

ORIGINAL ARTICLE

Management of neonatal abstinence syndrome in neonatal intensive care units: a national survey

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Aims: To determine the monitoring and treatment of neonatal abstinence syndrome (NAS) in neonatal intensive care units (NICUs) following opiate or polydrug exposure *in utero*.

Methods: A pretested questionnaire was distributed via email to the chiefs of the neonatology divisions with accredited Fellowship programs in Neonatal-Perinatal Medicine in the United States.

Results: Of the 102 individuals contacted, 75 participated in the survey. In all, 41 of the respondents (54.5%) have a written policy regarding the management of neonatal NAS. The method of Finnegan is the most commonly used abstinence scoring system (49 of 75, 65%), while only three respondents use the Lipsitz tool. Opioids (tincture of opium, or morphine sulfate solution) are used most commonly for management of both opioid (63% of respondents) and polydrug (52% of respondents) withdrawal, followed by phenobarbital (32% of respondents) for polydrug withdrawal and methadone (20% of respondents) for opioid withdrawal. In all, 53 respondents (70%) use phenobarbital, and 19 (25%) use intravenous morphine to control opioid withdrawal seizures, while 61 (81%) use phenobarbital in cases of polydrug withdrawal seizures. Only 53 respondents (70%) always use an abstinence scoring system to determine when to start, titrate, or terminate pharmacologic treatment of neonatal NAS.

Conclusion: The management of neonatal psychomotor behavior consistent with withdrawal varies widely, with inconsistent policies to determine its presence or treatment. Only about half of NICUs have written guidelines for the management of NAS, which may preclude effective auditing of this practice. Educational interventions may be necessary to ensure changes in clinical practice.

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Introduction

Drug abuse in pregnancy and neonatal psychomotor behavior consistent with withdrawal from opiate and polydrug withdrawal is currently a significant clinical and social problem. Approximately 3% of the 4.1 million drug-abusing women of child-bearing age, estimated from the 1995 and 1996 National Household Survey on Drug Abuse, are believed to continue drug use during pregnancy.^{1,2} The incidence of drug-exposed newborns has been reported 'to range from 3 to 50%, depending on the specific patient population, with urban centers tending to report higher rates.'² Infants experiencing withdrawal from substances upon which they have become physically dependent after *in utero* exposure may require prolonged treatment and weeks of hospitalization. In 1998, the American Academy of Pediatrics (AAP) published guidelines concerning the monitoring and treatment of neonatal abstinence syndrome (NAS) following opiate or polydrug exposure *in utero*.² However, many of the new guidelines or research findings do not reach the targeted group of treating physicians, and even if they do, they are not translated into daily practice.³ As a consequence, many patients do not receive the recommended care and may instead receive unnecessary, ineffective, or even harmful treatment.³

To date, the medical literature is devoid of data to determine if indeed the AAP guidelines for managing neonatal psychomotor behavior consistent with withdrawal have been assimilated into actual practice in the United States. The objective of this survey was to determine the extent and differences in the monitoring and treatment of neonatal psychomotor behavior consistent with withdrawal following *in utero* opiate or polydrug exposure in neonatal intensive care units (NICUs).

Methods

A pretested questionnaire (available online at www.nature.com/jp) was distributed via email to the chiefs of the neonatology divisions of all 102 accredited Fellowship programs in Neonatal-Perinatal Medicine in the United States to determine monitoring and treatment practices for NAS following opiate or polydrug exposure *in utero*. For the sample, the division chiefs were identified by their inclusion in the United States Neonatologists, Perinatologists, and

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Table 1 Drugs used in the management of neonatal psychomotor behavior consistent with withdrawal following *in utero* opioid or polydrug exposure

<i>Opioid withdrawal</i>		<i>Polydrug withdrawal</i>	
Drugs used as first line of management (Number of respondents)	Drugs added as second line of management (Number of respondents)	Drugs used as first line of management (Number of respondents)	Drugs added as second line of management (Number of respondents)
Opioids (47, 63%)	Phenobarbital (24) Intravenous morphine (10) Methadone (8) Clonidine (3) Diazepam (2)	Opioids (39, 52%)	Phenobarbital (27) Methadone (3) Clonidine (2) Diazepam (1) Variable (6)
Methadone (15, 20%)	Oral morphine (6) Phenobarbital (4) Tincture of opium (3) Clonidine (2)	Phenobarbital (24, 32%)	Opioids (8) Diazepam (8) Methadone (4) Rarely seen (4)
Phenobarbital (13, 17.3%)	Oral morphine (4) Methadone (4) Tincture of opium (3) Diazepam (2)	Methadone (8, 10.6%)	Phenobarbital (4) Opioids (3) Diazepam (1)
		Rarely seen (4, 5.4%)	

Newborn Intensive Care Units Directory, 2002; Section on Perinatal Pediatrics, American Academy of Pediatrics. Two reminders, at weekly intervals, were sent by email if no response had been received by 2 weeks of the initial mailing. Only the chiefs of the neonatology divisions were contacted via e-mails to maintain consistency and to ensure that the respondents would be aware of the policies where they existed. The questionnaire enabled compilation of data to determine the percentage of respondents using an abstinence scoring system, following a formal written policy or education program for management of NAS, and the use of pharmacologic agents most commonly used for opiate or polydrug withdrawal. The questionnaire was brief, with each question addressing a single point and requiring only a yes or no response in most cases.

The questionnaire and the survey protocol were evaluated and exempted from continuing review by the University of Michigan's Medical Institutional Review Board, which approved the project.

Results

Of the 102 individuals contacted, 75 (73.5%) responded to the survey. In all, 41 of the 75 respondents (54.5%) reported having a written policy regarding the management of NAS. The method of Finnegan is the most commonly used abstinence scoring system (49 of 75, 65%) to assess the severity of withdrawal symptoms; 16 respondents use the original system and 33 use the modified version. Only three respondents use the Lipsitz tool, while 10 respondents do not routinely use any abstinence scoring system. The remainder of the respondents use locally developed scoring systems or was not sure of the origin of the scoring system being used in their units.

A considerable majority of the respondents (62 of 75, 83%) routinely obtain urine and/or meconium for toxicology screening before starting drug treatment even, if there are compatible signs of withdrawal and a positive history of substance abuse in the mother. Opioids (tincture of opium or morphine sulfate solution) are used most commonly for management of both opioid withdrawal (47 respondents; morphine sulfate solution by 27, tincture of opium by 20), and polydrug withdrawal (39 respondents; morphine sulfate solution by 22, tincture of opium by 17), followed by phenobarbital (24 respondents) for polydrug withdrawal and methadone (15 respondents) for opioid withdrawal. Table 1 displays the distribution of the pharmacologic management of NAS.

In all, 30 respondents, who use phenobarbital as a first or second line medication to treat withdrawal signs, routinely start with a loading dose even in the absence of seizures. In all, 53 respondents (70%) use phenobarbital, and 19 respondents (25%) use intravenous morphine to control opioid withdrawal seizures, while 61 respondents (81%) use phenobarbital for polydrug withdrawal seizures. Only 53 respondents (70%) always use an abstinence scoring system to determine when to start or terminate pharmacologic treatment of neonatal NAS and whether a drug dose should be increased or decreased.

Discussion

Drug abuse during pregnancy is increasing in women of childbearing age. Between 48 and 94% of infants exposed to opiates *in utero* develop clinical signs of withdrawal,^{4,5} but the effect of polydrug use on the occurrence and severity of neonatal psychomotor behavior remains controversial.

The AAP² recommends that each institution should adopt an abstinence scoring method, preferably the Lipsitz tool,⁶ to measure the severity of withdrawal. Consistent scoring of signs of psychomotor behavior consistent with withdrawal enables decisions about the institution of pharmacologic therapy to be more objective and allows a quantitative approach to increasing or decreasing dosing. The Lipsitz tool offers the advantages of being a relatively simple numeric system with a reported 77% sensitivity using a value >4 as an indication of significant signs of withdrawal. Another well-recognized method, developed by Finnegan,⁷ uses a weighted scoring of 31 items and may be too complex for routine use on a busy clinical service. When pharmacologic treatment is chosen, the AAP² recommends that tincture of opium be the preferred drug for opiate withdrawal. For sedative-hypnotic withdrawal, phenobarbital is the agent of choice.² Despite clear cut, evidence-based recommendations from the AAP, the management of the newborn with psychomotor behavior consistent with withdrawal varies widely, as reflected by the survey, with inconsistent policies to determine the presence of psychomotor behavior consistent with withdrawal as well as how to treat it. Similar wide variations in the management have been noted in two other surveys concerning the use of withdrawal scoring systems and the pharmacologic management of neonatal psychomotor behavior consistent with withdrawal in other countries.^{8,9}

The excellent response rate (73.5%) to this survey indicates that the results reflect the attitudes and practices of neonatologists in training programs, who disseminate this information to their trainees. The survey included the division chiefs from all regions of the United States in order to minimize selection bias. One limitation is that these data may be based on 'what a single individual reported the group practice to be, which may not be completely accurate.'¹⁰ Another limitation is that there may be 'differences between what people believe is being done and what is actually done.'¹⁰ Nevertheless, the findings provide strong evidence that there are marked inter-center variations in the management of neonatal psychomotor behavior consistent with withdrawal, with inconsistent policies to determine diagnosis and treatment. The survey might have been more useful if detailed questions had been asked; however, we wished to keep the survey simple and limited to maximize the response rate.¹⁰ This questionnaire was intended as a 'screening survey' to identify differences in the monitoring and treatment of neonatal psychomotor behavior consistent with withdrawal following opiate or polydrug exposure *in utero*, rather than as a detailed analysis of the reasons for inter-center variations in this practice.¹⁰

The results of the survey highlight the fact that the adoption of evidence-based clinical practice guidelines is a very difficult transition.¹⁰ Similar to the experience with antenatal steroids, 'it is not easy to alter medical practices or clinician behavior, even when

there is compelling evidence to do so.'^{10,11} It is one thing to develop evidence-based practice guidelines, but it is another to implement them.^{10–12} Dissemination of information by passive means (e.g., distribution of clinical practice guidelines, lectures, etc.) is generally ineffective, and more proactive strategies, such as educational interventions (including outreach visits), reminders (manual or computerized), multifaceted interventions (e.g., audit and feedback, local consensus processes, and marketing), and interactive educational activities (such as workshops)¹³ may be necessary to achieve effective implementation of evidence-based recommendations and to ensure changes in clinical practice concerning the management of NAS consistent with published guidelines.¹⁰ It may also be difficult to establish quality improvement initiatives without having a standardized policy in place.

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