Perinatal Addiction: 
The Vancouver Experience

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When talking about drug use in pregnancy, we are immediately conditioned to think of “damaged” babies and inadequate parenting. Over the last generation, the approach to this population by the medical profession and society, has been abstinent based, with the belief that these women were in the most part incapable of parenting unless they were abstinent. Separation of the mother and baby was and still is the norm. We can reverse this trend by decreasing the amount of drug that the mother and baby are exposed to during the pregnancy and improving the socio-economic determinants of health.

In Vancouver we have improved outcomes for these women and families by adopting a harm-reduction philosophy and integrating the community and hospital into a seamless system of care. The foundation for this system of care is the Sheway Maternity Clinic in Vancouver’s Downtown East Side and the development of FIR (Families In Recovery) Square at BC Women’s Hospital 10 years ago, the first Combined Care Maternity Unit in Canada for pregnant women struggling with addiction.

The goals of this program are:

1. To decrease the amount of drug that the mothers and babies are exposed to (trauma informed care).
2. To facilitate bonding between mother and baby
3. To improve social stability.
4. To reduce withdrawal and the need to treat in the newborn.
5. To prevent apprehension safely.
6. To provide Trauma Informed Care

Vancouver’s downtown east side is an area of 10 city blocks. It is the poorest postal code in Canada. There is a high crime rate with an open drug market. Many of the women are living on the street, and are subjected to repeated and ongoing violence either through involvement in the sex trade and/or abusive partners. “Self medication” with heroin, (fentanyl) cocaine, alcohol etc. makes it possible for them to cope in this environment. The Hepatitis C rate is close to 90% and HIV is usually only 1 shared needle away. Being pregnant in this community meant that your baby was inevitably apprehended at birth.

Within this setting the Sheway Maternity Clinic was developed in 1992. It provides holistic services to pregnant women with substance use problems and supports mothers and their children until the children are 18 months of age. It is interprofessional by design and function. Funding is through several partners: BC Women’s Hospital, the Vancouver Health Department the Ministry of Social Services, the YWCA and the Vancouver Native Health Society. Its Mission statement states that “Sheway reaches out to women who are pregnant to assist them with meeting their needs for support, safe living conditions, economic security and physical well-being. The staff work with women to help them develop the information, skills and confidence that they will need to care for themselves and their children.” An evaluation of the Sheway maternity project in 1993 looked at several outcomes. It revealed that there were improvements in accessing prenatal care as well as a demonstrated increase in birth weights, improvements in nutritional status (e.g. hot lunches are served daily), demonstrated decrease in substance use, improved housing, and more mothers going home safely with their babies. These findings were identified as a result of their involvement with the Sheway
Program. Sheway delivers approximately 100 women per year and at any onetime we have a case load of 300 plus families.

Any “good” that is done in the community can be quickly nullified if the “institutions” do not provide similar care and support. With this in mind, Fir (Families In Recovery) Square, the first Combined Care Unit of its kind in Canada, was developed at BC Women’s Hospital in 2002. It is a 12 bed in patient dedicated unit that was designed to provide a continuum of in hospital care for maternity patients with addictions within a Harm Reduction context. It is an interprofessional team of physicians, nurses, a social worker, alcohol and drug worker, nutritionist, Infant development worker skilled in teaching parenting, and a Spiritual Care Minister. Staff were hired because they wanted to work in this setting AND because they had the “right” attitude. The staff received additional education and training specific to this population. Women can be admitted anytime during their pregnancy for obstetrical management and/or stabilization of their drug use. There are daily programs to support the women both individually and in groups. In keeping with providing a continuum of care, women deliver from the unit and are brought back to the unit for post partum care. The philosophy of the unit is harm-reduction in nature and based on the premise that outcomes can be improved by rooming in these babies with their mothers. All mothers are given the opportunity to room in with their babies. Over the last 15 years we have delivered approximately 1500 plus women.

The babies room-in with the Mom immediately after birth. Moms are encouraged and taught how to hold and cuddle their babies. Moms are allowed to breastfeed at any maternal dose of methadone and the only medical contra-indication that we use for breastfeeding is HIV positivity in the mom.

In this setting the babies are observed for withdrawal by monitoring the babies’ ability to gain weight. This minimizes observer bias inherent in the use of subjective signs of withdrawal (sneezing, tremors, crying, and not settling) that have been previously used to assess these newborns. As “normal” babies usually take 36-72 hours to gain weight while the breastmilk comes in and breastfeeding is established – we avoid treating with morphine during this period.

Within this context we have been able to decrease the number of babies requiring treatment. In fact, we are finding that most of our methadone babies, as long as they are rooming in with the mothers and being cuddled and held by their mothers, do not require treatment. If the babies require treatment, we are initiating morphine treatment while the babies are still rooming in with the mothers. Using an accelerated protocol we have been able to withdraw the babies off morphine within a period of 10 to 14 days before they are discharged.

We have noticed that the drugs that seem to have the most impact on the newborns ability to thrive in the newborn period, establish breast feeding and gain weight are not necessarily the opiates but are the prescribed medications such as the antidepressants and antipsychotics. With this experience, we now counsel the women about prescribed medications during their pregnancy. Most of these women suffer from chronic post traumatic stress as a result of their life experiences. Clinical depression is not the diagnosis. Developing cognitive based counselling programs and finding practical solutions for their poverty and housing issues, allows us to minimize the prescribing of anti depressants in this population. In fact, women coming through this program reported that a 100 percent of the women felt connected to the community, 74 percent reported a decreased use of their problem drug and 89 percent reported a decreased level of anxiety.

Along with these two programs we have developed a Primary Care Physician on call group called the Perinatal Addiction Service. These Family Physicians, have developed a clinical expertise that is unique to British Columbia, if not Canada. This call group provides a 24-7 consulting and referral service for Vancouver and the rest of British Columbia.

Unfortunately in Vancouver we have the distinction of possessing one of the poorest neighborhoods in Canada with a high drug and crime rate which has negatively impacted women and their desire to raise healthy families. As a response to this we have developed a harm-reduction philosophy which does not rely on urine drug screens as a measure of stability, but depends on clinical stability as a monitor for these women. This
approach, and the integrated community hospital program described above, have resulted in improved perinatal outcomes for both mother and baby. Less babies are requiring treatment for withdrawal and more babies are going home safely with their mothers. The babies and moms that come through this program are demonstrating to us, through our longterm follow up, that given the opportunity to bond together in the newborn period, they do indeed go on to be healthy and emotionally stable.

“Damaged babies and inadequate parenting is now a phenomenon of the “last generation”

Homelessness is the biggest hurdle for these women. This translates into apprehension of their children after they are stable and ready for discharge from our program. To reverse this social catastrophe we need to develop social housing in the context of it being affordable and supportive. Only then will both these moms and their babies and their families have a chance to “grow” within our community.

R. Abrahams MD FCFP

Ron Abrahams
August 29, 2018

The Honourable Darryl Plecas
Speaker of the Legislative Assembly
Suite 207, Parliament Buildings
Victoria, B.C. V8V 1X4

Dear Mr. Speaker,

We have the honour of submitting to the Legislative Assembly of British Columbia this joint special report *Promoting Access to Breastfeeding in Child Welfare Matters*. This report is prepared in accordance with Section 20 of the *Representative for Children and Youth Act* and s. 93(2) of the *Child, Family and Community Service Act*.

Sincerely,

Katrine Conroy
Minister of Children and Family Development

Bernard Richard
Representative for Children and Youth

pc: Mr. Craig James, QC
 Clerk of the Legislative Assembly

Mr. Nicholas Simons, MLA
Chair, Select Standing Committee on Children and Youth
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Introduction

This Joint Special Report is a collaborative initiative undertaken by the Ministry of Children and Family Development (MCFD) and the Representative for Children and Youth (RCY).

Earlier this year, RCY and the public became aware of an Indigenous infant who had been removed from a mother’s care by MCFD three days after birth. The lawyer for the mother’s community petitioned the B.C. Supreme Court on behalf of the mother, requesting that she have daily access to her newborn. After an unprecedented hearing, the court ordered MCFD to increase the mother’s access to her infant for breastfeeding and bonding. Shortly after, the Provincial Court ordered the infant be returned to the mother, finding that the ministry had not adequately considered less disruptive measures for the family and, specifically, the supports that were available in the community to keep the mother and infant together.

While this was a highly public case and decision, MCFD makes decisions every day that balance the safety of newborns with the importance of maintaining parental access to promote attachment between infants and their parents and breastfeeding or access to breastmilk. Many variables influence MCFD’s planning in this regard, including the risks and strengths within the family involved, the support of family and community and the availability of support and services, including visit supervisors.

For this report, RCY and MCFD have collaborated to examine what policies and practices could be enhanced or introduced in this province to strengthen families’ capacity to care for infants, support access to breastfeeding or breastmilk and potentially prevent the unnecessary removal of infants. This collaboration between RCY and MCFD is in keeping with the vision of the Honourable Ted Hughes in his 2006 B.C. Children and Youth Review, when he recommended that the Representative “… take part in the development of policies or practices that reflect a deeper understanding of the needs and interests of children, youth and their families.”

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Methodology

This report has been informed by a review of relevant literature as well as comparative information drawn from child welfare jurisdictions across Canada. It was also informed by visits to model support programs at Fir Square and Sheway in Vancouver. Also incorporated in the report is recent MCFD data on infants who entered care within 12 months of birth, an analysis of RCY advocacy data in instances where access or custody to support breastfeeding was a concern, RCY case studies and examples of best practices.

Background

Child protection services are intended to safeguard children from harm. The Child, Family and Community Service Act (CFCS Act) is the legislative authority for the ministry’s Child Protection Services (CPS). In cases where there is reason to believe that a child needs protection, workers are required to conduct investigations, assess risk to the child and determine the most appropriate action. The CFCS Act requires that the actions taken are consistent with the best interests of the child, and that least disruptive measures are considered when a child needs protective services.

In circumstances where it is unsafe for a child to remain in the care of his or her parent(s), placement outside the home may be required. Infants can be placed in out-of-care home arrangements through either a placement with extended family, a voluntary agreement with the parents, or by removal. Voluntary Care Agreements (VCAs) are made between the ministry and the parent, allowing MCFD to care for the child when the parent is temporarily unable to do so. Infants are removed when their health or safety is either in immediate danger or no other less disruptive measure is available or adequate to protect the infant.

Definitions

Director: a person designated by the minister under s. 91 of the CFCS Act. Directors delegate social workers to provide services under the Act.

Remove: to take a child into the care of a Director under s. 30, 36 or 42 of the Act.

Voluntary Care Agreement: A Director may make a written agreement with a parent who has custody of a child and is temporarily unable to look after the child in the home under s. 6(1–8) of the Act.
Looking at the Data

In order to understand the number of infants who are impacted by being separated from their parents (either by removal or a VCA), and the number of Indigenous infants who are disproportionately impacted by this action, it is important to take a close look at the data collected by MCFD.

Infants under age one represented 20 per cent of all children and youth between the ages of birth and 18-years-old who were placed in care either by removal or under a VCA in 2017/18.

The figure below shows that substantially more infants entered care by removal within 12 months of birth than by VCA during a five-year period (2,378 versus 287).

**Figure 1:** The total number of infants who entered care by removal or VCA within 12 months of birth, 2013/14 to 2017/18 (based on the first entry to care)
Looking only at infants who were removed and entered care within 12 months of their birth, the figure below shows that a total of 2,378 infants in this category were removed between 2013/14 and 2017/18. Of these infants, a higher number were Indigenous than non-Indigenous. For example, in 2017/18, 448 infants were removed at less than 12-months-old, and of those, 59 per cent were Indigenous.

**Figure 2:** Number of infants who were removed and entered care within 12 months of birth, by Indigenous status, 2013/14 to 2017/18
The figure below shows the age of infants (in days) and their Indigenous status at the time of their first removal during 2017/18.

Consistent across all age categories, a higher number of Indigenous infants entered care within 12 months of birth compared to their non-Indigenous peers.

For both Indigenous and non-Indigenous infants, the most common reason for entering care through a removal was neglect. Among the subtypes of neglect, the most frequent reasons for entering care under a removal were when the parent was unable or unwilling to care for the infant (65 per cent) and cases involving neglect by a parent that included physical harm (19 per cent).

**Figure 3:** Number of infants who were removed and entered care within 12 months of birth by age of infant at the time of removal order and Indigenous status, 2017/18
Looking at infants who entered care by a VCA within 12 months of their birth for the five-year period 2013/14 to 2017/18 the data shows that over this period, the majority of these infants were Indigenous. For example, of the 40 infants who entered care by VCA within 12 months of their birth in 2017/18, 77.5 per cent were Indigenous while 22.5 per cent were non-Indigenous.

Figure 4: Number of infants who entered care by VCA within 12 months of birth, by Indigenous status, 2013/14 to 2017/18
The figure below illustrates how old the infants were (in days) when they first entered care through a VCA. The figure shows that across each age category, a higher number of Indigenous infants entered care by VCA compared to non-Indigenous infants.

For both Indigenous and non-Indigenous infants, the most common reason for entering care by VCA was neglect.

**Figure 5:** Number of infants who entered care within 12 months of birth by a VCA – by age of infant and Indigenous status, 2017/18

![Bar chart showing the number of infants who entered care within 12 months of birth by age of infant and Indigenous status for 2017/18. The chart categorizes infants into three age groups: Birth to 7 days, 8 to 30 days, and 31 to 365 days. For each age group, the number of Indigenous and non-Indigenous infants is depicted. The chart indicates that a higher number of Indigenous infants entered care by VCA compared to non-Indigenous infants across all age categories.]
Literature Review

Rights-Based Literature

For social workers who work in child protection, the *United Nations Convention on the Rights of the Child (UNCRC)* is an overarching framework that should help to guide practice. The UNCRC was adopted in 1989 and ratified by Canada in December 1991.

- Article 3 of the UNCRC states that, “In all actions concerning children, whether undertaken by public or private social welfare institutions, courts of law, administrative authorities or legislative bodies, the best interests of the child shall be a primary consideration.”

- Article 9 of the UNCRC provides that, “State Parties shall respect the right of the child who is separate from one or both parents to maintain personal relations and direct contact with both parents on a regular basis, except if it is contrary to the child’s best interests.”

- Article 24 of the UNCRC notes that, “State Parties recognize the right of the child to the enjoyment of the highest attainable standard of health” and, “states should take appropriate measures to combat disease and malnutrition.”

Researchers in Australia have considered breastfeeding in the context of families involved in child protection services and in relation to the UNCRC rights referenced above. They note that the Australian High Court ruled in 2003 that when the state is intervening in a family’s life and the case against the parent(s) has yet to be established, “the very least the state can do is to make generous arrangements for contact.” The court continued that these arrangements must not be thwarted by a lack of resources but rather must be determined by the family’s needs. The ruling specifically mentions that nothing less than breastfeeding “will meet the imperative demands of the Convention (UNCRC).”

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3 Gribble, p. 439
Child Welfare-Specific Literature

In her paper "Rights of Children in Relation to Breastfeeding in Child Protection Cases," Karleen Gribble acknowledges the complexity of social workers’ tasks when considering the best interests of children. Where breastfeeding is involved, she suggests the following three ways that child protection authorities might support children’s rights in relation to breastfeeding:

1. create policies that reflect the rights of an infant with regard to breastfeeding
2. always consider options for co-locating the mother and infant during child protection investigations, and
3. where physical separation must happen, do everything to encourage breastfeeding, provide an electric breast pump and appropriate accessories, ensure the transport of the breastmilk to the infant, provide support for breastfeeding to the mother, and educate the caregiver on the importance of supporting breastfeeding.

In addition, a study using Australian data asked the question: Does breastfeeding protect against substantiated child abuse? A 15-year study was undertaken of 512 children with substantiated maltreatment reports to attempt to answer this question. The study concluded that while breastfeeding duration is only one factor of many that may be associated with maternal abuse and neglect, breastfeeding may be a possible protective factor against maternal neglect.

During 2009 and 2010, a Canadian study of mothers who use illicit drugs was conducted in Vancouver. Among other questions, 31 mothers were asked about opportunities for “breastfeeding, holding and developing attachment.” Only 26 per cent of the mothers said they had the opportunity to bond with their infants and only 19 per cent mentioned breastfeeding. Where mothers knew that there was no likelihood of gaining custody of their baby, or that the baby was to enter foster care, bonding was not pursued. The participants had access to specialized services such as housing, psychosocial services, social workers, food and practical supports, and also lived on the Downtown Eastside. Accessing these services resulted in a reduction of homelessness from 35.5 per cent to 9.7 per cent after their infants were born.

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Indigenous-Specific Literature

Women and families who are involved with child protection services during pregnancy, birth and the post-partum period are disproportionally poor and Indigenous. The Truth and Reconciliation Commission of Canada: Calls to Action, in the Child Welfare section, calls upon all levels of government to “commit to reducing the number of Aboriginal children in care by providing adequate resources to enable Aboriginal communities and child-welfare organizations to keep Aboriginal families together where it is safe to do so, and to keep children in culturally appropriate environments, regardless of where they reside.”

In Canada, the National Aboriginal Council of Midwives (NACM) conducted a situational analysis to consider Indigenous midwifery and to inform opportunities for future direction. Midwives are noted to have been part of Indigenous life prior to colonization, and the resurgence of Indigenous midwifery is pivotal to providing culturally safe health care services to women. NACM notes that returning birth (and thus breastfeeding) to communities is “critical to Indigenous people’s health … restoring skills and pride in communities.” The resurgence of Indigenous midwifery is consistent with the movement in Indigenous communities across B.C., who are acting to end the removal of their children by offering support and less disruptive measures to enable children to remain with their parents and/or in their communities.

Breastfeeding: Health and Social Benefits

Breastfeeding is universally known to be the optimum way to feed infants. The World Health Organization, United Nations Children’s Emergency Fund (UNICEF), the Public Health Agency of Canada, Health Canada, the Canadian Paediatric Society (CPS) and the B.C. Ministry of Health all recommend that infants be fed breastmilk exclusively for the first six months of their lives. Breastfeeding with complementary foods can be continued to age two and beyond.

“All the rivers of the earth are milk that comes from the breast of the Great Mother. Our breasts give the waters of life to feed the children.”
– ChoQosh Auh’Ho’oh, Elder

“Human milk is the epitome of individualized medicine – each mother makes milk that is specific to her baby’s needs at any particular time.”
– Natasha K. Sriraman

Colostrum, the first milk produced by a mother after birth is uniquely complex and provides essential immunological protection for an infant, is especially high in nutritional value and is well documented to reduce infants’ risk of developing several inflammatory diseases such as asthma.

The CPS endorses breastfeeding, noting, “It is universally accepted that breast milk is the optimum exclusive source of nutrition for the first six months of life” and that, from a nutritional perspective to date, the complexity of “bioactive” benefits cannot be replaced by formula. Further, CPS states that breastfeeding is a “critical public health initiative” with significant advantages to mothers and infants in terms of health, social and economic outcomes.12

While it is generally assumed that breastfeeding enhances the maternal infant bond, much of the literature concludes that there is no empirical evidence that this is the case. The quality of the attachment bond is predicated on the quality of the maternal infant relationship rather than the method of feeding.13

**Breastfeeding Special Circumstances: Opiates**

The literature is clear that breastfeeding is safe and of benefit to infants where the mother is taking opioid agonist therapy when the infant is born close to term and is medically stable. In the research paper “Breastfeeding and Opiate Substitution Therapy: Starting to Understand Infant Feeding Choices,” American and Canadian researchers detail that few women on opioid agonists breastfeed, in spite of its safety, likely due to societal stigmas and a lack of health-care provider information and education to the mothers.14 The paper details that both methadone and buprenorphine substitution therapy are safe while breastfeeding and reduce neonatal withdrawal symptoms. Both the Academy of Breastfeeding Medicine and the American Academy of Pediatrics support breastfeeding in these contexts. Lacaze-Masmonteil and O’Flaherty’s paper on managing the effects of withdrawal on infants born with opioid dependency suggests that opioid-dependent mothers should stay with their infants (rooming-in) when the infants are stable, to support breastfeeding initiation rates and early attachment.15 The paper notes that breastfeeding “should be encouraged”

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as part of the management of infants exposed to opioids as it can “delay the onset and decrease the severity of withdrawal symptoms.”

**Breastfeeding Special Circumstances: Human Immunodeficiency Virus (HIV) and Hepatitis C**

The most recent Canadian HIV guidelines for pregnancy and breastfeeding include the fact that mother-to-child transmission risk is less than one per cent due to excellent prenatal care, including HIV therapies. However, the use of formula rather than breastfeeding is recommended, as HIV can be transmitted via breastfeeding.

Maternal Hepatitis C infection appears to not be transmitted through breastmilk. It is generally considered safe to breastfeed for mothers with Hepatitis C, should they wish to do so.

**Breastfeeding Special Circumstances: Milk Banking**

Where a mother may not be able to directly breastfeed, options for expressed breastmilk (EBM) for her infant include milk banking, which is becoming more readily available. This can include milk banks in hospitals that provide donor breastmilk or the mother’s own EBM for her infant. Milk processing follows the Human Milk Banking Association of North America guidelines, and in Canada the processing of human breastmilk is subject to Health Canada regulations for food substances and regular inspections by the Canadian Food Inspection Agency. BC Women’s Hospital operates a provincial milk bank and has provided sick and/or premature infants with donated breastmilk since 1974. Donor milk is available at three sites: BC Women’s, Royal Columbian and Surrey Memorial Hospitals. Plans are underway to make this service available to more Neonatal Intensive Care Units in the province.

When a mother wishes to provide EBM for her infant, guidelines exist for the safe handling of EBM. This practice may be particularly useful when a mother cannot access her infant, where access is limited or where other reasons exist for not being able to directly breastfeed.
Jurisdictional Scan

Canada

A jurisdictional scan was conducted across 13 provinces and territories in April 2018 by the Provincial and Territorial Directors of Child Welfare Committee. The purpose of the scan was to obtain information on policy or practice standards, resources and residential services that support the promotion of breastfeeding between a mother and infant when the infant has been removed.

In this scan, nine out of 13 provinces and territories responded to the request for information. The scan revealed that, across these provinces and territories, there is no specific policy that addresses breastfeeding after an infant has been found in need of protection and removed from a mother’s care.

Many of the provinces had supports and resources available to facilitate the emotional and physical care needs of a child. For example:

• B.C.’s Nurse-Family Partnership (NFP) – a free public health program for women having their first baby. Public health nurses visit young women who are preparing to parent for the first time. Aimed at mothers whose circumstances place them at risk for vulnerability, the program provides home visits and intensive supports until their child’s second birthday. NFP starts prenatally, allowing it to influence child development right from the start. The program supports healthy pregnancy, preparation for childbirth, nutrition (including support for breastfeeding), exercise, parenting, child development, future life planning and accessing community resources.

• Alberta’s Vulnerable Infant Response Team – nurses are attached to infants three-months-old and under who may be at risk. The nurses provide parenting skills, mental health and breastfeeding support to a mother. This model of support is under development as a province-wide program.

• Saskatchewan’s Moving Families Forward program – provides intensive pre- and post-partum supports to women with addiction issues. Staff work closely with a breastfeeding parent on prevention and education about the impact of substance use on breastfeeding.

When a child protection authority is involved in the removal of an infant, some of the common themes of supporting the breastfeeding mother found in the jurisdictional scan included: encouraging ways to make breastmilk available to an infant; transporting breastmilk to foster homes; facilitating breastfeeding at mother visits; purchasing breast pumps; and residential outreach services that also have a focus on addiction support.
Residential models of support are another way to ensure a mother-infant connection while addressing any risk factors. Table 1 offers some examples.

**Table 1 – Residential Models of Support: Provincial Examples**

<table>
<thead>
<tr>
<th>Province</th>
<th>Residential Model of Support</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>Her Way Home</td>
<td>Provides in-home support for pregnant and parenting women who have a history of substance use</td>
</tr>
<tr>
<td>Alberta</td>
<td>Healthy, Empowered, Resilient</td>
<td>Provides accommodation and supports to vulnerable pregnant women up to six months after birth</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>Supported Housing for Young Mothers</td>
<td>Assists young mothers to develop skills to parent independently</td>
</tr>
</tbody>
</table>

Overall, the result of the cross-Canada jurisdictional scan indicates that there are no policies or guidelines for practitioners in child protection to follow that specifically support the promotion of breastfeeding between a mother and infant when the infant has been removed. However, many provincial authorities do have programs and services to facilitate breastfeeding and bonding.

**New Zealand**

UNICEF’s Baby Friendly Initiative in New Zealand, partnering with the Ministry of Health, operates a broad campaign to increase the frequency of breastfeeding among new mothers across the country.

Related to child welfare and removal, New Zealand references breastfeeding within an overarching policy to maintain an infant’s connection to his or her biological mother and extended family. This policy states:

> “When mokopuna cannot live at home it is important that they have meaningful contact with their family/whānau. Family/whānau will be part of their life forever, and they need to have safe and nurturing contact with family/whānau who can help them understand who they are and their place in the wider family/whānau system.”

Child welfare policy in New Zealand does not provide specific guidance on breastfeeding.
Review of RCY Advocacy Cases

The Representative's Office reviewed 110 advocacy files for the 5 ½-year period from early 2013 to mid-2018 that involved breastfeeding mothers. The purpose of the review was to determine if there were common case management themes or challenges that affected best practice in service delivery to families where MCFD or a Delegated Aboriginal Agency (DAA) were involved. The key challenges identified were:

- **Methadone/substance use** – some files involved mothers who were on a methadone management program or using substances and social workers were faced with differing medical opinions about the safety of breastmilk in these cases.

- **Domestic violence** – some files involved parents with a history of domestic violence in the family home. When an infant is found in need of protection and needs to be removed from the parents’ care, MCFD or the DAA will consider safe options available to facilitate breastfeeding. In some cases, this resulted in interruptions to breastfeeding as time was needed to assess current risk and to plan appropriately.

- **Cultural views specific to Indigenous families** – many files involved Indigenous families where cultural considerations around access and breastfeeding were not always apparent or considered in planning.

- **Inconsistent pre-birth planning** – many of the files involved parents who felt that MCFD or the DAA had not engaged with them in pre-birth planning to allow sufficient access for bonding and breastfeeding. One challenge in doing so is that there is no legal mandate to provide services without consent prior to the birth of a child; therefore, parental participation in services before an infant is born is voluntary.

- **Supervision/access issues to facilitate breastfeeding** – some files involved parents whose infant had been removed and MCFD or the DAA had agreed to provide supervised access to facilitate breastfeeding but encountered challenges increasing access time and finding supervision for visits. Parents also described situations where the mother pumped her breastmilk so the baby could receive it from the caregiver but MCFD or the DAA could not provide delivery services.

Overall, the review of the 110 RCY cases clearly illustrated the many challenges to facilitating breastfeeding when child protection concerns exist. Most families indicated that they were significantly affected by the lack of early planning or immediate planning by MCFD or the DAA to facilitate breastfeeding. Families felt it should be a priority to engage as soon as possible with family and extended family to create an access plan to facilitate breastfeeding. Extended family could include parents, grandparents, aunts, uncles, cousins, trusted friends and neighbours. The families felt that

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**A shelter** (following page) refers to transitional housing for women who are pregnant or have a newborn and need a safe place to stay. Most shelters have skilled staff attached and can provide supports such as emotional support, parenting support, advocacy, child care and help connecting to other resources. This can often serve as a planned alternative to the infant being removed at birth and provide the parent the opportunity to parent with support.
it would be more natural to create a plan with family or extended family to facilitate the access to breastmilk and bonding with the infant. This would promote the infant's best interests and support safety and follow-through by all parties. Creating solid safety plans can mitigate the risks to the infant and support the family in working toward reunification.

Some of these cases also highlight the need for a more supported housing or shelter model that would provide a safe and supported environment with skilled caregivers for mother and infant.

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**Case Study #1**
**Community Supports Playing a Critical Role – Betty’s Story**

Betty was a 20-year-old mom to baby James. The local DAA became involved with this family when it learned that Betty was pregnant and parenting support would be required to mitigate risk to the infant. Betty had shared that she was concerned her current living situation was not suitable or safe for a newborn and MCFD had some concerns due to a history of drug use. Betty had been connected to supports during her pregnancy and was on the methadone maintenance program. A pre-planning meeting occurred with the social worker, parents and other professionals shortly before James was born to discuss planning and develop a safety plan. The safety plan indicated that Betty would move into supportive housing with her newborn. James was born a week later. Several meetings were held at the hospital as hospital staff had concerns about James’ health and the parents’ capacity to care for him.

The DAA social worker decided that the current safety plan was no longer adequate to protect James because the shelter could not provide the necessary supports. Because no less disruptive measures were available, James was removed from his parents’ care and placed in a foster home. Initially, access was twice a week for 1 ½ hours. Betty made a request to the social worker to be able to breastfeed James daily. RCY provided advocacy around James’ access to his parents and breastfeeding. Betty pumped and froze her breastmilk between access visits. Because Betty was using marijuana and methadone, the social worker consulted with a physician who confirmed that there was no risk for James to receive his mother’s breastmilk.

Roughly a week later, during a visit with the social worker, concerns were raised about the baby’s physical health, as he was seen “twitching.” James was seen by a pediatrician, who was concerned about the inconsistency in the breastfeeding and that Neonatal Abstinence Syndrome withdrawal would happen if Betty was to start and stop breastfeeding James. It was decided that the breastfeeding would be discontinued until James was returned to his mom’s care. Access visits gradually increased and baby James was returned to his mother’s care under a Supervision Order.
Case Study #2  
**Interruptions in Breastfeeding – Cindy’s Story**

Cindy was the mother to 11-year-old Sam and infant Vince. There was a history of domestic violence between Cindy and Vince’s father and there was a no contact order between the parents at the time of Vince’s birth. When Vince was born, his father came to see Cindy in the hospital. MCFD became involved with this Indigenous family and Cindy was advised that MCFD intended to remove the children from her care because she allowed Vince’s father to visit. Cindy agreed to a safety plan and each child stayed with extended family.

Initially, Cindy had overnight visits with Vince and breastfed him. Overnight visits were stopped due to additional concerns and Vince was removed from his mother’s care. However, Cindy continued to have access to him during the day. MCFD received additional child protection reports and all access between Cindy and Vince ended. Cindy was very concerned that Vince had been bottle fed for 16 days and despite pumping her breastmilk (with little success), she was concerned that she would not be able to directly breastfeed when access was reinstated. After RCY involvement, access was reinstated at twice a week and with supervision. Unfortunately, Cindy was no longer able to breastfeed as her milk supply had dried up.

Case Study #3  
** Managing Multiple Challenges – Josephine’s Story**

Josephine was a client of Community Living British Columbia (CLBC) and living in a home share where she was supported with basic life skills such as cooking, budgeting and time management. She was 21-years-old when she gave birth to her daughter, Cloe. MCFD was notified of Josephine’s pregnancy seven months prior to the birth. Pre-planning meetings occurred between MCFD, CLBC and local service providers before Cloe’s birth and a plan had been drawn up with two options:

1. Upon discharge from hospital, Josephine would maintain guardianship and take Cloe home, staying with her home share provider.
2. Upon discharge from hospital, Cloe would be removed and placed in the home share provider’s care and Josephine would be able to remain there. The home share provider would assume a dual role, foster parent and CLBC caregiver.

After Cloe was born, she was removed from Josephine’s care and placed into a different foster home because MCFD believed that the home share provider would be unable to balance providing services to both Josephine and Cloe. At the time of the removal, MCFD permitted Josephine to have daily visits with Cloe; however, these visits ended up being just once per week for three hours at a time. This schedule did not permit regular breastfeeding opportunities and no alternative arrangements were made for Cloe to receive Josephine’s breastmilk. An RCY advocate became involved three weeks after Cloe’s birth. Several weeks after RCY’s involvement, Josephine’s home share placement broke down. The issue of breastfeeding was never resolved and Cloe was placed under a Continuing Custody Order by consent and later placed with family. This case illustrates the need for more rigorous pre-birth planning.
Promising Practices

When looking at changing practice to improve the lives of children and families, reviewing promising practices already in place can inform and improve service delivery on a larger scale. B.C. and Alberta provide three examples of programs that support the mother/infant bond through breastfeeding.

Fir Square Combined Care Unit

Fir (Families in Recovery) Square Combined Care Unit opened in 2003, located in BC Women’s Hospital and Health Centre in Vancouver. Fir Square provides perinatal care for women with problematic substance use and their exposed newborns by assisting women and their newborns to stabilize and withdraw from substances. The mother/infant partnership is kept together during their Fir Square stay while the mother works with community partners to facilitate remaining with her infant after discharge, where possible. An interdisciplinary team – including physicians, specialized nurses, a social worker, an Indigenous Elder in Residence, addictions counsellor, pharmacist, nutritionist, recreational and art therapist, spiritual carers, legal aid and a BC Housing and Health Coordinator – support the duo in a continuum of care.

Prior to the opening of Fir Square, infants were removed from women in this cohort 100 per cent of the time. Currently, Fir Square’s articulated goal is to be an “apprehension free” space providing robust support in the form of neonatal management (rooming-in), addiction management and obstetric management all in a trauma-informed and culturally safe way while understanding the social inequities and stigmatization that these women face.

Sheway

The Sheway program is located in the Downtown Eastside of Vancouver and is a community-based Pregnancy Outreach Program (POP) for women and children. Sheway provides health and social service supports to pregnant and parenting women with children under age five and who have current or historical substance use. The goal is for women to have choice in their care and to promote healthy pregnancies and positive early parenting. This is achieved by working collaboratively

21 Ainsley McCaskill, Perinatal Addictions, Hand Out, Fir Square, BC Women’s Hospital.
in partnerships and providing a “one-stop shop” for women and their children. A full medical clinic, a daycare (Crabtree Corner operated by the YWCA), a drug and alcohol counsellor, daily hot lunches, grocery supports, practical support for securing housing and social benefits, parenting support, First Nations Support Workers, Elders in Residence, social workers and medical professionals are all available on site. The YWCA also operates a residential space of 12 supported housing beds that are co-located in the building.

Both of these B.C. programs – Fir Square and Sheway – while distinct, share some fundamental philosophies and practices which are unique and have commendable outcomes. Both consider the pregnant mother or mother and infant as a team and support the mother to achieve better health for herself and her infant. Both programs work with mothers who use substances or have used substances. Neither program is in support of the removal of an infant from its mother for reasons such as trauma, inequity, homelessness or substance use. Each works to destigmatize these women and remove barriers for them to attain their goals. Each has created a place of safety for women and children, thereby disrupting the cycle of child apprehension and hopelessness that has characterized many of these women’s lives. Together, Fir Square and Sheway respond to systemic barriers in an integrated and multidimensional way to provide space for stabilization of the mother/infant team, which creates the possibility for change.

Sheway is a Coast Salish word that means “growth.” In both of these unique programs, women and their children are experiencing growth and success as they are given the chance to room-in with their infants, breastfeed if they desire, and parent, all of which have been historically (and contemporarily in most jurisdictions) denied them.

**Sheway Pregnancy Outreach Program**

- Approximately 80 per cent of women who access services have lived in foster care type arrangements.
- In 2012/13, 74 per cent of children were in the care of their parent/s while 24 per cent were in foster care. This contrasts with 1993, when 100 per cent of infants born to substance using mothers were apprehended.
- In 2016/17:
  - 331 women and 329 children received services through Sheway
  - 35 per cent of clients were on opiate replacement therapy
  - hot lunches were provided to 1,132 clients per month
  - 150 outreach visits attempted to engage and advocate for clients
  - 60 per cent of infants left the hospital in their mother’s care and 90 per cent remain in their mother’s care.
A Provincial Model: Alberta PCAP

The Parent-Child Assistance Program (PCAP) was developed at the University of Washington in 1991 as an evidence-based demonstration project aimed at the prevention of alcohol and drug exposed births. PCAP is a three-year home visitation program that partners a mentor with a high risk mother. The mentor supports the client to achieve her self-determined goals by creating relationships with community service providers. The PCAP program is in many ways similar to B.C.’s Sheway and Fir Square programs in terms of working with high risk substance using mothers to promote healthy pregnancies, healthy births and positive parenting.

In 1999, three PCAP programs operated in Alberta. Today 30 programs operate across the province located in urban centres, remote communities and First Nations communities. Typically, more than 600 women are served each year. The Alberta PCAP Council is a non-profit board that supports PCAP programs in the province to operate in an educated, culturally safe, thoughtful and efficient manner that is consistent with the Alberta PCAP model. Although considerations such as geographic isolation, location, availability of other resources and number of staff members has led to variations among programs, PCAP core training and other provincial supports contribute to conformity to the model and the success of PCAP in Alberta.

Funding is provided mainly by the Alberta FASD Cross Ministry Committee with representatives from the Ministries of Education, Community and Social Services, Children's Services, Enterprise and Advanced Education, Health, Aboriginal Relations and Justice and Solicitor General.

First Nation Inuit Health Branch has been funding seven First Nation PCAPs since 2006, and in 2015, Alberta Health provided funding for six additional PCAPs in First Nation communities.

PCAP and Child Welfare Involvement

- At intake, about half of the women served by PCAP had an open case with Children’s Services (CS) at some point in the previous three years, and more than half of the women had involvement with CS after the birth of the target infant.

- Throughout the program there is a small decrease in the number of women who accessed CS and an increase in the number of women who did not require CS services.

- PCAP mentors work closely with the community service providers who work with the women. Mentors help the women create action and safety plans, which could support their CS requirements. Mentors also encourage women to connect and communicate honestly with CS, building trust between the women and their CS worker.

- After the target infant’s birth, 76 per cent of women had legal custody of their infant, 17 per cent of the infants were in the custody of the Director, two per cent were in the custody of the father or other relative, and two per cent were in the custody of legal guardianship.
Huu-ay-aht First Nations Social Services Project: Safe, Healthy and Connected, Bringing Huu-ay-aht Children Home

Huu-ay-aht First Nations on Vancouver Island recently received federal and provincial government funding to begin implementing 30 recommendations made by its independent Social Services Panel in 2017. Of these recommendations, Huu-ay-aht has made Recommendation 26 one of its top priorities: working to establish a centre to keep families together. The need for prompt action to provide safe housing and resources has been a strong message from the Huu-ay-aht community. Building from models for social services homes that provide single-site programming and safe housing for Indigenous families – such as the Vancouver Aboriginal Mothers Centre and similar centres established by the Seabird Island and Sts’ailes First Nations – Huu-ay-aht aims to open a home in Port Alberni for services and families in the near future. Huu-ay-aht sees this as an important step toward minimizing harmful disruptions that separate Huu-ay-aht children and families.
Conclusion

In the context of child welfare matters, when an infant is removed from its birth mother, the infant is generally deprived of his or her right to the nutritional benefits of breastmilk, which research shows has a long-term impact on healthy development. Research also shows that breastfeeding promotes attachment, which similarly plays a positive role in a child’s development.

MCFD and RCY undertook this review of existing policies and practice in B.C. and other jurisdictions with a shared goal of strengthening families’ capacity to care for infants and potentially prevent the removal of infants from their birth mothers. To understand the present situation and to consider less disruptive measures for families, it was necessary to review MCFD data and relevant RCY advocacy cases. It is evident from this work that the role of extended family and communities must be considered as crucial supports that can keep mothers and infants together.

The over-representation of Indigenous children and youth in care begins with the decision to bring a child into care in the first place. It is therefore imperative that practices that result in fewer children entering care are considered and implemented in B.C.

While each situation that arises is unique, and it is complex to balance an infant’s right to nutrition and connection with his or her right to safety, MCFD and RCY are in agreement that guidelines must be in place and steps must be taken to promote family unity wherever possible. In the longer term, it is clear that this is in an infant’s best interests.
**Action Plan**

As a result of this review, MCFD has committed to the following actions:

1. MCFD will review and update its *Practice Directive on Working with Expectant Parents with High Risk Behaviours* with respect to considering additional practices and guidelines for social workers to plan with families to help mothers and their infants remain together, including the role of extended family and communities in supporting mothers and infants.
   - To be completed by September 30, 2019.

2. MCFD will develop guidelines for social workers to promote breastfeeding in circumstances in which infants have been removed. These would include: facilitating breastfeeding by mothers; ways to make breastmilk available to the infant; breastfeeding and substance use; and, purchasing breast pumps.
   - To be completed by March 31, 2019.

3. MCFD will research promising practice models of supportive housing alternatives in which both mothers and their infants at risk can be placed, and will develop a plan for implementation of those resources.
   - To be completed by September 30, 2019.

4. The Ministry of Health and the Ministry of Mental Health and Addictions will work with MCFD and Indigenous partners to continue to increase access to evidence-based programs that provide prenatal and post-partum care for women who use substances and to their infants exposed to substances.
   - To be completed by March 31, 2019.

5. MCFD and RCY will explore policies and practices to improve access to RCY advocacy services including:
   - RCY’S advocacy outreach initiatives will target stakeholders who provide services to expectant mothers.
   - In their review of Practice Directive noted in Action 1, MCFD will consider practices and guidelines for social workers to provide information to mothers, fathers and families about the role of RCY advocacy services on behalf of the expected child.
   - To be completed by September 30, 2018.
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A Rooming-in Program to Mitigate the Need to Treat for Opiate Withdrawal in the Newborn

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Abstract

Objective: The purpose of this study was to explore the effect of our rooming-in protocol on the need to treat withdrawal in the opiate-exposed newborn.

Methods: We reviewed the medical records of mother–infant dyads born between October 1, 2003, and December 31, 2006, who received care in our rooming-in program. Data on the type of drug used by the mother, maternal methadone dose at delivery, morphine treatment of the baby, and perinatal outcome were considered.

Results: We found a significant positive relationship between maternal methadone dose at delivery, “other opiate” use, and breastfeeding and the need to treat the neonate for withdrawal. We also found the maternal methadone dose at delivery to be related to the duration of pharmacological treatment of the neonate.

Conclusion: Our findings suggest a role for our rooming-in program in mitigating the relationship between maternal methadone dosage and the need to treat opiate withdrawal in the newborn. Consideration of the role played by the mother–infant dyad model of care needs to be considered in future studies.

INTRODUCTION

Methodone treatment is a preferred treatment for opiate-dependent pregnant women, and it has been shown to improve prenatal care compliance and perinatal outcomes over continued illicit drug use.1–3 Maternal methadone usage, however, is also associated with neonatal abstinence syndrome in 13% to 94% of exposed neonates.4–6 The relationship between maternal methadone dosage and NAS is controversial, and the available data are conflicting.7–11 Many of the previous studies in this area have been limited by small sample size and inadequate statistical power.12 Furthermore, it has been difficult to draw any general conclusions with regard to any relationship between maternal methadone use and NAS because of differences in study designs, populations under study, rates of concomitant illicit drug use, reporting of maternal methadone dosages, and assessment protocols for withdrawal.13,14
A few recent studies have reported a dose–response relationship between the maternal methadone dosage and the need to treat the infant for withdrawal.\(^7\),\(^12\),\(^15\) A positive relationship between the dosage of maternal methadone at delivery and the duration of the NAS episode has also been reported.\(^15\) Dryden et al.\(^7\) examined the development of NAS and the duration of infant hospital stay in 450 singleton pregnancies in women prescribed methadone during pregnancy. Over 45% of infants developed withdrawal requiring pharmacological treatment, and the need for treatment was independently related to the prescribed maternal methadone dose rather than to associated polydrug misuse. Rooming-in, the practice of caring for newborn and mother together in the same room, was promoted in the population under study, with infants being cared for at their mother’s bedside. Nonetheless, almost 40% of the infants in this study were admitted to the neonatal nursery, and it is unclear whether rooming-in mediated the relationship between the maternal methadone dose and the treatment for neonatal withdrawal.

Our recent retrospective review of maternal–infant outcomes in a substance-using population demonstrated that rooming-in can facilitate a smooth transition to extraterine life for substance-exposed newborns by decreasing neonatal intensive care unit admissions and length of stay for term infants, encouraging breastfeeding, and increasing maternal custody of infants at discharge.\(^16\) The purpose of the current study was to determine the relationship between maternal drug use and treatment for neonatal withdrawal in our rooming-in program.

**METHODS**

We analyzed medical chart data on mother–infant dyads who received rooming-in care between October 1, 2003, and December 31, 2006, on Fir Square, a combined care unit within BC Women’s Hospital, a major prenatal care provider and the major tertiary care centre in British Columbia for women and newborns. Data were collected by clinical chart review. This review was conducted by two research assistants who independently reviewed each chart and entered data into an outcome variable data table, developed a priori. The analysis of outcomes was restricted to singleton pregnancies.

To examine the possible effects of drug use, methadone dose, gestational age, and breastfeeding on the duration of morphine treatment, we used a negative binomial regression for count data as implemented in the MASS package in R (R Foundation for Statistical Computing, Vienna, Austria) on the subsample of 63 babies who received morphine. For all coefficients and variables, we report means ± standard errors.

Fir Square, the first unit of its kind in Canada, provides obstetrical care, detoxification, and stabilization for pregnant and postpartum women with problematic substance use. Problematic substance use is defined as drug use (prescribed or not prescribed) that affects the well-being of the pregnancy, both obstetrically and socially. Mothers and babies are cared for together in the same room beginning immediately after birth. Fir Square offers a comprehensive program addressing mothers’ drug use (if current), while allowing her to care for her newborn at the bedside immediately postpartum, enabling breastfeeding, skin-to-skin holding, and cuddling. Care providers provide education on newborn parenting and provide trauma-informed care, which is a necessity for many women. Fir Square is the referral centre for this population in British Columbia and, as such, cares for particularly high-risk patients.\(^16\) Data on the type of drug used by the mother, maternal methadone dose at delivery, morphine treatment of the baby, and perinatal outcome were considered.

Mothers are encouraged and taught how to hold their babies, with the aim of settling the baby and minimizing withdrawal symptoms. Care providers concentrate on identifying symptoms such as diarrhea, vomiting, and an inability to feed well. The effect of these symptoms on the baby’s ability to thrive is measured objectively with daily weighing, thereby eliminating the observer bias inherent in the recognized scoring systems for classification of withdrawal. Babies are not treated with morphine during the initial 36 to 72 hours. If the baby loses more than 10% of birth weight and there are no other reasons for weight loss (such as poor maternal milk production, inability to latch, or any other underlying acute medical condition), then the baby is treated for withdrawal with morphine. Initially, the baby receives a loading dose of 0.03 mg per kilogram every three hours. Typically the baby settles in two to three days (i.e., starts feeding well and gaining weight) and the morphine dose is then decreased by 0.02 mg/kg every two days until the baby is weaned off morphine. Importantly, babies are treated for withdrawal while still rooming-in with the mother.

Ethics approval for this study was obtained from the University of British Columbia Children and Women’s Research Ethics Board.
RESULTS

Our sample was 295 women with a mean (± SD) maternal age of 27.5 ± 6.2 years. This sample captured all women on Fir Square within the study period except those with twins, who were excluded from the analysis. The mean gravidity was 3.8 ± 2.5; 33.9% of mothers were primiparous and 66.1% were multiparous. The mean gestational age at delivery was 37.9 ± 1.8 weeks, and the mean birth weight of the neonates was 3084 ± 523.8 grams.

The women in our original rooming-in group used a variety of substances (Table 1). A multivariate analysis (logistic regression) was conducted to determine whether the type of substance used by the mother, her methadone dose, breastfeeding, and gestational age influenced whether her baby was treated with morphine for withdrawal. In total, of the 295 neonates in our sample, 63 (21.1%) were treated with morphine. The mother’s methadone dose, other opiate use, and breastfeeding were all significant predictors of a baby’s probability of receiving morphine. Neither gestational age nor other drug types were significantly associated with probability of morphine treatment. Of the 15 babies whose mothers used other opiates, eight (53%) were treated with morphine, while only 55 of the 287 babies (19%) whose mothers did not use other opiates were treated with morphine. Of the 196 babies who were breastfed, 24 (12%) were treated with morphine, while 37 of the 99 babies (37%) who were not breastfed received morphine treatment. Babies whose mothers did not use opiates of any kind were never treated with morphine. In addition, 153 mothers in our cohort (52.0%) received methadone on the day of delivery (this information was missing for one woman). A larger number of babies born to these mothers (37.3%) received morphine for withdrawal after birth than the babies of mothers who did not receive methadone on the day of delivery (3.5%). The probability of a baby receiving morphine if the mother did not use other opiates, receive methadone, or breastfeed was not significant ($P = 0.15$). The use of other opiates was significantly associated with an increased probability of the baby receiving morphine (OR 6.31 ± 1.86; 95% CI 1.88 to 21.24, $P = 0.004$) (Table 2). This odds ratio corresponds to an increase of 531% in a baby’s odds of receiving morphine if the mother took other opiates relative to the odds of babies whose mothers who did not take other opiates. Breastfeeding was associated with a decrease in the probability of a baby receiving morphine (OR 0.21 ± 1.43; 95% CI 0.10 to 0.42, $P < 0.001$), corresponding to a decrease of 79% in the odds of a baby receiving morphine when the mother was breastfeeding. In addition, the mother’s dose of methadone (range 0 to 250 mg) on the day of delivery was a significant predictor of whether a baby received morphine (OR 1.024 ± 1.004; 95% CI 1.016 to 1.031, $P < 0.001$).

If the mother’s breastfeeding and other drug use were held constant, there was a 24% increase in a baby’s odds of receiving morphine for every 10 mg increase in methadone on the day of delivery (Figure, Table 2). The predicted probabilities of babies receiving morphine for different doses of methadone, for breastfeeding, and for other opiate use are shown in Table 3. The predicted methadone dose required for 50% of babies to receive morphine was 74 mg when mothers did not breastfeed or take other opiates, 143 mg when mothers breastfed and did not use other opiates, 0 mg when mothers did not breastfeed but used other opiates, and 54 mg when mothers breastfed and used other opiates.

The mean total length of neonatal morphine treatment was 17.9 days (range 6 to 55, median 16). The only significant predictor of the length of morphine treatment was the size of the mother’s methadone dose on the day of delivery (likelihood ratio test statistic = 11.66; $P < 0.001$). The results suggest that for every 10 mg increase in methadone on the day of delivery, the duration of morphine treatment increased by 4%.

DISCUSSION

Our data agree with previous findings reporting a dose–response relationship between maternal methadone dosage and treatment for neonatal withdrawal. In agreement with Dryden et al., we observed a strong positive relationship between the maternal methadone dose at delivery and the need to treat the neonate for withdrawal. In the study by Lim et al., 77% of methadone-exposed neonates received pharmacological treatment for withdrawal, whereas only 37.3% of the methadone-exposed neonates in our sample required morphine. Rather than concluding that rooming-in mitigates this relationship, it could be argued that because the mean methadone dosage was lower in our study, fewer neonates in our sample required pharmacological treatment for withdrawal. In the study by Lim et al., 77% of methadone-exposed neonates received pharmacological treatment for withdrawal, whereas only 37.3% of the methadone-exposed neonates in our sample required morphine. Rather than concluding that rooming-in mitigates this relationship, it could be argued that because the mean methadone dosage was lower in our study, fewer neonates in our sample required pharmacological treatment for withdrawal. However, the mean maternal methadone doses at which babies received treatment for NAS was 62.0 ± 26.3 mg in the non–rooming-in population, and 83.0 ± 7 mg in our rooming-in cohort. Similarly, in the study by Dashe et al., the threshold of maternal methadone resulting in treatment of the neonate for withdrawal was much lower, with 90% of infants whose mothers took > 40 mg/day of methadone requiring treatment for withdrawal. These results suggest that our rooming-in program does indeed mitigate the
Table 1. Types of drug exposure of the mother and fetus

<table>
<thead>
<tr>
<th>Substance</th>
<th>Yes n (%)</th>
<th>No n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methadone (on day of delivery)</td>
<td>153 (52.0)</td>
<td>141 (48.0)</td>
</tr>
<tr>
<td>(missing n = 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heroin</td>
<td>101 (34.2)</td>
<td>194 (65.8)</td>
</tr>
<tr>
<td>Other opiates (opium, hydromorphone, pentazocine, codeine, oxycodone, street methadone)</td>
<td>15 (5.1)</td>
<td>287 (94.9)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>69 (23.4)</td>
<td>226 (76.6)</td>
</tr>
<tr>
<td>Crack cocaine</td>
<td>174 (59.1)</td>
<td>121 (40.9)</td>
</tr>
<tr>
<td>Crystal meth (methamphetamines)</td>
<td>41 (13.9)</td>
<td>254 (86.1)</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>7 (2.4)</td>
<td>288 (97.6)</td>
</tr>
<tr>
<td>Amphetamines (including methylphenidate)</td>
<td>10 (3.4)</td>
<td>285 (96.6)</td>
</tr>
<tr>
<td>Cigarettes</td>
<td>247 (87.3)</td>
<td>36 (12.7)</td>
</tr>
<tr>
<td>Total sample, n</td>
<td>295</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Results of logistic regression on probability of morphine treatment for withdrawal

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard error</th>
<th>Deviance</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>−1.7</td>
<td>0.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s methadone dose</td>
<td>0.023</td>
<td>0.004</td>
<td>53.71</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>−1.58</td>
<td>0.36</td>
<td>20.87</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Other opiates</td>
<td>1.84</td>
<td>0.62</td>
<td>8.44</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Probability of baby receiving morphine treatment by mother’s methadone dose according to other opiate use and breastfeeding. The lines show the predicted probabilities from the logistic models for different levels of the explanatory variables. The tick marks on the top and bottom indicate the density of overlapping data at each point.
relationship between maternal methadone dose at delivery and the need to treat the neonate for opiate withdrawal. It appears that babies who are permitted to room-in with their mothers in our program do not develop (and are not treated for) withdrawal symptoms to the same degree as non–rooming-in infants reported in other studies.

Contrary to the findings of Dryden et al.,7 we found that “other opiate” use also independently predicted development of NAS. Many previous studies have restricted their analyses to methadone treatment of the mother and morphine treatment of the baby.11–13,15 However, we felt it was important to include all women admitted to Fir Square because previous reports have documented a relationship between nicotine exposure and withdrawal in the neonate17,18 that may be confused with neonate opiate withdrawal. Our analysis did not reveal such a trend, but this may be because fewer infants were identified as having NAS and treated for withdrawal using our objective classification of withdrawal. In our sample, not only the maternal methadone dose at delivery, but also other opiate use, was found to be related to the need to treat the infant for withdrawal. However, this relationship disappeared when we examined the relationship between maternal drug use and the duration of morphine treatment of the neonate. We found maternal methadone dose at delivery to be the only independent predictor of the duration of morphine treatment of the neonate. Lim et al.15 also found a positive relationship between the last dose of maternal methadone just before delivery and the duration of treatment for NAS. These authors found that each 1 mg increase in the last maternal methadone dose before delivery was associated with an additional 0.18 days of infant treatment for NAS.15 A comparative increase in the methadone dosage in our cohort resulted in a smaller increase in the number of days the neonate was treated for withdrawal. It may be that rooming-in mitigated this relationship, or that the dose response relationship is more accurate in our cohort because of our larger sample size and our use of an objective scoring system for determining withdrawal. Indeed, Saiki et al.19 also found that the duration of treatment in infants who roomed-in was less than that in infants admitted to the neonatal unit.

A greater proportion of infants in our study than in other studies8,15 were breastfed. As breast milk contains methadone, and low levels of methadone have been found in the plasma of methadone-exposed newborns,20–22 breastfed babies have been observed to exhibit less severe withdrawal, and a shorter duration of withdrawal, than their non-breastfed counterparts.15,23 In addition, it is possible that by facilitating breastfeeding and thereby fostering a soothing bond between mother and child24 in the quieter postnatal ward rather than the noisier NICU,19 our rooming-in model of care contributed to the aforementioned effects on infant withdrawal and the reduced need for pharmacological treatment. Anecdotally, in our sample, babies who were initially breastfed but then switched to formula (for reasons such as poor maternal milk production) were able to gain weight effectively and subsequently did not require pharmacological treatment for withdrawal. This suggests that the role played by methadone in breast milk in lessening withdrawal symptoms is minimal.

The retrospective nature of this study meant that we could consider the maternal methadone dose only at delivery because of constraints in documented data. However,

<table>
<thead>
<tr>
<th>Mother's methadone dose (mg)</th>
<th>No breastfeeding and no other opiates</th>
<th>Breastfed and no other opiates</th>
<th>No breastfeeding and other opiate use</th>
<th>Breastfed and other opiate use</th>
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</thead>
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<td>0.03</td>
<td>0.52</td>
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<td>0.98</td>
<td>0.92</td>
<td>1.00</td>
<td>0.99</td>
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</tbody>
</table>
other studies have also faced similar restrictions. Future studies should address the relationship between illicit drug and methadone use over the course of pregnancy and the need to treat for opiate withdrawal in the newborn. Indeed, Harper et al. found a significant relationship between the amount of methadone ingested in the last 12 weeks of pregnancy and the rate and severity of neonatal withdrawal. Similarly, future studies should also examine the influence of other drugs such as antiretrovirals and antidepressants that, like nicotine, may also cause a form of neonatal withdrawal. Furthermore, the objective determination of withdrawal in our sample results in fewer neonates being identified as having NAS and being treated for withdrawal. We believe our classification of withdrawal eliminates the observer bias inherent in other methods of withdrawal classification, but future research should address this.

We acknowledge that a comparison of our results with those from the non–rooming-in population is limited by the potential role of confounding factors not specific to the model of care. To determine the effect of our rooming-in program on such outcomes conclusively, it would be necessary to compare our rooming-in model of care directly with a non–rooming-in model of care in a comprehensive study.

This study highlights the need for future research to consider the effect of the mother–infant dyad model of care (in substance-using populations) on the need to treat the neonate for withdrawal. Fortunately, the practice of rooming-in as a standard of care may be becoming more widespread in other jurisdictions. We have found that the first step in implementing such a model of care is to break down the prejudices concerning this population. In our experience, presentation of evidence at a symposium attended by a multidisciplinary audience of nurses, physicians, social workers, administrators, and representatives of community programs has been sufficient in overcoming such attitudinal hurdles. Having a dedicated unit for substance-using mothers is not a requirement for offering rooming-in. Rather, a supportive attitude on the part of staff and administrators can enable the success of this care model.

CONCLUSION

The current study suggests a useful role for rooming-in in mitigating the relationship between maternal methadone dose and the need to treat the newborn for opiate withdrawal. Rooming-in appears to be a safe alternative to the current standard of care that separates mother and baby in substance-using populations.

ACKNOWLEDGEMENTS

This project was supported by the BC Children’s Hospital Foundation through their Telethon granting competition.

The authors wish to thank the Women’s Health Research Institute staff for assistance with data collection for this study, Dr Arianne Albert for statistical support, the staff of Fir Square for their unique skills in providing care and practising harm reduction on a practical level, the physicians of the Perinatal Addiction Service, and Dr Paul Thiessen and his pediatric colleagues for their invaluable support.

REFERENCES


An Evaluation of Rooming-in Among Substance-exposed Newborns in British Columbia

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Abstract

Objective: Rooming-in, the practice of caring for mother and newborn together in the same room immediately from birth, is preferred for the general postpartum population but is not yet standard practice of care for newborns of substance-using women. Such newborns are usually separated from their mothers and admitted to a neonatal intensive care unit and treated for substance withdrawal if necessary. We compared clinical and psychosocial outcomes associated with traditional standard care models versus an interdisciplinary rooming-in model of care for substance-exposed newborns.

Methods: We conducted a retrospective comparative review of a cohort of substance-exposed newborns. Data were extracted from the British Columbia Perinatal Health Program database to populate the standard care and rooming-in groups. The main study outcomes were neonatal admission to NICU, breastfeeding, presence of neonatal withdrawal, length of stay, and custody status at discharge.

Results: Rooming-in was associated with a significant decrease in admissions to NICU and a shorter NICU length of stay for term infants, increased likelihood of breastfeeding (either exclusively or in combination with formula) during the hospital stay, and increased odds of the baby being discharged home with the mother. There were no significant differences between groups with respect to the presence of neonatal substance withdrawal or breastfeeding status at discharge.

Conclusion: Rooming-in may facilitate a smooth transition to extrauterine life for substance-exposed newborns by decreasing NICU admissions and NICU length of stay for term infants, encouraging breastfeeding, and increasing maternal custody of infants at discharge. This review supports the finding that rooming-in is both safe and beneficial for substance-exposed babies.

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Key Words: Postnatal care, rooming-in care, substance use disorders, neonatal abstinence syndrome, policy

Competing Interests: None declared.
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Résumé

Objectif : La cohabitation est associée à une baisse considérable des soins à la mère et au nouveau-né dans la même pièce immédiatement à la suite de l’accouchement) soit privilégiée pour la population postpartum générale, elle ne constitue toujours pas la pratique standard pour ce qui est des soins offerts aux nouveau-nés issus de mères toxicomanes. Ces nouveau-nés sont habituellement séparés de leurs mères, admis à l’unité néonatale de soins intensifs et font l’objet d’un traitement visant les symptômes de sevrage, au besoin. Nous avons comparé les issues cliniques et psychosociales associées aux modèles soins standard traditionnels et au modèle interdisciplinaire de soins en cohabitation visant les nouveau-nés ayant été exposés à des substances psychoactives.


Résultats : La cohabitation était associée à une baisse considérable du nombre d’admissions à l’UNSI et à une durée de séjour moindre à l’UNSI pour ce qui est des enfants nés à terme, à une probabilité accrue d’allaitement (que ce soit de façon exclusive ou conjointement avec une préparation lactée) au cours de l’hospitalisation, ainsi qu’à une probabilité accrue de voir le nouveau-né retourner à la maison en compagnie de sa mère. Aucune différence significative n’a été constatée entre les groupes en ce qui a trait à la présence de symptômes néonatals de sevrage ou au statut quant à l’allaitement au moment de l’obtention du congé de l’hôpital.

Conclusion : La cohabitation peut faciliter la mise en œuvre d’une transition en douceur vers la vie extra-utérine pour les nouveau-nés ayant été exposés à des substances psychoactives, et ce, en diminuant le nombre d’admissions à l’UNSI et en écourant la durée du séjour à l’UNSI pour ce qui est des enfants nés à terme, en favorisant l’allaitement, ainsi qu’en augmentant la probabilité que la mère obtienne la garde du nouveau-né au moment de l’obtention du congé de l’hôpital. Cette analyse soutient la constatation selon laquelle la cohabitation s’avère sûre et bénéfique pour les nouveau-nés ayant été exposés à des substances psychoactives.
INTRODUCTION

While it is acknowledged that prenatal drug use is a serious concern in Canada, only limited prevalence estimates are available for Canadian populations.1 Recently, however, the Canadian Maternity Experiences Survey noted a 6.7% and a 1% prevalence, respectively, of street drug use in women in the three months preceding pregnancy and during pregnancy.2 Substance-exposed newborns commonly experience drug withdrawal, known as neonatal abstinence syndrome,3,4 and may display jitteriness, inconsolable and high-pitched crying, weight loss, vomiting, diarrhea, poor sucking, and even convulsions.3–7 Standard care for substance-exposed newborns means immediate separation from their mother and transfer to a higher-care nursery or neonatal intensive care unit. Such separation is generally based on two assumptions: (1) that the mothers involved are incapable of being "good" mothers, and (2) that the management of withdrawal for these babies is safer when they are not in the care of their mothers.

Separation of mother–infant dyads in the early postpartum period is detrimental to the development of mother–infant bonding and attachment.8 It is predictive of infant abandonment, abuse, and neglect in the non-addicted population.2–12 and is even more likely to be so for high-risk populations.9 We know that this early period is critical and influential; the health benefits of immediate contact from birth seem to be life-long,11 and substance-exposed infants are the most at-risk for poor attachment and abandonment.13 In addition, an early and immediate separation of mother and infant limits the likelihood of breastfeeding.11,14 which is encouraged and considered safe for infants of mothers maintained on methadone treatments.15 However, rooming-in, now standard in maternity settings, is not usually offered to substance-using women, in spite of the known consequences of early separation.3 Findings from our previous evaluation of the effect of rooming-in5 suggested that this unique model of care may ease opioid-exposed newborns’ transition to extrauterine life and promote more effective mothering. The current retrospective review was designed to extend this earlier evaluation to a more expansive review of all substance-exposed newborns who received either standard or rooming-in models of care in the province of British Columbia during the study period. To our knowledge, this investigation is the most comprehensive evaluation of rooming-in for substance-exposed newborns to date.

METHODS

We conducted a retrospective review of all newborns born to women who were identified by hospital administrative data as having used substances during their pregnancy and having delivered in British Columbia between October 1, 2003, and December 31, 2006. Newborns and their mothers were categorized into two groups based on whether they were delivered at BC Women’s Hospital (rooming-in group) or elsewhere in British Columbia (standard care group). The data examined for these two groups included all demographic and clinical variables. The data were provided by the BC Perinatal Database Registry, an administrative database that captures maternal and newborn health variables for all births in British Columbia and is administered by the British Columbia Perinatal Health Program. Only hospitals with neonatal intensive care units (i.e., a Level II or Level III nursery) and only singleton infants were included in the analysis.

The main study outcomes were newborn admission to a higher level of care nursery, breastfeeding during hospital stay and at discharge, presence of neonatal substance withdrawal, newborn total length of stay (including NICU days if applicable), mother’s length of stay, and custody status at discharge.

Substance-using mothers were identified by examining two data sources: (1) the British Columbia Perinatal Health Program “substance use” flag, which is separate from “drugs (over the counter),” “alcohol,” or “smoking” social history risk flags; and (2) the Canadian Institute for Health Information Discharge Abstract Database ICD 10CA, “maternal use of drugs affecting pregnancy” and “identification of specific drug.” If either of these fields indicated substance use affecting pregnancy, the case was included in our analysis.

The rooming-in group received care at Fir (Families in Recovery) Square, a combined care unit within BC Women’s Hospital, a major prenatal care provider and the major tertiary care centre in British Columbia for women and newborns. Fir Square, the first unit of its kind in Canada, provides care, detoxification, and stabilization for pregnant and postpartum women with problematic substance use. Mothers and their babies are cared for together in the same room, and routine care includes comprehensive education and hands-on instruction for mothers on how to care for their babies and how to identify signs of withdrawal. Fir Square is the referral centre for British Columbia and, as such, cares for particularly high-risk patients.

The standard care group received care elsewhere in British Columbia from hospitals that did not practise the same extensive prenatal and postnatal care. The nursing staff working on the maternity unit of each of these hospitals were contacted to confirm that they did not offer rooming-in to mothers with substance abuse during the
study period. The mother–infant dyads in the standard care group came from the following 12 hospitals in British Columbia: Royal Columbian, Victoria General, Surrey Memorial, Matsqui-Sumas-Abbotsford General, Burnaby General, St. Paul’s, Richmond General, Lion’s Gate, Royal Inland, Kelowna General, Nanaimo Regional General, and Prince George Regional.

Statistical analyses were performed using SPSS version 17 (SPSS Inc., Chicago IL). Demographic and clinical variables were summarized using descriptive statistics. Hierarchical logistic regression models were used to examine the relationships between rooming-in versus standard care and the categorical neonatal outcomes (admission to NICU, breastfeeding, symptoms of withdrawal, custody), controlling for potential covariates when appropriate (e.g., gestational age and NICU admission). Differences in the continuous neonatal outcomes (length of stay in hospital, length of stay in NICU) between rooming-in and standard care groups were examined using ANOVA.

Ethics approval for the study was provided by the University of British Columbia Clinical Research Ethics Board, and the Children’s and Women’s Hospital and Health Centre Research Review Committee. Further ethics approval was provided by the British Columbia Perinatal Health Program to extract data to populate the two study groups.

RESULTS

All results reported are based on analyses of singleton infants with a full range of gestational ages. However, the same analyses were conducted restricting the sample to term infants. In most instances the results did not differ, but the results of both analyses are reported where they did. The characteristics of the 952 substance-exposed newborns populating the rooming-in group (n = 355) and the standard care group (n = 597) are presented in Table 1. Differences between groups with respect to maternal age, gravidity, and parity were not significant.

Controlling for gestational age at delivery, substance-exposed newborns who received the rooming-in model of care at Fir Square had decreased odds of being admitted to NICU relative to those who received standard care at other British Columbia hospitals with NICU access (OR 0.68; 95% CI 0.51 to 0.92, P = 0.01). This result persisted when the analysis was restricted to term infants (OR 0.47; 95% CI 0.324 to 0.67, P < 0.001). Details of all newborns and term newborns who were admitted to NICU are presented in Table 2.

Newborns in the rooming-in group also had increased odds of receiving breast milk (either exclusively or in combination with formula) during their hospital stay (OR 2.11; 95% CI 1.61 to 2.77, P < 0.001) (Table 3), but there was no difference between groups in breastfeeding status at discharge, either exclusively or in combination with formula (OR 0.953; 95% CI 0.67 to 1.35, P = 0.79) (Table 4).

There was no significant difference between groups with respect to symptoms of neonatal withdrawal (OR 1.06; 95% CI 0.79 to 1.43, P = 0.687). The majority of infants in both groups did not exhibit symptoms of neonatal withdrawal, as indicated in Table 5.

Detailed information regarding length of stay for both newborns and mothers is presented in Table 6. On average, newborns in the rooming-in group were admitted to hospital for almost 21 days (± 20.50), and those in the standard care group remained in hospital for approximately 11 days on average (± 19.45). Both newborn length of stay (F = 56.20, df = 1,944, P < 0.001) and mother’s length of stay (F = 311.76, df = 1,950, P < 0.001) were significantly higher in the rooming-in group, but there was no difference between groups with respect to total days spent in NICU (F = 0.004, df = 1,950, P = 0.95). On average, newborns in the rooming-in group spent nearly 12 days (± 10.53) together with their mothers during their hospital stay. When preterm infants were excluded from the length of stay analyses, the same trends were seen in all comparisons apart from the total amount of time spent in the NICU. The total number of NICU days was significantly shorter for rooming-in infants (mean 1.1 ± 3.1 days) than for standard care infants (mean 3.1 ± 8.3 days; F = 13.68, df = 1,689, P < 0.001).

Finally, the newborns in the rooming-in group also had increased odds of being discharged home with their mothers compared to being discharged to foster care or adoption (OR 1.63; 95% CI 1.22 to 2.19, P = 0.001). Details of discharge status are presented in Table 7.

DISCUSSION

Rooming-in of substance-exposed newborns was associated with a significant decrease in neonatal admissions to NICU, a shorter NICU length of stay for term infants, increased likelihood of breastfeeding (either exclusively or in combination with formula) during the hospital stay, greater lengths of stay for both newborns and mothers, and increased odds of newborns being discharged home with their mothers. There were no significant differences between groups with respect to neonatal withdrawal symptoms or breastfeeding status at discharge, although in both groups, the majority of newborns did not exhibit withdrawal symptoms and were not breastfed (with or without formula) at discharge.

The finding that newborns in the rooming-in group were half as likely to be admitted to NICU is consistent with our preliminary study⁵ and supports the finding that mother–infant contact is beneficial for other at-risk
An Evaluation of Rooming-in Among Substance-exposed Newborns in British Columbia

Table 1. Characteristics of women and their newborns in each study group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rooming-in group (n = 355)</th>
<th>Standard care group (n = 597)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean maternal age, years (SD)</td>
<td>27.49 (6.23)</td>
<td>26.13 (6.13)</td>
<td>F = 10.986, df = 1,950, P = 0.001</td>
</tr>
<tr>
<td>Mean gravidity (SD)</td>
<td>3.84 (2.46)</td>
<td>3.32 (2.21)</td>
<td>F = 11.202, df = 1,950, P = 0.001</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primiparous, n (%)</td>
<td>121 (34.1)</td>
<td>222 (37.2)</td>
<td>χ² = 0.929, df = 1, P = 0.335</td>
</tr>
<tr>
<td>Multiparous, n (%)</td>
<td>234 (65.9)</td>
<td>375 (62.8)</td>
<td></td>
</tr>
<tr>
<td>Mean gestational age at delivery, weeks (SD)</td>
<td>37.39 (4.32)</td>
<td>37.64 (2.61)*</td>
<td>F = 1.228, df = 1,937, P = 0.268</td>
</tr>
<tr>
<td>Mean birth weight, grams (SD)</td>
<td>2934 (681)</td>
<td>2971 (643)†</td>
<td>F = 0.723, df = 1,948, P = 0.395</td>
</tr>
</tbody>
</table>

*n = 584
†n = 595

Table 2. Admissions to NICU

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rooming-in group (n = 231)</th>
<th>Standard care group (n = 282)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICU (n %)</td>
<td>138 (38.9)</td>
<td>231 (45.0)</td>
<td>OR 0.68; P = 0.68;</td>
</tr>
<tr>
<td>No NICU (n %)</td>
<td>217 (61.1)</td>
<td>282 (55.0)</td>
<td>P = 0.01*</td>
</tr>
</tbody>
</table>

*n = 584
†n = 595

Table 3. Babies receiving breast milk (either exclusively or in conjunction with formula) during hospital stay

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rooming-in group (n = 353)</th>
<th>Standard care group (n = 579)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast milk (n %)</td>
<td>225 (63.7)</td>
<td>263 (45.4)</td>
</tr>
<tr>
<td>No breast milk (n %)</td>
<td>128 (36.3)</td>
<td>316 (54.6)</td>
</tr>
</tbody>
</table>

Table 4. Breastfeeding (either exclusively or in conjunction with formula) at discharge (excluding unknowns)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rooming-in group (n = 194)</th>
<th>Standard care group (n = 487)</th>
<th>Total (n = 681)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding (n %)</td>
<td>66 (34.0)</td>
<td>171 (35.1)</td>
<td>237 (34.8)</td>
</tr>
<tr>
<td>Not breastfeeding (n %)</td>
<td>128 (66.0)</td>
<td>316 (64.9)</td>
<td>444 (65.2)</td>
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</table>

Table 5. Presence of neonatal opiate withdrawal symptoms

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rooming-in group (n = 355)</th>
<th>Standard care group (n = 597)</th>
<th>Total (n = 952)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of neonatal withdrawal (n %)</td>
<td>97 (27.3)</td>
<td>156 (26.1)</td>
<td>253 (26.6)</td>
</tr>
<tr>
<td>Absence of neonatal withdrawal (n %)</td>
<td>258 (72.7)</td>
<td>441 (73.9)</td>
<td>699 (73.4)</td>
</tr>
</tbody>
</table>

Table 3. Babies receiving breast milk (either exclusively or in conjunction with formula) during hospital stay

The association between rooming-in and increased rates of breastfeeding during hospital stays supports our preliminary findings and those of other studies that found rooming-in promotes breastfeeding.11,14,18

In addition, term infants from the rooming-in group admitted to the NICU had a shorter NICU lengths of stay than their standard care counterparts. Long stays in the NICU are disruptive to the infant’s family and are likely to interfere with mother–infant bonding.16 As a result of such findings, policies in the United Kingdom have been changed: instead of assessing and treating infants with neonatal abstinence syndrome on the neonatal unit, they are cared for on the postnatal ward together with their mothers.17 Indeed, this has been standard of care on Fir Square since its inception over eight years ago.
We expected both newborn and mother’s length of stay to be higher in the rooming-in group; our program has the resources for extensive prenatal and postpartum care. Moreover, it seems this increased maternal length of stay may be an important feature of the rooming-in model. Indeed, Alexander and Korenbrot found that prenatal care including obstetric care and interdisciplinary support was the biggest source of benefit to at-risk populations and could decrease the risk of poor obstetrical outcomes. It seems plausible that this finding may also extend to the prenatal setting. In the current study, the Fir Square newborn length of stay was substantially greater than that found in our earlier study of a small cohort of women (n = 32). The length of stay reported in the current, much larger, study is considered a more accurate reflection of reality because length of stay is frequently prolonged due to inherent problems created by socioeconomic factors, especially the lack of suitable housing.

Finally, while the majority of newborns in both groups were discharged with their mothers, newborns who roomed-in were more likely to remain in the custody of their mothers at discharge. Maternal retention of custody at discharge after rooming-in is in accordance with other studies that have found rooming-in to have a positive effect on mother–infant relations. The secondary analysis of administrative data for research purposes presents a number of limitations. Failure of databases to capture such variables as morphine treatment specific to opiate-exposed dyads in a consistent manner means that the research questions are currently driven by the data. In our analysis we were unable to report instances of morphine treatment for neonatal opiate withdrawal because this variable was not recorded. Similarly, while no significant difference was found in the presence of neonatal withdrawal symptoms, this variable is considered unreliable because the institutions vary in their reporting of less routine variables such as this.

A further limitation of our study is that we were unable to reliably report the type of illicit drugs used by pregnant women. This may have adversely affected the comparability of our groups. While the coding was available for the capture of this variable, in the majority of instances the field was incomplete or inconsistently used.

Overall, our findings indicate that this rooming-in model of care is both safe and beneficial for substance-exposed populations, because it may reduce NICU admissions, encourage breastfeeding, and support maternal custody of infants at discharge. Contrary to the current standard of care for this population, it does not seem justifiable to separate these newborns from their mothers simply because of the substance exposure, and to do so is not supported by this clinical evidence. Finally, given that this newborn population is

### Table 6. Length of stay for all populations

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rooming-in group</th>
<th>Standard care group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>All newborn LOS, days</td>
<td>355</td>
<td>20.7 (20.5)</td>
</tr>
<tr>
<td>Term newborn LOS, days</td>
<td>255</td>
<td>17.6 (11.3)</td>
</tr>
<tr>
<td>All newborn NICU days</td>
<td>355</td>
<td>5.0 (19.2)</td>
</tr>
<tr>
<td>Term newborn NICU days</td>
<td>255</td>
<td>1.1 (3.1)</td>
</tr>
<tr>
<td>Mother prenatal LOS, days</td>
<td>350</td>
<td>7.4 (14.8)</td>
</tr>
<tr>
<td>Mother postpartum LOS, days</td>
<td>355</td>
<td>14.0 (10.8)</td>
</tr>
</tbody>
</table>

LOS: length of stay

### Table 7. Custody status at discharge (excluding transfer to another hospital or unknown status)

<table>
<thead>
<tr>
<th>Status at discharge</th>
<th>Rooming-in group (n = 326)</th>
<th>Standard care group (n = 555)</th>
<th>Total (n = 881)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home, n (%)</td>
<td>228 (69.9)*</td>
<td>326 (58.7)*</td>
<td>554 (62.9)</td>
</tr>
<tr>
<td>Foster care or adoption, n (%)</td>
<td>98 (30.1)</td>
<td>229 (41.3)</td>
<td>327 (37.1)</td>
</tr>
</tbody>
</table>

*OR = 1.63, P = 0.001
already high-risk for poor developmental outcomes, it seems even more important to promote the nurturing rooming-in environment immediately from birth.

Our findings have implications for the policy and practice of care of substance-using maternity populations and their newborns in British Columbia. There is direct relevance to British Columbia from a policy perspective; recently, the BC Ministry of Health Services created a framework to address how best to manage problematic substance use and addictions. Moreover, British Columbia is developing a “comprehensive, integrated, evidence-based system of mental health and addictions services,” with a focus on “promoting health, preventing harm, treating dependency, and supporting the individual and family resiliency and self-care.” Such characteristics are at the core of the interdisciplinary rooming-in model at Fir Square, which focuses on prenatal care and emphasizes harm reduction, as disciplinary rooming-in model at Fir Square, which focuses inclusion of foster care, and mother–infant dyad support in using hospital resources, separation of mother–infant and care models, including supporting the mother–infant dyad would benefit from cost comparisons between different levels of care. This has resulted in longer lengths of stay and a high percentage of inpatient days at an “Alternative Level of Care” designation, indicating that the patient no longer requires acute care but the services or care the patient requires are not available in the community. This is a separate issue and beyond the scope of this study. It does, however, suggest that economic evaluation for providing care for substance-using mothers. This has resulted in longer lengths of stay and a high percentage of inpatient days at an “Alternative Level of Care” designation, indicating that the patient no longer requires acute care but the services or care the patient requires are not available in the community. This is a separate issue and beyond the scope of this study. It does, however, suggest that economic evaluation for providing the appropriate care for substance-using women is an important area for future study. Health service planning would benefit from cost comparisons between different care models, including supporting the mother–infant dyad using hospital resources, separation of mother–infant and inclusion of foster care, and mother–infant dyad support in the hospital and the community.

CONCLUSION

Our study has provided a foundation for future investigations to address whether rooming-in influences morphine administration for neonatal withdrawal. There are standard codes within provincial and national perinatal registries for identifying substance-using maternity patients and pharmacological interventions for neonatal withdrawal. Nevertheless, a provincial standard must be established to further define variables such as the definition of a substance-using woman. Application of consistent guidelines for identification and data abstraction within this population would lead to a better understanding of care requirements and outcomes for substance-using women and their newborns.

ACKNOWLEDGMENTS

The authors wish to thank the Fir Square staff and perinatal addiction physicians for their support and expertise. They especially wish to acknowledge Dr Paul Thiessen for his support and Dr Michael Papsdorf for his statistical guidance. This project was supported by the BC Children’s Hospital Foundation through their Telethon granting competition.

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Rooming-in compared with standard care for newborns of mothers using methadone or heroin

Ronald R. Abrahams MD CCFP FCFPC  S. Ann Kelly MPH  Sarah Payne RN MA  Paul N. Thiessen MD FRCP C Jessica Mackintosh  Patricia A. Janssen PhD

ABSTRACT

OBJECTIVE To evaluate the effect of rooming-in (rather than standard nursery care) on the incidence and severity of neonatal abstinence syndrome among opioid-exposed newborns and on the proportion of mothers who retain custody of their babies at hospital discharge.

DESIGN Retrospective cohort study.

SETTING Lower mainland in southwestern British Columbia.

PARTICIPANTS We selected 32 women in the city of Vancouver known to have used heroin or methadone during pregnancy between October 2001 and December 2002. Comparison groups were a historical cohort of 38 women in Vancouver and a concurrent cohort of 36 women cared for in a neighbouring community hospital.

MAIN OUTCOME MEASURES Need for treatment with morphine, number of days of treatment with morphine, and whether babies were discharged in the custody of their mothers.

RESULTS Rooming-in was associated with a significant decrease in need for treatment of neonatal abstinence syndrome compared with the historical cohort (adjusted relative risk [RR] 0.40, 95% confidence interval [CI] 0.20 to 0.78) and the concurrent cohort (adjusted RR 0.39, 95% CI 0.20 to 0.75). Rooming-in was also associated with shorter newborn length of stay in hospital compared with both comparison groups. Newborns who roomed in at BC Women’s Hospital were significantly more likely to be discharged in the custody of their mothers than babies in the historical cohort (RR 2.23, 95% CI 1.43 to 3.98) or the concurrent cohort (RR 1.52, 95% CI 1.15 to 2.53) were.

CONCLUSION Rooming-in might ease opioid-exposed newborns’ transition to extraterusive life and promote more effective mothering.

EDITOR’S KEY POINTS

• When a baby is born to a mother known to be using methadone or heroin, the baby is usually separated from the mother, admitted to an intensive care nursery for observation in a quiet, dimly lit environment, and treated for withdrawal if necessary. The purpose of separation and sensory deprivation, however, has not been studied as an independent predictor of improvement in neonatal withdrawal. Separation might contribute to decreased maternal attachment and neonatal abandonment.

• In this retrospective cohort study of newborns of mothers using methadone or heroin, clinically relevant outcomes (treatment for neonatal withdrawal, discharge in the care of the mother) were studied in 2 groups: newborns who roomed in with their mothers or those who received traditional care in the intensive care nursery.

• The researchers found that newborns who roomed in with their mothers were less likely to require treatment for neonatal withdrawal and more likely to be discharged home with their mothers. Rooming-in might promote more effective mothering and might reduce the prevalence and severity of neonatal withdrawal.

This article has been peer reviewed.

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Nouveau-nés de mères consommant de la méthadone ou de l'héroïne: cohabitation ou traitement standard?

Ronald R. Abrahams MD CCFP FCFPC  S. Ann Kelly MPH  Sarah Payne RN MA  Paul N. Thiessen MD FRCP  Jessica Mackintosh  Patricia A. Janssen PhD

Résumé

OBJECTIF Évaluer les effets de la cohabitation mère-nouveau-né à l'hôpital (plutôt que les soins standards en pouponnière) sur l'incidence et la sévérité du syndrome de privation néonatal chez les nouveaux-nés exposés aux opiacés et sur la proportion des mères qui conservent la garde de leur bébé au sortir de l'hôpital.

TYPE D'ÉTUDE Étude de cohorte rétrospective.

CONTEXTE Basses terres du sud-ouest de la Colombie-Britannique.

PARTICIPANTS On a choisi 32 femmes de la ville de Vancouver qui avaient consommé de l'héroïne ou de la méthadone durant la grossesse, entre octobre 2001 et décembre 2002. Les groupes de comparaison étaient une cohorte antérieure de 38 femmes de Vancouver et une cohorte concomitante de 36 femmes traitées dans un hôpital communautaire du voisinage.

PRINCIPAUX PARAMÈTRES ÉTUDIÉS Le besoin d'un traitement à la morphine, la durée en jours de ce traitement et si le bébé avait quitté l'hôpital sous la garde de sa mère.

RÉSULTATS La cohabitation s’accompagnait d’une diminution significative du besoin de traitement pour syndrome de privation néonatale par rapport au groupe traditionnel (risque relatif [RR] ajusté: 0,40, intervalle de confiance [IC] à 95%: 0,20 à 0,78) et par rapport avec la cohorte concomitante (RR ajusté: 0,39, IC à 95%: 0,20 à 0,75). La cohabitation était aussi associée à un séjour hospitalier plus court pour le nouveau-né par rapport aux 2 autres groupes de comparaison. Les bébés ayant partagé la chambre avec leur mère au BC Women's Hospital avaient une probabilité significativement plus élevée de quitter l’hôpital sous la garde de leur mère en comparaison de la cohorte traditionnelle (RR: 2,23, IC à 95%: 1,43 à 3,98) ou de la cohorte concomitante (RR: 1,52, IC à 95%: 1,15 à 2,53).

CONCLUSION La cohabitation avec la mère pourrait faciliter la transition du nouveau-né exposé aux opiacés vers la vie extra-utérine et promouvoir un maternage plus efficace.
The usual care provided to newborns of women known to be using methadone or heroin in North America involves admission to an intensive care nursery immediately after birth for observation, and, if needed, treatment for neonatal abstinence syndrome (NAS).1-4 Between 48% and 94% of infants exposed to opiates in utero develop clinical signs of withdrawal that manifest at 1 to 7 days of age, usually within 72 hours.1 Clinical features of neonatal opiate abstinence syndrome include neurologic excitability, gastrointestinal dysfunction, and autonomic system disorganization.2 Treatment has traditionally had a 2-pronged approach: supportive care, including minimization of sensory stimulation and frequent small feedings of hypercaloric formula2,4; and administration of a narcotic or central nervous system depressant titrated to facilitate gradual withdrawal and management of symptoms.2,4 Physical separation from the mother has been deemed necessary for the purpose of careful observation and of maintaining the newborn in a quiet, dimly lit room. Studies in the non-addicted population have shown that separation of mother-infant dyads during the early postpartum period is detrimental to development of maternal attachment5 and predictive of infant abandonment.6,7 Having difficulty with attachment and abandonment are both hallmark behaviours of substance-using mothers.8

To date, use of sensory deprivation has not been examined as an independent predictor of reduction in severity of symptoms associated with neonatal withdrawal.9 In spite of this, rooming-in, now standard in standard care settings, is not offered to women using illicit drugs or methadone. The goal of this study was to compare the prevalence and severity of neonatal abstinence syndrome and the rates of retention of child custody between opioid-exposed newborns rooming in with their mothers and similar newborns who received standard care in intermediate-level nurseries.

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**METHODS**

**Setting**

In Vancouver, BC, pregnant women who identify themselves as users of illicit drugs are referred by their primary care physicians, social workers, street nurses, alcohol or drug counselors, or themselves to a community outreach clinic (Sheway) located in the inner-city core. At Sheway, a multidisciplinary team provides routine antenatal care, medical care, advocacy for housing and financial services, and social support. Women are referred by Sheway to BC Women’s Hospital (BCWH) during the antenatal period for treatment of infection, cellulitis, intrauterine growth retardation, and stabilization of methadone dosage, as needed. The BCWH is an obstetric teaching hospital, and for the city of Vancouver, the referral centre for women using illicit drugs. A continuum of care between the clinic and hospital is ensured through close communication among nurses, physicians, and social workers at both settings, including shared-case conferences. This integrated approach to care does not exist elsewhere in Canada.

**Rooming-in group**

Our study cohort consisted of new mothers at BCWH who disclosed use of heroin or methadone or whose newborns were identified as exhibiting symptoms of opiate withdrawal. Rooming-in became available at BCWH in October 2001 to all women who used illicit drugs. Routine care for these mothers included instruction by nursing staff on how to care for the baby and how to identify symptoms of NAS. Nursing and medical staff assessed the parenting skills of rooming-in mothers and observed babies for symptoms of NAS. Observations were documented daily in medical records. They also consulted with mothers about their observation of NAS symptoms in their newborns. Between October 2001 and December 2002, all 32 women admitted to BCWH who used heroin or methadone roomed in with their newborns, and all their records were reviewed for this study.

**Comparison groups**

The first comparison group consisted of a historical cohort of all women who gave birth at BCWH between January 1999 and September 2001 before the advent of the rooming-in program (n = 110) and who disclosed use of heroin or methadone or whose babies were admitted to a level II nursery for observation of NAS symptoms. To minimize the resources needed for chart review, every third subject was selected for inclusion in the study. The final cohort consisted of 38 women. The women in this cohort had also been Sheway clients and, as such, had received the same coordinated approach to obstetric care as the study group, but had not had rooming-in.
The second comparison cohort consisted of all women \( (n=36) \) who reported use of heroin or methadone or whose babies were admitted to a level II observation nursery for assessment or treatment of symptoms of NAS between January 1999 and December 2002 at Surrey Memorial Hospital (Surrey), a community hospital about 30 minutes’ drive from BCWH. This period coincided with the observation period of the other 2 study cohorts combined. Surrey has the only level II nursery in the suburban and rural area it serves. In Surrey, women did not have access to specialized addiction services in the community. In both comparison groups, babies were kept in a nursery, separate from their mothers during the first week of life.

Screening urine for drug metabolites was not standard practice in either of the study hospitals. Self-reported drug use has been shown to be highly correlated with positive urine screens. Women who reported use of cocaine or crack (about one third of drug-dependent women in the lower mainland region) but not opioids were excluded.

Newborns in all 3 cohorts stayed in hospital for at least a week for observation of symptoms of NAS. Pediatricians prescribed morphine if needed and titrated to control symptoms. In the rooming-in group, newborns requiring morphine roomed in with their mothers until they were weaned from morphine and were then discharged. In the comparison groups, babies continuing to exhibit symptoms of NAS after the initial observation week were transferred to a pediatric chronic care facility (Sunny Hill Hospital) where they were cared for in a low-stimulation environment and treated with morphine until symptoms of withdrawal subsided. Length of stay required for weaning from morphine ranged from 2 to 3 months.

Before starting the study, a certificate of ethical approval was obtained from the University of British Columbia Clinical Ethics Board.

Neonatal outcomes

Primary outcomes for this study included need for treatment with morphine, number of days of treatment with morphine, and discharge of babies in the custody of their mothers. Apprehension of babies by social services was based on individual social workers’ assessment of mother’s motivation and demonstrated ability to care for her newborn. Secondary outcomes included prevalence of symptoms of NAS, infants’ length of stay in hospital, weight loss greater than 10% in the first week of life, and need for admission to a level II nursery or chronic care unit.

Newborns in all cohorts were monitored daily for symptoms of NAS using a modified version of the Finnigan scale. The Finnigan scale has an interrater reliability coefficient of 0.82 among trained nursing staff. It was designed to rate the severity of narcotic-withdrawal symptoms for titrating pharmacotherapy. It was validated initially in a sample of 121 physically dependent infants and has been in widespread use since evaluation of NAS symptoms. We used items measuring soother use, feeding and sucking, jitteriness, diarrhea, muscle tone, vomiting, and inconsolable crying (Figure 1). We eliminated items we thought were susceptible to observer bias, including sleeping time after feeding, disturbed Moro reflex, regurgitation, yawning, nasal stuffiness, sweating, and motting. Babies were followed until final discharge from hospital, either the primary hospital or the chronic care hospital. Study outcomes were abstracted from hospital charts after discharge.

Analysis

An initial power calculation was not done, as there was no basis in experience or the literature upon which to hypothesize effect sizes in relation to rooming-in. The association between rooming-in and study outcomes was explored initially in bivariate analysis and reported as relative risks (RRs) and 95% confidence intervals (CIs) for categorical outcomes and \( P \) values derived from \( t \) tests for continuous variables. Unconditional logistic regression models were derived subsequently for each binary outcome variable by adding potential confounders one at a time to the model, retaining the one with the most important contribution as measured by the Wald statistic and then repeating the process with the remaining variables.

Factors entered into the model included ethnicity (white, First Nations, other, or unknown), involvement of birth father, support of family, housing (stable, temporary), income (employed, social assistance, reliance on partner, no source), smoking status, alcohol consumption, methadone dose at delivery (none, 10 to 29, 30 to 59, 60 to 89, and \( \geq 90 \) mg), gestational age at delivery, mean number of prenatal visits, hospital antenatal admission (yes or no), and parity. Variables were retained in the logistic regression model if their inclusion changed the estimate of the odds ratio (OR) by 10%. Using this method, we retained at most 2 variables in each multivariate model.

We then calculated Mantel-Haenszel weighted RRs stratified on the most statistically significant variable from each multivariate analysis. We reported RRs adjusted in this fashion to avoid inflation of the ORs associated with outcomes with a prevalence of \( >10\% \). Multiple linear regression was used to determine the effect of study group on infant length of stay in hospital while adjusting for relevant variables in a similar fashion. Length of stay was transformed by taking the square root of observed values to approximate more closely a normal distribution. \( \beta \)-coefficients, standard errors, and \( P \) values were reported for variables retained in the final linear regression model.
Women in all 3 study cohorts were comparable in age (Table 1). Women in the rooming-in cohort were more likely to be known to be white or First Nations compared with the other cohorts for whom ethnicity was less likely to have been documented. Involvement of birth fathers and family support were more prevalent in the Surrey group. Women in the BCWH historical group were more likely to have stable housing. More women in the Surrey group had no source of income (30.6%) compared with rooming-in mothers (3.1%) and BCWH historical-group mothers (10.5%).

Smoking habits differed somewhat by study group. Women in the Surrey group were more likely to smoke, and, in particular, more likely to smoke more than 1 pack daily. Fewer women in the rooming-in group reported consumption of alcohol (18.8%) compared with women in the BCWH historical (44.7%) and Surrey (27.8%) groups (Table 2). More than 88% of women in all groups reported use of heroin, and about 20% of both the BCWH groups and 50% of the Surrey group reported use of methadone before hospital admission.

Concurrent use of crack or cocaine was common in all 3 groups, ranging from 46.9% for cocaine use in the rooming-in group to 78.9% in the BCWH comparison group. Mean number of prenatal visits was 5.0 in the Surrey group compared with 8.8 and 12.2 in the BCWH groups, where prenatal care was facilitated by the Sheway program. Also, antenatal admission to hospital was much more common in the BCWH groups. Among women who had had children previously, fewer in the rooming-in group had retained custody of at least 1 child (7.7%) than in the BCWH comparison group.
Rooming-in newborns of mothers using methadone or heroin

In bivariate analysis, rooming-in was associated with substantially reduced rates of newborn treatment with morphine, length of morphine treatment, vomiting, admission to a level II nursery, and length of stay in hospital. Mothers who roomed in were substantially more likely to retain custody of their newborns (Table 3).

The adjusted RR of requiring morphine treatment associated with rooming-in compared with standard care in a nursery was 0.40 (95% CI, 0.20 to 0.78) for the BCWH historical group and 0.39 (95% CI, 0.20 to 0.75) for the Surrey group, adjusted for maternal methadone dose at delivery (Table 4). The adjusted RR of admission to a level II or III nursery were markedly lower in the rooming-in group than in the BCWH historical and Surrey groups (RR 0.41, 95% CI 0.25 to 0.65 and 0.45, 95% CI 0.11 to 0.57, respectively), adjusted for antepartum admission of mothers. Newborns cared for by their mothers (rooming-in) at BCWH were significantly more likely to be discharged in the custody of their mothers, adjusted for history of previous child apprehension, compared with those who were cared for in the nursery at BCWH (RR 2.23, 95% CI 1.43 to 3.98) or Surrey (RR 1.52, 95% CI 1.15 to 2.53). Stratified analysis of other binary outcome variables was precluded by small numbers in outcome categories.

Newborn length of stay in hospital (square root) was significantly shorter in the rooming-in group compared with the BCWH comparison group (β-coefficient for cohort membership 1.17, standard error 0.46, P = .01), adjusted for maternal methadone dose at delivery and involvement of the father. Length of stay (square root) was significantly predicted by cohort membership in the comparison between rooming-in and Surrey groups (adjusted β-coefficient for cohort 0.76, standard error 0.21, P = .001).

**DISCUSSION**

Among opiate-dependent women, rooming-in was associated with a statistically significant decrease in need for newborn treatment of neonatal abstinence syndrome, need for admission to a neonatal intensive care nursery, and mean neonatal length of stay in hospital compared with standard care in a nursery. Infants whose...
mothers roomed in were significantly more likely to be discharged in the custody of their mothers.

In our study, we could not separate the effects of rooming-in from those of breastfeeding, as more than 60% of women in the rooming-in group breastfed compared with about 10% in each of the comparison groups. Because breastfeeding is a desirable and natural consequence of rooming-in, separation of these effects might be of little clinical interest in most cases. The distinction between rooming-in and breastfeeding might be of interest when breastfeeding is contraindicated because mothers test positive for HIV. In our study, only 5 women (15.6%) in the rooming-in group were HIV positive.

When we restricted our analysis to non-breastfeeding women, significantly fewer of the rooming-in newborns required admission to a level II or III nursery (50%, n = 6) compared with 94.3% (n = 33) in the BCWH comparison group and 87.5% (n = 28) in the Surrey group, P < .001. Although based on small numbers and not statistically significant, observed differences in newborn length of hospital stay for rooming-in compared with the BCWH comparison and the Surrey groups (15.5 days vs 24.2 and 28.8 days, respectively) favored the rooming-in group as did the presence of diarrhea (8.3% vs 11.4% and 18.8%) and vomiting (0 vs 20.0% and 18.8%). Our study needs to be replicated in a large sample of women who are not breastfeeding to further explore outcomes independently associated with rooming-in.

A potential outcome of breastfeeding in this population might be delayed onset of NAS. At BCWH, all women and their newborns discharged from the rooming-in unit are followed for at least 6 months by the medical director of the unit. None of the newborns who roomed in required readmission for symptoms

| Table 2. Pregnancy characteristics and use of substances by study cohort |
|-----------------------------|-----------------------------|-----------------------------|
| CHARACTERISTICS             | BCWH ROOMING IN N = 32   | BCWH HISTORICAL (NOT ROOMING IN) N = 38   | SURREY HOSPITAL (NOT ROOMING IN) N = 36   |
| Smoking                     |                            |                            |                                            |
| • None                      | 7 (21.9)                   | 9 (23.7)                   | 5 (13.9)                                  |
| • <1 pack/d                 | 14 (43.8)                  | 11 (28.9)                  | 15 (41.7)                                 |
| • ≥1 pack/d                 | 10 (31.3)                  | 9 (23.7)                   | 15 (41.7)                                 |
| • Smoked, amount unknown    | 1 (3.1)                    | 9 (23.7)                   | 1 (2.8)                                   |
| Alcohol consumption         | 6 (18.8)                   | 17 (44.7)                  | 10 (27.8)                                 |
| Drug use                    |                            |                            |                                            |
| • Heroin                    | 32 (98.3)                  | 35 (92.1)                  | 32 (88.9)                                 |
| • Methadone (before hospital admission) | 6 (18.8) | 8 (21.1) | 18 (50.0) |
| • Other opioid              | 8 (25.0)                   | 8 (21.1)                   | 16 (44.4)                                 |
| • Cannabis                  | 4 (12.5)                   | 6 (15.8)                   | 15 (41.7)                                 |
| • Cocaine                   | 15 (46.9)                  | 30 (78.9)                  | 16 (72.2)                                 |
| • Crack                     | 11 (33.9)                  | 16 (48.5)                  | 10 (29.4)                                 |
| • Benzodiazepine            | 4 (12.5)                   | 2 (5.3)                    | 3 (8.3)                                   |
| • Other (crystal meth, ecstasy) | 2 (6.3) | 0 (0.0) | 2 (5.6)                                   |
| Daily methadone dose at delivery (mg)  |                            |                            |                                            |
| • 0                         | 7 (21.9)                   | 16 (42.1)                  | 19 (52.8)                                 |
| • 1–29                      | 3 (9.4)                    | 7 (18.4)                   | 3 (8.3)                                   |
| • 30–59                     | 10 (31.3)                  | 8 (21.1)                   | 5 (13.9)                                  |
| • 60–89                     | 5 (15.6)                   | 5 (13.2)                   | 3 (8.3)                                   |
| • >90                       | 7 (21.9)                   | 2 (5.3)                    | 6 (16.7)                                  |
| Gravidy                     |                            |                            |                                            |
| • 1                         | 6 (18.8)                   | 5 (13.5)                   | 5 (13.9)                                  |
| • 2                         | 5 (15.6)                   | 8 (21.6)                   | 9 (25.0)                                  |
| • 3                         | 3 (9.4)                    | 4 (10.8)                   | 8 (22.2)                                  |
| • 4                         | 5 (15.6)                   | 10 (27.6)                  | 5 (13.9)                                  |
| • 5 or more                 | 13 (40.6)                  | 10 (27.0)                  | 9 (25.0)                                  |
| Nulliparous                 | 6 (18.7)                   | 6 (15.8)                   | 5 (13.9)                                  |
| Antenatal admission to hospital | 20 (62.5) | 22 (57.9) | 4 (11.1)                                 |
| Breastfeeding               | 20 (62.5)                  | 3 (7.9)                    | 4 (11.1)                                  |
| Gestational age at first prenatal visit | 18.7 (7.0) | 20.2 (9.7) | 22.3 (8.7)                                 |
| No. of prenatal visits      | 12.2 (8.0)                 | 8.8 (7.8)                  | 5 (4.1)                                   |

BCWH—British Columbia Women's Hospital, SD—standard deviation

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of NAS. While breastfeeding is not contraindicated for mothers maintained on methadone, methadone levels in breast milk have not been studied in large samples. A recent study concluded, similar to other small series, that in spite of known variability in the concentration of methadone in breast milk (dependent on fat content of the milk and on sampling time), newborns exposed to the highest reported level of methadone in milk would still be ingesting methadone in the lowest dosage range recommended for neonatal withdrawal. Exposure to methadone through breast milk is thought to be at or below the lowest level of physiologic significance.

**Limitations**

The non-random allocation of subjects to study groups was a potentially limiting factor in our study design. Subjects, however, did not choose their study groups.

The historical control group consisted of a non-biased sample of all eligible women in the city of Vancouver, and the concurrent control group constituted the population of eligible women in a suburban municipality. We cannot exclude the possibility that mothers of newborns who did not exhibit signs of NAS were not included in the study. If their babies exhibited signs of NAS during the first 2 to 3 days of life, however, the mother-infant dyad was included.

**Conclusion**

Outcomes of pregnancies complicated by addiction are difficult to ascribe to a particular treatment because of the number and importance of potentially confounding lifestyle-related factors. Our reported findings of reduced need for treatment of NAS and retention of custody at discharge among mothers of newborns who

### Table 3. Infant outcomes by study cohort

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>BCWH ROOMING IN</th>
<th>BCWH HISTORICAL (NOT ROOMING IN)</th>
<th>SURREY HOSPITAL (NOT ROOMING IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=32 N (%)</td>
<td>N=38 N (%)</td>
<td>N=36 N (%)</td>
</tr>
<tr>
<td>Treated with morphine</td>
<td>8 (25.0)</td>
<td>21 (55.3)</td>
<td>19 (52.8)</td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Soother use</td>
<td>10 (31.3)</td>
<td>9 (23.7)</td>
<td>5 (13.9)</td>
</tr>
<tr>
<td>• Jitteriness</td>
<td>26 (81.3)</td>
<td>28 (73.7)</td>
<td>25 (69.4)</td>
</tr>
<tr>
<td>• Poor sucking</td>
<td>10 (31.3)</td>
<td>22 (57.9)</td>
<td>9 (25.0)</td>
</tr>
<tr>
<td>• Diarrhea</td>
<td>3 (9.4)</td>
<td>5 (13.2)</td>
<td>9 (25.0)</td>
</tr>
<tr>
<td>• Vomiting</td>
<td>0</td>
<td>8 (21.1)</td>
<td>6 (16.7)</td>
</tr>
<tr>
<td>• Inconsolable crying</td>
<td>4 (12.5)</td>
<td>16 (42.1)</td>
<td>2 (5.6)</td>
</tr>
<tr>
<td>Weight loss ≥10% during first week</td>
<td>5 (16.6)</td>
<td>2 (5.2)</td>
<td>2 (5.3)</td>
</tr>
<tr>
<td>Admitted to NICU</td>
<td>12 (37.5)</td>
<td>34 (95.5)</td>
<td>30 (83.3)</td>
</tr>
<tr>
<td>Discharged in custody of mother</td>
<td>23 (71.9)</td>
<td>12 (31.6)</td>
<td>17 (42.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of days of morphine treatment</td>
<td>5.9 (14.2)</td>
<td>18.6 (23.4)</td>
<td>.007*</td>
</tr>
<tr>
<td>No. of days in hospital</td>
<td>11.8 (9.1)</td>
<td>23.5 (24.6)</td>
<td>.014</td>
</tr>
</tbody>
</table>

**Table 4. Infant outcomes by study cohort and adjusted relative risks**

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>BCWH ROOMING IN</th>
<th>BCWH HISTORICAL (NOT ROOMING IN)</th>
<th>SURREY HOSPITAL (NOT ROOMING IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=32 N (%)</td>
<td>N=38 N (%)</td>
<td>N=36 N (%)</td>
</tr>
<tr>
<td>Treated with morphine*</td>
<td>8 (25.0)</td>
<td>21 (55.3)</td>
<td>19 (52.8)</td>
</tr>
<tr>
<td>Admitted to an NICU†</td>
<td>12 (37.5)</td>
<td>34 (95.5)</td>
<td>30 (83.3)</td>
</tr>
<tr>
<td>Discharged in custody of mother‡</td>
<td>23 (71.9)</td>
<td>12 (31.6)</td>
<td>17 (42.5)</td>
</tr>
</tbody>
</table>

**BCWH—British Columbia Women's Hospital, NICU—neonatal intensive care unit, SD—standard deviation.**

*Among those receiving morphine.

†Adjusted for methadone dose at delivery.

‡Adjusted for postpartum admission of mother.

§Adjusted for history of apprehension of a child.

*Among those receiving morphine.
roomed in remained statistically significant after adjustment for income, housing, social support, and use of other substances, including tobacco and alcohol. These results should encourage further study in the context of a randomized design with prognostic stratification on breastfeeding. Rooming-in, under the care of supportive nursing and medical staff, might prove to be a safe and potent tool with which to reduce the prevalence and severity of NAS and to promote more effective mothering that might ease opioid-exposed newborns’ transition to extraterine life.

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Contributors

Dr Abrahams, Ms Kelly, Ms Payne, Dr Thiessen, Ms Mackintosh, and Dr Janssen contributed to concept and design of the study; data gathering, analysis, and interpretation; and preparing the article for submission.

Competing interests

None declared

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References

Problematic Substance Use in Pregnancy and Epigenetics

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March 2007

It is becoming increasingly apparent that as physicians we need to recognize an individual patient as a comprehensive "environmental unit". In the past we have focused predominantly on toxic insults that directly target and damage the genetic material of the host, potentially leading to disease states. However, it appears that so-called epigenetic factors i.e. those that indirectly influence the expression of key genes in a living organism can profoundly alter the homeostasis of a living organism, and can thus drive pathophysiologic processes without actually changing the sequence of the gene itself. (Weaver et al, 2004; Harper, 2005; Reik et al 2001; Wade P.A., Archer T.K. [editorial] Perspectives)

Clinically, it is likely not enough to focus solely on how a specific toxin directly damages the “cellular DNA machinery”. Recent research using laboratory rats has demonstrated that different “parenting styles” can actually alter the non-coding chemistry of the DNA of the genes that are involved in various stress responses. A positive nurturing maternal-infant rat interaction in the newborn period resulted in the production of less stress hormones as result of changes in gene expression. (Michael Meaney) Moreover, “rooming in” of newborns exposed in utero to opiates of mothers with problematic Substance Use (PSUP) has also been shown to ameliorate withdrawal symptoms in the newborn and may be the human equivalent to the epigenetic process seen in the rat model. (Abrahams et al). Clearly, we need to instigate controlled population studies linking the environment to gene expression to help us better understand how and which environmental factors can directly or indirectly modulate these key biologic processes. As health care providers, it is imperative to take into account and advocate for improving the overall “fitness” of the pregnant patient’s particular “environmental Unit. This would include the need to study the epigenetics of:

1) maternal infant bonding
2) safe adequate housing
3) nutritional status
4) sanitation
5) community support/feeling of being safe
6) sense of well being
7) self-esteem
8) trauma/childhood abuse

i.e. the Social Determinants of health consistent with what is commonly referred to as a “HEALTHY SOCIETY”
Perinatal Addictions

‘Mother the Mother and you will mother the Child’

A Brief Introduction

Fir Square is an 11-bed unit dedicated to managing addiction in pregnancy and post-partum at BC Women’s Hospital in Vancouver, Canada. Primarily serving women from the Downtown Eastside (read the poorest postal code or 10-block area in the country), pregnancy is frequently complicated by more than just drug use; mental illness, trauma, disease, poverty, homelessness and malnutrition are common. Fir Square aims to help patients work towards stability and keeping their baby, an aspiration virtually impossible before its opening in 2002.

Bedroom/Shooting Gallery/Alley

A committed, multi-disciplinary team employs a harm reduction model of care to provide in-patient treatment to women in need of drug use stabilization and obstetric management at any time during their pregnancy. A community based pregnancy outreach partner program called Sheway, located in the Downtown Eastside, actively engages women early in their pregnancy with a wide range of services until the child is 18 months.

Statement of Educational Aims

- Addiction management: understanding patterns of addiction, triggers and barriers to change as well as the risks specific to street drug use

  Crack Cocaine/Rock/Base

- Obstetric management: extensive learning in antenatal care, admit patients and assist deliveries

- Neonatal management: “rooming-in” of baby with mother with reduced need to treat withdrawal in the newborn

- Trauma: appreciating trauma as a risk factor for addiction, the vulnerability inherent to addiction as a risk factor for further trauma and compounded trauma as the general experience of the entrenched addict

- Poverty: understanding the socioeconomic and cultural implications of addiction, poverty, homelessness, illiteracy and the resulting challenges faced by the disempowered patient

Reflection on Experience

My Fir Square elective was a powerful experience. Getting to know the patients was incredibly valuable to my understanding of the complexity of addiction and why the poverty cycle is so difficult to escape. Frank interactions with these ladies, revealing glimpses into their hard lives, their ambitious and overtly intense desire to raise their babies and the frustration inspired by extensive obstacles and an seemingly endless unfair uphill battle were compelling and reinforced my interest in holistic patient care.

Open drug trade, E Hastings St

Statements of Conclusion

I recommend this elective to everyone. Challenging patients with complex medical and psychosocial issues will fascinate interested students. Ambivalent students will be forced to contemplate their perception of addiction and reconsider ‘addicts’ as unlucky individuals with very long problem lists.

Photo 1: www.greaterfool.ca, photo 2: HUM News/Les Neuhau photo 3: www.fabbrunette.com
Models of care for neonatal abstinence syndrome: What works?

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A R T I C L E   I N F O

Keywords:
Neonatal abstinence syndrome
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Baby-centered
Trauma-informed care
ESC
Rooming-in
Standardized care
Substance-exposed infants

A B S T R A C T

Opioid use disorders and the prescription of long-acting medications for their treatment have increased dramatically over the last decade among pregnant women. Newborns who experience prolonged in utero opioid exposure may develop neonatal abstinence syndrome (NAS). Until recently, much of the focus on improving care for NAS has been on pharmacologically-based care models. Recent studies have illustrated the benefits of rooming-in and parental presence on NAS outcomes. Single center Quality Improvement (QI) initiatives demonstrate the benefits of non-pharmacologic care bundles and symptom prioritization in decreasing the proportion of infants pharmacologically treated and length of hospital stay. Little remains known about the impact of these varied cared models on maternal-infant attachment and mental health. In this review article, we will propose an optimal model of care to improve short- and long-term outcomes for newborns, their mothers and families, and perinatal care systems.

1. Background

Opioid use and misuse, and medication-assisted treatment (MAT) for opioid use disorders (OUD), have increased dramatically over the last decade, including among pregnant women [1–3]. Newborns who experience prolonged in utero opioid exposure may develop neonatal abstinence syndrome (NAS) [4–8]. Rates of NAS, also known as neonatal opioid withdrawal syndrome (NOWS), have grown nearly fivefold over the past decade [9–11]. Although NAS is self-limited, its expression is variable. For infants exposed to methadone and buprenorphine, long-acting opioid replacement medications used for MAT, NAS typically peaks on the third or fourth days of life [12]. As symptoms can be further delayed in some infants [13], the American Academy of Pediatrics (AAP) recommends 4–7 days of postnatal observation [4]. For the subset of newborns with NAS symptoms severe enough to warrant pharmacologic treatment with opioid replacement medication, hospital length of stay (LOS) can be prolonged. In 2012, the average opioid-exposed infant had a LOS of 16 days, and the pharmacologically treated subset remained hospitalized for 23 days [10,14]. LOS varies by center, medication used for treatment, and poly-substance exposure [10,15,16].

An estimated 1.5 billion dollars were spent on NAS care in the United States (U.S.) in 2012 with mean inpatient costs of $93,400 per newborn [9,10]. Costs are largely driven by Neonatal Intensive Care Units (NICUs) [17–19]. By 2012, U.S. NICU admissions for NAS accounted for 4% of all NICU bed-days [19]. Variation in NAS care is common in NICUs and other settings, and likely contributes to increased costs and variable outcomes [17,20–22]. In this article, we will review various components of NAS care and the efficacy of different models of care for opioid-exposed newborns. Then, we will propose an optimal model of care that could improve outcomes for newborns, mothers and families, decrease unnecessary variation, control costs, and limit systemic strains on perinatal care systems.

2. Scoring and assessment

2.1. The Finnegan Neonatal Abstinence Syndrome Scoring Tool (FNAST)

The most common model of care for opioid-exposed newborns over the past 40 years is centered on the Finnegan Neonatal Abstinence Scoring Tool (FNAST) [17,18,23]. The FNAST was developed in the early 1970s by Dr. Loretta Finnegan and colleagues as a research tool to systematically assess the most common symptoms of opioid withdrawal.
and to monitor responses to treatment. In a standardized training program designed to promote inter-observer reliability among staff using the FNAST, initiation or escalation of pharmacotherapy is recommended for three consecutive symptom scores ≥ 8 or 2 scores ≥ 12 [24]. Although the FNAST demonstrated robust inter-rater reliability with its original development [23] and is recognized for its clinimetric properties [25], optimal scores for pharmacologic treatment initiation, adjustment, or discontinuation have not been established. A review of the original study reveals that the ‘8’ threshold was chosen based on the researchers’ clinical experience: “The infant with a score of ‘7’ or less was not treated with drugs for the abstinence syndrome because, in our experience, he would recover rapidly with swaddling and demand feedings. Infants whose score was ‘8’ or above were treated pharmacologically.” [23] Although most non-opioid exposed newborns score < 8, a score of 7 is in the 95th percentile [26], meaning that 5% of unexposed newborns could be eligible for NAS pharmacotherapy based on established FNAST treatment criteria [24].

Although most hospitals report using 3 scores ≥ 8 or 2 scores ≥ 12 to initiate pharmacologic treatment, variation exists [17,18]. Concerns expressed regarding the FNAST have included the subjective nature of certain tool items, inconsistencies in scoring when staff are not formally trained, length and complexity of a research instrument used for clinical care, and poor psychometric properties [27]. Families report anxiety due to score-based thresholds. They find it stressful and disruptive to infants, noting discrepancies between care providers [28,29]. Parents and nursing staff express concern that the scored symptoms are not specific to NAS, as some symptoms are also seen in “normal” or non-opioid exposed infants [26]. Additionally, it is important to recognize that the FNAST was developed to monitor opioid-exposed newborns [23] and was not designed to assess effects of other in-utero substance exposures.

2.2. Modifications of the FNAST and of its use

Different FNAST score thresholds affect the chances an infant will be prescribed medication. In a retrospective study of 146 methadone-exposed newborns, 73% of infants would meet criteria for morphine treatment with a single score ≥ 9 as a threshold, while only 26% would be treated for 3 scores ≥ 9 (or 2 ≥ 12) [30]. Several studies have compared abbreviated, or modified, symptom assessment scales with the FNAST with the aim of finding a more efficient, effective, or easier system [27,31–33]. Though these alternative systems typically correlate with the FNAST [31] and may help differentiate between infants needing and not needing pharmacologic treatment [34], they have not been widely adopted into clinical practice [17].

Additionally, some centers have developed methods of score prioritization, using the FNAST, or a modification of it, to obtain the infants score and then prioritize the symptoms most problematic for the infant to aid in decisions around the initiation of pharmacotherapy [35,36].

The most significant limitation in this literature is that all measured outcomes relate to short-term outcomes associated with newborn hospitalization. There are no data available on the long-term outcomes of these different care approaches to symptom assessment or different thresholds for neonatal pharmacotherapy.

2.3. Alternative assessment approaches

Several prospective cohort studies have attempted to identify a more physiologically relevant assessment approach to identify newborns who might benefit from (or respond to) pharmacotherapy for NAS, but parameters such as maternal vagal tone [37], neonatal heart rate variability [38,39], skin conductance [40,41], and pupillary size [42] have failed to be adopted into clinical practice. A recently developed novel assessment approach, “Eating Sleeping Consoling” (ESC), prioritizes opioid withdrawal symptoms most functionally relevant for the newborn [43]. As opposed to a lengthy symptom checklist that includes potentially irrelevant physiologic symptoms, the functional ability to eat, sleep and be consoled are the primary measures for NAS severity and the parameters used to drive pharmacologic treatment.

Institutional use of ESC resulted in a pharmacologic treatment rate of 12% in a cohort of newborns whereas 62% would have received medication with treatment decisions governed by FNAST [44]. For the subset of babies where a traditional FNAST protocol recommended pharmacologic treatment, the average FNAST score decreased by 0.9 points the following day without medication initiation. This decrease in withdrawal symptoms in the absence of pharmacotherapy suggests that babies who demonstrate moderate NAS symptoms may not require medication. Again, no data are available comparing how long-term outcomes might vary given different approaches to neonatal symptom control. Additionally, there is no known standard on an ideal proportion of opioid-exposed newborns that should be pharmacologically treated, nor is it known if neonatal morphine treatment is beneficial or harmful to the infant’s neurologic development in the setting of NAS.

3. Pharmacologic care

Although the AAP recommends that non-pharmacologic care be the mainstay of treatment for NAS [4], most research has compared effectiveness of different medication regimens on NAS outcomes. Although recent studies suggest that buprenorphine [45,46] and methadone [47,48] may be more effective in reducing length of treatment (LOT) and LOS, when compared with morphine, the optimal pharmacological agent for NAS is yet to be determined [49,50]. Moreover, several studies suggest that standardization of care practices has more impact on short-term outcomes than does the specific medication utilized, as will be reviewed later.

4. Non-pharmacologic care

The impact of non-pharmacologic care on NAS is well recognized [4,36,51–54]. This is especially true for rooming-in and parental presence as they have been associated with significantly lower rates of pharmacologic treatment and shorter LOS [35,43,55–58], and may additionally promote mother-infant bonding and attachment when the mother is present.

4.1. Rooming-in

In 2007, Abrahams et al. published a seminal article on rooming-in for opioid-exposed newborns that demonstrated a LOS reduction from 23.5 days to 11.8 days when compared with traditional NICU care [55]. Since this time, additional studies have evaluated the impact of rooming-in on NAS outcomes with six studies recently assessed via a meta-analysis after meeting inclusion criteria in a systematic review of the literature [35,43,56,58–61]. No randomized control trials were available for inclusion. Four studies included retrospective cohorts with before- and after-assessments and two were QI reports. Pooled analysis of the six studies found rooming-in to be associated with lower proportions of pharmacologic treatment (RR 0.33, 95% CI 0.18–0.63) and reduced LOS (weighted mean difference of −11.29 days, 95% CI 17.40–5.19) compared with standard NICU care. Given significant heterogeneity across studies, a sensitivity analysis was performed excluding three studies that involved multiple interventions or maternal group selection and still favored rooming-in for pharmacotherapy reduction (RR 0.20, 95% CI 0.17–0.47) and LOS (−14.12, 95% CI -19.28–8.97 days) [56]. The authors of the individual studies did not report increases in adverse events or readmissions.

In addition to a quiet, low stimulation environment, rooming-in facilitates privacy for mothers to provide skin-to-skin contact and breastfeeding. It also allows families greater access to their newborns to...
provide additional non-pharmacologic care measures that decrease NAS symptoms, including holding, early response to hunger cues, and prompt calming when fussy. Despite benefits of rooming-in for opioid-exposed newborns, many hospitals do not or are unable to offer this model of care. A 2015 survey of 76 U.S. hospitals revealed that though most sites offer rooming-in with families during the initial observation period for NAS, a significant proportion (41%) never offer rooming-in and only 11% do so during pharmacologic treatment [17]. Other supportive care measures that promote maternal contact, including skin-to-skin contact, are reduced during pharmacologic treatment in these centers. Elements that do not utilize human contact increase when infants require pharmacotherapy, including the use of non-nutritive sucking and vibrating or moving seats/beds. It is important to note that newborn lack of human contact, especially with their mothers, may increase physiologic stress and be manifested in dysregulated behaviors. These behaviors may then be confused with opioid withdrawal or exacerbate NAS symptoms (disorganized feeding, difficulties sleeping, increased crying) and may potentially lead to increased pharmacologic treatment and LOS.

4.2. Parental presence

Investigators have attempted to determine how important continuous parental presence is to the benefits attributed to rooming-in. In a retrospective cohort study of 86 opioid-exposed mother-infant dyads cared for in a rooming-in setting, Howard et al. evaluated the impact of parental presence on hospital LOS, pharmacotherapy use, and mean FNAST score [57]. Maximum parental presence at the bedside for the entire newborn hospital stay was associated with a 9-day shorter LOS, and a 1-point decrease in mean daily FNAST score compared to infants with no parent present. Parental presence was higher and mean FNAST score lower for infants who breastfed. In multiple linear regression analysis, including adjusting for breastfeeding, parental presence remained significantly associated with a lower mean FNAST score of 0.8 points, 5.7 fewer days of opioid therapy, and a non-significant trend of shorter LOS of 5 days. Barriers to parental presence included lack of transportation, childcare responsibilities, off-site methadone dosing, residential substance disorder treatment requirements, intervention by child protection, and stigma and guilt experienced while watching infant withdrawal. Other studies of families of infants with NAS have also demonstrated similar themes [28,62].

As rooming-in and parental presence pose minimal risks, decreasing barriers to continuous rooming-in and implementation of interventions to increase parental presence are now evidence-based strategies to improve NAS care. In cases where child protective services have deemed that the newborn is unsafe to be discharged home with the biological mother, the infant can still benefit from care and presence of their mother within the safety of the hospital. If the newborn’s mother is deemed unsafe to be with her infant within the hospital and/or if the mother herself disengages in care due to continued substance use or other mental health concerns, custodial arrangements should be made early in the newborn hospitalization. This allows designated kin or foster parents to be present to provide the necessary non-pharmacologic care and help promote attachment with one continuous care provider. Volunteer or staff cuddlers can also be utilized to help provide the benefit of human contact for non-pharmacologic care of NAS [35,36], and potentially infant mental health, when the biological mother or another designated “family member” is not available. The use of cuddlers, and of alternative kin or foster parents, is a largely unstudied area in the care of opioid-exposed infants both for short and long-term physical and mental health outcomes. The importance of attachment regarding infant mental health will be reviewed later in this article.

5. Models of care

5.1. Care models focused on standardized care and pharmacologic treatment

5.1.1. Single center studies of care standardization

In an East Tennessee Children’s Hospital NICU quality improvement (QI) project, standardized pharmacologic treatment protocols and FNAST use, family-centered communication, and a separate 16-bed specialized, rooming-in NAS unit yielded a 10.5 day reduction in LOS. Although a noteworthy reduction, 40% of infants at this center were in the hospital for over 30 days and 6% for over 60 days. The University of Louisville NICU’s implementation of a standardized, evidence-based treatment protocol of morphine every 3 h plus adjuvant clonidine was associated with reduced LOS from 42 days to 33 days when compared retrospectively with morphine every 4 h and adjuvant phenobarbital [64]. Although standardization of care using evidence-based treatment protocols was associated with significant improvements at both centers, LOS remained longer than the national mean of 23 days for pharmacologically treated infants. When considering these single center studies, it is important to note that other factors may contribute to longer LOS, including a greater proportion of mothers with active addiction and polysubstance use, and the type of opioid to which the infant was exposed (e.g., heroin vs long-acting MAT).

5.1.2. Statewide collaboratives focused on care standardization

The Ohio Perinatal Quality Collaborative (OPQC) has engaged 52 of 54 Ohio NICUs in NAS QI. In a cohort study of 547 infants pharmacologically treated in 20 of these centers, those cared for in centers utilizing standardized weaning protocols had a significantly shorter LOS (22.7 days vs 32.1 days) independent of specific opioid used for treatment [16]. Initially, three of Ohio’s six neonatology groups used wean-based treatment protocols and three did not. In a follow-up study, all six groups implemented a standardized weaning protocol, and retrospective analysis of 981 pharmacologically treated infants revealed significantly shorter LOS (23.7 days vs 31.6 days) in the three groups that previously lacked protocol-driven weaning guidelines, and sustained outcomes in the three groups using specific weaning guidelines at baseline [65].

In their recent quality report, the OPQC reported results of an 18-month intensive statewide initiative to improve care for pharmacologically treated infants with NAS [66]. Through their comprehensive multi-disciplinary QI initiative based on practices recommended in the Vermont Oxford Network (VON) Internet-based Newborn Improvement Collaborative for Quality (iNICQ) [67], the OPQC aimed to reduce duration of opioid treatment and hospital stay through 1) prenatal identification and counseling of women with OUD, 2) improved recognition and support of opioid-exposed women and newborns through trauma-informed, non-judgmental care, 3) high reliability standardized training of nurses in use of the FNAST, 4) adoption of a non-pharmacologic care bundle promoting maternal involvement, swaddling, skin-to-skin contact, a calm rooming-in environment, breastfeeding for mothers without active substance use or use of low-lactose formula if not breastfeeding, 5) a standardized pharmacologic treatment protocol, and 6) partnering with families for a plan of safe discharge. Of 3266 opioid-exposed infants cared for within 54 level 1, 2 and 3 nurseries, OPQC teams aimed for all infants to receive the non-pharmacologic care bundle, and to initiate pharmacologic treatment for 2 FNAST scores ≥9. Using these criteria, 48% of babies were treated pharmacologically. Fifty six percent of hospitals chose a standardized morphine protocol, 35% chose a standardized methadone protocol, and 9% used other protocols. Regardless of the specific opioid replacement agent used, LOS significantly decreased across the collaborative from 18.3 days to 17.0 days. The final LOS achieved in this project was 6 days shorter than the national mean. Although reliable use of the non-pharmacologic care bundle improved over time, it was implemented
overall by only 58%. Total bundle compliance was lowered by less than recommended feeding practices, but compliance with swaddling, rooming-in and a calm environment was fairly reliable. Several factors were hypothesized to contribute to the issues with feeding, including limited evidence for efficacy of low lactose feedings when formula was used, and that half of mothers were not eligible to breastfeed due to illicit opioid use.

5.1.3. National/international collaboratives

Vermont Oxford Network (VON) led a large-scale NAS QI collaborative between 2012 and 2015 [67]. A total of 199 centers participated and contributed data on 3458 infants. Most centers (98.5%) were from the U.S. with remaining centers from the United Kingdom and Canada. Interventions included developing and implementing standardized processes for the identification, evaluation, and treatment of infants with NAS, and measuring and reporting rates of NAS and drug exposure. Additionally, the effort promoted creation of a culture of compassion, understanding, and healing for the mother–infant dyad. Additional interventions included rooming-in, parental engagement in care, non-pharmacologic care as first-line treatment, breastfeeding for eligible mothers, standardized processes for safe discharge, and universal interdisciplinary NAS education. Among participating centers, the mean number of NAS guidelines increased from 3.7 to 5.1 of a possible 6 guidelines. Guideline implementation and adherence improved 1) maternal substance screening from 75.4% to 89.8%, 2) newborn evaluation and treatment from 76.2% to 95.0%, 3) standardized NAS scoring from 44.8% to 76.5%, 4) non-pharmacologic treatment strategies from 59.1% to 84.0%, 5) standardization of pharmacologic treatment from 68.0% to 91.6%, and 6) provision of human milk from 48.6% to 72.3%. A significant decrease was seen in the proportion of infants discharged on medication (e.g., phenobarbital) for NAS (from 39.7% to 26.5%). After adjusting for potential confounders, having a standardized NAS scoring process was associated with a 3.3 day shorter LOS. No LOS differences were demonstrated for the other interventions. The full cohort reduced LOS from 21 days to 19 days (P = .002) over 18 months. $170 million could be saved annually if these improvements were extended to all U.S. hospitals. LOS varied greatly across participating centers (14–33 days), highlighting significant persistent variation even during active promotion of standardization.

5.1.4. NAS-dedicated treatment settings

Several studies have evaluated special units dedicated to care of opioid-exposed newborns. As previously reviewed, East Tennessee Children’s Hospital developed a special NAS unit in which trained, dedicated staff provide care for opioid-exposed newborns, and parents can room in, within a calm, quiet developmentally appropriate environment. Study of the unit found a significant reduction in LOS of 10.35 days [63]. Although this reduction in LOS is significant, the final mean LOS (29.6 days) remained longer than the national mean and much longer than LOS achieved in other single-center QI studies that will be reviewed later in this article. Long-term impact of this dedicated unit was not evaluated.

Loudin et al. describe significant improvements in LOS when a special 15-bed neonatal therapeutic unit (NTU) with dedicated, trained nursing staff was developed in a tertiary care perinatal referral center in southern West Virginia in response to the vastly increased number of opioid-exposed newborns delivering in their region [68]. In contrast to the East Tennessee experience, this hospital was unable to allow parents to room-in with their infants due to space constraints. A related, free-standing NAS center, called ‘Lily’s Place’, was subsequently developed. At Lily’s Place, comprehensive care is provided through dedicated nurses, patient care assistant staff, NAS-trained volunteers, and social workers who assist in care coordination and safe transitions to home. Due to a limited number of patient rooms, Lily’s Place is also unable to allow parents to room-in. Although significant reductions in costs occurred with the new care sites, mean LOS for otherwise well, pharmacologically treated infants increased from 24 days in the NICU to 26 days in the NTU and 33 days in Lily’s Place. As in other studies reviewed thus far, these LOS are longer than the national mean and considerably longer than in centers that promote rooming-in, parental presence, and other optimal non-pharmacologic care interventions. It is unknown how or if newborn LOS has bearing upon longer term outcomes in early childhood. It is also unknown how this type of care model may impact infant neurodevelopmental outcomes with the lack of a continuous caregiver to promote attachment.

5.1.5. Home-based pharmacotherapy

In recent years, home-based pharmacotherapy has been trialed as a way to facilitate shorter LOS and promote maternal-infant bonding at home. Six retrospective studies on home-based pharmacotherapy [69–74] were recently analyzed in a systematic review of the literature after meeting inclusion and exclusion criteria [75]. This review demonstrated that outpatient weaning for select infants was associated with shorter LOS and reduced hospital costs compared with infants weaned in the hospital, with adverse events rarely reported. However, LOT was significantly longer in the outpatient weaning groups in the majority of studies including 32 days in one study [72] and 37 days in another [70]. A 2018 retrospective cohort study of infants enrolled in the Tennessee Medicaid program revealed that initial LOS was also significantly shorter for infants discharged home on medication (11 days vs 23 days) but LOT was more than 3 times longer with infants weaned prior to discharge to home (60 days vs 19 days; adjusted incidence rate ratio [aIRR] = 2.84) [77]. In this study, infants discharged on outpatient pharmacotherapy also had a 1.5 times increased risk of ED visits within 6 months of discharge compared with those weaned before discharge. Another recently published retrospective study of 774 infants cared for at the Royal Hospital for Women in Sydney, Australia demonstrated that outpatient pharmacologic care of opioid-exposed infants was sustainable and safe when infants were cared for in a coordinated multidisciplinary clinic with close follow-up and high parental compliance. However, similar to other studies of home-based pharmacotherapy, LOT was significantly prolonged and even more so in this center with a median LOT of 76 days (range 35–120 days) [76]. While home-based pharmacotherapy models of care appear effective in decreasing time spent in the hospital with subsequent reductions in medical costs, and may help aid maternal-infant bonding with earlier transitions to home, little remains known about the long-term impact of prolonged opioid exposure on an infant’s neurodevelopment or future risk for addiction. Given animal data that demonstrates potential negative effects [78,79], it may be better to focus on initiatives that aim to decrease postnatal opioid exposure through optimized non-pharmacologic care and medication treatment decisions tailored to symptoms that are most impacting an infant’s function rather than on those aimed only to decrease LOS. If home-based pharmacotherapy is to be implemented, more frequent weaning than that performed in studies to date should be considered to help limit postnatal opioid exposure. Additionally, close coordinated follow-up with neurodevelopmental assessments, and reporting on these outcomes in the literature, is encouraged.

5.2. Care models focused on non-pharmacologic care and symptom prioritization

Several recent single center QI studies have demonstrated the impact of baby-centered NAS care bundles, wherein parents serve as the newborn’s primary caregiver, non-pharmacologic care is optimized in a private room, and providers prioritize symptoms most relevant to an infant’s physiologic function. In such models, pharmacologic treatment is deferred until these measures have proved insufficient to treat the infant’s opioid withdrawal symptoms, unless significantly concerning symptoms are present that prompt earlier treatment [35,36,43].
5.2.1. Children’s Hospital at Dartmouth-Hitchcock

In a formal QI initiative, launched as part of the 3-year VON NAS iNICQ, the Children’s Hospital at Dartmouth-Hitchcock (CHaD) transformed their care of opioid-exposed newborns and demonstrated improved short-term outcomes and cost savings [35]. Over an 18-month period involving 163 opioid-exposed infants and more than 10 PDSA cycles (Fig. 1), CHaD changed its care model from one focused on initiating pharmacologic treatment in the NICU, based on FNAST criteria, to one focused on parents providing non-pharmacologic care in private rooms throughout the entire hospitalization and a family-centered approach to functional symptom assessment. A subset of mothers was educated prenatally regarding ways they could best prepare for their baby’s birth hospitalization, such as planning to stay with their baby in a private room throughout the entire hospital stay, providing frequent skin-to-skin contact, breastfeeding, and planning in-hospital family and friend support while limiting excessive visitors to avoid disrupting the infant. Education also included planning for safe transitions to home, including early follow-up with the newborn’s medical provider, a home visiting nurse, and strategies for withdrawal symptoms such as difficulty consoling. Rather than reflexively starting babies on pharmacologic treatment for 3 FNAST scores ≥8 (or 2 ≥ 12), providers prioritized symptoms of poor feeding, difficulties sleeping, inconsolability, tachypnea, fever, vomiting, or diarrhea over other symptoms that were present but not functionally impacting the newborn (increased tone, tremors, sneezing, yawning) prior to considering pharmacologic treatment. A volunteer cuddler program was implemented to assist during times when parents needed to be away. Utilizing baby-centered assessments performed around the baby’s natural sleep-wake-feeding cycle, staff trained and reliable in FNAST scoring, parents providing optimal non-pharmacologic care in their own room, and Finnegan symptom prioritization, CHaD significantly decreased the proportion of morphine treatment from 46% to 27%, use of adjunctive agents from 13% to 2%, LOS from 16.9 days to 12.3 days, and mean hospital costs from $19,737 to $8,755 per pharmacologically treated infant. Costs for the population of opioid-exposed infants, which included close to 10% of all births by the end of the study period, fell from $11,000 to $5,300. There were no adverse events. Most mothers were receiving MAT and many received comprehensive care in an addiction treatment program affiliated with the hospital [35].

5.2.2. Yale New Haven Children’s Hospital

In a 6-year QI initiative involving 287 methadone-exposed newborns, Grossman et al. demonstrated that a coordinated multi-disciplinary NAS program empowering parents to be their baby’s primary caregiver and moving care from the NICU to a rooming-in environment with non-pharmacologic care optimized yielded short-term NAS improvements without increased adverse outcomes [43]. Yale implemented eight interventions over their project’s duration: 1) standardization of non-pharmacologic care with rooming-in and optimal feeding practices; 2) transfer of infants requiring increased observation or pharmacologic treatment from the well-baby nursery to the inpatient pediatrics unit rather than to the NICU; 3) development and implementation of the ESC approach to assessment and medical decision making; 4) spread of change concepts to the NICU for infants requiring care there for any reason; 5) change from a gradual to rapid weaning of morphine for those requiring pharmacologic treatment; 6) prenatal parent education; 7) morphine given on an as needed, rather than scheduled, basis; and 8) empowering messaging for parents stressing that parental presence is the primary medical treatment for NAS. Yale decreased pharmacologic treatment from 98% to 14%, LOS from 22.4 days to 5.9 days, and hospital costs from $44,824 to $10,289 per treated infant with their QI initiatives. Rates of breastfeeding increased from 20% to 45% [43].

5.2.3. Boston Medical Center

In another comprehensive QI initiative, the Boston Medical Center (BMC) aimed to improve NAS inpatient outcomes through 1) adoption of a non-pharmacologic care bundle (similar to that implemented at the Children’s Hospital at Dartmouth-Hitchcock and Yale-New Haven Children’s Hospital), 2) empowering prenatal/parental messaging regarding the importance of parental presence at the bedside and of the mother being her newborn’s primary NAS treatment, 3) Finnegan symptom prioritization with pharmacologic treatment initiated only if an infant had difficulties feeding, excessive vomiting, diarrhea, poor consolability, and/or sleep not responsive to optimization of non-pharmacologic care as per the CHaD model, 4) staff QI project education, 5) a switch from morphine to methadone as the primary opioid for infants requiring pharmacologic treatment, 6) incorporation of a cuddler program to assist in caring for opioid-exposed newborns, and 7)
5.3. Care models focused on comprehensive treatment for pregnant women and their newborns

Although much attention has been paid to higher rates of NAS and associated inpatient healthcare expenditures related to perinatal opioid exposure, there has been less attention given to the increased risk of prematurity, low birth weight, placental abruption, and stillbirth associated with untreated prenatal OUD [80,81]. There are better maternal and child outcomes when pregnant women with OUD receive MAT [82], especially when it is provided within multi-disciplinary programs that include obstetrical, mental health, and substance use disorder treatment [83]. Benefits of these integrated models include increased prenatal care attendance, and decreased rates of illicit substance use, placental abruption, fetal loss, preterm labor, prematurity, and fetal growth restriction [80,84–86].

Although some studies demonstrate similar reductions in preterm delivery and low birth weight for groups of pregnant women treated with buprenorphine or methadone [81], others find buprenorphine superior [82]. In a systematic review and meta-analysis of prenatal buprenorphine as compared to methadone, Brogly et al. found that the unadjusted NAS treatment risk was lower (RR 0.90) and mean hospital LOS shorter (−7.23 days) for infants perinatally exposed to buprenorphine [87]. A significantly shorter treatment duration (−8.46 days) and lower cumulative morphine dose (−3.60 mg) was also seen for infants prenatally exposed to buprenorphine as compared to methadone, Brogly et al. found that the delivery and low birth weight for groups of pregnant women treated with methadone and buprenorphine as compared to methadone, Brogly et al. found that the delivery and low birth weight for groups of pregnant women treated with methadone and buprenorphine as compared to methadone, Brogly et al. found that the delivery and low birth weight for groups of pregnant women treated with methadone and buprenorphine as compared to methadone, Brogly et al. found that the delivery and low birth weight for groups of pregnant women treated with methadone and buprenorphine as compared to methadone, Brogly et al. found that.

5.3.1. Integrated models of care for the mother-baby dyad

5.3.1.1. University of North Carolina’s Horizons program

Founded in 1993, Horizons is the archetype for comprehensive care for mother-infant dyads with SUD [105]. It includes prescription of MAT, provision of mental health care, peer support, and prenatal education focused on intrapartum pain management and in-hospital neonatal care. Horizons facilitates multi-disciplinary, mother-baby centered care of opioid-exposed newborns through trauma-informed, non-pharmacologic care during the newborn hospitalization. Horizons’ levels of care and extensive community integration are particularly noteworthy. Varied intensities of maternal OUD treatment are available and individualized to the pregnant woman, from outpatient MAT to residential care where a mother can live with her children while undergoing inpatient treatment. Community reintegration services are particularly robust, including legal services, job training and placement services, and substance-free transitional housing.
5.3.1.2. Dartmouth-Hitchcock Moms in Recovery program. Dartmouth-Hitchcock (D-H) Moms in Recovery (MORE) was established in 2013 as a comprehensive, multi-disciplinary prenatal care service for women with OUD and co-occurring psychiatric conditions [106,107]. When a woman discloses an OUD anywhere in the D-H health system (which cares for about half of the region’s population), she is referred to the MORE program. MORE has cared for more than 160 pregnant and parenting women since its inception (D Goodman, personal communication, 2019). An addiction psychiatrist provides MAT and comprehensive substance abuse and psychiatric care. Licensed social workers, a licensed drug and alcohol counselor, and behavioral health specialists provide group counseling sessions and support services. A certified peer recovery coach provides lived-experience support to women in the program. A midwife provides prenatal and postpartum care including family planning and primary reproductive health services. A team of pediatricians delivers prenatal education sessions on NAS and on-site dyadic well-child care for newborns and siblings. Social workers and the recovery coach coordinate referrals to community services regarding intimate partner violence, early intervention, and subsidized housing. As not all pregnant women with substance use disorders participate in the MORE program, D-H also has a dedicated SUD prenatal clinic for women who receive addiction treatment at other programs, and a related recovery-friendly pediatric practice (Fig. 2). These care models have been associated with increased numbers of prenatal visits, adequate prenatal weight gain, adherence to substance disorder treatment, and decreased rates of non-prescribed opioid use, low birthweight, prematurity, pharmacotherapy for NAS, and increased postpartum retention in MAT (Frew JR, Goodman DJ, Saunders EC. Manuscript in preparation. 2019).

5.3.2. Safe transitions to home and post-discharge care of the opioid-exposed infant

Most studies to date regarding opioid-exposed infants have focused on in-hospital care while little has been published on safe transitions to home and post-discharge care of the opioid-exposed newborn especially when care is provided outside of comprehensive, coordinated care settings. The importance of developing a “Plan of Safe Care” for substance-exposed infants has been highlighted and now mandated in the U.S. through the 2016 Comprehensive Addiction and Recovery Act, commonly referred to as CARA [132]. CARA requires that a Plan of Safe Care address the health and substance use disorder treatment needs of the infant and affected family or caregiver. The Substance Abuse and Mental Health Services Association (SAMHSA) has recently published “Clinical Guidance for Treating Pregnant and Parenting Women with Opioid Use Disorder and their Infants” in which recommendations, web-based resources, and discharge checklists can be found to help providers develop Plans of Safe Care for opioid-exposed mother-infant dyads [133]. Safe discharge planning optimally starts prenatally with referrals to community agencies (e.g., home visiting programs and parenting resource centers) and helps ensure that the home is safe and equipped for care of a newborn. As noted previously, Plans of Safe Care should include continued maternal opioid use disorder treatment, especially in the high risk postpartum period. Caregiver abstinence from any substance use in parenting should be strongly encouraged, not only for the mother but also any other infant caregiver. Parenting education should include ways to identify signs of early hunger and how to optimize feeding including if the baby has any difficulties after discharge. Parenting education should include instruction on ways to calm a fussy baby and the importance of never shaking a baby. Parents should be educated on safe sleep practices including safe swaddling and the importance of no co-sleeping, as well as the importance of early follow up with the baby’s primary care provider (PCP) for routine well-baby care and any difficulties with feeding, sleeping, consoling, or other acute signs of increased NAS or illness. Post-discharge follow-up with the baby’s PCP and home visiting nurse agency, and referral to early intervention services, should be made before hospital discharge. Newborn follow-up evaluations should include assessment of the baby’s and family’s transition to home, infant feeding, elimination and weight patterns, and any signs of increased opioid withdrawal. Support and encouragement for continued breastfeeding can be provided by the PCP, home visiting nurse, and/or through referral to a lactation consultant or other community breastfeeding support agency. PCPs can further reinforce referrals, made prenatally and in the birth hospital, to services that provide perinatal and infant health care to promote optimal physical and emotional health of the mother-infant dyad and reduce the risk of infant or maternal morbidity and mortality [133], especially as related to parenting resource centers, home visiting nurse
programs, early intervention, and other social supports needed by the family including help with transportation, housing, and food security.

6. Developing an optimal model of care for opioid-exposed newborns and their families

6.1. Impact of care models on maternal-infant attachment and infant mental health

As mentioned previously, little is known about how family-centered care models, or rooming-in postnatal care, might impact longer-term developmental outcomes for children who had NAS as newborns. There is extensive literature on how early maternal-infant attachment affects long-term outcomes, and this is worth reviewing in this context.

In a prospective cohort study of 31 newly delivered young, unmarried, first-time mother-baby dyads, study authors compared care provided in one hospital that promoted skin-to-skin contact and rooming-in with one that limited contact to every 4 h for feedings [108]. The 15 mothers in the rooming-in group demonstrated significantly more time looking at and talking to their infants and less time watching television or talking with others. Mothers in the rooming-in group also spent significantly more time touching their infants in age-appropriate manners and had higher ratings on the attentiveness and touching subscales than did the 16 mothers in the limited contact group. Although this study is not specific to care of opioid-exposed newborns, it is important that we consider the impact of rooming-in on mothering behaviors (e.g., looking at and talking to infant, touching infant in an age-appropriate manner) and how these behaviors may aid in providing calm, non-stimulating, supportive and developmentally-appropriate care for newborns at risk for problematic withdrawal symptoms. More importantly, these behaviors may aid in improving the mother-infant attachment relationship. Protecting and promoting infant neurologic development and mental health is an important aspect of care that has been insufficiently considered in the literature and clinical practice regarding NAS to date.

The formal study of infant mental health is a multidisciplinary research and clinical practice ‘enterprise’ [109]. It is based on the understanding that the postnatal period is a time of rapid neurodevelopment [110] and it recognizes that infant brain development is experientially- and environmentally-dependent [111]. For an infant, experience and environment are relationally-based, making attachment fundamental for infant mental health. Loosely defined, attachment refers to an affective relationship with a particular, preferred individual, usually the person providing consistent care for the infant [109]. This generally occurs in the context of the infant’s primary attachment relationship, most often with his/her biological mother [112]. Infants who experience deficient or absent primary attachment relationships are known to experience significant long-term behavioral, psychological and emotional difficulties [113]. Mothers with untreated SUD may have difficulty with attachment when their active addiction consumes much of their energy and attention.

Newborn birth hospitalization can disrupt attachment between the infant and primary caregiver(s) in the first few days of life [114]. Prolonged hospitalizations for NAS are likely to further contribute to disruptions in attachment, especially when care is provided in the NICU where the ability to room in is typically limited [17,19], and where mothers may spend less time with newborns due to feeling unwelcomed or judged by hospital staff [28,29].

Attachment is largely dependent on three key elements: proximity, reciprocity and commitment [115]. Proximity includes touching and eye contact, which enable the caregiver to communicate with the infant. Reciprocity involves interaction between the infant and the caregiver, including how well the caregiver responds to the cues the infant sends. Commitment describes the ongoing nature of the relationship. The highly technological environment of most NICUs is often not conducive to these key attachment elements [114]. The NICU can be especially restrictive when an infant has an acute medical condition that may include intubation, intensive cardiorespiratory monitoring, and incubator warming – all of which may further restrict maternal-infant contact.

For these reasons, providing care to opioid-exposed newborns in a calm private room with their own mother or another consistent, attentive caregiver should be prioritized. When this is not possible given an individual hospital setting, it is especially important for nurses to understand their role in supporting and facilitating mother-infant attachment [116]. Interventions and strategies that can help facilitate attachment in the technological intensive care environment include: skin-to-skin care [117], breastfeeding [118], participation in routine care (e.g., feeding, bathing, diaper changes) [119], and psychosocial support of the mother [120]. All of these interventions have proven beneficial to the development of healthy attachment in NICU environments. It is also important for staff to provide care in a trauma-informed manner, as many women with SUD have a history of physical and/or sexual trauma and can be re-traumatized by interactions with health care providers [121]. We refer the reader to two excellent reviews on trauma-informed care in the NICU for the support of women with SUD and implications for early childhood development [121,122].

A recent extensive systematic review failed to identify any interventions intentionally aimed at optimizing infant mental health for hospitalized opioid-exposed infants (S Blythe, personal communication, 2018). In response to this gap in the literature, investigators qualitatively studied how nurses promote attachment for hospitalized newborns experiencing NAS [123]. Nurses implement a range of activities to promote attachment, but articulate difficulties in promoting attachment for infants with NAS when the mother is absent [124]. In other studies, mothers have shared barriers to being present including lack of transportation, childcare responsibilities, need to leave the hospital to receive their MAT, residential SUD treatment program requirements, feeling judged, stigma and guilt [28,29,36]. Maternal absence may also stem from physical or mental health difficulties, active substance use issues, and/or the involvement of child protective services [125]. As such, hospitals and providers can assist mothers to overcome these barriers through care coordination, substance use and mental health disorder treatment, and trauma-informed care.

6.1.1. Interventions to improve infant attachment

Although advocacy for the presence of the biological mother in the care of the opioid-exposed infant has recently increased, the focus has been on improving short-term neonatal outcomes related to pharmacotherapy and LOS [35,36,43,56,58,126,127]. In these studies, attachment is not acknowledged from the point of healthy neurodevelopmental process or the promotion of the infant’s mental health, but rather as a physical symptom reliever. One recent exception is a mixed methods study on skin-to-skin contact in opioid-dependent mother-infant dyads, in which investigators quantitatively measured pre- and post-intervention salivary cortisol levels, heart rates, attachment scores and “dyad synchrony” following a brief educational intervention on the benefits of skin-to-skin contact [128]. Currently, the research team is collecting data from maternal interviews, and data on infant LOS and hospital costs. There is a clear need to consider the infant’s mental health and development in these contexts of care [129].

6.2. Key components of optimal care for opioid-exposed newborns

The executive summary of a joint workshop of the National Institute of Child Health and Human Development, American College of Obstetricians and Gynecologists, American Academy of Pediatrics, Society for Maternal-Fetal Medicine, Centers for Disease Control and Prevention, and the March of Dimes, states that care of the opioid-exposed infant should focus on four goals: 1) support of vital neonatal functions and development, 2) initiation and support of family bonding, 3) prevention of complications, and 4) family education and provision...
of adequate medical and social resources after discharge [130]. When considering these treatment goals and an optimal care model for opioid-exposed newborns, we should think comprehensively about care that includes the mother and family, and considers the newborn’s individual clinical context, the greater health care system, and society as a whole. In a recent article that proposes a social ecological approach, comprehensive care models for the opioid-exposed infant can be designed to address the 1) micro-system (infant, mother, and family), 2) meso-system (standardized evidence-based care guidelines, rooming-in, trauma-informed care, NAS Prenatal Education, Rooming-in, Skin-to-skin, Breastfeeding, Parental Presence, Baby-Centered Care, Function-based Standardized Assessments by Trained Staff, Pharm Rx Only if NAS Not Well Controlled by Optimal Non-Pharm Care, Plans of Safe Care Including Early PCP & Home Visiting Nurse Visits, Resource Referrals for Social Determinants of Health, Early Intervention and Close Neurodevelopmental Follow-Up, & Continued Family Mental Health & Addiction Treatment), 3) exo-system (hospitals, medical insurance programs, public health systems), and 4) macro-system (governmental policies related to safe transitions to home and availability of comprehensive treatment for OUD, educating the community on the science of addiction and decreasing stigma) [131]. We refer the reader to Fig. 3 and Table 1 for key components of optimal care models for opioid-exposed newborns that include their mothers and families.

### Table 1

<table>
<thead>
<tr>
<th>Key components of an optimal model of care for opioid-exposed newborns</th>
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<tbody>
<tr>
<td>• Prenatal Screening, Brief Intervention, and Referral to Treatment (SBIRT) for pregnant women with substance use disorders</td>
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<tr>
<td>• Maternal comprehensive, multi-disciplinary, individualized addiction treatment including buprenorphine as preferred MAT when appropriate, behavioral and mental health counseling, and medication treatment for maternal co-occurring psychiatric conditions</td>
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<tr>
<td>• Prenatal education for families on NAS and ways they can optimize fetal and neonatal outcomes through prenatal care, smoking cessation, rooming-in, parental presence, and non-pharmacologic care</td>
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<td>• Trauma-informed, non-judgmental care individualized to the neonate, mother, and family</td>
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<tr>
<td>• Rooming-in in a calm, nurturing environment that promotes parents as the newborn’s primary care providers, and ensures adequate rest and support for the infant and parents</td>
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<tr>
<td>• Frequent skin-to-skin contact with an alert, rested caregiver</td>
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<td>• Feeding on demand at early hunger cues and until content</td>
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<tr>
<td>• Breastfeeding and/or provision of mother’s milk (unless medically contraindicated)</td>
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<tr>
<td>• Use of pacifiers for non-nutritive sucking only after an infant is well-fed</td>
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<tr>
<td>• Staff trained and competent in performing consistent NAS neurobehavioral assessments</td>
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<tr>
<td>• Assessments performed after feedings while the infant is held by a parent/caregiver</td>
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<tr>
<td>• Non-pharmacologic care interventions (e.g., rooming-in, parental presence, skin-to-skin, holding, swaddling, calm environment, limiting visitors, non-nutritive sucking) optimized to their fullest extent possible and individualized to the clinical setting prior to considering pharmacologic treatment</td>
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<tr>
<td>• Treatment decisions prioritized to symptoms physiologically and neurobehaviorally relevant to the infant’s function and gestational age</td>
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<tr>
<td>• Pharmacologic treatment initiation, escalation, and weaning performed using a standardized protocol</td>
</tr>
<tr>
<td>• Development of a Plan of Safe Care for the mother-infant dyad that includes referrals to community support agencies (including home health visiting programs and parenting centers), substance use disorder treatment for the family (including smoking cessation interventions), and early and frequent follow-up with recovery-friendly primary care, obstetric, and addiction treatment providers</td>
</tr>
<tr>
<td>• Referrals to early intervention services and careful follow-up for optimal neurodevelopment</td>
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</tbody>
</table>

### 7. Conclusions

Models of care for NAS that promote baby-centered, function-based, non-pharmacologic care, with the mother as the primary means of treatment, may be more effective in reducing LOT and LOS than those focused on specific medications, protocol standardization, or home-based pharmacotherapy. Given the evidence to date, care for opioid-exposed newborns should occur in settings that maximize rooming-in and trauma-informed supportive care for families. Social ecological approaches to care should be incorporated to help optimize maternal-infant health outcomes and safe transitions to home. Further studies are needed to assess these models of care on maternal-infant attachment and long-term neurodevelopmental outcomes. Research investigating scenarios where the infant has been separated from the mother (e.g., foster care) are also warranted as care models used in these situations will likely differ.
7.1. Practice points

- Different FNAST score thresholds affect the likelihood an infant will be prescribed medication
- Standardized treatment protocols reduce LOS regardless of specific medication used
- Care provided in NAS-dedicated settings is associated with varied impacts on LOS
- Care models focused on symptom prioritization and non-pharmacologic care are associated with lower rates of pharmacotherapy, LOS, and hospital costs compared with score-based, standardized treatment including that provided in dedicated NAS treatment settings
- Home-based pharmacotherapy significantly reduces LOS but significantly increases LOT and may increase post-newborn discharge ED visits
- Better health outcomes are experienced by dyads cared for in comprehensive, multi-disciplinary treatment programs

7.2. Research directions

Role of the following on short- and long-term NAS outcomes including proportion of infants pharmacologically treated, LOS, hospital costs, maternal-infant attachment, childhood neurodevelopment, and future risk of addiction:

- FNAST score vs ESC function-based assessments and medication treatment decisions
- Specific medication used when non-pharmacologic care is optimized prior to pharmacotherapy initiation
- Cumulative postnatal opioid exposure among infants weaned in vs out of hospital
- Rooming-in care models using biological parents vs foster parents (or designated kin) vs hospital cuddlers
- Protecting and promoting infant mental health during withdrawal and hospitalization in varied care settings

Authors’ contributions to manuscript

Dr. Whalen led conception and design of the review, drafted all sections except that by Dr. Blythe, critically reviewed and incorporated revisions provided by co-authors, and finalized the version submitted. Dr. Holmes critically reviewed and revised the review, and provided final approval of the version submitted. Dr. Blythe co-led conception of the review, wrote the section on infant mental health and attachment, critically reviewed and revised the review providing additional items for inclusion, and provided final approval of the version submitted.

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