuous Observation Workflow Time Study to Access Intravenous Push Waste (2020)*,[2] this reduction represents an estimated $46,309.88 in annual narcotic wasting cost.

"Having the product sizes that better matched our clinical practice helped us reduce waste and make a big impact throughout our stewardship program," said Zybert.

WASTE DATA OBSERVED: PRODUCT OPTIMIZATION OPPORTUNITIES

Hydromorphone Before	
Days Observed	183
Wastes Per Day	56.15
Waste Events	**10,276**

Hydromorphone After	
Days Observed	153
Wastes Per Day	8.3
Waste Events	**1,271**

Fentanyl Before	
Days Observed	364
Wastes Per Day	9.53
Waste Events	**3,470**

Fentanyl After	
Days Observed	358
Wastes Per Day	4.3
Waste Events	**1,538**

In addition to reduction in waste, the change resulted in significant time savings and improved workflows for nursing and pharmacy staff. Using the same Hertig 2020 framework, which conservatively doesn't account for waste witness time or pharmacy time, this waste reduction represents 410 hours' worth of nursing time saved.

"Our nurses like the product because it's ready to use. They don't have to draw from a vial to administer the medication. They can just pull it out of the packaging and have the medication ready. And, my opinion is when you can reduce waste, you decrease the risk of diversion," Zybert said. **"On the pharmacy side, we see benefits in the tamper-evident packaging, especially when diversion is suspected. It makes it much clearer whether something has happened with an individual product or something else may be going on."**

Overall, by focusing on maximizing opioid stewardship through reviewing data and reducing waste, Middlesex Hospital was able to improve their operations and reduce the time nursing and pharmacy spent documenting and handling it.

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Important Safety Information

Simplist Dilaudid® (HYDROmorphone HCl) Injection, USP

INDICATIONS AND USAGE

DILAUDID INJECTION is indicated for the management of pain severe enough to require an opioid analgesic and for which alternate treatments are inadequate.

Limitations of Use: Because of the risks of addiction, abuse, and misuse with opioids, even at recommended doses, reserve DILAUDID INJECTION for use in patients for whom alternative treatment options [e.g., non-opioid analgesics or opioid combination products]:

- Have not been tolerated, are not expected to be tolerated
- Have not provided adequate analgesia, or are not expected to provide adequate analgesia

IMPORTANT SAFETY INFORMATION

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See full prescribing information for complete boxed warning.

- **DILAUDID INJECTION exposes users to risks of addiction, abuse, and misuse, which can lead to overdose and death. Assess patient's risk before prescribing and monitor regularly for these behaviors and conditions.**
- **Serious, life-threatening, or fatal respiratory depression may occur. Monitor closely, especially upon initiation or following a dose increase.**
- **Prolonged use of DILAUDID INJECTION during pregnancy can result in neonatal opioid withdrawal syndrome, which may be life-threatening if not recognized and treated. If prolonged opioid use is required in a pregnant woman, advise the patient of the risk of neonatal opioid withdrawal syndrome and ensure that appropriate treatment will be available.**
- **Concomitant use of opioids with benzodiazepines or other central nervous system (CNS) depressants, including alcohol, may result in profound sedation, respiratory depression, coma, and death. Reserve concomitant prescribing for use in patients for whom alternative treatment options are inadequate; limit dosages and durations to the minimum required; and follow patients for signs and symptoms of respiratory depression and sedation.**

DILAUDID INJECTION is contraindicated in patients with:

- Significant respiratory depression.
- Acute or severe bronchial asthma in an unmonitored setting or in absence of resuscitative equipment.
- Known or suspected gastrointestinal obstruction, including paralytic ileus.
- Known hypersensitivity to hydromorphone, hydromorphone salts, sulfite-containing medications, or any other components of the product.

Life-Threatening Respiratory Depression in Patients with Chronic Pulmonary Disease or in Elderly, Cachectic, or Debilitated Patients: Monitor closely, particularly during initiation and titration.

Adrenal Insufficiency: If diagnosed, treat with physiologic replacement of corticosteroids, and wean patient off of the opioid.

Severe Hypotension: Monitor during dosage initiation and titration. Avoid use of DILAUDID INJECTION in patients with circulatory shock.

Risks of Use in Patients with Increased Intracranial Pressure, Brain Tumors, Head Injury, or Impaired Consciousness: Monitor for sedation and respiratory depression. Avoid use of DILAUDID INJECTION in patients with impaired consciousness or coma.

DILAUDID INJECTION contains sodium metabisulfite. There is a risk of anaphylactic symptoms and life-threatening asthmatic episodes in susceptible people.

Most common adverse reactions are lightheadedness, dizziness, sedation, nausea, vomiting, sweating, flushing, dysphoria, euphoria, dry mouth, and pruritus.

To report SUSPECTED ADVERSE REACTIONS, contact Fresenius Kabi USA, LLC at 1-800-551-7176 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

Serotenergic Drugs: Concomitant use may result in serotonin syndrome. Discontinue DILAUDID INJECTION if serotonin syndrome is suspected.

Monoamine Oxidase Inhibitors (MAOIs): Can potentiate the effects of hydromorphone. Avoid concomitant use in patients receiving MAOIs or within 14 days of stopping treatment with an MAOI.

Mixed Agonist/Antagonist and Partial Agonist Opioid Analgesics: Avoid use with DILAUDID INJECTION because they may reduce analgesic effect of DILAUDID INJECTION or precipitate withdrawal symptoms.

Pregnancy: May cause fetal harm.

Overdosage: Acute overdose with DILAUDID INJECTION can be manifested by respiratory depression, somnolence progressing to stupor or coma, skeletal muscle flaccidity, cold and clammy skin, constricted pupils, and, in some cases, pulmonary edema, bradycardia, hypotension, partial or complete airway obstruction, atypical snoring, and death. Marked mydriasis, rather than miosis, may be seen with hypoxia in overdose situations.

This Important Safety Information does not include all the information needed to use DILAUDID safely and effectively. Please see accompanying full prescribing information, including Boxed Warning, for DILAUDID INJECTION. Also available at www.simplist-us.com.

Simplist Fentanyl Citrate Injection, USP

INDICATIONS AND USAGE

Fentanyl Citrate Injection, for intravenous or intramuscular use, is indicated for:

- Analgesic action of short duration during the anesthetic periods, premedication, induction and maintenance and in the immediate postoperative period (recovery room) as the need arises.
- Use as an opioid analgesic supplement in general or regional anesthesia.
- Administration with a neuroleptic as an anesthetic premedication, for the induction of anesthesia and as an adjunct in the maintenance of general and regional anesthesia.
- Use as an anesthetic agent with oxygen in selected high risk patients, such as those undergoing open heart surgery or certain complicated neurological or orthopedic procedures.

Fentanyl Citrate Injection should be administered only by persons specifically trained in the use of intravenous anesthetics and management of the respiratory effects of potent opioids. Ensure that an opioid antagonist, resuscitative and intubation equipment, and oxygen are readily available.

IMPORTANT SAFETY INFORMATION

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See full prescribing information for complete boxed warning.

- **Fentanyl Citrate Injection exposes users to risks of addiction, abuse, and misuse, which can lead to overdose and death. Assess patient's risk before prescribing and monitor regularly for these behaviors and conditions**
- **Serious, life-threatening, or fatal respiratory depression may occur. Monitor closely, especially upon initiation or following a dose increase.**
- **Concomitant use with CYP3A4 inhibitors (or discontinuation of CYP3A4 inducers) can result in a fatal overdose of fentanyl.**
- **Concomitant use of opioids with benzodiazepines or other central nervous system (CNS) depressants, including alcohol, may result in profound sedation, respiratory depression, coma, and death. Reserve concomitant prescribing for use in patients for whom alternative treatment options are inadequate; limit dosages and durations to the minimum required; and follow patients for signs and symptoms of respiratory depression and sedation.**

Fentanyl Citrate Injection is contraindicated in patients with a hypersensitivity to fentanyl.

Risks of Skeletal Muscle Rigidity and Skeletal Muscle Movement: Manage with neuromuscular blocking agent. See full prescribing information for more detail on managing these risks.

Severe Cardiovascular Depression: Monitor during dosage initiation and titration.

Serotonin Syndrome: Potentially life-threatening condition could result from concomitant serotonergic drug administration. Discontinue Fentanyl Citrate Injection if serotonin syndrome is suspected.

Adrenal Insufficiency: If diagnosed, treat with physiologic replacement of corticosteroids, and wean patient off of the opioid.

Risks of Use in Patients with Increased Intracranial Pressure, Brain Tumors, or Head Injury: Monitor for sedation and respiratory depression.

The most common serious adverse reactions were respiratory depression, apnea, rigidity, and bradycardia.

To report SUSPECTED ADVERSE REACTIONS, contact Fresenius Kabi USA, LLC, at 1-800-551-7176 option 5 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

Concomitant Use of CNS Depressants: May decrease pulmonary arterial pressure and may cause hypotension. See full prescribing information for management instructions. For post-operative pain, start with the lowest effective dosage and monitor for potentiation of CNS depressant effects.

Mixed Agonist/Antagonist and Partial Agonist Opioid Analgesics: Avoid use with Fentanyl Citrate Injection because they may reduce the analgesic effect of Fentanyl Citrate Injection or precipitate withdrawal symptoms.

Pregnancy: May cause fetal harm.

Lactation: Infants exposed to Fentanyl Citrate Injection through breast milk should be monitored for excess sedation and respiratory depression.

Geriatric Patients: Titrate slowly and monitor for CNS and respiratory depression.

This Important Safety Information does not include all the information needed to use Fentanyl Citrate Injection, safely and effectively. Please see accompanying full prescribing information, including Boxed Warning, for Fentanyl Citrate Injection. Also available at www.simplist-us.com.

Contact us

To learn how narcotic waste is impacting your hospital, contact your Sales Representative or call Customer Service at 1.888.386.1300

www.simplist-us.com

References: 1.Fanikos J, Burger M, Canada T. An assessment of currently available i.v. push medication delivery systems. *Am J Health Syst Pharm.* 2017;74(9):e230-e235. 2. Hertig J, Jarrell K, Arora P, et al. A continuous observation workflow time study to assess intravenous push waste. Hosp Pharm. 2021;56(5):584-591. 3. The Joint Commission. "Quick Safety." Apr. 2019. https://www.jointcommission.org/-/media/tjc/newsletters/quick_safety_drug_diversion_final2pdf.pdf. 4. Tom Knight, Bernie May, Don Tyson, Scott McAuley, Pam Letzkus, Sharon Murphy Enright, Detecting drug diversion in health-system data using machine learning and advanced analytics, *American Journal of Health-System Pharmacy,* Volume 79, Issue 16, 15 August 2022, Pages 1345–1354, https://doi.org/10.1093/ajhp/zxac035 5. American Society of Health-System Pharmacists. ASHP Guidelines on Preventing Diversion of Controlled Substances. *Am J Health-Syst Pharm.* 2022;79:2279-2306, doi: https://doi.org/10.1093/ajhp/zxac246.

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Three Corporate Drive
Lake Zurich, IL 60047
1.888.386.1300
www.fresenius-kabi.com/us

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