

## Supplementary Online Content

Liebschutz JM, Xuan Z, Shanahan CW, et al. Improving Adherence to Long-term Opioid Therapy Guidelines to Reduce Opioid Misuse in Primary Care: A Cluster-Randomized Clinical Trial. *JAMA Intern Med*. Published online June 26, 2017. doi:10.1001/jamainternmed.2017.2468

**eAppendix A.** Expanded definitions of key variables

**eAppendix B.** Details of intervention and nurse care manager responsibilities

**eAppendix C.** Specific opioids

This supplementary material has been provided by the authors to give readers additional information about their work.

## **Appendix A: Expanded definitions of key variables**

**Early Refill Calculation:** We calculated the refill date accounting for the duration of a prescription based on the directions and number of pills dispensed, assuming that the patient had taken the pills at the maximum prescribed rate. We examined the charts of 20 random cases of refills within 7 days of the initial prescription and determined that they were all reprints or administrative corrections to the prior prescription. Thus, we excluded refills within 7 days of an initial prescription.

**Discontinuation:** The absence of an opioid prescription in the final 60 days of the intervention period.

**MEDD determination:** We determined the MEDD by converting the prescribed opioids into morphine equivalent doses using a standard conversion tool.<sup>48</sup> We assumed the patient took the maximum dose per day that was prescribed unless number of days or length of prescription were specified in the instructions (e.g. “this is a 28 day supply”). We examined the mean MEDD for the 30 days prior to the intervention start date and days 331-360 (12<sup>th</sup> 30-day period) of the post-intervention period.

## **Appendix B: Details of intervention and nurse-care manager responsibilities**

**NCM Prescribing responsibilities:** At three sites, after reviewing the MA prescription monitoring program and urine drug test results, the LPNs and RNs prepared prescriptions for the PCPs to sign. If there were abnormalities in any monitoring, the LPN and RNs brought the abnormalities to the attention of the PCP prior to preparing a prescription, in order to make any changes to the prescription or monitoring plans. At the fourth site, the PCPs prepared and printed the prescriptions themselves. The RN at this site reviewed the same monitoring data as that reviewed by the nurses at the other three sites, and provided the data to the PCP at the time the prescription was due.

**Urine Drug Toxicology:** The electronic registry had an algorithm to determine urine drug toxicology screening intervals, based on the risk profile entered by the NCM. Low-risk patients or those who had not yet had a risk assessment were scheduled for UDT twice per year. Moderate-risk patients had UDT four times per year, and high-risk patients had UDT with every opioid prescription. In general, the NCMs used the registry to identify when the UDT was due, and was responsible for collecting it. Either the PCP or the NCM could initiate random or scheduled UDTs. The NCM responsibilities included using the registry to determine when a UDT was needed. When the UDT was due, The NCM asked the patient to provide the urine sample before receiving the prescription. If a PCP requested a random UDT, the NCM could help contact the patient and collect the urine.

There was no specific protocol regarding evaluation of UDTs. The NCMs looked for unexpected results (e.g. prescribed opioid was absent or a non-prescribed substance was present) when preparing opioid prescriptions. In addition, the NCMs assisted PCPs in interpretation of UDT results. The response to unexpected UDT results was jointly formulated between the NCM and PCP, but ultimately was the responsibility of the PCP.

**Electronic Tools:** We developed the publicly available website [www.mytopcare.org](http://www.mytopcare.org) based on consensus from multiple primary care and opioid prescribing clinicians. The material was drawn from guidelines, published literature and expert opinion when published data was not available. Information on the website is divided into three categories; for prescribers, pharmacists and patients, with most attention to the prescriber portion. The website organizes the prescriber tools according to four stages of opioid prescribing: before starting opioids, starting opioids, continuing opioids, and discontinuing opioids. The material includes validated information (when available), sample language for communication with patients about opioids, and interactive tools. For example, the study team developed an interactive tool for interpretation of urine drug

testing to determine when the findings are as expected or suspicious for opioid misuse or diversion.

### **Appendix C: Specific Opioids**

The opioids used in this trial included:

#### **Opioids**

Codeine Y/N

Fentanyl transdermal (Duragesic); Fentanyl Oralet (oral lozenge); Fentanyl Actiq (lozenge on a stick) Y/N

Hydromorphone (Dilaudid) Y/N

Meperidine (Demerol) Y/N

Methadone (Dolophine) Y/N

Morphine Sulfate (Sustained release tablets MS Contin; Sustained release capsules Avinza, Kadian) Y/N

Oxycodone (Sustained release tablets OxyContin) Y/N

Propoxyphene (Darvon Pulvules) Y/N

Oxymorphone (Opana) Y/N

#### **Oral Analgesic Combinations**

Codeine/acetaminophen (Tylenol-Codeine #3) Y/N

Codeine/aspirin (Empirin) Y/N

Hydrocodone/acetaminophen (Norco, Vicodin, Lortab) Y/N

Hydrocodone/ibuprofen (Vicoprofen) Y/N

Oxycodone/acetaminophen (Percocet, Roxicet, Tylox) Y/N

Oxycodone/aspirin (Percodan) Y/N

Propoxyphene/aspirin Y/N

Propoxyphene/acetaminophen (Darvocet) Y/N

Of note, prescriptions for codeine-containing cough medication (e.g. guaifenesin with codeine) were excluded from all analyses.