

# Assessing Opioid Dosage Using Electronic Health Records' Prescription Data

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## Background

Many patients with chronic pain rely on long-term opioid therapy, which can lead to dose-dependent harms, including opioid addiction or overdose death. Tracking opioid dose from electronic health record (EHR) data is often challenging, with variability across health systems. Standardized approach to quantify daily morphine milligram equivalent (MME) dose could help health systems and clinicians better monitor opioid prescribing, improving chronic pain care and patient safety.

### Study Objectives

To develop reliable methods for assessing daily MME using the EHR data, we conducted a study to

- Review existing MME computation strategies.
- Propose standardized methods to estimate the total daily dose of prescribed opioids on the health system level.

### Study Significance

- To identify challenges and issues related to MME computation, and
- To introduce conceptual and analytical components designed to increase reliability of the estimated morphine equivalent daily dose (MEDD) of prescribed opioids using the EHR data.

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## Method

### Study Setting and Population

The study population included adult patients (≥18 years old) who had visits at primary care (family medicine, internal medicine) clinics in a large midwestern academic center. To be included in the study, individuals must have met the following criteria:

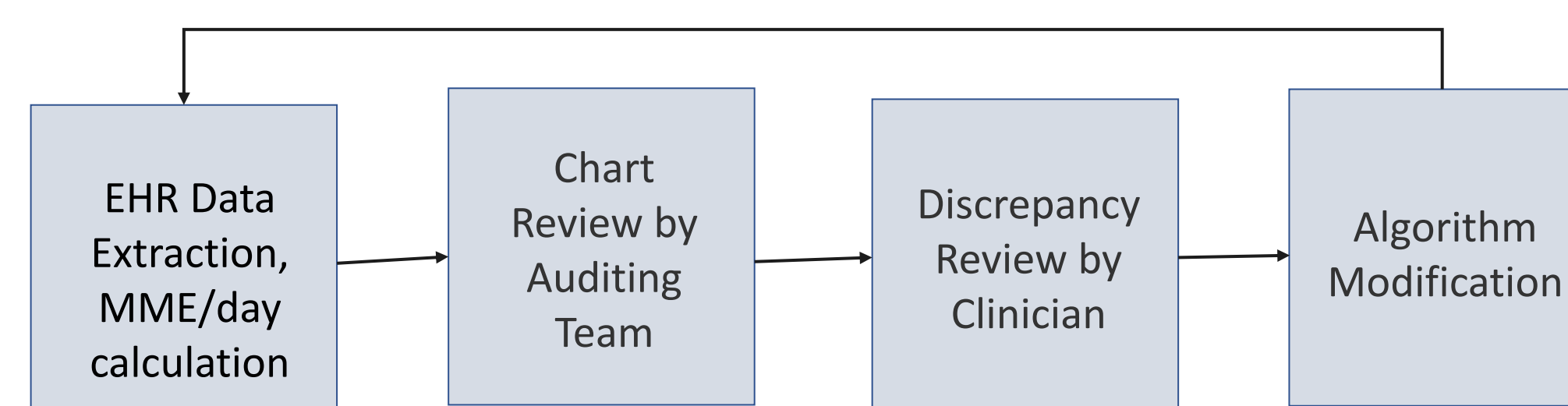
- Prescribed long-term (at least 3 months) outpatient opioids by clinicians at the primary care clinics in Jan 2018- Dec 2019;
- No cancer diagnoses (except non-melanoma skin cancer) or palliative/hospice care status;

### Data Source and Computation

Opioid medication data were extracted from an enterprise EHR system (Epic System, Verona, WI). Algorithms were developed by the expert team to estimate the total MME in the past 90 days and calculate MEDD per target patient.

### Chart Review Analysis

MEDD and quality metrics extracted from EHRs were further cross-examined and validated:



- An expert team, including a physician, pharmacologist, health services researchers and health system audit team.
- EHR's database, containing 1,824 records of different opioid medication types, available for prescription, were reviewed to determine their suitability for outpatient prescribing for pain care, and their conversion ratios.

## Results

Table 1. MME conversion factors

Selected examples of common opioid medications	Unit	MME Conversion Factors
Buprenorphine patch (applied to skin)	mcg/hr	12.6
Buprenorphine tablet or film (oral)	mg	30
Butorphanol nasal solution	mg	7
Codeine	mg	0.15
Dihydrocodeine	mg	0.25
Fentanyl tablets, lozenges (oral)	mcg	0.13
Fentanyl patch (applied to skin)	mcg/hr	7.2
Hydrocodone	mg	1
Hydromorphone	mg	4
Methadone (1-20; 21-40; 41-60; >60)	mg	4; 8; 10; 12
Morphine	mg	1
Opium	mg	1
Oxycodone	mg	1.5
Oxymorphone	mg	3
Tapentadol	mg	0.4
Tramadol	mg	0.1

- 3,022 target patients were identified; 65 were randomly selected for a 'manual audit.'
- More than 87,883 outpatient opioid Rx orders were extracted. Conversion factors, confirmed by the study team, are in Table 1.
- A number of challenges were noted in the MEDD calculation; different approaches to MEDD calculation yielded different results:

**Real Word Scenario:** J.S. was prescribed long-term two opioids: a) morphine ER 30 mg BID (disp#60) and b) hydrocodone 5 mg tabs (disp#60) to take 1 tab q4 hours PRN.

- Approach 1:** The auditing team determined the morphine dose to be 60 mg/day. The estimation of hydrocodone's MEDD was more challenging (PRN sig; lack of the Rx end dates). The team manually reviewed the EHR (progress notes; Rx data), noting that the prescribing clinician's intention, consistent with the current Rx, was for hydrocodone to last 30 days. The calculated MEDD was 70 mg/day [60 mg morphine/day + (hydrocodone 60 tabs x 5 mg x 1 conversion factor) / 30 days = 70].

## Results

- Approach 2:** The automated formula calculated the MEDD using the signature field of the active Rx. It tended to either under- or over-estimate the MEDD, particularly for the PRN medications. The calculated MEDD was 90 mg/day [60 mg morphine/day + (5 mg hydrocodone x 1 conversion factor x 6 times/day) = 90] exceeding by 20 mg/day the audit team's 'manual' estimate and placing this patient in the high-dose opioid category (per CDC prescribing guidelines).
- Approach 3:** The team developed algorithm calculated MEDD by adding the MED of all opioids prescribed over the 90-day period, using the 'dispense' quantity, not signature, then dividing the total MED by 90. The MEDD computed was 72 mg/day. Subsequent 'manual' audit rendered this MEDD accurate: the patient received 3 sets of Rx for usual morphine + hydrocodone (70 mg/day MEDD), and also received an extra Rx during the 90-day assessment period for 30 tabs of 5 mg hydrocodone.

## Discussion

- Manual MEDD estimation is time/effort consuming and can be error-prone if accounting only for the current prescriptions.
- Computing MEDD using the EHR data is complex; health systems and clinicians should verify the quality of MEDD calculation methods to ensure their accuracy.
- Automated computing algorithms based on the quantify of opioids prescribed over 90 days, rather than the signature of active Rx, can reliably estimate MEDD from EHR data. This method can effectively use the EHR data for monitoring of opioid prescribing, and improving care quality and patient safety.