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RESEARCH NOTES

# Unintentional methadone and buprenorphine exposures in children: Developing prevention messages

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ABSTRACT

*Objectives:* To develop key messages for methadone and buprenorphine safety education material based on an analysis of calls to the NYC Poison Control Center (NYC PCC) and designed for distribution to caregivers of young children.

*Methods:* Retrospective review of all calls for children 5 years of age and younger involving methadone or buprenorphine from January 1, 2000, to June 15, 2014. A data abstraction form was completed for each case to capture patient demographics, exposure and caller sites, caller relation to patient, qualitative information regarding the exposure scenario, the product information, if naloxone was given, and the medical outcome of the case.

*Results:* A total of 123 cases were identified. The ages of the children ranged from 4 days to 5 years; 55% were boys. All exposures occurred in a home environment. The majority of the calls were made to the NYC PCC by the doctor (74%) or nurse (2%) at a health care facility. Approximately one-fourth of the calls came from the home and were made by the parent (22%) or grandparent (2%). More than one-half of the exposures involved methadone (64%). Naloxone was administered in 28% of cases. Approximately one-fourth of the children did not experience any effect after the reported exposure, one-half (51%) experienced some effect (minor, moderate, or major), and there was 1 death (1%). More than one-half of the children were admitted to the hospital, with 40% admitted to critical care and 13% to noncritical care. Approximately 23% were treated and released from the hospital, and 20% were lost to follow-up or never arrived to the hospital. The remaining 4% were managed on site without a visit to the hospital.

*Conclusion:* Exposures to methadone and buprenorphine are dangerous with some leading to serious health effects. Safe storage and disposal instructions are needed for homes where children may be present.

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The New York City Poison Control Center (NYC PCC) provides treatment advice about poison exposures and medicine safety information 24 hours a day, 7 days a week (1-800-222-1222 or 212-POISONS). Calls are answered by registered pharmacists and nurses certified in poison information; they are free of charge and confidential. Translation services are available for more than 150 languages.

Nationally, there are 55 certified PCCs that provide similar services. Each year, more than 2 million calls are made involving intentional and unintentional poisoning exposures; more than 1 million involve children 5 years of age and younger. The majority of calls involving young children are unintentional (unsupervised) exposures. Unintentional ingestion of prescription medicines by children under 6 years of age has resulted in an increase of both calls to PCCs and emergency department visits.[1-3] Calls to PCCs involving pediatric exposures to methadone have continued to increase since 2000, and there has been a dramatic rise in the number of pediatric exposures to buprenorphine reported to PCCs.[1] From 2007 to 2011, an annual estimate of 34,503 emergency department visits resulted from unsupervised ingestion of oral prescription medicines in children under the age of

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6 years; unintentional buprenorphine ingestion accounted for the highest rate of hospitalizations.[3] From 2004 to 2011, emergency department visits rose for exposures to buprenorphine in children under 6 years of age.[4] Conversely, from 2013 to 2015, emergency department visits for ingestion of buprenorphine and naloxone in children decreased after introduction of child-resistant single-dose packaging changes.[5] Increased access to methadone and buprenorphine in households leads to greater risk for potentially serious exposures among young children.[1,6,7]

Patient counseling and education about the danger of both methadone and buprenorphine exposures to young children is recommended.[1,4,6,8-13] Several studies have examined safe storage practices of methadone in the home.[8,14-16] Unfortunately, patients often do not remember receiving information about safe storage when receiving methadone.[8,14,16]

## Objective

The purpose of the present study was to develop key messages for methadone and buprenorphine safety education material based on an analysis of calls to the NYC PCC and designed for distribution to caregivers of young children.

## Methods

A retrospective review was conducted of calls made to the NYC PCC from January 1, 2000, to June 15, 2014, involving children 5 years of age and younger and reported exposure to either methadone or buprenorphine in the home setting. For each case, a data abstraction form was completed to capture patient demographics, exposure and caller sites, caller relation to patient, qualitative information regarding the exposure scenario, the product information, if naloxone was given, and the medical outcome of the case. Outcomes were defined as no effect, minor effect (the patient showed some symptoms but they were minimally bothersome), moderate effect (patient had pronounced or prolonged symptoms because of the exposure but they were not life threatening), major effect (patient exhibited symptoms as a result of the exposure that were life threatening or resulted in significant disability or disfigurement), and death.[17] Qualitative scenario information was categorized based on key words in the notes section of each case. The data were reviewed by 2 independent reviewers. The study was approved by the NYC Department of Health and Mental Hygiene Institutional Review Board.

## Results

A total of 123 cases were analyzed. The ages of the children ranged from 4 days to 5 years; more than one-half (67, 55%) were boys. Almost all exposures occurred in the child's home (117, 95%), and a small number occurred in another residence (3, 2%). The majority of calls were made to the NYC PCC by a health care provider—either a doctor (86, 74%) or a nurse (2, 2%)—and originated at the facility treating the patient. Approximately one-fourth of the PCC calls originated in the home and were made by the parent (25, 22%) or grandparent (2, 2%). Nearly two-thirds of the exposures involved methadone (76, 63%). Naloxone was administered in 34 cases (28%). The medical outcomes of the cases are presented in Table 1. In 27 cases (22%), the children did not experience any effect after the reported exposure. One-half of the children experienced some effect (minor [18, 15%], moderate [29, 24%], or major [15, 12%]) and there was 1 death (1%). Twenty-eight (23%) were noted as potentially toxic exposures but were unable to be followed. The remaining cases were judged to be nontoxic exposure (1, 1%), not followed because minimally toxic exposure (1, 1%), unrelated effect (2, 2%), and nonexposure (1, 1%).

**Table 1**
Medical outcomes

| Outcome | n | % |
|---|---|---|
| No effect | 27 | 22% |
| Minor effect | 18 | 15% |
| Moderate effect | 29 | 22% |
| Major effect | 15 | 12% |
| Death | 1 | 1% |
| Potentially toxic, unable to be followed | 28 | 23% |
| Nontoxic exposure | 1 | 1% |
| Not followed because minimally toxic exposure | 1 | 1% |
| Unrelated effect | 2 | 2% |
| Nonexposure | 1 | 1% |
| Total | 123 | 100% |

More than one-half of the exposed children were admitted to the hospital, with 49 (40%) admitted to critical care and 15 (13%) to noncritical care. Twenty-eight (23%) were treated and released from the hospital, and 26 (21%) were lost to follow-up or never arrived at the hospital. The remaining 5 (4%) were managed on site without a visit to the hospital.

A review of the qualitative scenario information provided for the cases showed that 86 (70%) were described only as ingestion of either methadone or buprenorphine, but in most of the cases the details leading up to the exposure were not provided. In addition, improper storage of methadone liquid was described in 14 cases (11%). Of these, 9 involved storage of the medication in a beverage container or drinking glass and 5 exposures occurred when the child obtained the medication from the refrigerator. The remaining 23 cases (19%) were reported as medication intended for a pet (6, 5%), ingested film strip (3, 2%), withdrawal symptoms question (3, 2%), exposure to patch (2, 2%), dosing error (2, 2%), and possible exposure through breast milk (2, 2%), with 5 cases listed as unknown exposures.

## Discussion

Our analysis found that one-half of the exposures resulted in hospital admission and 1 child died. Safe storage and patient education initiatives should be emphasized to keep children safe from exposures to medications, particularly with methadone and buprenorphine, which are associated with serious and even fatal outcomes. Although it is imperative to provide information to parents and caregivers taking methadone or buprenorphine, exposures also happen when children visit other homes or visitors bring their medications into the home. Exposures to medications can occur when medications are transferred to beverage containers and mistakenly ingested. Children may find a lost or discarded tablet, open container, or partially filled cup of medication.[17,18] It is important that when young children visit or are supervised by grandparents or