

Overdose Risk Score

The NarxCare application delivers several elements of discrete data and a visually enhanced, interactive PDMP report. Contained on the report, and delivered as discrete data, is an Overdose Risk Score (ORS). This score numerically represents the risk of unintentional overdose death.

The ORS has the following characteristics:

1. The score is three digits and ranges from 000–999.
2. Risk approximately doubles for every 100-point increase in the score.
3. Using patients who score 0–199 as a reference group, the odds ratio associated with successive 100-point bins is as follows:

ORS	Odds Ratio of Unintentional Overdose Death
000–199	1
200–299	10

ORS	Odds Ratio of Unintentional Overdose Death
300–399	12
400–499	25
500–599	44
600–699	85
700–799	141
800–899	194
900–999	329

ORS Algorithm

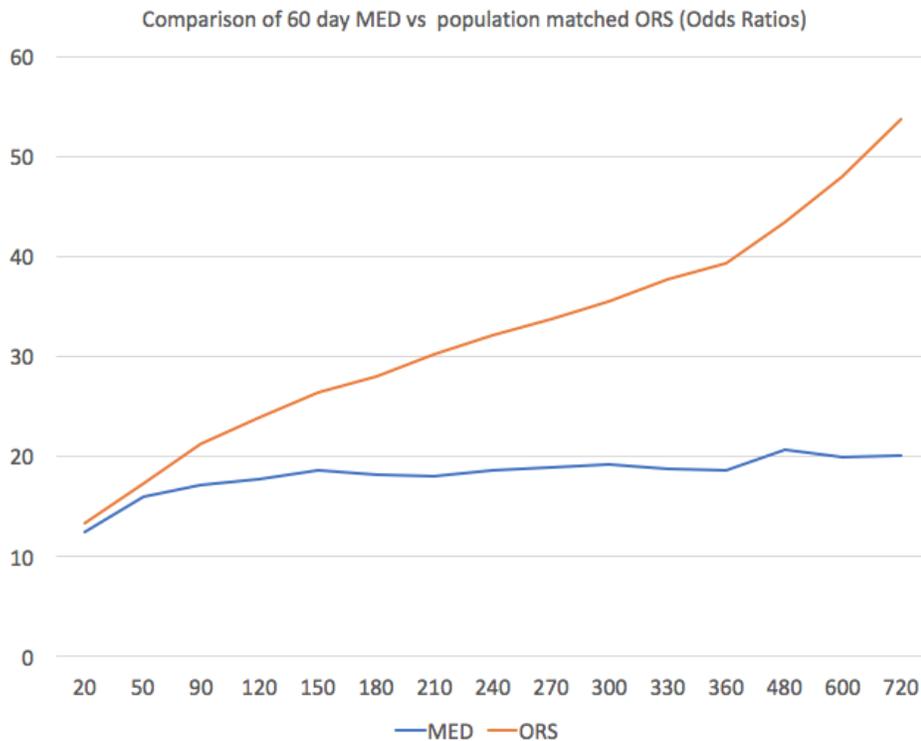
The ORS algorithm was derived using machine learning and other predictive techniques applied to a large case series of over 5,000 unintentional overdose deaths. For the first version of the score, more than 70 PDMP variables were evaluated with 12 chosen for the final model. Subsequent revisions of the model have included evaluation of thousands of variables, and efforts to include non-PDMP data such as criminal justice information, claims data, overdose registry data, etc., are ongoing. A specific characterization of the current variables and coefficients is beyond the scope of this document. In general, the variables that have shown to be predictive of unintentional overdose death include:

- The number of pharmacies visited per unit time
- Maximum morphine milligram equivalency (MME) in the last year
- The number of prescribers in the last two years
- Various slopes of opioid and sedative use
- Various slopes of prescriber usage

This section will be updated when new types of variables are incorporated and/or new sets of data are included.

Clinical Application

The ORS is intended to eventually provide a holistic estimate of overdose risk. At the current time, the risk assessment does not incorporate any data other than PDMP usage. This aligns the clinical application of the score with other sources of overdose risk assessment based on PDMP data such as number of pharmacies visited in the last 90 days or daily morphine equivalent dose (MED). The ORS performs much better than estimates using only one variable. For example, when comparing the utility of average MED in the last 60 days to the ORS, one can easily see that while MED does have a dose response curve, the ORS has markedly higher performance.



The absolute risk of death from unintentional overdose is very low in the population of patients found in a PDMP. Even though the annual unintentional overdose death rate is unacceptably high, measured in the thousands for many states, the number of people using controlled substances in those same states are in the multiple millions. Patients on elevated doses of medication are also prevalent and have a low overall incidence of unintentional overdose death. For example, in evaluating average daily MED over a period of 60 days in one state, the following death rates were found:

60-day MED avg	Decedents	Living	Death Rate
90 MED	1,008	162,231	0.6%
150 MED	722	94,681	0.8%
480 MED	144	13,693	1.0%

The results of this analysis equate the CDC-recommended maximum 90 MED for chronic opioid use to an expected death rate of just 0.6%. It isn't until you get to an average MED of 480 that

the death rate reaches 1%, and at that level, there are over 13,000 patients in the PDMP database.

One method of incorporating the ORS into clinical practice is to use a value of 650 as a threshold approximately equivalent to the CDC's recommended maximum of 90 MED. Just as patients who are above 90 MED are often evaluated for dose reduction, patients above a score of 650 may similarly be considered for:

1. Substance Use Disorder evaluation and treatment (if appropriate)
2. Discontinuation of potentiating drugs (if present)
3. Dose reduction
4. Provider lock-in
5. Pharmacy lock-in
6. Consideration of non-opioid therapy

Score-Based Guidance

The ORS can be applied to clinical practice in a manner analogous to daily MED. The CDC opioid prescribing guidelines recommend naloxone be considered at 50 MED and that most patients should be treated at a dose of 90 MED or less. Using an equivalent population methodology, the following ORS ranges can be associated with CDC MED-based guidance.

Score	Approximate CDC MED Equivalent	Guidance
< 010–440	< 50 MED	Consider other sources of risk beyond PDMP data. See below
450–650	50 MED (or more)	Consider naloxone prescription. See below.

Score	Approximate CDC MED Equivalent	Guidance
> 650	90 MED (or more)	<p>Consider naloxone prescription.</p> <p>Review use patterns for unsafe conditions.</p> <p>If multiple providers involved in unsafe prescribing, discuss concern with patient and consider contacting other providers directly.</p> <p>If multiple pharmacies involved in unsafe prescribing, discuss concern with patient and consider pharmacy lock-in program.</p> <p>If overlapping medications of same or different type, discuss concern with patient and consider taper to lower dose and/or discontinuation of potentiating medications.</p> <p>If patient has evidence of a substance use disorder, consider inpatient admit or referral for outpatient evaluation and treatment.</p>