Clinical and laboratory observations

Effectiveness of a targeted screening program in identifying infants with positive urine toxicology screening results in a regular neonatal nursery

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We compared the effectiveness in identifying infants with positive results on urine screening for drugs of abuse of a universal screening program and a targeted screening program on the basis of clinical suspicion. A carefully run targeted screening program identified 24.3% of the admissions for toxicology testing and would have found all but two of the infants with positive results. (J PEDIATR 1993;123:137-9)

Identification of infants exposed prenatally to drugs of abuse is important for the following reasons: (1) there is an increased incidence of perinatal morbidity and death[1-5]; (2) long-term neurodevelopmental problems have been identified in these infants, indicating the need for early intervention[6, 7]; (3) their mothers may benefit from enrollment in substance abuse programs; and (4) these infants are at increased risk for abuse or neglect and need to be identified to the various social service agencies available. However, in urban institutions, where many women receive little prenatal care or care from outside sources, identification of infants exposed prenatally to drugs of abuse remains a difficult problem. Frequently the only maternal and pregnancy history available is that obtained at the time of delivery. We have tried to deal with the problem of identification of drug-exposed infants by using a targeted screening program based on clinical suspicion. Because we were concerned that infants exposed prenatally to drugs were not being identified, a policy of universal drug screening of all infants was instituted in our regular neonatal nursery. During the first 5 months of the universal screening program, a prospective study was undertaken to assess the effectiveness of the targeted screening program, which was conducted concurrently.

Presented in part at a meeting of the Ambulatory Pediatric Association, Baltimore, Md., May 4-7, 1992.

Submitted for publication Oct. 16, 1992; accepted March 8, 1993.

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0022-3476/93/$1.00 + .10 **9/24/46933**

METHODS

This study was carried out at the University of Chicago Hospitals and Clinics from June 1 through Oct. 31, 1991. All infants admitted to the regular neonatal nursery from either the delivery or the birthing room were enrolled. The study was approved by the university's institutional review board.

For universal screening, a bagged urine sample was obtained from all infants during the first 24 hours of life for analysis by the hospital laboratory. All infants were examined by attending pediatricians and pediatric residents in the nursery.

While the program of universal screening was in effect, the physicians in the nursery were instructed to continue the targeted screening program that had been in use for the past several years. The indications for screening under this program are listed in the Table. The physicians were asked to select infants who met any of the criteria during the admission history and physical examination. The names of the

Table. Criteria for inclusion of newborn infants in targeted screening of urine for drugs of abuse

1. Infants of mothers who admit to drug abuse during pregnancy or who have had positive results on a urine toxicology screen at any time during pregnancy
2. Infants with signs or symptoms of neonatal abstinence syndrome
3. Infants of mothers who have previously delivered a child with positive results on a neonatal urine toxicology screen
4. Infants whose mothers show physical signs of drug abuse
5. Infants whose mothers demonstrate inappropriate behavior
6. Infants with evidence of intrauterine growth retardation (<10th percentile for gestational age)
7. Infants with identified renal, cardiac, or neurologic congenital anomalies
8. Infants of mothers who did not receive prenatal care

infants and the reason for screening were recorded in a logbook separate from the medical record. The physicians in the nursery were aware that all infants would be screened regardless of the decision to include them in the targeted screening log. However, the targeted infants were identified before we obtained urine samples or the results of the toxicology screening.

Urine samples were sent to the in-house laboratories of the University of Chicago for screening. The tests performed included screening, by enzyme-mediated immunoassay techniques, for the presence of amphetamines, barbiturates, benzodiazepines, cocaine metabolites, opiates, phencyclidine, and ethanol.

The values reported are the actual numbers or are expressed as percentages.

RESULTS

During the 5-month study period, 1150 infants were admitted directly to the regular nursery from either the delivery or the birthing room. Of the 1150 study infants, no urine sample was obtained from 137. The reasons recorded in the chart for failure to obtain an adequate specimen were transfer to the intensive care nursery within hours of admission (14 infants), stay of less than 24 hours (22), contaminated specimen (4), and parental refusal (1). No reason was charted for 96 infants.

Urine for universal toxicology screening was obtained from the remaining 1013 study infants. Of these, 949 had negative results, and drugs of abuse were found in 64. The following drugs were identified: cocaine metabolites (57 infants), opiates (2), phencyclidine (2), barbiturates (3), amphetamines (1), and ethanol (2). Three urine samples contained two drugs of abuse.

During the study, 269 infants, representing 23.4% of the admissions, met the established criteria for targeted screening. Of the infants who ultimately had positive test results, 62 were included in the list of infants to be screened. Two infants with positive results would not have been screened in the targeted program. One was found to have cocaine metabolites in the urine, and phencyclidine was found in the other's urine.

DISCUSSION

Identification of infants exposed to drugs of abuse prenatally is a major problem facing the health care system. It is especially difficult in institutions in which, because many of the mothers have received either no prenatal care or prenatal care at outside clinics, the initial contact is established at the time of delivery. The results of this study demonstrate that 6.3% of the infants screened, or 5.6% of all admissions, had positive results on urine toxicology screening during the first 24 hours of life. The targeted screening program used before the initiation of universal screening in our nursery was apparently effective in identifying infants with positive results; 97% with positive results would have been detected by the targeted screening program. A retrospective review of the maternal and infant charts for the two infants with positive results missed by targeted screening confirmed that none of the inclusion criteria were met in either case.

There was no evidence that physicians' knowledge that a universal screening program was in effect influenced their behavior with regard to enrolling infants in the targeted screening program. During the 15 months preceding the institution of universal screening, when only the targeted screening program was in effect, 697 screens were ordered (approximately 20% of admissions, an average of 46.5 screens per month); 136 of these screens (19.5%) showed that drugs of abuse were present.

This study was designed to determine whether universal screening of neonatal urine improved the detection of prenatal drug exposure compared with a targeted screening program in a population in which a large percentage of women receive prenatal care at outside clinics. The number of infants with positive results (5.6%) is an underestimate of the true incidence of drug abuse by pregnant women in our population. Drug use by pregnant women, especially cocaine use, has been associated with preterm delivery and complications of pregnancy such as abruptio placentae. These pregnancies frequently result in the delivery of premature or sick infants who require admission to the intensive care nursery. A study from our own institution found that 34% of the infants who weighed less than 1500 gm had cocaine metabolites in their urine.[8] The second reason for underestimating the incidence of drug exposure is the use of neonatal urine for screening. A positive result is indicative of drug use only during the few days preceding delivery; a negative result does not rule out drug use earlier in the pregnancy. Recently, screening of meconium has been reported to be more sensitive[9, 10]; a method suitable for mass

screening of meconium samples has been proposed.[11] At present, however, urine testing is the only method available for large screening programs at many institutions.

Our institution is a large inner city hospital serving predominantly patients without private insurance (68.6% of patients), and the screening criteria used in the targeted screening program were developed for use in this population. Other institutions might find it necessary to modify these criteria.

We conclude that a targeted screening program would have identified 97% of the infants in our neonatal nursery who had urine screens during the first 24 hours of life with positive results for drugs of abuse. The program of universal screening identified only two infants who were missed by the targeted screening but resulted in the ordering of 881 additional tests, an incremental yield of 0.23%. The cost of these additional tests, both monetary and in time spent by the nursery staff, is considerable. The advantages of universal urine screening of all infants admitted to a regular neonatal nursery over a careful targeted screening program are limited. On the basis of the results of this study, we have abandoned universal screening in favor of a targeted screening program.

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Transplacental passage of fluorides

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Transplacental passage of fluorides was studied in 25 randomly selected neonates. Blood samples collected simultaneously from the mother and the umbilical cord showed that average fluoride concentration in the cord blood was 60% of that in mother's blood. When concentration in the mother's blood exceeded 0.4 ppm, the placenta acted as a selective barrier. (J PEDIATR 1993;123:139-41)

Fluorosis is endemic in several parts of India. Despite the efforts of the local governments, a large population has no alternative but to drink water with a high fluoride content. New areas are being discovered in which water contains fluoride concentrations ranging from 4.5 to 8.5 ppm.

Gardner et al.[1] observed that fluoride levels in maternal blood and in the placental tissues of pregnant women were increased in areas in which the drinking water contained 1 ppm of fluoride. Feltman and Kosel,[2] Shen and Taves,[3] and Gedalia et al.[4, 5] reported that the placenta passively permits fluorides to pass to the fetus. Armstrong et al.[6] measured fluorides in maternal uterine vessels and in the

Submitted for publication Dec. 30, 1992; accepted Feb. 11, 1993.

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0022-3476/93/$1.00 + .10 **9/24/46458**