

The Data Science Behind Drug Diversion Detection

with Bluesight for Controlled Substances

Within the hospital setting, tracking controlled substances has traditionally been a piecemeal process, usually involving either spot-checks of collected transactional data or, more frequently, reliance on partial data extracted from automated dispensing cabinets.

Current methods of pattern detection have moved beyond this type of laborious, manual process, assigning most of the effort of examining large databases to machine learning algorithms and then applying pattern recognition analysis to surface outliers.

Bluesight for Controlled Substances goes one step further by using prescriptive analytics to recommend one or more courses of action, showing the likely outcome of each decision.

Calculating Overall Risks

Bluesight CS offers a proprietary risk score calculation to help identify clinicians whose behavior differs from that of their peers in substantial ways, without requiring users to dig through separate metrics and dashboards.

The **Individual Risk Identification Score (IRIS)** is a weighted assessment of the degree of difference across all metrics that Bluesight CS tracks, leveraging industry-leading data science techniques and calculations.

- An IRIS ranking does not imply diversion; just difference in behavior patterns compared to peer groups.
- A higher IRIS ranking indicates a greater degree of difference in an individual's behavior compared to that of their peers.

- An individual may exhibit greater degrees of difference because they have a higher or lower comparative pattern on any specific metric. Bluesight CS can flag those individuals who are different because of a **lower** rate of activity—something that's entirely missing from traditional standard deviation analysis.
- IRIS rankings adjust to reflect the most current data in the system and evolving patterns.

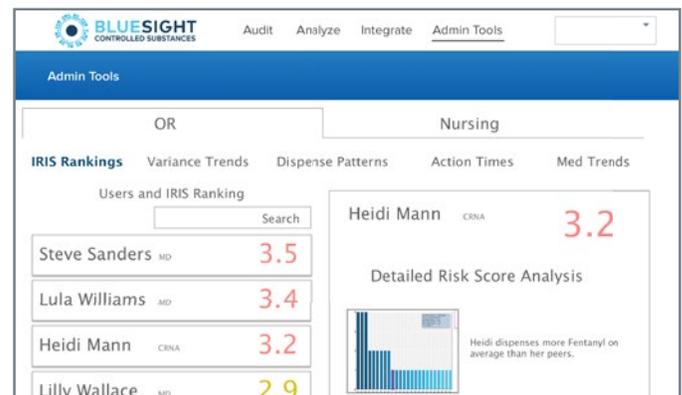


Fig. 1 Bluesight for Controlled Substances utilizes a weighted assessment score (IRIS) to highlight clinician outlier behavior

FOCUSING EFFORTS WITH PRIORITY ASSESSMENTS

Unlike traditional standard deviation analysis or rank order based on net counts or averages, Bluesight CS presents a relative priority level within specific dashboards.

“ There's a lot of excitement right now about how artificial intelligence (AI) is going to change health care.”

Kalis, B. ; Collier, M. and Fu, R. (2018, May 10), Harvard Business Review. Retrieved from hbr.org

This level is assigned based on a **proprietary outlier priority assessment** which incorporates information about both the variance rate and the total variance counts.

- Higher percentages of higher overall metric counts will be ranked higher in the order.
- A high variance rate (even 100%) in a **low volume** area may rank below a lower variance rate in a **higher volume** area depending on the relative outlier priority assessment.

CAPTURING MOVEMENT AND VARIABILITY

To understand unexpected or nonstandard movement and activity patterns, Bluesight CS aggregates data across fifteen separate vectors in a **local outlier factor algorithm**.

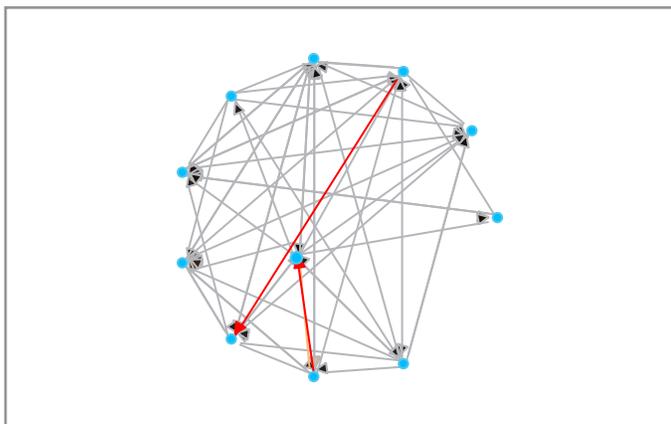


Fig. 2 Peer group analysis being used to monitor waste buddies

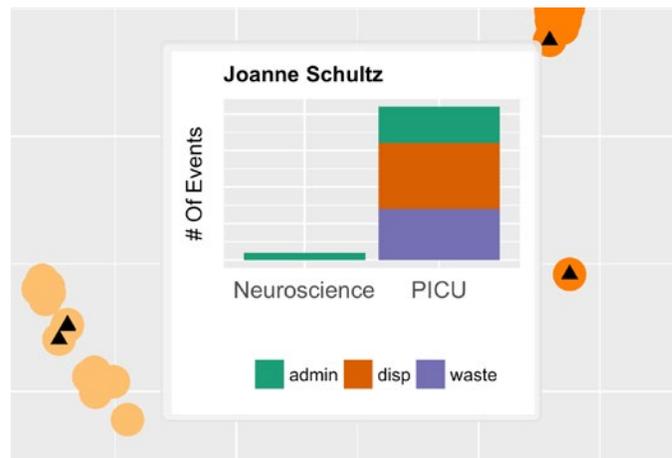


Fig. 3 Example of Bluesight CS activity tracker

High-density clusters form when users who are primarily active in one location (e.g., department) all act in a very similar fashion.

An individual tightly aligned with the cluster exhibits behavior and patterns very similar to the rest of clinicians in that location. Those separate from the cluster may still primarily work in that department but exhibit other behavior patterns that indicate connections to other locations. Outliers are identified based on the degree of difference in behavior patterns compared to all other clinicians in the same area.

ADDITIONAL ANALYTICS COMPONENTS

All of the Bluesight CS dashboards and analytics tools enable the user to:

- Interact with analytics in real time—no more waiting until the end of the month to find a pattern.
- Drill down into specific data points, like waste witness relationships and time elapsed between transaction events.
- See where activity happens, not just what or when.
- Understand differences within peer groups based on the specific group's patterns.
- Note relationships between individuals exhibiting anomalous behavior.