

Antihypertensive medication use in pregnancy: A pilot OHDSI network analysis in electronic health record data

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Background

Pregnant people are systematically excluded from most trials and studies despite often having great need for effective therapies. Approximately 85,000 pregnancies each year in the U.S. are complicated by chronic hypertension, which is a driver of adverse birth outcomes and disparities. An urgent need exists to identify which medication therapies maximize benefits and safety for pregnant people. Distributed data network studies using observational electronic health record and administrative claims data have the potential to answer such comparative effectiveness research questions that cannot feasibly be addressed by randomized controlled trials (Suchard et al., 2019). In this study, we build on prior work that developed accurate, scalable methods to identify obstetric cohorts in OHDSI OMOP EHR data (Callahan et al., 2022) to conduct a pilot study of antihypertensive medication use in pregnancy across three medical systems.

Methods

The methods employed in this pilot study were developed and evaluated using data from Stanford Health Care / Stanford Medicine Children's Health (2015-2022), and subsequently implemented at Columbia University Irving Medical Center (2020-2022) and MaineHealth (2012-2022). These sites were selected because they represent patient populations that are diverse in race, ethnicity, payer status, and rural/urban residence, and institutions that vary in acuity of care, patient volume, geography, and history of OHDSI participation (MaineHealth having recently joined OHDSI). All available complete years of data were included. We used methods previously developed by our team to extract obstetric data from electronic health records. We used diagnosis codes to identify end-of-pregnancy events and structured fields from flowsheets to capture details of fetal presentation and multifetal gestation. We also used natural language processing with regular expressions to extract gestational age, parity, fetal presentation, and multifetal gestation from patient notes. In the resulting patient cohorts, we identified prescriptions of antihypertensive medications during pregnancy based on end-of-pregnancy dates and gestational duration, with antihypertensive medications identified in prior work (Bateman et al., 2015).

Results

Identification of a pregnancy cohort was successful at all three institutions. Further, standardized methods identified the number of pregnant patients prescribed antihypertensive medications (Table 1). The findings show both consistency and variation in the medications used. The most common medications used at each institution were labetalol and nifedipine, which was similarly found in a recent multi-site clinical study on chronic hypertension in pregnancy (Tita et al., 2022). In addition, the absolute numbers of patients prescribed any antihypertensive medication align with the expected values based on annual delivery volume at each hospital and the prevalence of hypertension in pregnancy (Leonard et al., 2023).

Table 1. Any and most common antihypertensive medications prescribed in pregnancy at 3 medical systems, using EHR data in the OHDSI OMOP common data model

| Stanford | | Columbia | | MaineHealth | |
|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|
| Medication | Number of patients | Medication | Number of patients | Medication | Number of patients |
| Any anti-hypertensive | 2711 | Any anti-hypertensive | 6797 | Any anti-hypertensive | 7101 |
| Labetalol | 1041 | Labetalol | 1907 | Nifedipine | 402 |
| Nifedipine | 775 | Nifedipine | 1605 | Labetalol | 323 |
| Metoprolol | 308 | Metoprolol | 581 | Metoprolol | 87 |
| Propranolol | 65 | Amlodipine | 376 | Esmolol | 26 |
| Amlodipine | 57 | HCTZ | 235 | Lisinopril | 22 |

Conclusion

We demonstrated the ability to identify pregnancy cohorts across multiple OHDSI sites, including a newer site, and ascertain prescription of specific antihypertensive medications in these cohorts using electronic health record data in the OHDSI OMOP common data model. This pilot study lays the foundation for a future OHDSI network study to compare the effectiveness of antihypertensive medications in pregnancy as well as to conduct additional comparative effectiveness studies in obstetric cohorts.

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