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PEDIATRIC OPIOID ENDEMIC**ABSTRACT***Introduction*

As of 2017, 54 out of every 1,000 children born in West Virginia were affected by opioid use. NAS Centers provided care to infants who have been diagnosed with, or have been vulnerable to develop, NAS. The purpose of this research study reviewed the Pediatric Opioid Endemic happening in West Virginia and determined if NAS programs and prenatal opioid maintenance therapy would increase access to NAS patients and decrease the cost of treatments.

Methodology

The methodology was a literature review. Thirty-nine sources were referenced for this literature from 2010-2020.

Results

This review examined sources of the Pediatric Opioid Endemic in West Virginia. This review focused on NAS programs and how prenatal opioid maintenance therapy can increase access to NAS Patients. This decreased the number of infants diagnosed with NAS and decreased the cost of treatments for infants and mothers.

Discussion/Conclusion

The purpose of this research paper was that NAS Centers and prenatal opioid maintenance therapy would help improve the pediatric opioid endemic by decreasing the number of NAS patients and decrease the cost of treatments for infants. The review explored research and an expert in NAS therapy was conducted. The results from this showed that NAS Centers offering therapy to both mother and patients will decrease the amount of infants diagnosed with NAS and decrease the cost of treatments.

Key Words: NAS, Neonatal Abstinence Syndrome, Opioid Endemic, Opioid Therapy, Prenatal Opioid Maintenance

INTRODUCTION

Neonatal Abstinence Syndrome (NAS) has been described as a postpartum drug withdrawal condition that typically transpires among opioid-exposed newborns following birth (Ko, et al, 2016). Opioids have been defined as prescribed or illegal classes of drugs utilized to decrease pain (CDC, 2018). NAS has been associated with central nervous system sensitivity, autonomic hyperactivity, and gastrointestinal issues (Ko, et. al, 2016). NAS has been labelled as a short-term occurrence that ranges in severity where some infants need treatment while others do not (NAS, 2017).

Endemic has been referred to as a disease or condition amidst specific people within a given area (Lexico, 2020). The state with the highest opioid death rate in the nation has been West Virginia (Cenziper, Corio, Hooper, Soule, 2019). Every 137.6 per 100 people in West Virginia have been prescribed an opioid (Lilly, et al. 2019). In 2018, West Virginia had 51.5 drug overdose deaths per 100,000 people (Hedegaard, Minino, Warner, 2020). WV has the third highest age-adjusted death rate from drug poisoning in the country and the third-highest prescribing rate of opioids (Paulozzi, Mack, Hockenberry, 2014).

As of 2017, 54 out of every 1,000 children born in West Virginia were affected by opioid use (Knisely, 2019). More specifically, in Bluefield, West Virginia, nearly 3.5% of newborns were diagnosed with drug withdrawal in 2017 (Patrick, 2019). The crisis is not only happening across America, but hurting small towns and taking a toll on pregnant women and their babies (Patrick, 2019). From 2009 to 2015, the number of Medicaid-covered infants in West Virginia that were diagnosed with NAS was documented at 6 million births, which is higher than any

other city (Patrick, 2019). The opioid crisis has not only been a healthcare problem, but has grown into a social problem resulting in babies being treated for drug withdrawal (Patrick, 2019).

West Virginia, Tennessee, and Kentucky have had the highest NAS incidence rates with 1,058 to 4,172 NAS infants per 1,000 births (Wolf, Tong, Sabo, Woolf, Abbinanti, Pecsok, Krist, 2019). NAS has been found typical among 25% of states with high amounts of rural residents (Wolf, et. al, 2019). While West Virginia has also had the highest incidence of NAS in the United States (U.S.), 33.4 per 1,000 newborns, the state has also spearheaded strategies to improve the issue nationwide (Gottlieb, Davies, Wright, 2018).

The public's focal point has not been on whether the opioid was prescribed by a healthcare provider for conditions, including pain management or treatment for Opioid Use Disorder (OUD), or the mother has abused medications and illegal opioids (NAS, 2017). In 2018, Healthy Connections was developed to supply family services, promoted policy change and increased treatment options, researched and applied procedures, and provided substance use disorder education (Gottlieb, et. al, 2018).

NAS Centers (NASC) have been described as organizations that deliver care to infants who have been diagnosed with, or have been vulnerable to develop, NAS (WVDHHR, 2019). The WVDHHR has received authorization from the U.S. Centers for Medicare and Medicaid Services (CMS) to offer NAS treatment services, including complete assessments, Pharmaceutical Withdrawal Treatment, slow presentation of sensory stimuli, and observing withdrawal objective assessments, and West Virginia was the first state to receive approval

(WVDHHR, 2018). Due to the opioid epidemic, there have been more drug-addicted babies in West Virginia compared to any other state and opening up these centers in the state has established a mechanism that helps fight the opioid epidemic (Hodousek, 2018). The West Virginia NAC licensure rule has required a NASC to have at least two licensed nurses present during each period of work (WVDHHR, 2019). NAS centers have offered pharmacological and non-pharmacological techniques to intervene during the withdrawal process (WVDHHR, 2018).

The Neonatal Therapeutic Unit (NTU) at Hoops Family Children's Hospital in Huntington, West Virginia, opened its doors in 2012 with the purpose to care for babies experiencing NAS (Murray, 2017). Within the first five years, the unit exceeded the 12-bed capacity and had to allow change to meet the needs of patients and parents (Murray, 2017). The NTU has been used when babies do not need the services offered in the Neonatal Intensive Care Unit (NICU), but have found comfort in the NTU staff's support (Hoops Children's Hospital, 2020). The NTU has also involved family members in the babies' care, creating practices that can be utilized after the hospital stay (Hoops Children's Hospital, 2020).

In 2014, Lily's Place was the first NAS center to open in the U.S. in Huntington, West Virginia, and has received national attention (Null, 2018). Lily's Place has delivered care to West Virginia babies experiencing the withdrawal process and families learning the fundamentals of how to care for a NAS infant (Null, 2018). Cabell Huntington Hospital in West Virginia had initiated Lily's Place and Cabell Huntington Hospital's NTU (Powell, 2019). The

United States' first interim care nursery, Pediatric Interim Care Center (PICC), located in Kent, Washington, was the motivation for the establishment (Powell, 2019).

Lily's Place has been the first in the state to receive the U.S. Centers for Medicare and Medicaid Services' approval for reimbursement for NAS treatments (Snoderly, 2018). The facility has received funding from the state since opening its doors, covering approximately 60% of the center's costs (Snoderly, 2018). In 2018, Lily's Place received a \$500,000 grant from Pfizer to continue offering advanced neonatal care and support for mothers. The services from Cabell Huntington Hospital's MOMs program have been incorporated into Lily's Place plan-of-care to ensure comprehensive services are available (The Herald-Dispatch, 2018). Once an infant has become a Lily's Place patient, Child Protective Services (CPS) has made certain that family members, including mothers, have been taking the necessary steps to become clean (Davis, 2016a).

Lily's Place has influenced federal bills including the NAS Healthy Babies Act (Davis, 2016b). The act has mandated the Government Accountability Office (GAO) to disclose information on NAS (CRS, 2016). The NAS Healthy Babies Act would have also given nationwide facilities the opportunity to replicate Lily's Place (Davis, 2016b). The bill was introduced on April 18, 2018, to U.S. Congress, but had not been enacted due to dying in a previous Congress (GovTrack, 2020).

The purpose of this research study reviewed the Pediatric Opioid Endemic happening in West Virginia and determined if NAS programs and prenatal opioid maintenance therapy would increase access to NAS patients and decrease the cost of treatments.

METHODOLOGY

The methodology for this study was literature research and review of case studies and a semi-structured interview. The primary hypothesis for this research paper was that NAS Centers and prenatal opioid maintenance therapy would help improve the pediatric opioid endemic by decreasing morbidity in NAS patients and decrease the cost of treatments for infants.

Search Strategy

The review utilized in this study about Pediatric Opioid Endemic in West Virginia was composed of primary and secondary data. The conceptual framework, illustrated by Figure 1, for this review was adapted from the steps and research used by Morgan and Wang (2019). The research method was an adoption of the framework showing the linkages between early exposure to opioids such as maternal prescribed use, a child's subsequent risk for disability, and results of receiving special education services. Throughout the process assessment, the use of opioid maintenance and education services among the fetal and infant stages and how they affected the early childhood stages. The framework explored the exposure to opioids in utero and linked them to the postnatal effects through environmental contexts. Maternal opioid use has been said to result in NAS, as well as cognitive, physical, and behavioral impairments. See Figure 1.

The literature was conducted in three stages: (1) developing a search strategy and gathering data; (2) determining and analyzing the relevant literature; (3) allotting literature to appropriate categories.

Step 1: Literature Identification and Collection

When implementing the search, the following keywords were employed: “pediatric opioid endemic” AND “neonatal abstinence syndrome” OR “NAS” AND “prenatal opioid maintenance” OR “opioid therapy”. The following electronic databases were utilized to gather literature: Medline, Access Pharmacy, PubMed and Google Scholar. The Center for Disease Control and Prevention, National Academy of Sciences, National Institute of Health, and West Virginia Department of Health and Human Resources were reliable websites that were also minded in the review. PRISMA was used as an overview for the literature evaluation for reporting systematic reviews and meta-analyses..The search identified 540 relevant citations and articles were excluded (N= 506) if they did not meet inclusion principles. Articles were included (N= 34) if they described the pediatric opioid endemic and NAS centers: articles from other sources (N=17) were also minded in this search. These 34 references were subject to full-text review, and these 34 citations were included in the data abstraction and analysis. Only 39 references were used in the results section. (See Figure 2).

A semi-structured interview with an expert was conducted regarding the pediatric opioid endemic happening in West Virginia. This expert was an Executive Director at Lily’s Place in Huntington, West Virginia, and was referred to as an expert in NAS. This individual was chosen for the semi-structured interview due to her high amount of experience in recovery administration. This semi-structured interview was IRB approved and took place via phone.

Step 2: Establishment of Inclusion Criteria and Literature Analysis

The Pediatric Opioid Endemic has become important because of its impact on West Virginia. Therefore, the literature analyzed focused on the following key areas: Opioid Endemic in West Virginia, Neonatal Abstinence Syndrome (NAS), Specific Drug Trends, and NAS therapy. The articles written in the English were published between 2010 and 2020. Thirty-nine were utilized for this research study. This literature search was conducted by OM and MW and validated by AC, who acted as the second reader and double checked to ensure that references met the inclusion criteria.

Step 3: Literature Categorization

The following subheadings were included in the research: *Pediatric Opioid Endemic in West Virginia, NAS and Drug Specific Trends, NAS Centers and NAS Treatment, Prenatal Opioid Maintenance, and Maintenance Programs.*

RESULTS

Pediatric Opioid Endemic in West Virginia

An umbilical cord tissue study was completed in eight West Virginia hospitals, where infants were tested on the exposure to licit/illicit drugs and alcohol (Lilly, et al. 2019). The study showed that 20% of the infants had been exposed (Lilly, et al. 2019). In 2010, Charleston Area Medical Center (CAMC) in West Virginia stated that 1 and 3 women tested positive for opioid abuse (Harold, 2011). The study included 706 pregnant mothers between July 2010 and July 2011 were tested for drug use and 74% tested positive for marijuana, 20% tested positive for opioids, 12% tested positive for Benzodiazepines, and 6% tested for Methadone (Harold, 2011).

Another study completed by Stitely, et al. (2010) tested 759 pregnant women in West Virginia for drug and alcohol abuse and 146 or 19.2% tested positive.

NAS and Drug Specific Trends

The opioid epidemic has had consequences that have affected pregnant women and NAS has been diagnosed in 55%-94% of newborns (Nair, Soraisham, and Akierman, 2012). This has caused health complications during pregnancy for the infant and caused by the use of Heroin, Codeine, Oxycodone, methadone, and Buprenorphine (Medline Plus, 2017). Hospital charges for NAS have reached \$1.5 billion in 2012, with 81% of the cost being charged to state Medicaid programs (Patrick, Davis, Lehman, and Cooper, 2015). Between 2004 and 2014, the amount of NAS cases in West Virginia increased from 1.5 cases per 1,000 births to 8.0 cases per 1,000 hospital births (NIH, 2019). This has been the same as an infant being born with symptoms of NAS every fifteen minutes (NIH, 2019). Hospital costs for NAS have increased from \$91 million to \$563 million due to the increase in the number of cases from 2004- 2014 and an increase from 1.5- 8.0 for NAS incident rates and 150 to 563 million dollar cost inflation.

138,224 out of 55,781,965 hospitalizations in pregnant women were due to the opioid crisis (Krans, Cochran, and Bogen, 2015). More than 35% of the women tested positive for marijuana, cocaine, benzodiazepines, and 77%-95% had smoked tobacco (Krans, et al, 2015).

A study completed by Stabler, et al. (2018), examined NAS and drug specific trends in West Virginia by examining 119,605 live births in West Virginia hospitals. It was found that 1,974 of the births were NAS diagnoses and the number of cases diagnosed at birth were 98.4% of the total cases (Stabler, et al. 2018). The findings from the study showed that NAS rates have continued to rise in West Virginia (Stabler, et al. 2018). Within the years of 2007 to 2013, the rate of newborns diagnosed with NAS in West Virginia increased from 1.89 to 8.09 for narcotics,

the diagnosis of hallucinogen exposure did not change over time, and the diagnosis of cocaine exposure decreased from 1.77 to 0.74 per 1,000 live births (Stabler, et al. 2018).

NAS Centers and NAS Treatment

NAS centers were created to help treat babies who have been born addicted to drugs, allowing Lily's Place and the Neonatal Therapeutic Unit (NTU) at Hoops Family Children's Hospital to be recognized and treat infants (Hodousek, 2018). Each year, the state Medicaid program has covered more than \$1 billion to care for infants with NAS (Normile and Hanlon, 2018). In February 2018, the Centers for Medicare and Medicaid Services (CMS) approved a new financing approach to be more cost efficient for state Medicaid programs covering the cost of NAS treatments (Normile and Hanlon, 2018). The average hospital stay for an infant with NAS has been 17 days and has cost nearly \$93,000 and non-hospital treatments for infants with less severe cases of NAS have ranged from \$600-\$2,600 per treatment (Normile and Hanlon, 2018).

Prenatal Opioid Maintenance

Opioid use during pregnancy has increased the risk of NAS in linked to other complications throughout the pregnancy and has resulted in the infant needing treatment such as buprenorphine (Nguyen, et al. 2018). Although NAS has been a serious condition, the mothers of the infants should receive treatment of buprenorphine during and after the pregnancy to quit the use of drugs. Methadone and buprenorphine have been used to help treat the baby of opioid use during pregnancy (Nguyen, et al. 2018). Buprenorphine has been a formula used to help limit fetal exposure due to fetal withdrawal, potential mix of hormones, and behavioral effects (Nguyen, et al. 2018). Studies have shown that individuals treated with methadone and

buprenorphine during the pregnancy have infants who are less likely to be diagnosed with NAS, had a lower peak NAS during treatment, and improved delivery (Wiegand, et al, 2015). The study included 62 mothers, 31 of those were treated with methadone and the other 31 were treated with buprenorphine and naloxone. The methadone group had a Neonatal Abstinence Syndrome (NAS) diagnosis of 51.6% compared to the buprenorphine and naloxone group who had a NAS diagnosis of 25.1% (Wiegand, et al, 2015).

Maintenance Programs

Drug Free Moms and Babies Program (DFMB) has been a program in West Virginia that has been offered to mothers and children that suffer from substance abuse (Greenbrier Valley Medical Center, 2020). The goal of the program has been to have healthier outcomes for the mother and baby, and this has been done by providing prevention, early intervention, education, addiction treatment, and recovery support services (Greenbrier Valley Medical Center, 2020). Medication-Assisted Treatment (MAT) has been the standard care for those with opioid use disorder and has been the safest, most effective treatment (Greenbrier Valley Medical Center, 2020).

DISCUSSION

The purpose of this research study reviewed the Pediatric Opioid Endemic happening in West Virginia and determined if NAS programs and prenatal opioid maintenance therapy would increase access to NAS patients and decrease the cost of treatments. The primary hypothesis for this research paper was that NAS Centers and prenatal opioid maintenance therapy would help improve the pediatric opioid endemic by decreasing the number of NAS patients and decrease the cost of treatments for infants. Results from the literature review have shown that West Virginia has continued to have an increased number of NAS births and have addressed the issue

by establishing NAS centers such as Lily's Place, a Neonatal Therapeutic Unit (NTU), and the Drug Free Moms and Babies Program that have offered NAS services during and after pregnancies to mothers and babies.

The opioid crisis has developed from a healthcare issue to a social issue nationwide. NAS has been diagnosed in 55%-94% of newborns. Opioid use during pregnancy has caused pregnancy issues and have resulted in NAS treatment for the infant. Heroin, Codeine, Oxycodone, Methadone, and Buprenorphine have produced health difficulties for NAS babies. By 2012, NAS related charges in hospitals totaled \$1.5 billion and 81% was charged to state Medicaid programs. In West Virginia, every 137.6 per 100 people have been prescribed an opioid. A 2018 study focused on 119,605 live births in WV hospitals and discovered that 1,974 of the births were NAS diagnoses.

West Virginia has had the highest number of drug-addicted babies than any other state. Several movements have taken place in West Virginia to fight the pediatric opioid endemic. NAS Centers have offered pharmacological and nonpharmacological treatments to infants. Lily's Place opened in 2014 and was the first NAS center to open within the United States. Babies who have gone through the withdrawal process have been treated at Lily's Place while parents have been taught the basics to care for an NAS infant.

Lily's Place Executive Director, Rebecca Crowder, was interviewed via phone conference. While Lily's Place has been licensed to allow up to 16 babies at a time, the facility has preferred no more than 14 babies to leave space for a set of twins. The average length of stay for a Lily's Place patient has been 30 days. Crowder stated that Lily's Place has offered services including medication and therapeutic handling to babies going through the withdrawal process. Mothers have been provided peer support specialists and rooming-in, which has added to the

recovery program already in place. Fathers and families have also been involved with treatment plans including CPR, first aid, follow-up clinics, counselors, and social work. Crowder stated that since opening in 2014, the number of neonatal patients has steadied out because the choice of drugs has shifted and obvious, exposure symptoms have been different.

In 2012, the NTU opened in Huntington, West Virginia, at the Hoops Family Children's Hospital. When infants have not benefited from the services offered in the hospital NICU, the NTU has been utilized to care for NAS babies. In 2012, hospital charges for NAS reached \$1.5 billion. Prevention and treatment for NAS should have begun before, during, and after pregnancy. The Drug Free Moms and Babies Program (DFMB) was established in West Virginia with an ultimate goal of providing prevention, intervention, education and treatment to mothers and infants.

Study Limitations

This study was limited due to the number of databases used for the secondary search, restraints in the literature search strategy, and bias of the researchers. The study was focused on NAS prevention, intervention, and treatment in West Virginia and detailed research for other states was not included.

Practical Implications

NAS Centers have been established in West Virginia and have provided care to NAS babies and mothers. West Virginia NAS Centers have become a model for other states that have also battled the pediatric opioid endemic. Treatment models from Lily's Place and other NAS Centers within West Virginia have created a way for health care providers nationwide to care for

NAS infants. The continued use of such models and prenatal opioid maintenance therapy will decrease the NAS morbidity and cost of treatments.

CONCLUSION

The purpose of this research paper was that NAS Centers and prenatal opioid maintenance therapy would help improve the pediatric opioid endemic by decreasing the number of NAS patients and decrease the cost of treatments for infants. The review explored research and an expert in NAS therapy was conducted. The results from this showed that NAS Centers offering therapy to both mothers and patients, will decrease the amount of infants diagnosed with NAS and decrease the cost of treatments.

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FIGURES/TABLES

FIGURE 1. Special Education Conceptual Framework

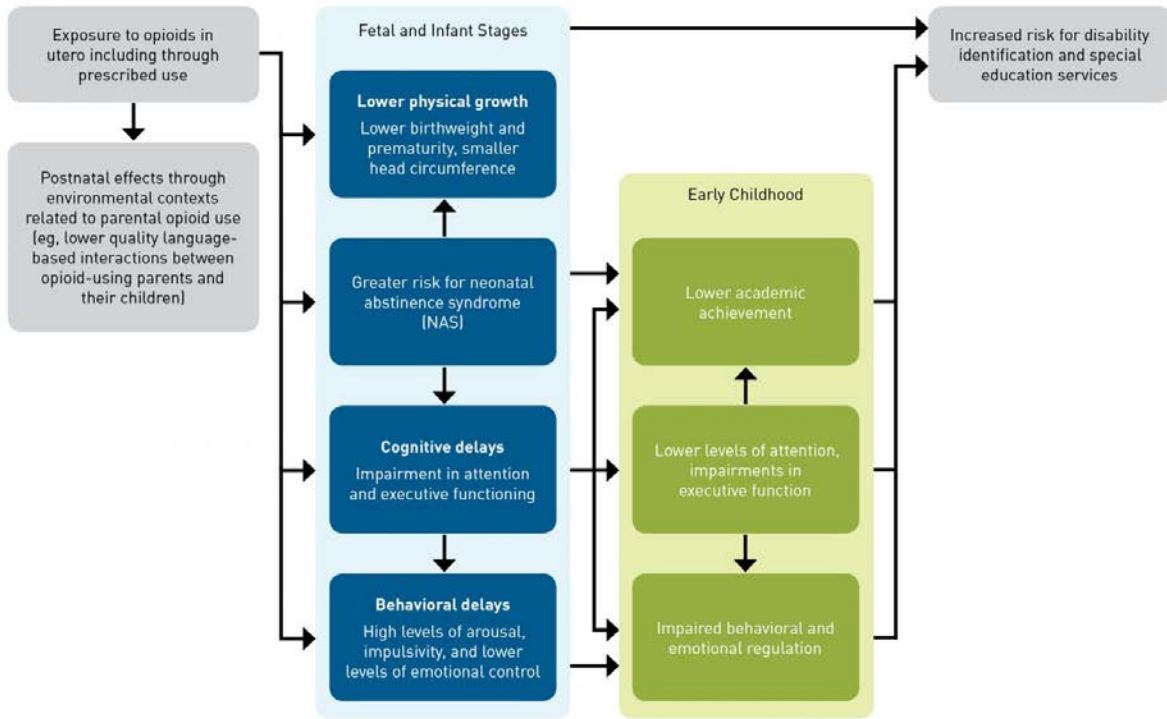


Figure 1. Conceptual research framework. Source: (Morgan and Wang, 2019).

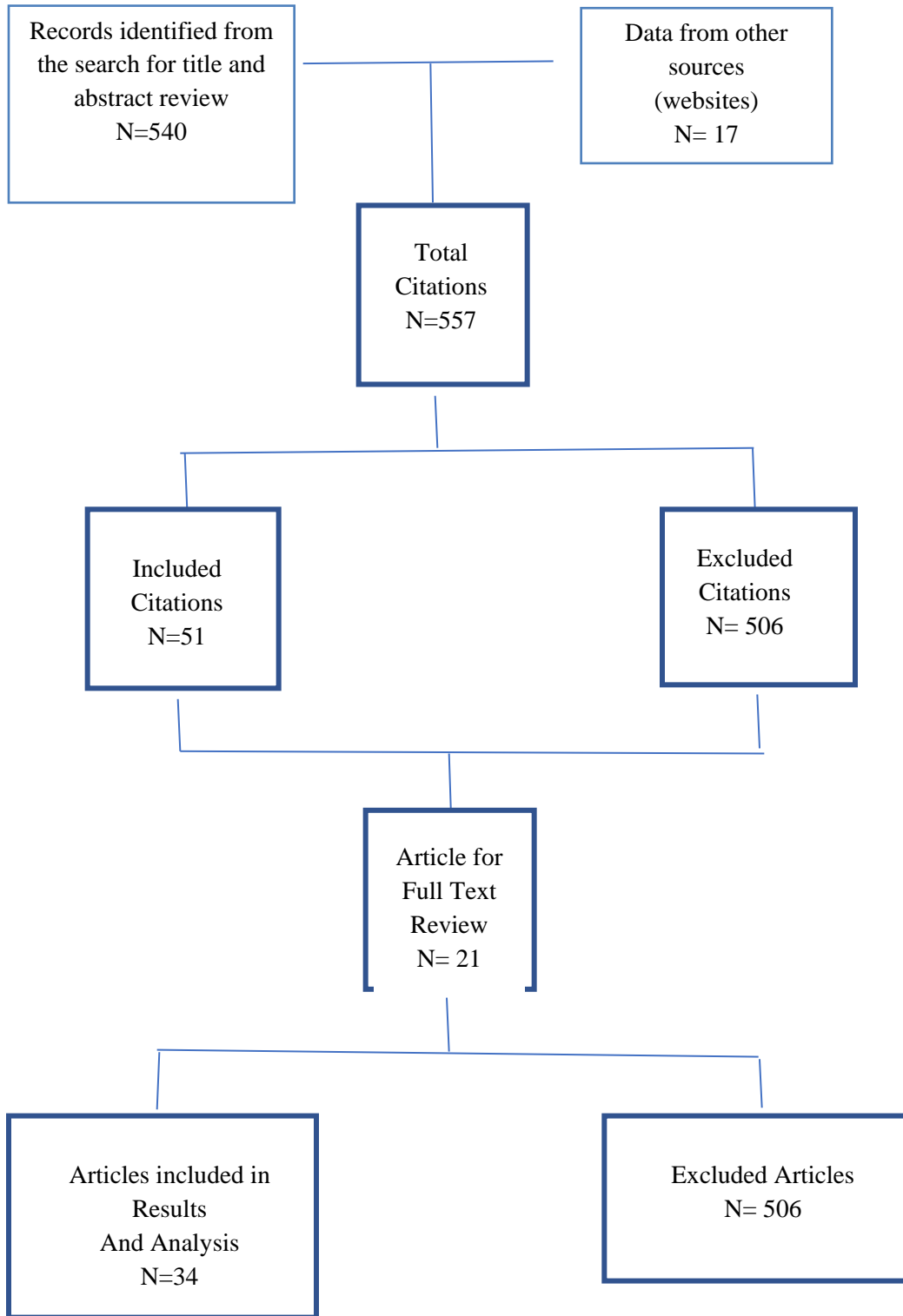


Figure 2. PRISMA- Overview of Literature Evaluation.

APPENDIX

This research paper will include a semi-structured interview with Lily's Place Executive Director, Rebecca Crowder.

1. What treatments are available at Lily's Place for babies going through the withdrawal process?
2. How many patients can be enrolled at once? Why? Why not?
3. What specific treatments and/or programs are offered to mothers? Why?
4. Compared to when Lily's Place opened in 2014, how much of an increase have you seen in neonatal patients? Why?
5. How does Lily's Place adapt to the increasing needs of patients? Why?
6. How has Huntington's pediatric opioid endemic and Lily's Place helped create a replication plan? Why?
7. What is the average length of stay for a Lily's Place patient? Why?
8. As executive director, what techniques do you utilize to lead your team members and fulfill the Lily's Place mission? Why?
9. What are the requirements of the patient's guardian to receive guardianship? Why?
10. Are families involved in Lily's place after treatment? Why? Why not?

11. If a patient's parent does not want to keep guardianship, does Lily's place facilitate adoptions? Why? Why not?