Urine drug screening on labor and delivery

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BACKGROUND: Substance use including opioids, methamphetamines, benzodiazepines, and barbiturates during pregnancy is harmful for the pregnant person and the fetus. Routine screening using validated questionnaires is recommended, but often biologic sampling is done instead. There is often bias in urine drug screening on labor and delivery units.

OBJECTIVE: This study aimed to compare characteristics of people who did and did not receive urine drug screening during labor and delivery and to examine the relationship of maternal results to neonatal results.

STUDY DESIGN: This was a retrospective chart review examining all people in 2017 who delivered in the labor and delivery unit at our institution. We collected urine drug screening result information, maternal demographic data, follow-up after positive maternal tests, and neonatal test results. Individual characteristics and obstetrical outcomes were analyzed.

RESULTS: Of 6265 deliveries, 297 urine drug screening tests were ordered. People who were tested identified most commonly as Native Hawaiian or Pacific Islander ($P<.0001$). The most common indications for ordering tests were a history of substance use and insufficient prenatal care ($P<.0001$). People who tested positive were more likely to self-identify as White ($P=.03$) and have history of substance use ($P<.0001$). Among the positive test results, 24 (24%) were caused by a provider−ordered medication. Self-identification as Native Hawaiian or Pacific Islander was not predictive of a positive result. Of the tested people, 36% (108/297) had a positive result on preliminary testing, and 33% (98/295) on confirmatory testing.

CONCLUSION: Native Hawaiians and Pacific Islanders were more likely to undergo testing, whereas White people were more likely to have a positive result. Maternal results were not reliable for predicting neonatal drug test results and vice versa. With rising rates of substance use disorders in the pregnant and reproductive-age population, standardized unbiased race-neutral guidelines for urine drug screening should be implemented using laboratory test results that include preliminary and reflex confirmatory results.

Keywords: biologic screening, indigenous population, neonatal screening, policy, poor, pregnancy, provider bias, racism, substance use, toxicology

Substance use in reproductive-age people has increased significantly in the past decade.[1] Opioid use disorder affects up to 2% of pregnancies, and up to 20% of pregnancy-associated deaths have been attributed to opioid overdose.[1] According to one study, 4.7% of pregnant people report using an illicit substance, defined as marijuana, cocaine, heroin, hallucinogens, inhalants, methamphetamine, or misuse of prescription psychotherapeutics in the previous month.[2] Substance use during pregnancy can cause serious consequences to the health of both the pregnant person and neonate. For the pregnant person, substance use may result in death from overdose, high blood pressure, heart attack or failure, stroke, seizures, or coma.[2,3] For the fetus and neonate, maternal substance use can result in miscarriage, placental abruption, preterm birth, low birthweight, brain injury, birth defects, developmental delay, neonatal abstinence syndrome, stillbirth, and neonatal death.[2]

Because of the potential harms of substance use during pregnancy and the opportunity for intervention, routine screening for alcohol and other substances should be done for everyone during their antepartum, peripartum, and postpartum course. The American College of Obstetricians and Gynecologists recommends universal screening for substance use regardless of age, sex, race, ethnicity, or socioeconomic status.[4] Screening should be done using validated questionnaires such as the 4P's or 4P's Plus because of their high sensitivity and negative predictive value, which are superior to biologic sampling.[5,6] Biologic sampling carries a high rate of false-positives, provides only a small percentage of new diagnoses, does not exclude specific substance use, does not routinely test for the most commonly used substance (tobacco, caffeine, and alcohol), and is not systematically linked with support and treatment.[2] Biologic sampling is neither mandatory nor necessary to identify those who use drugs or have substance use disorders in pregnancy.[3,4]

At the time of data collection, there were no hospital guidelines for urine drug screening, and consequently there were no guidelines on follow-up for a positive result. Urine drug screening (UDS) tests were ordered on the basis of clinical judgment by healthcare providers. When patients are tested according to provider discretion, they may be disproportionately screened on the basis of their demographics. Therefore, we aimed to evaluate the screening practices of providers at our institution to determine if provider bias in ordering UDS tests is present in our population in the labor and delivery unit and evaluate relationships associated with positive screening tests.

Materials and Methods

We conducted a retrospective chart review of all people who delivered at our institution in the labor and delivery unit between January 1, 2017 through

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AJOG MFM at a Glance

Why was this study conducted?

This study was conducted to determine if there was provider bias in ordering urine drug screening tests on our labor and delivery unit.

Key findings

Native Hawaiian and Pacific Islander people were tested the most; however, this was not predictive of a positive result. Less than half of people tested had a positive result. Positive tests were associated with self-identifying as White and having a history of substance use.

What does this add to what is known?

Without a urine drug screening policy, toxicology screening on labor and delivery is subject to implicit bias, which leads to disparities in testing. Indigenous populations are disproportionately screened, although they do not have a higher rate of positive results.

December 31, 2017. With the help of the Health Information Management department, we pulled information directly from the electronic health records for all people who received a UDS test in 2017 and for all people who delivered in 2017. Among those who received a UDS test, we manually confirmed the results, collected additional and missing data through chart review, and coded the information into a final spreadsheet. The data collection team consisted of obstetrics and gynecology residents and medical students, all of whom were trained in data collection by the primary researcher. Data discrepancies were resolved by the primary researcher and the principal investigator.

Demographic data included age, race/ethnicity, county of origin, housing situation, type of insurance, route of delivery, body mass index, parity, hypertensive disease, late or insufficient prenatal care, incarceration during pregnancy, history of substance use, and gestational age at delivery. Testing information included reason for UDS test if documented, verbal consent if documented, positive results after a provider-administered medication, maternal preliminary and confirmatory results, and neonatal preliminary and confirmatory results. Preliminary results refer to rapid preliminary tests that are performed first to detect broad drug categories (eg, amphetamines or opiates). Such preliminary tests may be positive because of prescribed medications or foods and do not indicate illicit substance use. Confirmatory results refer to reflex confirmation tests that are performed for positive preliminary results. Final results of confirmatory tests take longer to receive but are more specific and accurate for detecting illicit use.[4] Because of differences in provider knowledge about specific orders in our electronic medical system, all but 2 people had UDS tests ordered with reflex confirmatory testing. Neonates were tested for substances via UDS tests, meconium tests, or both.

Follow-up information included presence of neonatal abstinence syndrome, low birthweight, social work or child welfare service (CWS) involvement, and referral for treatment. Presence of neonatal abstinence syndrome was determined on the basis of the International Classification of Diseases, Ninth Revision, as reported in our electronic medical records. Options available for substance use treatment included resources within the Hawaii Department of Health Coordinated Access Resource Entry System such as outpatient, inpatient, and residential treatment programs. Examples of outpatient treatment programs offered by community health centers include the Waikiki Health PATH Clinic and the Waianae Coast Comprehensive Health Center.[7] This study was approved by our institutional review board.

We determined maternal race/ethnicity by self-report in our electronic health records; the first identifier listed in the record was abstracted as the primary race/ethnicity. We specifically collected these data because previous studies have demonstrated that people of color are disproportionately affected by UDS test ordering and results.[8] We determined housing situation by self-reported or provider-reported housing instability in our electronic health records. We determined reason for ordering UDS tests and if verbal consent was documented by reviewing all history and physical and progress notes for the specific encounter. We reviewed all medications given before a positive confirmatory result to determine if a provider ordered any medications that might have inadvertently resulted in a positive UDS test.

Late or insufficient prenatal care was defined as care provided to anyone who initially presented for prenatal care at ≥20 weeks of gestation. Preterm delivery was defined as any delivery at <37 weeks of gestation. Low birthweight was defined as any weight <2500 g. Referral for treatment was defined as referral to any substance treatment program other than tobacco cessation.

Categorical variables were analyzed using the Pearson chi-square or Fisher exact tests, as appropriate. Continuous variables were analyzed using the Student *t* test or analysis of variance, as appropriate. Nominal logistic regression models were used to assess the relationship between people who received a UDS test and those who did not. Univariate analysis was performed for all other data analyses. Significance level was set at P=.05. Data were analyzed using JMP Pro 16.1.0 (JMP Statistical Discovery LLC, Cary, NC).

Results

Between January 1, 2017 and December 31, 2017, among 6265 births, 281 UDS tests were ordered for 297 (5%) pregnant people who presented to labor and delivery. People who were tested were significantly younger than those who were untested (27 vs 29 years; P<.001). Tested people were more likely to self-identify as Native Hawaiian or Pacific Islander and have a history of substance

TABLE 1
Characteristics of people with and without urine drug screening tests

Characteristic	People with UDS N=281	People without UDS N=5984	*P* value[a]
Age (y)	27.4 (6.4)	29.6 (6.1)	<.0001
Native Hawaiian/Pacific Islander	173 (58)	1750 (30)	<.0001
Multiparity	189 (67.3)	3612 (60.4)	.06
History of substance use	147 (52.3)	308 (5.2)	<.0001
Insufficient prenatal care	4 (1.4)	4 (0.1)	<.0001
Housing instability	30 (10.7)	28 (0.5)	<.0001
CHTN	3 (1.1)	21 (0.4)	.12
Prisoner	1 (0.4)	0	<.0001

Data are mean (standard deviation) or number (percentage) unless otherwise specified.

CHTN, chronic hypertension; *UDS*, urine drug screening.

[a]*P* values calculated with the Pearson chi-square test, Fisher exact test, or analysis of variance, as appropriate.

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use, insufficient prenatal care, or housing instability compared with people who were not tested (Pearson chi-square and Fisher exact tests; *P*<.0001) (Table 1). Among those tested, there was a higher rate of adverse obstetrical outcomes, including preterm delivery, low birthweight, neonatal abstinence syndrome, gestational hypertension, and preeclampsia compared with those who were not tested (Pearson chi-square and Fisher exact tests; *P*<.0001) (Table 2). Significantly more tested people received a social work consultation (85% vs 20%; *P*<.001).

The indications for ordering maternal UDS tests are shown in Table 3. The most common reason for ordering a UDS test was for a reported history of substance use (n=147, 52%). Confirmatory testing results were positive in 52 (35%) of such cases. The second most common reason for ordering a UDS test was insufficient prenatal care (n=47, 16%), with confirmatory results positive in 13 (28%) of such cases. Reason for ordering UDS test was not documented in 91 (31%) of UDS tests ordered. Among all UDS tests ordered, 104 (35%) had verbal consent documented.

Among those tested, factors predictive of a positive result included self-identifying as White or experiencing housing instability, and having a history of substance use (*P*<.0001). These factors are shown in Table 4. Other variables such as insufficient prenatal care and identifying as Native Hawaiian or Pacific Islander were not predictive of a positive result, despite these being common reasons for ordering UDS tests. People with a positive result were more likely to experience preterm delivery, low birthweight, and cesarean delivery (Pearson chi-square; *P*<.05) (Table 5).

Preliminary results were positive in 108 (38%) of people, and confirmatory results were positive in 98 (35%) of people. The most common substance identified in the UDS test was methamphetamine (n=46, 47%) followed by amphetamine (n=45, 46%) and 11-nor-9-carboxy-THC (n=27, 28%). In 24 (24%) of confirmatory positive tests, medications ordered by the provider caused the positive result, including morphine, alprazolam, butalbital, oxycodone, buprenorphine, and hydromorphone. Confirmatory results were negative in 6 (6%) of all positive maternal UDS tests, all of which preliminarily resulted as benzodiazepine. However, 2 (2%) of the positive preliminary results were not sent for confirmatory testing because automatic reflexing to such testing requires a specific order in our hospital system. These tests preliminarily resulted positive for amphetamine and barbiturate.

After a positive maternal UDS test, 97 (90%) of people received a social work consultation, 76 (70%) were referred to CWS, and 64 (59%) were referred to substance treatment. However, 33 (11%) people were already in a substance treatment program.

Neonatal screening was ordered according to provider discretion. All neonatal screening was reflexed to confirmatory testing. Out of all neonatal

TABLE 2
Obstetrical outcomes of people with and without urine drug screening tests

Obstetrical outcome	People with UDS N=281	People without UDS N=5984	*P* value[a]
Preterm delivery	47 (16.7)	306 (5.1)	<.0001
Low birthweight	74 (26.3)	761 (12.7)	<.0001
Neonatal abstinence syndrome	5 (1.8)	4 (0.1)	<.0001
Gestational hypertension	80 (28.5)	962 (16.1)	<.0001
Preeclampsia	44 (15.7)	361 (6)	<.0001
Delivery route			
Vaginal delivery	203 (72.2)	4458 (74.5)	.03
Cesarean delivery	75 (26.7)	1518 (25.4)	.03
Social work consult	240 (85.4)	1180 (19.7)	<.001

Data are number (percentage) unless otherwise specified.

UDS, urine drug screening.

[a]*P* values calculated with the Pearson chi-square test, Fisher exact test, or analysis of variance, as appropriate.

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TABLE 3
Reason for ordering urine drug screening tests and confirmatory positive result

Reason for ordering	N (%) N=281	Confirmatory positive result N (%)[a]
History of substance use	147 (52.3)	52 (35)
Not documented	91 (32.4)	30 (33)
Insufficient prenatal care	47 (16.7)	13 (28)
Unexplained elevated blood pressure	7 (2.5)	1 (14)
Housing instability	2 (1)	1 (50)
Other	2 (1)	1 (50)
Behavior/signs of intoxication	1 (<1)	1 (100)

[a]Percentage is out of those tested for that particular reason.

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TABLE 4
Predictors of positive urine drug screening result

Characteristic	Chi-square	*P* value[a]
Housing instability	19.41	<.001
History of substance use	262.25	<.001
History of tobacco use	12.63	<.001
Insufficient prenatal care	0.18	.67

[a]Nominal regression analysis was performed to determine which factors predicted a positive urine drug screening result. Race and ethnicity were not included in the nominal regression model because of several small subpopulation groups with 0 frequencies.

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TABLE 5
Urine drug screening result by demographic and obstetrical outcome

Demographic/obstetrical outcome	UDS positive	UDS negative	*P* value[a]
White	21 (22.3)	20 (10.7)	.03
History of substance use	52 (55.3)	95 (50.8)	<.0001
Preterm delivery	22 (23.4)	25 (13.4)	.04
Low birthweight	34 (36.2)	40 (21.4)	.01
Neonatal abstinence syndrome	3 (3.2)	2 (1.1)	.22
Gestational hypertension	29 (30.9)	51 (27.3)	.53
Preeclampsia	16 (17)	28 (15)	.66
Delivery route			
Vaginal delivery	58 (61.7)	145 (77.5)	.02
Cesarean delivery	34 (36.2)	41 (21.9)	.02

Data are number (percentage) unless otherwise specified.

UDS, urine drug screening.

[a]*P* values calculated with the Pearson chi-square test, Fisher exact test, or analysis of variance, as appropriate.

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UDS confirmatory positive results, 39 (70%) were positive and 10 (18%) were negative, with 7 (13%) having an insufficient sample for confirmatory testing, most of which were preliminarily positive for cannabinoids.

Out of all neonatal meconium confirmatory positive results, 40 (83%) were positive and 3 (6%) were negative, with 5 (10%) having an insufficient sample for confirmatory testing. Out of 201 maternal results with a corresponding neonatal result, the positive predictive value of maternal to neonatal result was 77%, and the negative predictive value of neonatal to maternal result was 5%.

Discussion

Principal findings

Our study shows that the maternal UDS test ordered on labor and delivery has a low positive predictive value for detecting substance use. Most pregnant people who received UDS tests identified as Native Hawaiian or Pacific Islander, and had a history of substance use, insufficient prenatal care, or housing instability. Identifying as Native Hawaiian or Pacific Islander and having insufficient prenatal care were not predictive of a positive test result, whereas identifying as White had a higher association with a positive UDS result. Over half of tested people were referred to a substance treatment program. We found poor association between maternal and neonatal results and vice versa.

Results

Although history of substance use and insufficient, late, or no prenatal care are often considered as reasons to order a UDS test, multiple studies have shown that this approach discriminates against non-White people on public insurance because of lack of access to early prenatal care.[8] Consequences of a positive UDS result are heightened for pregnant and postpartum people, particularly among people of color. Black people are 1.5 times more likely to be tested than non-Black people, and Black people who test positive are 10 times more likely to be reported to CWS.[8] This is especially problematic given the possibility of false-positive results,

particularly if confirmatory testing is not universally used. Most of the UDS tests ordered for non-White persons in our study returned negative on confirmatory testing.

Many UDS tests were ordered without a documented reason for ordering or verbal consent. This highlights the importance of obtaining verbal or written consent, unless performed in emergency situations. The Substance Abuse and Mental Health Services Administration recommends written consent when performing UDS tests on pregnant people because of the severe consequences of a positive result.[9] Consent should include reason for testing, clear explanation of confidentiality, types of drugs being tested, and potential consequences of a positive test. A significant number of people had a positive UDS test as a result of a medication ordered by their provider, which was confirmed by reviewing each inpatient medication record.

Six percent of preliminary positive maternal results were found to be negative on confirmatory testing. All neonatal testing, including UDS tests and meconium drug screening, were systematically reflexed to confirmatory testing. This highlights the importance of confirmatory testing on maternal samples to minimize the social stigmatization of having a positive UDS result. One of the major concerns of maternal opioid use during pregnancy is the development of neonatal abstinence syndrome; however, we found a low rate among all mothers who received UDS tests, which was also true among mothers who did not receive UDS tests. This was reflective of the low rate of opioid use in our population.

Clinical implications

Validated questionnaires are superior to UDS tests for identifying substance use in pregnancy.[5,6] A negative UDS result does not preclude use because some substances, such as the most common and harmful substances, tobacco and alcohol, are not detected on all assays. People with substance use disorder can strategically time visits to provide negative samples to prevent reports to CWS, whereas those with a positive UDS result often are not referred for appropriate treatment. Positive biologic test results may particularly harm families when an individual is stigmatized and labeled as a "drug user."[4] There are 23 states plus the District of Columbia that define substance use during pregnancy as child abuse, which, along with knowledge of potential CWS involvement, may ultimately decrease adherence to prenatal care because of fear of these ramifications.[10,11] There are at least 2 states, Alabama and Tennessee, that have passed laws criminalizing people who use drugs during pregnancy, regardless of knowledge, gestational age, or intent of pregnancy.[8] An example is Tennessee's Fetal Assault Law that was passed in 2014, which for the first time allowed prosecution of pregnant people for their pregnancy outcomes. Under this law, people could be prosecuted if their child was born addicted or harmed by illegal use of narcotics during the pregnancy. Fortunately, the Tennessee General Assembly observed that people avoided prenatal care because of fear of legal ramifications due to this law; therefore, this was allowed to sunset in 2016.[12,13]

Our results demonstrate that ordering UDS tests according to clinician discretion leads to disproportionately higher screening in stigmatized groups, which can perpetuate interpersonal and institutional racism. This higher screening can also further health disparities by delaying care. It is recognized that the use of illicit substances, particularly stimulants, is contraindicated while breastfeeding. However, confirmatory results often do not result until after discharge or after maternal care has already been altered by preliminary results. The neonatal benefits of breast milk may not be received, and bonding may be reduced on the basis of false-positive preliminary results. Postpartum persons who do require treatment for substance use may be shamed, prohibited, or discouraged from providing breast milk to their infants, including starting the process of pumping and dumping while seeking treatment. Positive UDS results for methamphetamine can also affect maternal care for hypertension in pregnancy. Some practitioners have incorrectly insisted that active methamphetamine is a contraindication to prescribing the commonly used beta-blocker labetalol. However, according to a systematic review in 2015, for methamphetamine-related tachycardia and hypertension that does not respond to sedation, labetalol is actually the preferred treatment because of its beta- and alpha-blocking ability and the added advantage of being lipophilic, thus penetrating the blood–brain barrier and decreasing agitation.[14,15] Thus, maternity patients with severe hypertension and a false-positive preliminary UDS test showing methamphetamine may have appropriate treatment withheld in their care.

The current UDS test performed at our institution does not test for alcohol, tobacco, or synthetic and semisynthetic opioids, which may be more prevalent in the community and more harmful to pregnancy. Thus, our current UDS test may not be helpful for both pediatricians and obstetricians because of the limited substances tested and the short interval during which common substances are detectable in the urine (eg, 48–72 hours for methamphetamine and cocaine).

Education about the limitations and consequences of UDS testing, appropriate care pathways, and safe medications to treat maternal symptoms would be beneficial for all labor and delivery staff and peripartum healthcare providers. In addition, the incorporation of validated questionnaires as standard practice into electronic health record templates would be beneficial to ensure proper utilization.

Research implications

These findings were presented to our institution, and an evidence-based UDS testing policy was implemented as a result. Future research is needed to determine if this policy has decreased biased screening, improved the positive predictive value of the test, and improved care of our pregnant patients. Other institutions with UDS testing policies also need to examine the effects and changes to patient care that have

resulted after implementation of these policies.

Strengths and limitations

The strengths of our study include a unique, underrepresented, indigenous population that differs from contiguous US cohorts, and comparison with neonatal biologic samples. Limitations of our study include being conducted at a single institution, which limits our generalizability, and ascertainment bias owing to the retrospective nature of our data collection. For example, some of our data points, such as reason for ordering UDS tests, were not documented regularly and thus may have been a confounder when we analyzed these results. However, despite these limitations, similar biases against minority racial/ethnic groups to those reported in the contiguous United States were observed in our population of indigenous people.

Conclusions

When used on labor and delivery, UDS tests have a poor positive predictive value for identifying substance use. Traditional indications for ordering UDS tests, such as insufficient prenatal care, do not reliably predict substance use and may perpetuate racial and social discrimination. More research is needed to elucidate medical indications for UDS tests that are not stigmatizing and are associated with improved perinatal outcomes. ■

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