CARING FOR CHILDREN WITH PRENATAL SUBSTANCE EXPOSURE: AN EDUCATIONAL VIDEO AND PILOT STUDY

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Marie E. Smith entitled "Caring for Children with Prenatal Substance Exposure: An Educational Video and Pilot Study" and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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Final approval and acceptance of this DNP project is contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

I hereby certify that I have read this DNP project prepared under my direction and recommend that it be accepted as fulfilling the DNP project requirement.

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STATEMENT BY AUTHOR

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SIGNED: Marie E. Smith

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DEDICATION

For my babies Max, Izzy, and Carmie, my little one in my belly, my wonderful husband Shad, and for all the children and families who have been affected by prenatal substance exposure. To all my fellow foster families and healthcare professionals who work tirelessly to positively impact the lives of these vulnerable children on a daily basis, thank you for all you do and may this project be a resource for you.

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ABSTRACT

Background: Prenatal exposure to opioids, cocaine, and methamphetamine is associated with alterations in fetal brain that lead to structural changes in the brain postnatally, contributing to developmental and behavioral effects seen throughout childhood. Opioid exposure is associated with withdrawal in newborns, effects on somatic growth of infants, difficulty with executive functions and a tendency towards externalizing behaviors in older children. Cocaine and methamphetamine exposure are associated with effects on somatic growth, irritability and feeding issues in infants, problems with executive functions, and externalizing behaviors. Many substance-exposed children are placed in foster care and the pre-licensure training for foster parents does not specifically address how to care for substance-exposed children.

Purpose: To create and evaluate a video that outlines common effects of prenatal exposure to opioids, cocaine, and methamphetamine, as well as evidenced-based caregiver interventions.

Methods: The script for the video "Caring for Children with Prenatal Substance Exposure: Opioids, Cocaine, and Methamphetamine" was written by the author and evaluated by two clinical experts. The video was filmed and was presented to 6 licensed foster parents and 1 unlicensed adoptive parent who evaluated the video's presentation at Devereux Foster Care Agency in Tucson, AZ using the Patient Educational Materials Assessment Tool for Audio/Visual (PEMAT-AV). Responses were entered into the PEMAT Autoscoring tool and component scores for understadability and actionability were calculated.

Results: Both clinical experts evaluated the video's content as being factual, and consistent with evidence-based research. Mean PEMAT-AV understandability and actionability scores were both 100%.

Discussion: The video's content and presentation are both strong as evidenced by high evaluation scores from clinical experts and foster parents, making it a useful educational tool for educating foster parents on caring for substance-exposed children. Further research is needed to determine if the viewing video increases foster parent knowledge and produces long-term change in parenting practices. Additionally, the video was designed to also be used to educate biological parents of substance-exposed children, but future studies are needed to determine if the video is an effective educational tool for this population.

CHAPTER I: INTRODUCTION

Over the past few decades, researchers and healthcare providers have become increasingly aware of the short- and long-term consequences of prenatal substance exposure. Fetal exposure to opioids, cocaine and methamphetamine is associated with effects on child development and behavior that stem from infancy well into adolescence and even adulthood (Ross, Graham, Money, & Stanwood, 2015). Understanding these effects and educating those that care for these children are of vital importance to improving outcomes for substance-exposed children.

Background

Drug use among pregnant women is an increasingly prevalent phenomenon. In particular, opioid use among pregnant women has increased fivefold in the last decade which has produced a sharp increase in the number of newborns diagnosed with Neonatal Abstinence Syndrome (NAS), the clinical diagnosis for opioid withdrawal in infants (Association of State and Territorial Health Officials [ASTHO], 2014; Siu & Robinson, 2014). Short-term consequences of opioid withdrawal in newborns include extreme irritability, tachypnea, sweating/fevers, tremors, vomiting, diarrhea, hypertonicity, and seizures, which can lead to brain damage (ASTHO, 2014). Additionally, opioid exposure can negatively impact attention and working memory, which can manifest in later stages of childhood, particularly when the child enters school (Ross et al., 2015).

Though cocaine and methamphetamine are not typically associated with severe withdrawal, recent longitudinal studies indicate that the impact of prenatal exposure to these substances may become increasingly apparent as the child grows, particularly in regards to the

child's cognitive functioning and behavior (Richardson, Goldschmidt, Larkby, & Day, 2015; Smith et al, 2015).

Though neuroimaging studies do indicate that prenatal exposure to these substances may have a permanent effect on brain structure and chemistry, research does indicate that positive caregiving environment can be protective and may reduce the number and/or severity of developmental and behavioral effects (Bada et al., 2012; Ross et al., 2015). Thus, it is imperative that caregivers of exposed children receive thorough education on potential effects and interventions that they can implement in the home that promote healthy development and behavior.

Foster parents have a high probability of caring for a substance-exposed child as national data indicates that 31-60% of children (depending on the state) are removed due to parental substance use (Children's Bureau, 2014). Due to the many biological effects of prenatal drug exposure, which are compounded by abuse, neglect, and an overall negative caregiving environment, substance-exposed children who enter the foster care system can be challenging to care for. This is especially true if foster parents are not educated about the substance-exposed child's unique needs or equipped with tools to and resources to meet those needs (Bada et al., 2012). Though the standardized foster parent education curriculum in Arizona known as Partnering for Safety and Permanence Model Approach to Partnerships in Parenting (PS-MAPP) has some information about caring for substance exposed children, most of this information is limited to effects in infancy (PS-MAPP AZ edition, 2009). However, research indicates that some effects extend into the preschool, school-aged, and adolescent years, with other effects not appearing until later childhood (Ross et al., 2015). It is therefore important that education

pertaining to substance-exposed children cover all stages of childhood, which is the intent of the video proposed in this project.

Local Problem

Substance use during pregnancy is a growing problem in Arizona. Between 2008 and 2014, the rate of newborns requiring hospitalization due to effects from maternal drug use increased from 10.7 to 17.5 per 1000 (Arizona Department of Health Services, 2014). The number of infants diagnosed with NAS nearly tripled from 1.5 per 1000 in 2008 to 4.03 per 1000 in 2013 (Hussani, 2014). Out of all the counties in Arizona, Pima County reported the highest rate of NAS per 1000 births with rate of 5.08. Due to these alarming statistics, the Arizona Department of Health Services hosted a conference in July 2015 aimed at educating healthcare professionals on NAS and generating ideas on how to address the issue in Arizona. An important issue discussed was the need for more resources to educate caregivers, particularly foster parents, about caring for opiate and poly substance exposed children (Arizona Department of Health Services, 2015). This project is aimed at addressing this need. After extensive review, this author has not been able to identify any existing videos that provide training on caregiving techniques for children throughout childhood. The videos that do exist either solely focus on infancy, or are more anecdotal, sharing stories of families that have cared for substance exposed children. Thus, the author has identified a need for a video that provides caregivers with information about physiologic effects of prenatal substance exposure, as well as tools for caring for the children throughout childhood.

Purpose

The purpose of this project is to create and evaluate an educational video that will assist healthcare providers in educating caregivers concerning the long-term effects developmental and behavioral effects of prenatal exposure to cocaine, opiates and/or methamphetamine. The video will be composed of two sections. The first section will provide a basic overview of the physiology of how exposure to each of the three substances affects the developing fetal brain. The second section will discuss potential developmental and behavioral effects commonly seen in each stage of childhood (infancy, preschool, school-aged, adolescence) and evidenced-based interventions that caregivers can implement in the home.

Providing patient and parent education is an important part of the role of the advanced practice nurse though a lack of appropriate educational resources may hinder the Advanced practice registered nurse's (APRN) ability to provide such education for parents and caregivers of substance exposed children. Though the long-term goal is that the video will be used in a variety of neonatal and pediatric healthcare settings for biological parents and other caregivers, the scope of this project will focus on increasing foster parent knowledge by presenting the video at a foster parent ongoing training.

Stakeholders specific to the completion of this project include foster parents and administrative and educational staff for Devereux foster care agency. Since the project will be involve presenting the video at a foster parent training session, the Devereux educational staff would need to approve the video prior to scheduling the training. After completion of the initial study, the stakeholder group could be extended to include community healthcare providers who treat pregnant women and children, as well as NICU clinical staff (if the video were to be

introduced as an educational tool for parents of substance exposed infants in the NICU). The goal of the project is to create an educational resource that could be used by healthcare professionals who work with substance exposed children and their caregivers and as such, local pediatric and women's health providers could act as future stakeholders.

Study Question

Is an educational video covering basic physiological concepts, expected effects of prenatal exposure to opiates, cocaine, and methamphetamine, and evidenced based interventions an effective intervention for educating foster parents about caring for substance exposed children?

Theoretical Framework

Utilization of a theoretical framework is essential to successful completion of the DNP project and for guiding nursing practice in general because it "provides an orderly way to view phenomena" (Moran & Burson, 2017). The Health Beliefs Model (HBM) will provide such a framework to guide the creation of the foster parent training video addressing the topic of caring for substance exposed children proposed in this project.

Developed in 1950s, the HBM was designed to help researchers and health professionals successfully implement health promotion and disease prevention programs that would be accepted and implemented by the intended audience (Skinner, Tiro, & Champion, 2015). For any project to ultimately produce the desired effect, members of the population of interest must buy-in to the proposed intervention. The six elements of the HBM described below aid the health professional/change agent in understanding concepts and factors that contribute to an

individual's desire to adopt a proposed change, which can help guide the design and implementation of the intervention (Skinner, Tiro, & Champion, 2015).

Health Beliefs Model Components

Perceived Susceptibility

This element refers to a person's perception of their own likelihood of being affected by a condition or disease. For this proposed project, the intended audience are foster parents who currently care for (or may care for in the future) children prenatally exposed to opiates, cocaine, and/or methamphetamine. Though their children already have been exposed, it is important to convey the likelihood that they may experience developmental delays or maladaptive behaviors. In some cases of substance exposure, a child may exhibit very few effects in infancy or early childhood, causing caregivers to believe that their children are not affected (Ross, Graham, Money, & Stanwood, 2015). However, some developmental and behavioral effects begin to manifest later in childhood and adolescence, a concept which must be articulated in the video to help foster parents understand the nature of their child's susceptibility to these effects.

Perceived Severity

To readily accept a proposed intervention, people must acknowledge that serious consequences can occur if the intervention is not implemented and the condition is left untreated (Skinner, Tiro, & Champion, 2015). This is especially important during the neonatal period when infants may experience potentially life-threatening withdrawal known as Neonatal Abstinence Syndrome (NAS) (MacMullen, Dulski, & Blobaum, 2014). While infants diagnosed with NAS are typically admitted to and managed in the NICU, there are many non-pharmacologic interventions that parents and foster parents can perform that can greatly reduce symptoms and

possibly negate the need for pharmacologic treatment (MacMullen, Dulski, & Blobaum, 2014). It is also important to communicate in the video that these interventions should be continued after the infant is discharged, as some effects of withdrawal may linger for several months (Kocherlakota, 2014). Though beyond the initial withdrawal period, prenatal substance exposure is not typically life-threatening, children who do not receive intervention services from their caregivers and healthcare professionals may have significant developmental and cognitive delays as well as behavior problems that hinder their ability to perform well in school and interact socially, which can cause significant problems as they enter adulthood (Richardson, Goldschmidt, Larkby, & Day, 2015; Ross et al., 2015; Smith et al, 2015). Thus, it is important to communicate the need for the interventions discussed in the video.

Perceived Benefits

Foster parents must understand the positive consequences of implementing the interventions such as improved executive functioning in their children (attention, memory, and impulse control) – which can help them be more successful at school – improved social relationships, less behavioral problems, and a decreased risk of subsequent problems in the future (if early intervention is achieved). Other benefits include less stress and frustration for the foster parent that comes from increased understanding of the child's condition and needs.

Perceived Barriers

For foster parents to take the step to implement the interventions proposed in the video, they must feel that are able to do so without incurring negative consequences or obstacles (Skinner, Tiro, & Champion, 2015). A potential barrier might be a concern about not seeing measurable improvement in their child. While this is a possibility, it will be important to remind

them in the video that the interventions may be still making a positive difference in their child's life even if the outward evidence is limited (for example, their child's grades might not immediately improve). Another potential barrier is perceived futility of efforts if the child will likely return to the birth family who does not implement the interventions. The concept of shared parenting is central in foster care and therefore foster parents should be encouraged to teach birth parents about the concepts explained in the video so that the child is receiving consistent care in both their foster home and their birth family's home (Arizona Department of Child Safety, 2009). The content of the video should also be applicable to all caregivers such that it could be shown to birth parents as well as foster parents in order to promote continuity of care.

Cues to Action

This element refers to cues that cause members of the intended audience to take action (Skinner, Tiro, & Champion, 2015). This video will be part of a foster parent training and participants will have the opportunity to ask questions about the interventions and information provided. Additionally, facilitators will encourage participants to try implementing the interventions at home. Foster care specialists who have participated in the training can also provide reminders and encouragement on home visits with foster families with substance exposed children.

Self-Efficacy

It is important to instill confidence in the participants that they have the capabilities of implementing the interventions (Skinner, Tiro, & Champion, 2015). In order to accomplish this, the video will include demonstrations of interventions such as swaddling and vertical rocking that may be unfamiliar to participants. The video will also include tangible ways that parents can

become more involved in their child's life (one of the evidenced based interventions to reduce externalizing and internalizing behaviors). Such examples include eating dinner together, attending school and sporting events, etc. Follow up and reinforcement of concepts by foster care specialists during their monthly in-home visits is also important for helping parents to feel confident in their abilities to implement the interventions.

For this project, the HBM will serve as a framework for designing the foster parent prenatal substance exposure training video in a manner that will prompt foster parents to use the information and interventions in their daily interactions with their children. By helping foster parents to understand their children's susceptibility to potentially severe developmental and behavioral effects, enumerate the benefits of implementing proposed interventions, providing solutions for potential barriers, and providing foster parents with demonstrations to increase self-efficacy, it is the author's goal that the HBM will help the project to achieve sustainable, long lasting effects.

Concepts

The terms prenatal substance exposure, opioids, cocaine, methamphetamine, and neonatal abstinence syndrome are used frequently in this paper and are key concepts in the video script as well. Prenatal substance exposure refers to maternal ingestion of drugs, tobacco, or alcohol that crosses the placenta and enters the fetal blood stream, causing changes in fetal development (Behnke & Smith, 2013). Prenatal substance exposure is detected through various methods including maternal self-report of substance use during pregnancy, maternal urine drug testing prior to delivery, and fetal urine and meconium samples obtained shortly after birth (Behnke & Smith, 2013). Opioids are central nervous system (CNS) depressants that bind to mu, delta, and

kappa receptors in the brain (Ross et al., 2015). Examples of opioids include prescription narcotics such as Vicodin, Percocet, morphine, Dilaudid, methadone, and buprenorphine, as well as illicit narcotics such as heroin. Cocaine is a CNS stimulant made from coca leaves that increases dopamine levels in the brain by preventing reuptake of dopamine into the cells (Ciccarone, 2011). It is illegal in all U.S. states but is sold illicitly on the streets as a fine white powder that can be snorted, smoked or injected (when dissolved in water) (National Institute on Drug Abuse, 2016). Other names associated with cocaine include crack, rock, blow, snow, and coke (National Institute on Drug Abuse, 2016). Methamphetamine, or 'meth,' is also a CNS stimulant that affects dopamine and other neurotransmitter pathways, but acts by increasing secretion of neurotrasmitters into the synaptic cleft (Ciccarone, 2011). Methamphetamine can also be snorted, smoked, injected, or consumed orally (National Institute on Drug Abuse, 2017).

Neonatal abstinence syndrome (NAS) is the clinical diagnosis for severe withdrawal withdrawal in newborns with chronic prenatal opioid exposure (Kocherlakota, 2014). Onset and severity of NAS vary based on maternal patterns of opioid use and not every baby exposed to opioids in utero will be diagnosed with NAS, though approximately 55%-95% do undergo withdrawal (D'Apolito, 2012; Kocherlakota, 2014).

This paper also references the stages of childhood. The newborn period is defined as birth through 28 days old. Infancy encompasses the newborn period and is 0-12 months. Toddlerhood is 1-3 years old (though this stage is discussed in the infancy sections of this paper). The preschool stage is ages 3-5 years old, school-aged is 6-12 years old, and adolescence (for the purpose of this paper) describes children ages 13-17 years old.

CHAPTER II: SYNTHESIS OF EVIDENCE

To address the need of an educational video to inform caregivers on caring for substance exposed children, a review of pertinent literature and a subsequent synthesis of evidence was performed (Appendix A). Topics explored included physiological mechanisms by which prenatal exposure to opioids, cocaine, and methamphetamine affected fetal brain structure and development, physical developmental and behavioral effects that manifest throughout childhood, and evidenced based interventions that can be implemented by caregivers in the home setting. PubMed and Google Scholar were the primary databases used to locate articles. Search terms included "prenatal substance exposure," "pathophysiology," "developmental effects," "neonatal abstinence syndrome," "caregiver interventions," "non-pharmacologic interventions," and "interventions to improve executive functioning." Initially, only studies in English from the last 10 years with human subjects were included. However, after reviewing the initial studies, it was determined that rodent studies pertaining to pathophysiology should also be included due to scarcity of such studies with human subjects. Though these studies do not provide definitive answers to physiologic processes in humans, they do provide insight into possible mechanisms and were included in systematic reviews pertaining to effects of prenatal substance exposure that are included in this synthesis of evidence.

Pathophysiology

Opiates

Unfortunately, the precise mechanisms by which prenatal opioid exposure affects the human fetus are still unclear. However, animal model and neuro-imaging studies do provide insights into how brain development is affected and consequently how these structural changes

manifest in the cognitive, motor, behavioral, and other developmental effects seen throughout childhood. In rodent models, prenatal opioid exposure has been linked to decreases in dendritic branch length in the somatosensory cortex, which may affect the cells' ability to transmit signals (Ross et al., 2015). Other studies found that synaptic proteins responsible for signal transmission were affected as well (Ross et al., 2015). Additionally, there is evidence to suggest that opioids may affect myelination of central nervous system neurons, which may impact problem solving skills, recognition/recall, reading, and visuospatial memory (Konijenberg & Melinder, 2011; Ross et al., 2015).

Another proposed mechanism for altering brain development is through reduction of neurons through increased apoptosis due to in utero opiate exposure. In rats, prenatal morphine exposure resulted in fewer neurons in the hippocampus, somatosensory, and secondary visual cortex (Ghafari & Jafar Golalipour, 2014). Other studies also support the theory that opioid exposure causes increased neuronal apoptosis particularly in dopaminergic cells and the hippocampus, which may help to explain some of the problems with memory experienced by opioid exposed children as the hippocampus plays a crucial role in memory formation and storage (Ross et al., 2012). Furthermore, rodent studies indicate that postnatal opioid exposure may also alter hippocampal structure mainly through decreased GABA expression, which carries potential implications for postnatal treatment of Neonatal Abstinence Syndrome (NAS) (Traudt, Tkac, Ennis, Sutton, Mammel, & Rao, 2012). Early exposure to opioids both prenatally and postnatally may also disrupt the maturation of the opioid system, leading to increased opioid tolerance, which may make exposed children more likely to abuse drugs later in adolescence and adulthood (Ross et al., 2015).

Konijenberg and Melinder (2011) propose that opioid exposure may also affect brain size, citing neuroimaging studies showing decreased brain growth in heroin-exposed children. However, even maintenance treatment with methadone or buprenorphine may also cause decreased overall brain growth as exposure to these substances is associated with an increase in dopamine, which may inhibit brain growth during periods of crucial development (Konijenberg & Melinder, 2011). Brain growth may also be affected by interactions by alterations in opioid growth factor. A 2008 study by Farid et al. proposed that methadone may interact with the opioid growth factor receptor and that increased binding of this receptor may inhibit fetal brain growth (Konijenberg & Melinder, 2011). Stunted brain growth has significant implications for cognitive functioning and intelligence and this mechanism may help to explain long term affects on attention, inhibition, and other cognitive functions seen in children exposed to opioids and opioid agonists (Konijenberg & Melinder, 2011).

Opiates may also have indirect effects on the fetus through vasoconstriction in the maternal vessels and placenta, causing decreased blood flow to the fetus (Minnes et al., 2011). Multiple studies document the negative effects of opioid exposure on somatic growth, and decreased placental blood flow to the fetus puts the baby at risk for intrauterine growth retardation (Minnes et al., 2011; Ross et al., 2015).

Cocaine

Though the pathophysiology of how prenatal cocaine exposure (PCE) affects the fetus is not fully understood, there is strong evidence that it affects the monoaminergic system, altering circulating concentrations of dopamine (DA), serotonin, and norephinephrine (NE). One mechanism by which cocaine affects these neurotransmitters is through direct inhibition of

monoamine re-uptake at the presynaptic cleft (Ross et al., 2015). Increased concentrations of DA, NE, and serotonin may affect the development of the monoaminergic system overall, contributing to problems with attention and cognition (Ross et al., 2015). Min et al. (2014) also found that PCE contributes to changes in the monoaminergic system, particularly in the pre-frontal cortex. Neuroimaging studies also revealed increased creatinine in frontal lobe white matter, leading to less mature development of the pathways in this region (Ackerman et al., 2010). The pre-frontal cortex is associated with social cognition and personality development, and early damage to the pre-frontal cortex is associated with antisocial or violent behaviors (Grossman, 2013). Disruptions in development in this region by cocaine may explain some of the effects on temperament and destructive behavior described by Richardson et al. (2015) and Min et al. (2014).

There is also some evidence provided by animal model studies that cocaine exposure disrupts cortical neurogenesis and migration, with reduced neuronal density in the cortex, which could have affects on intelligence and cognitive functioning (Ross et al, 2015). Other effects noted on neuroimaging studies include volumetric decreases in gray matter in the left occipital lobe, right parietal lobe, and caudate, and possible alterations in cerebral blood flow (one study) although it is unclear how these changes affect development (Ackerman et al., 2010).

Like opioids, cocaine causes vasoconstriction in maternal vessels including the placenta, reducing blood flow to the fetus (Minnes et al., 2011). This is one mechanism that may contribute to decreased somatic growth in the fetus, and increases the risk for preterm delivery. However, multiple studies indicate that reductions in somatic growth persist even into the

teenage years, indicating that another mechanism may responsible for this as well (Richardson et al., 2015; Ross et al., 2015).

Methamphetamines (MA)

METH, like cocaine, primarily affects the monoaminergic system in the brain, though through slightly different mechanisms. METH activates the reward cascade, causing a substantial release of dopamine, in part through acting on the dopamine transmitter (DAT) which causes the release of dopamine (DA) and inhibition of its reuptake (Ross et al., 2015; Salisbury, Ponder, Padbury, & Lester, 2009). METH also acts on the serotonin transporter (SERT) and inhibits monoamine oxidase, causing higher concentrations of serotonin and norepinephrine (NE) to remain in the synaptic cleft (Salisbury et al., 2009) Neuroimaging studies identified several differences in brains of MA exposed children including a significantly reduced caudate nucleus volume (Ross et al., 2015; Smith et al., 2015). Due to its role in motor functioning, as well as learning and executive functions, it is not surprising that deficits in these areas have been documented in METH-exposed children (Smith et al., 2015). Like opioids, MA also appears to alter the hippocampus in terms of reducing its volume and altering N-methyl-D-aspartic acid (NMDA) receptors, providing insight into observed deficits in attention and memory tasks, as well as behavior (Smith et al., 2015). It is also notable that a magnetic resonance spectroscopy study found decreased levels of myoinositol in the thalamus of MA exposed preschoolers, which may correlate with poor performance on visual motor integration tasks (Ross et al., 2015).

Smith et al. (2015) also discusses the differences observed in affects related to timing of exposure during pregnancy. While first trimester exposure is associated with behavioral delays,

later exposure produces more cognitive deficits, especially in terms of special learning and memory (third trimester).

MA also has indirect effects on the fetus through vasoconstriction, causing fetal hypoxia and contributing to growth restrictions (Minnes et al., 2011; Salisbury et al., 2009).

Developmental Effects

Opiates

Infancy. Neonates born to mothers who used opiates or opiate agonists on a fairly frequent or chronic basis often undergo a period of withdrawal following delivery characterized by disturbances in central nervous system, metabolic, respiratory and gastrointestinal functioning (Kocherlakota, 2014). Common central nervous system withdrawal signs include increased muscle tone (hypertonicity), evident by stiffness or rigidity in the infant's body, difficulty in extending the infant's extremities, and the absence of head lag, tremors commonly seen in the hands and feet, a high-pitched cry, increased fussiness, and poor sleep quality and duration (Logan, Hayes, & Brown, 2013). More severe withdrawal may produce myocolonic jerks and seizures, though the difference between the two may be hard to distinguish and and an electroenchephalogram (EEG) may be needed to diagnose seizures (Kocherlakota, 2014). Autonomic dysregulation is exhibited through sweating, fevers (typically a core temperature equal to or greater than 37.2 deg C after controlling for environment), frequent yawning and sneezing, and an increased respiratory rate (greater than 60 breaths per minute) (Hamdan, 2014). Gastrointestinal disturbances include loose or watery stools, frequent regurgitation or projectile vomiting, excessive sucking, and poor feeding (Logan et al., 2013). Opiate-exposed infants are evaluated for signs of withdrawal using a scoring tool (most commonly the Finnegan scoring

tool) and decisions concerning the level of treatment required are made based on scores (Hamdan, 2014). Neonatal Abstinence Syndrome (NAS) is the clinical diagnosis used to describe infants who demonstrate significant signs of withdrawal, exhibited by elevated scores, and require increased monitoring and possibly pharmacologic treatment (Kocherlakota, 2014).

The incidence of NAS and withdrawal among opiate exposed infants is fairly high with 55-94% of opiate exposed infants demonstrating signs of withdrawal (Hamdan, 2014). 50-80% of heroin exposed infants develop NAS, while 60-90% of methadone and buprenorphine exposed infants are diagnosed (D'Apolito, 2015). Signs of withdrawal typically present within 24-72 hours for shorter acting opioids such as heroin, but may take up to 7-14 days to present in methadone exposed infants due to the drug's longer half-life. (Hamdan, 2014; Logan et al., 2013). An infant diagnosed with NAS may have an initial period of approximately 1-2 weeks of intense systemic withdrawal signs, followed by a period of relapsing signs (typically sleep disturbances, irritability, and hyperphagia) which may last for a few weeks to a few months (Kocherlakota, 2014).

In addition to withdrawal, opiate-exposed infants tend to have lower birth weights and smaller head circumferences than non-exposed infants of the same gestational age (Ross et al., 2014). There is also evidence that opiate exposure, particularly methadone exposure, may increase the risk of preterm delivery, which has the potential to cause more neurodevelopmental delays later in childhood (Konijenberg & Melinder, 2011).

Though there is controversy concerning the magnitude of long-term effects, many studies reviewed did indicate that exposure increased an infants risk of cognitive, behavioral, and motor developmental delays. For example, a study published in 2013 by Logan, Brown, & Hayes found

significant delays in 9-month old methadone exposed infants in sitting independently and crawling. In terms of cognitive and behavioral effects seen in later infancy and toddlerhood, a study conducted by Nygaard, Moe, Slinning, and Walhovd (2015) revealed that opiate and polysubstance-exposed toddlers scored lower on the Bayley II Mental Development index than children in the control group. Though the difference was relatively small in one and two-year old girls, it was much more pronounced in boys and the difference between the exposed and control groups increased from age one to age two in boys (Nygaard et al., 2015). The Bayley II Mental Development Index tests cognitive functioning in areas such as sensory/perception, discrimination, verbal communication, memory, and problem solving, indicating that opiate-exposed children may have deficits in these areas early on (Laberge, 2016). However, not all studies of cognitive functioning found statistically significant differences between opiate-exposed children and their controls. One such study was a 2014 meta-analysis that examined articles studying differences between opiate-exposed older infants (12-19 months) and their controls in terms of cognition, psychomotor skills, or behavior, (Baldacchino, Arbuckle, Petrie, & McCowan, 2014). Though the results of the meta-analysis did not show statistically significant differences in cognition among toddlers, poorer trends were revealed in the exposed groups. Additionally, this meta analysis only included five studies, each of which utilized different cognition tests, which may have contributed to the lack of statistical significance.

Preschool. As is the case with later infancy and toddlerhood, there is a mix of results in terms of the effects of opiate-exposure seen in the preschool-aged child. The Nygaard et al. study discussed above indicated that poorer cognitive performance in the exposed group persisted throughout the preschool years with exposed children scoring lower on the Bayley II Mental

Development Index at age three years and on the McCarthy General Cognitive Index at age 4½ years. Studies reviewed by Konijenberg and Melinder (2011) showed mixed results with some studies indicating statistically significant differences between methadone or buprenorphine exposed preschoolers and controls on the Bayley Mental Development Index, Bayley cognitive and language scales, and the Stanford-Binet Intelligence scales, while other studies did not reveal statistical significance. A proposed mechanism that may account for the variability seen in exposed children is that the timing of exposure in utero may impact how children are affected (Konijenberg & Melinder, 2011). Because rapid critical brain growth occurs between 24 and 34 weeks gestation, exposure during this period may carry a greater impact on later cognitive development than exposure at other times of the pregnancy (Konijenberg & Melinder, 2011). However, regardless of statistical significance, many studies do indicate poorer performance on such tests, indicating that opiate exposure may result in deficits in cognitive functioning and language development in preschoolers. Minnes et al. (2011) also found that opiate-exposed 3-year olds tended to perform poorer on tests of verbal, reading, and arithmetic skills. Additionally, preschoolers may also have motor and cognitive impairments and problems with inattention and hyperactivity (Ross et al., 2015).

School-aged. As children enter school, attention problems among opiate-exposed children may become more apparent. Heroin exposure, in particular, is associated with the development of ADHD that is commonly diagnosed after children enter school and attention deficits are more visible (Ross et al., 2015). Other executive functions such as memory and inhibitory control may also be affected with exposed children exhibiting difficulties with spatial

learning and memory. Disruptive behaviors are also common among exposed children (Minnes et al., 2011; Ross et al., 2015).

Additionally, the Nygaard et al. (2015) study indicated that though nurturing caregiving environments may provide some initial protection against developmental delays, especially in girls (as exhibited by relatively low differences between the exposed and non-exposed groups on cognitive functioning tests), this protection may diminish in the school-aged years as children are presented with more complex cognitive and social challenges. This was evident in a sharp increase in the differences between the exposed and non-exposed groups at age 8½ years with exposed girls performing significantly worse on the Weschler Intelligence Scale (Nygaard et al., 2015). Though greater differences were seen between exposed and control boys prior, this was reversed at age 8½ years indicating that vulnerabilities among exposed girls may become especially apparent at this time (Nygaard et al., 2015). These significant differences were still apparent even after accounting for environment, with exposed school-aged children adopted into nurturing homes prior to age one year performing significantly worse on cognitive and intelligence tests at age 8½ years.

Adolescence. Unfortunately, few longitudinal studies have been performed with opiate-exposed children that extend into adolescence. However, the limited evidence that does exist indicates that cognitive impairments, inattention, hyperactivity, and disruptive behavior (poor impulse control) may continue into the teenage years (Ross et al., 2015). Evidence also indicates that prenatal opioid exposure increases the child's sensitivity to opioids with may result in problems with substance use and abuse in adolescence and adulthood (Vassoler, Byrnes, & Pierce, 2014).

Cocaine

Infancy. Growth restrictions are well-documented for cocaine-exposed newborns, possibly due to decreased placental blood flow due to vasoconstriction. Newborns with PCE tend to have lower birth weights, smaller head circumferences, and be shorter in length than non-exposed newborns (Ross et al., 2015). Cocaine exposure is also associated with an increased risk of preterm delivery, which carries its own set of potential developmental delays (Ross et al., 2015). In addition to physical affects, cocaine exposure also causes behavior dysregulation among newborns with includes poor arousal and self-regulation, excitability, and jitteriness, which may continue or even worsen throughout infancy and toddlerhood (Ross et al., 2015). A study performed by Condradt et al. (2013) found that the infants exposed to both opiates and cocaine exhibited the greatest amount of dysregulation and stress during a sustained attention procedure, as indicated by higher heart rates, lower respiratory sinus arrhythmia, and hypertonicity. Sensory and motor asymmetry, along with poor muscle tone were also indicated as effects of PCE by Minnes et al. (2011). However, as is the case with opiates, there are mixed results concerning developmental deficits in older infants and toddlers. While some studies indicate no significant cognitive deficits in infants or toddlers, one study did indicate that heavy PCE resulted in significantly lower mental development scores at 18 months (Frank, Augustyn, Knight, Pell, & Zuckerman, 2001).

Preschool. Growth restrictions present in infancy may persist through the preschool years particularly in terms of head circumference and height (Ross et al., 2015). Additionally, cocaine-exposed preschoolers showed subtle delays in language development even after correcting for covariates (Ackerman, Riggins, & Black, 2010). Exposed preschoolers also performed poorer

than non-exposed children on perceptual reasoning tasks and on tests of sustained attention (Minnes et al., 2011).

School-aged. Effects on cognition, language, and behavior that were previously subtle may become more prominent in the school-aged years. A review by Ackerman et al. (2010) found that children with high PCE exhibit more externalizing behaviors, have a slightly lower IQ, and tend to have more problems with delayed recall activities and perceptual reasoning tasks. However, some of these effects may be due in part to other factors such as smaller head circumference (perceptual reasoning tasks), and other environmental factors (IQ) (Ackerman et al., 2010). Other studies reviewed also indicate that cocaine exposure is associated with attention problems, signs and symptoms of ADHD and oppositional defiance disorder (ODD), language delays, and externalizing/disruptive behaviors both by self-report and caregiver report (Min et al., 2014; Minnes et al., 2011; Ross et al., 2015).

A longitudinal study by Richardson, Goldschmidt, Larkby, and Day (2013) examining the effects of PCE on growth, development and behavioral in 10-year olds found that first trimester exposure was significantly related to growth restrictions by age 10 years, that was not solely due to the effects of PCE on birth measurements (weight, height and OFC). This study provides evidence that children may not necessarily be able to catch up to their peers in weight, height, and head circumference, as was argued by Ackerman et al. (2010), and that growth restrictions may become even more pronounced as the child grows.

Additionally, the results from the Richardson et al. study (2013) indicate that first trimester PCE is associated with maternal reports of their children being less social and more withdrawn (temperament). Though exposure to violence may account for some internalizing and

externalizing behaviors seen in children with PCE, this study indicates that PCE may directly affect a child's temperament.

Adolescence. In a 2015 follow-up study, Richardson et al. found that PCE was predictive of increased adolescent self-report of delinquent behaviors. Though violence exposure mediated some of the increase in theft among exposed 15-year olds, it was not strongly associated with the increases in damage and status offenses seen in this population, indicating that first trimester cocaine exposure may have direct affects on the brain that cause teens to be more at risk for committing these types of crimes (Richardson et al., 2015). First trimester exposure was also associated with poorer skills in problem solving, abstract reasoning, and executive functioning, as well as growth restrictions at age 15 years (Richardson et al., 2015). Third trimester exposure, conversely, correlated with poorer self-reported mood and less persistence (Richardson et al., 2015).

A similar study by Min et al. (2014) also found that cocaine exposed teenagers had more self-reported externalizing behaviors and were 2.8 times more likely to abuse substances, even among teens in stable foster placements or kinship care, indicating that nurturing caregiving environments may not be fully protective against behavior problems and substance abuse in cocaine-exposed teens. However, a previous study by Bada et al. (2012) showed that while PCE was strongly associated with externalizing behaviors and attention problems in children and teens, a child's resilience could be protective of severe effects and was affected by caregiving environment, particularly parental involvement (Bada et al., 2012). These caregiver-influenced protective factors will be discussed in more detail in a later section of this paper

Methamphetamines

Infancy. The Infant Development Environment and Lifesyle (IDEAL) study provides important insights into the effects of methamphetamine exposure in early childhood (Smith et al., 2015). The study, which included methamphetamine (MA) exposed children from multiple sites and countries, found that MA exposure may result in growth restrictions, poor suck, and disturbances in physiologic state that are dependent on timing of exposure during pregnancy (Smith et al., 2015). Specifically, infants exposed during the first trimester exhibited more total and physiologic stress when examined using the the NICU Network Neurobehavioral Scale (NNNS), while infants exposed during the third trimester were more lethargic and hypotonic (Smith et al., 2015). MA exposure may also affect fine motor development, with exposed infants and toddlers demonstrating poorer grasping ability at ages 1 and 3 years. However, some studies indicate that fine motor delays may disappear by or after age 3 years (Ross et al., 2015).

The IDEAL study also revealed that maternal factors such as stress and level of prenatal care may have an effect on childhood outcomes. Maternal stress, for example was associated with higher levels of infant stress (Smith et al., 2015). In terms of prenatal care, growth restrictions were more pronounced in infants in the USA than in infants born in New Zealand where there are fewer CPS referrals for drug use and more MA using mothers received prenatal care, indicating that consistent prenatal care may help to reduce growth restrictions seen in MA exposed infants and toddlers (Smith et al., 2015).

Preschool. According to the IDEAL study, behavior problems became apparent in preschool aged children exposed prenatally to MA (Smith et al., 2015). According to caregiver reports, exposed children at ages 3 and 5 years exhibited more anxiety, depression, and

emotional reactivity than non-exposed children (Smith et al., 2015). Additionally, five year olds tended to show more externalizing behaviors and were more at risk of developing ADHD according to the Connors' Kiddie Continuous Performance test (Smith et al., 2015). Ross et al. (2015) also indicated that MA exposed preschoolers may perform lower on tests of visual motor integration, attention, verbal memory, and long-term spatial memory.

Caregiving environment also impacts development of MA exposed children. Positive environments in which caregivers are responsive to their child's developmental needs may be protective against internalizing and externalizing behaviors, whereas caregiver stress can negatively impact behavior independently of MA exposure (Smith et al., 2015).

School-aged. Effects on memory and attention seen in the preschool years can continue and even worsen when the child enters school (Ross et al., 2015). In addition, decreased emotional control seen in five-year olds, correlated to executive functioning deficits by age 6½ years, though these effects may be influenced by childhood adversity (Smith et al., 2015). Specifically, school-aged children heavily exposed to MA in utero had significantly decreased accuracy when performing an activity requiring them to name the position, of a word on a page, rather than the word itself (Stroop effect) indicating poor inhibitory control (Smith et al., 2015).

Adolescence. Unfortunately, there is very sparse data concerning effects of prenatal MA exposure seen in adolescence. The IDEAL study, as summarized by Smith et al. (2015) is the only longitudinal study examining the effects of prenatal MA exposure and the results only extend to school-aged children. The effects seen in school-aged children (problems with visual motor integration, attention, and memory) may continue into adolescence, however, more studies

are needed to confirm this (Ross et al., 2015). It is unclear as to whether growth restrictions carry into adolescence.

Evidenced-Based Caregiver Interventions

Infancy

The majority of studies pertaining to interventions for substance-exposed infants focuses on non-pharmacologic management of NAS. A systematic review by MacMullen, Dulski, and Blobaum (2014) highlights the importance and effectiveness of interventions such as breastfeeding, swaddling, low stimulation environments, non-nutritive sucking, music therapy, and massage therapy. A study by Jansson, Choo, Velez, Harrow, Schroeder, Shakleya, and Huestis (2008) found that while methadone concentrations in breast milk do increase in the first month, the amount ingested by the infant is relatively low, demonstrating that breastfeeding while using methadone is safe for the newborn. Additionally, the study found that while it was not statistically significant, fewer breastfed newborns required pharmacologic treatment for NAS (Jansson et al., 2008).

NAS infants are at risk for poor weight gain due to vomiting, diarrhea, and poor feeding related to disorganized sucking. Multiple studies support feeding these infants higher caloric formula to adjust for this (Hudak & Tan, 2012; MacMullen et al., 2014). Additionally, smaller more frequent feedings may help infants tolerate intake better and experience less vomiting and gastric discomfort.

A review by Sublett (2013) also highlights evidenced-based complementary therapies for NAS. Skin-to-skin, or kangaroo care, is effective in reducing pain scores and improving sleep in withdrawing infants, and gentle massage can also reduce stress and improve weight gain

(Sublett, 2013). Other complementary therapies that caregivers can use are light therapy, aromatherapy (lavender or mother's scent), and music therapy. Though there is limited music therapy research specifically with the NAS population, a study by Lowry, Stewart, Dassler, Telsey, and Hommel (2013) found that sung lullabies decreased heart rate and improved sucking and weight gain in preterm infants, two desired outcomes in NAS infants.

Other interventions that are important to include in this review are activities that promote development of executive functions. Harvard University Center on the Developing Child published a guide for caregivers listing such activities for children ages six months through adolescence. Recommendations for infants include lap games such as peekaboo and pat-a-cake to improve working memory and inhibitory control, hiding games that improve working memory, imitation games that work on recall, attention, and working memory, simple conversations and storytelling that expand language development, self control, and attention, sorting games and puzzles that work on problem solving and memory, and imaginary play that helps with self-regulation (Harvard University, ND).

Preschool

Few articles describe interventions specifically tested with substance exposed preschoolers, but the consensus from studies such as the IDEAL study is that support of caregivers to reduce parental stress is key to improving outcomes for children (Smith et al., 2015). The author expanded the search of the literature to include studies focusing on interventions for all children with attention problems and externalizing behaviors. An article by Bagner, Sheinkopf, Vohr, and Lester (2010) studied the effects of the Parent Child Interaction Therapy (PCIT) on behaviors in preschoolers and found that PCIT was effective in increasing

attention, and reducing externalizing, internal, and aggressive behaviors. While this particular intervention was administered by therapists, there are several elements of the therapy that can be used by caregivers in their daily interactions with preschoolers. The PRIDE model ("praising the child, reflecting the child's statements, imitating the child's play, describing the child's behavior, and using enthusiasm") provides a structure for parents and caregivers to provide their children with feedback regarding appropriate behavior (Bagner et al., 2010).

Caregiver interventions for preschoolers included in the Harvard guide include imaginary play, storytelling, movement songs and games (inhibitory control), sorting by rule games (inhibitory control), puzzles (visual working memory and planning), and cooking (working memory and attention) (Harvard University, ND).

School-Aged

As is the case with preschoolers, there is limited research done on interventions specicially for drug-exposed school-aged children, but the Ross et al. (2015) and the Ackerman et al. (2010) reviews echo the protective nature of a good caregiving environment that is linguistically rich in reducing language delays associated with PCE.

A study by Diamond and Lee (2011) showed that computerized games, particularly CogMed, could greatly improve memory in children ages 4-12 years. Aerobic exercise can also improve pre-frontal cortex functioning and executive functioning tasks, with running and increased intensity exercises providing the most improvement in cognitive flexibility (Diamond & Lee, 2011). This data supports enrolling substance exposed children in sports which combine aerobic exercise with problem solving and socialization skills that require sustained attention.

Martial arts and mindfulness training (including yoga) also are effective in improving all areas of executive functioning (Diamond & Lee, 2011).

Additional activities that support executive functions (EF) in school aged children include games such as freeze tag, red light/green light, Simon says (inhibitory control and attention), singing in rounds and clapping complex rhythms (inhibitory control), card games and board games (mental flexibility and working memory), learning to play a musical instrument (attention, working memory), and brain-teasers (working memory) (Harvard University, ND).

Adolescence

A study by Bada et al (2011) found that teens with a high protective index were far less likely to exhibit behavior problems than children with few protective factors. Protective factors included having many friends (lowered internalizing behavior scores), readily available family resources (lower overall behavioral scores except externalizing behaviors), and high level of parental/caregiver involvement in the child's life (Bada et al., 2011). The article also named the child's resilience as a key factor in mitigating behavioral effects from substance exposure and suggested that this resilience could be built up by spending time with family and perceiving support from one's family (Bada et al., 2011).

Activities to support executive functioning in teens include encouraging them to set goals and plan for the future, teach them to monitor their behavior through self talk, journal writing, and practicing empathy (attention, decrease impulsive behavior), encouraging participation in sports, music, theater, and other activities that require sustained attention and work on self-regulation, and helping them to develop study skills (Harvard University, ND).

Use of Videos for Patient Education

Three studies were analyzed pertaining to use of videos as patient educational tools. These three articles were selected because they were similar in design to this proposed project. All three studies found that educational videos are useful tools for educating patients and improving desired outcomes (increased patient knowledge, compliance, etc.) (Brown et al., 2017; Guiliano, Nofar, & Edwin, 2017; Platt-Mills et al., 2016). Of particular interest, the study by Brown et al. (2017) utilized the Health Beliefs Model to develop the video and this strategy was effective in improving health related behaviors by increasing the number of patients who received the pneumococcal vaccine. This supports the theoretical framework that guides the development of the prenatal substance exposure educational video proposed in this project.

Gaps and Limitations

While there are more articles describing consequences of cocaine exposure, there are relatively few for opioids and even fewer for methamphetamine. In fact, the IDEAL study outlined by Smith et al. (2015) is the only published large-scale longitudinal study that focuses on prenatal methamphetamine exposure. Furthermore, all articles reviewed indicated that the precise mechanisms of how these substances affect the fetal brain and how that translates into developmental effects are still unclear. While rodent models shed light on potential mechanisms, further studies in humans are needed. Additionally, more studies need to be conducted pertaining to interventions to improve cognitive and social development of substance exposed children specifically. While studies looking at interventions for all children with ADHD, for instance, are helpful in addressing attention problems in substance-exposed children, the degree of effectiveness of such interventions for this specific population is unclear.

Summary

There is a growing body of evidence pertaining to short and long-term effects of prenatal substance exposure and the majority of evidence indicates that long term impacts on development and behavior do occur on some level in children exposed to opioids, cocaine, and/or methamphetamine. Therefore, proper caregiver education is warranted concerning these effects and interventions that caregivers can implement in the home that will improve developmental and behavioral outcomes. Use of videos to educate patients is a relatively recent phenomenon, but is proving effective in positively impacting health-related behaviors.

CHAPTER III: METHODS

Design

The project was composed of two stages. The first stage involved writing the video script, submitting it to content experts for review, and filming. After the script was completed and reviewed by the project chair, the script was submitted to two content reviewers. The content reviewers were Dr. Ahmed Saleem, a neonatologist at Carondelet St. Joseph's Hospital, and Renee Burrous, a pediatric nurse practitioner who also has experience as a foster and adoptive parent. These experts reviewed the script for accuracy of content.

The video was filmed and edited by the author and professional filmographer Caleb Jackson. The visual footage was obtained through original filming and by using short clips from existing YouTube videos according to Fair Use Policy. Multiple drafts of the video were reviewed by the author and the final version of the film was completed on September 28, 2017.

The second stage of the project represented a pilot study in which parents who attended a foster parent training viewed the video and used the Patient Education Materials Assessment Tool for Audio/Visual (PEMAT-A/V) to evaluate the understandability and actionability of the video (Shoemaker, Wolf, & Brach, 2017). Because the project involved the creation of new educational materials rather than the implementation of existing ones, an evaluative pilot study was the most appropriate design as it provided data concerning the effectiveness of the video's design and content. Further studies could be done following this pilot study that investigate the longitudinal effects of the education on foster parenting practices.

Participants

Foster parents were recruited to participate in the training through email advertisements from Devereux Foster Care agency in Tucson, AZ. Devereux foster care specialists also identified foster parents that are either currently caring for or are interested in caring for substance exposed children and encouraged them to attend the training. Because the study was exempt from Human Subjects Review by the Institutional Review Board, informed consents were not required for participants, as they represented experts who were evaluating the overall formatting and presentation of the educational material. Disclosures were given to each participant prior to viewing the video, informing them that the video was completed as part of a DNP project and that the evaluations were voluntary. Following the video presentation, participants completed the PEMAT evaluation questionnaire. For the purposes of data collection, only evaluations completed by licensed foster parents, adoptive parents, or kinship caregivers who could speak and read in English were included, although a future study could involve evaluation of the video by biological parents or healthcare professionals.

Setting

The training was conducted at Devereux Foster Agency office in Tucson, AZ in the conference room on September 28, 2017 at 6 pm. The room was equipped with computers and a projector, which was used to show the video. The viewing of the video and the data collection occured during an hour-long scheduled foster parent training session in September 2017 that consisted of viewing the video, completing the evaluation, then discussing the content.

Intervention

The training video consisted of two sections. The first section contained a basic overview of how prenatal exposure to each substance affects fetal brain development and the specific areas of the brain affected. The second section discussed common developmental and behavioral effects that may be witnessed in infancy, toddlerhood, and the preschool years. While some effects that manifest during the school-aged years were mentioned, the video predominately focused on early childhood. (For more detailed information concerning content included in the video, please see the video script in Appendix B). After viewing the video and completing the PEMAT evaluations, foster/adoptive parents participated in a brief 15-minute discussion reviewing concepts addressed in the video and were provided with a pamphlet to take home containing key concepts addressed in the video, though the evaluation focused on the video alone.

Tools for Data Collection

The Patient Education Materials Assessment Tool for Audio/Visual (PEMAT-A/V) was completed by participants to evaluate the video (Appendix C). PEMAT is a tool published by the Agency for Healthcare Research and Quality (AHRQ) designed to evaluate the understandability and actionability of patient educational materials (Shoemaker, Wolf, & Brach, 2017). The PEMAT exists in two forms: one specific for printed materials and one for audio/visual materials (Shoemaker, Wolf, & Brach, 2017). Since the focus of this project is a video, the PEMAT-A/V was selected as the most appropriate tool to evaluate the intervention. The first 19 questions on the PEMAT-A/V focus on the video's understandability (Shoemaker, Wolf, & Brach, 2017). Questions ask participants to evaluate how the content, organization, layout and use of visual

aids either enhanced their ability to understand the material presented or detracted from it. The final four questions pertain to actionability, or feasibility of participants to put the material into practice (Shoemaker, Wolf, & Brach, 2017). PEMAT underwent four rounds of reliability testing before being published and has a strong internal consistency of α=0.71 (Shoemaker, Wolf, & Brach, 2014).

Data Analysis

Foster/adoptive parent PEMAT-A/V questionnaires were entered into the PEMAT-AV autoscoring tool by the author to generate percentage scores for understandability and actionability. Mean scores and standard deviations were then calculated for each component (understandability and actionability) and results were interpreted by the author according to the instructions provided by the Agency for Healthcare Research and Quality (AHRQ). The author had intended to run a statistical analysis to determine whether scores were statistically significantly different for unlicensed individuals as compared to licensed individuals, but the sample size was not sufficient to do so.

CHAPTER IV: ETHICAL CONSIDERATIONS

Throughout each step of this project the three ethical principles as defined by the Collaborative Institutional Training Initiative (CITI) (2014) – respect for persons, beneficence, and justice – were maintained to ensure the physical and psychological safety of all participants.

Respect for Persons

Participation in the study component is optional. Foster parents were provided with a disclosure, informing them that participation in the video evaluation was voluntary (Appendix D). Foster parents who attended were given the option of viewing the video and participating in the discussion even if they decline to complete the PEMAT evaluation and would not have been penalized by Devereux if they chose to do so. In this way, autonomy was maximized. Those who elected to participate in the study by completing the surveys were assured that the surveys are anonymous and the data collected would be confidential, and only shared if necessary with my DNP committee, IRB, and/or Office for Human Research Protection. Neither the video production or evaluation directly involved vulnerable populations such as children. In the video production stage, original footage was only obtained of the author, and additional footage was drawn from existing YouTube videos in which permission had already been obtained to film children. Additionally, the project was submitted to IRB for approval to ensure participant safety and was determined to be exempt from Human Subject Review.

Beneficence

The study was designed to be completely safe for participants and was aimed at informing foster parents and kinship caregivers. There was no risk of bodily injury associated with participation as the training only required participants to watch a short film and participate

in a discussion (verbal contributions not required). Therefore, participants could experience benefits (increased knowledge) with little to no risk. In addition, the study was reviewed by IRB to ensure safety for participants and was exempt from Human Subjects Review.

Justice

All who wished to attend the training were welcome to do so and even those who did not pre-register were included. While biological parents would ideally be included, it is more difficult to recruit this population, and for the purposes of this study, only licensed foster parents, adoptive parents, and kinship caregivers were included in the data collection portion (though biological parents could have attended the training if they desired).

CHAPTER V: RESULTS

Content Review

The video script was reviewed by a neonatologist and by a pediatric nurse practitioner at El Rio Community Health Center who has experience as a foster and adoptive parent. The review by the neonatologist was completed prior to the filming, however he did not suggest any revisions and thus the script was not changed due to his evaluation. The author had originally contacted another pediatrician to review the script prior to filming, but he was unable to complete the review. The author then contacted a PNP in late September and the completed evaluation was returned to the author on October 3, 2017 (after the video had been filmed). These evaluations were completed by the clinical experts by hand, but were transcribed into electronic format by the author (Appendix D.

Both evaluators marked "strongly agree" to questions 1-3 pertaining to the factuality of the physiology (question 1) and developmental/behavioral effects (question 2) sections, and the understandability of the language used in the script. The neonatologist marked "strongly agree" to question 4 pertaining to the strength and safety of the recommendations/interventions presented and the PNP s marked "agree." The PNP also presented suggestions for further research on the short and long term effects on brain structure/physiology and the possibility of using neuro-feedback therapy for substance exposed children. While the author was not able to find research studying neurofeedback therapy in substance-exposed children specifically, a 2016 article highlighted its effectiveness in children with ADHD (Deilami et al., 2016). Since children prenatally exposed to opioids, cocaine and methamphetamine are at higher risk for developing ADHD, this might be a promising future treatment, though more research is needed.

Presentation Review

The video was presented at Devereux Foster Care Agency on September 28, 2017 at 6:00 pm Arizona Time. A total of 10 individuals attended the training including six licensed foster parents, 1 unlicensed adoptive parent, 1 licensed social worker (Devereux staff), and two members of the authors family who are not foster/adoptive parents or kinship caregivers. Based on the inclusion criteria previously specified, only the evaluations from the licensed foster parents and the unlicensed adoptive parent were included in the data collection. Of the six licensed foster parents, one was also a kinship caregiver. There were no unlicensed kinship caregivers present.

All evaluators gave both the understandability and actionability components scores of 100%. Thus, the mean score (for both) for understandability and actionability was 100%. The standard deviation was 0. The author had initially planned to perform a data analysis to determine if scores were statistically significantly different between licensed and unlicensed individuals, however the sample size was too small to perform this analysis, and it would not have revealed differences because all evaluators assigned the same scores (Table 1). The only differences in the evaluations were that two evaluators (Reviewers # 5 and 7) assigned scores of 1 (agree) to questions 19 and 25, whereas the other evaluators selected "N/A." Additionally, Reviewer # 3 rated question 12 as "N/A," whereas the other reviewers scored this question as 1 (agree). However, since no evaluators assigned a score of 0 (disagree) to any question, these differences did not affect the overall component scores (a score of "not applicable" eliminates the question from the overall score calculation).

TABLE 1. *PEMAT-AV Scores Evaluating the Effectiveness of the Video Presentation*

Participant No.	Role	Understandability	Actionability
1	Licensed Foster Parent	100%	100%
2	Licensed Foster Parent	100%	100%
3	Licensed Foster Parent	100%	100%
4	Licensed Foster Parent	100%	100%
5	Licensed Foster Parent	100%	100%
6	Licensed Foster Parent/Kinship	100%	100%
7	Unlicensed Adoptive Parent	100%	100%
	Mean	100%	100%

CHAPTER VI: DISCUSSION AND IMPLICATIONS

The positive reviews given by the clinical content experts and the high PEMAT scores given by the foster/adoptive parents (presentation experts) indicate that the video has the potential to be a useful and effective tool for teaching parents and caregivers about the effects of prenatal exposure to opioids, cocaine, and methamphetamine. While the author does not feel that there is sufficient evidence at this time to edit the video to include recommending neurofeedback as a treatment for substance-exposed children, this is an area of ongoing research and in the future this may be an evidence-based and extremely effective form of treatment, especially in children who develop ADHD.

The high PEMAT scores indicate that the overall presentation of the educational material is effective. The author used the PEMAT-AV as a guide/rubric for creating the video, and as such, it is encouraging that the evaluators perceived that the video met all of the items on the PEMAT-AV. However, the lack of variability between scores could be due to several factors. First, the sample size was small (n=7) and larger sample sizes typically produce slightly more variability in the data. Secondly, the evaluators had at least some contact with the video creator (author) and thus may have felt some degree of personal obligation to give the video higher scores. The third explanation is that the lack of variability is due to the tool itself. For each of the items on the PEMAT-AV, there are only three answer choices (1=agree, 0=disagree, and N/A). There would likely have been more variability in scores had the tool included more answer choices such as strongly agree, partially agree, partially disagree, and strongly disagree.

However, the PEMAT-AV is a published tool with a plethora of research supporting its use to determine effectiveness of patient educational materials, and therefore the author concludes that the video does meet the criteria of an effective educational tool.

Limitations

As stated previously, sample size was a limiting factor in this study. The sample size was originally projected to be 20 based on the number of foster/adoptive parents and kinship caregivers who pre-registered for the training. However, despite reminder emails issued by Devereux, 13 of these pre-registered individuals did not attend. Additionally, the contact between the PI and the evaluators could have caused a positive skew in the data and it is possible that a format in which evaluators viewed the video and completed the PEMAT-AV without contact with the PI may have produced a different data set. However, this is not certain and the data could have been very similar or identical even with this change in format.

Future Research

There are several potential directions for future research to proceed following this pilot study. This study indicated that the video has the potential to be an effective educational tool based on its content and presentation format, but a future study could use a pretest/posttest design to reveal its effectiveness in teaching the material to foster parents. The author would also be interested to study the longitudinal effect of the video's content in producing change in foster parent practices at home.

Another potential avenue for future research would be to study the effectiveness of the video as an educational tool for other populations such as biological parents and healthcare professionals. It would be interesting to compare PEMAT-AV scores from biological parents and

healthcare providers with those from foster parents, as each group has a different educational and training requirements. The video was designed to be applicable for caregivers of various roles and thus it would be pertinent to gather additional data from other groups in the overall target population of individuals who provide care for substance-exposed children to determine whether the video is a potentially effective tool for individuals other than foster/adoptive parents.

Implications for Practice

Based on the positive result from this pilot study, the author intends to offer the video as a training resource to foster care agencies in Tucson (and any other organization or individual who desires to use it for educational purposes). Additionally, at the suggestion of clinical expert evaluator and neonatologist Dr. Saleem, the author also intends to share this video with staff in the neonatal intensive care unit at Carondelet St. Joseph's Hospital in Tucson, AZ as a means of disseminating information and positively impacting nursing care of substance-exposed newborns. The author will also utilize the information learned during this research process to provide individualized, evidenced-based care to substance exposed children in the pediatric clinical setting, and to provide their parents/caregivers with specific suggestions for dealing with developmental and behavioral challenges.

Conclusion

A clear understanding of the mechanisms by which substance exposure alters fetal development and the manner in which these alterations affect subsequent childhood development and behavior is vital to helping caregivers anticipate potential developmental challenges and to seek early intervention (Edelstein et al., 2017). Use of educational videos for patient and family education is a promising avenue for relaying information in a manner that can positively impact

health behaviors and could be an effective tool for training caregivers and improving outcomes for substance-exposed children (Brown et al., 2017; Platt-Mills et al., 2016). DNP-prepared neonatal, pediatric, and family practice nurse practitioners play crucial roles in child developmental screening and parent education. It is important for pediatric primary care providers to know the common effects of prenatal exposure to opioids, cocaine, and methamphetamine that can be seen in each stage of childhood, as the number of exposed children in the United States continues to rise. The research reviewed in this project indicates that prenatal substance exposure places children at greater risk for developmental delays, learning disabilities, ADHD, and behavioral problems and APRNs should be at the forefront of screening for these conditions and educating parents on interventions that they can implement in the home. The video developed during this project is a tool that can help to accomplish these tasks and improve overall care of substance-exposed children.

APPENDIX A:

SYNTHESIS OF EVIDENCE TABLE

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
(Ackerman et al., 2010)	Patho-physiology Developmental Effects	What are the effects of prenatal cocaine exposure on growth, cognitive ability, academic performance, and brain structure in school-aged children?	Systematic Review No theoretical framework discussed	32 studies included. Sample sizes of studies ranged from 26-1056 participants.	PubMed, MEDLINE, TOXNET, and Psychinfo databases were used to locate articles. Studies were selected based on criteria discussed in the article. Each article was independently reviewed by 2 researchers.	No meta-analysis performed.	While PCE appears to have some effect on growth, cognitive abilities, language and academic performance, it is unclear whether these differences may be caused by environmental factors. There are subtle differences in brain structure and function including less mature development in white matter in the frontal cortex among children with PCE when compared to controls.
(Bada et al., 2012)	Developmental effects Caregiver interventions	Do high levels of prenatal cocaine exposure (PCE) produce effects that persist through adolescence. What roles do risk factors and protective factors play on behavioral outcomes for adolescents? Hypothesis: Effects of PCE will persist throughout adolescence and risk factors will have a cumulative effect on	Longitudinal cohort study No theoretical framework discussed	1022 children with known prenatal cocaine exposure.	Longitudinal follow up began at 1 month and continued through age 15. Study did not specify how often children were evaluated Child Behavior Checklist administered at ages 5, 7, 9, 11, 13, 15. Other tools used for assessment include Wechsler Abbreviated Intelligence Scale, Beck Depression Inventory, Child	Chi-square tests Latent growth curve using MPlus Software Median split used to categorize risk and protective factors	Children with high levels of PCE and opiate exposure had higher scores for externalizing behaviors and total behavioral problems. Boys had more externalizing behaviors and attention problems. Risk factors such as caretaker substance use, caretaker psychopathology, and child abuse increased behavior and attention problems. Protective factors such

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		behavior but protective factors will mitigate some of these effects.			Health and Illness Profile, Strange Situation procedure, Home Observation and Monitoring of Environment Survey, and the Supervision Questionnaire - Primary Caretaker		as high resilience scores, having many friends, and caretaker involvement were associated with lower overall problem scores. High protective index mitigated negative effects of high risk index.
(Baldacchino et al., 2014)	Developmental Effects	Do statistically significant differences in neurobehavioral functioning exist between infants and preschoolers with prenatal opioid exposure and their non-exposed counterparts?	Meta-Analysis No theoretical framework discussed	5 studies included based on criteria	Cinahl, EMBASE, MEDLINE, and PsychINFO were used to locate articles. Inclusion was based on Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines and Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines. 200 potential studies were identified but only 5 were included	Standard meta-analysis techniques	Trends in poorer outcomes in terms of cognition and behavior were observed in opioid-exposed infants and preschoolers, but these differences were not statistically significant.
(Brown et al., 2017)	Videos as educational tools	Does viewing an educational video about the pneumococcal vaccine positively effect patient perceptions about the	Quasi-experimental HBM and Extended Parallel Process Model (EPPM)	73 participants were interviewed	Focus groups. Patients interviewed with mixture of open-ended questions and Likert-scale questions pertaining to video experience.	Frequency, mean and SD of demographic data, Likert scale questions, vaccine outcomes	Video improved vaccine outcomes. (12.9% intended to get vaccine before viewing video, among those who viewed video, 47.9% received vaccine).

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		vaccine and improve vaccine outcomes?					Patients had positive comments about video. Only one patient stated that he did not get a vaccine due to video.
(Diamond & Lee, 2011)	Evidenced based interventions	What programs/activities help children to develop executive functioning skills in early childhood?	Literature review No theoretical framework discussed.	Number of articles included not specified.	No systematic approach discussed.	No analysis performed	Computerized training such as CogMed, aerobic exercise, Tae-kwon do, and yoga were found to improve EF in school-aged children.
(Edelstein et al., 2017)	Education for foster parents about substance exposure	Does the PREP curriculum shift foster parent attitudes concerning substance exposed children and make them more willing to adopt substance exposed children with special needs?	Pre/Post test design. No theoretical framework discussed.	1836 prospective foster/adoptive parents	Prospective parents completed pre surveys (attitude, knowledge, willingness). Participants underwent 9 hour PREP course, then completed post surveys.	Paired t-tests with Bonferroni correction. Exploratory regression analysis.	d
(Ghafari & Golalipour, 2014)	Patho-physiology	What is the effect of prenatal morphine exposure and exposure during breastfeeding on pyramidal neurons in the hippocampus of newborn mice at days 18 and 32 of life?	RCT (preclinical mouse model) No theoretical framework discussed	30 female mice in study. 24 offspring randomly selected for evaluation of cerebrum (6 from morphine exposed and 6 from non-morphine exposed euthanized at 18 days, and 6 more from each group at day 32 of life).	Mice in experimental group were given morphine sulfate during mating period, gestation, and 18 and 32 days respectively after delivery. Mice in control group were given saline. 6 offspring from each group were randomly selected at 18 and six more from each group	SPSS 16 used to run t-tests on data.	Morphine sulfate exposure during pregnancy and lactation causes pyramidal cell loss in the hippocampus of newborn mice. Chronic morphine exposure also induces neuronal apoptosis

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
					at 32 days of life to be euthanized for cerebral evaluation. Rigorous methods used to ensure randomization and consistency between groups.		
(Guiliano et al., 2017)	Videos as educational tools	Does viewing a short educational video improve patient knowledge about apixaban in an inpatient setting?	Quasi-experimental (pre-test/post-test) No theoretical framework discussed	33 patients receiving apixaban therapy	2 videos developed (treatment/ prevention of DVT, prevention of AFIB in stroke) using Camtasia. Pre-test/post tests and satisfaction survey completed.	Paired t-tests using SPSS Version 22, p-value < 0.05	Patient scores increased by 19.7% (19.1% for AFIB video and 22.2% for DVT/PE video High satisfaction: 97% of patients would recommend viewing the video to another patient. Video is viable educational tool.
(Jansson et al., 2008)	Caregiver interventions	What are the methadone concentrations of breast milk in methadone-maintained mothers? Do behaviors of breastfed infants of methadone maintained mothers differ from formula fed infants of methadone maintained mothers. Is breastfeeding safe when the mother is on	Non-RCT No theoretical framework discussed	8 mothers who were on methadone-maintenance treatment (MMT)	Mothers on MMT provided breast milk samples on postpartum days 1, 2, 3, 4, 14, and 30. Methadone concentrations were measured in breast milk as were maternal and infant plasma concentrations of methadone. These were compared to control group of methadone-maintained mothers	Wilcoxon signed rank test used to compare breastfeeding subjects to matched controls. Spearman correlations used to compare strength of correlation between methadone concentrations in breast milk. P values reported	Though peak methadone concentrations in breast milk did increase during the first month from 6.6% to 21.5%, ingestible infant dose and infant plasma concentrations remained low and there were not significant differences between breastfed and formula fed infants in terms of neurobehavior. Though not deemed statistically significant, fewer breastfed infants

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		MMT?			who were strictly formula feeding.	to support clinical and statistical significance of results (p <0.5).	required pharmacological treatment Breastfeeding is safe for infants of methadone- maintained mothers.
(Nygaard et al., 2015)	Developmental effects	Do differences in cognitive functioning between substance exposed (opioid and polysubstance) and non-exposed children decrease over time between ages 1 and 8.5 years? Hypothesis: Differences will not decrease and may increase over time.	Longitudinal cohort study. No theoretical framework discussed	124 children (72 substance exposed and 58 non-exposed) at start, but only 103 retained at 8 ½ year evaluation.	Mental Development Index of Bayley II Scales of Infant Development used to evaluate cognitive functioning at 1, 2, and 3 years old. McCarthy Scales of Children's Abilities used to evaluate children at 4 ½ years old. Wechsler Scale of Intelligence used to evaluate children at 8 ½ years old. Scores were converted in to total IQ score using Norwegian norms.	T-tests Linear Regression Analyses Mixed Effect Models	Differences in cognitive abilities between opiate exposed and non-exposed children does not decrease over time. Differences were highly significant at age 8 ½. Differences were similar between children who lived with biological parents and those who were moved to stable foster/adoptive homes before age 1, indicating that differences cannot be solely attributed to environment. Differences were greater in boys prior to age 8 ½, but differences were greater in girls at age 8½.
(MacMullen et al., 2014)	Caregiver interventions	What is the best nursing practice pertaining to NAS infants? What non-pharmacologic	Systematic Review No theoretical framework discussed	480 articles reviewed and 24 included selected for inclusion.	CINAHL, PubMed/Medline, Cochrane Systematic Reviews, Joanna Briggs Institute, and HSTAT databases	Meta-analysis not performed (no formal analysis listed)	Breastfeeding may decrease severity of NAS. Quiet environment, non-nutritive sucking, swaddling, and minimal

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		interventions are recommended for NAS infants?			were used to pull articles. Studies chosen were published within the last 10 years and had to pertain to nursing interventions for NAS infants. A mixture of RCTs, cohort studies, and case studies were selected. Though systematic process was rigorous, one RCT selected supported an intervention more useful with cocaine exposed infants rather than infants with NAS (the study excluded actively withdrawing infants).		handling encouraged to reduce withdrawal signs. Music therapy may reduce NAS score.
(Min et al., 2014).	Developmental effects	Does PCE cause more externalizing behaviors and problems with substance use in adolescents? Hypothesis: PCE 15 year olds will have more externalizing behaviors and problems with substance use than non-exposed	Longitudinal cohort study No theoretical framework discussed	358 adolescents (183 with PCE and 175 non-exposed).	Infants recruited at birth based on criteria. Children seen at ages 2, 4, 10, 12 and 15 years of age. Externalizing behavior assessed using Youth Self Report. Substance use was assessed using Substance Use and Abuse scale from the Problem Oriented	Log transformations Chi-square tests Zero-order Pearson Correlation	Exposed teens were 2.8 times more likely to use/abuse substances. Amount of PCE was associated with increasing externalizing behaviors. No differences between kids in foster care and kids living with parents and/or relatives.

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		counterparts.			Screening Instrument for Teenagers (POSIT). At previous visits blood lead levels were checked (ages 2 and 4). At age 10, caregivers completed a tool assessing externalizing behaviors in their child, and at age 12 parental attachment, monitoring, and violence exposure were assessed using Assessment of Liability and Exposure to Substance Use and Antisocial Behavior (ALEXSA).		
(Minnes et al., 2014)	Developmental effects	Do preadolescent children with prenatal cocaine exposure perform significantly worse on executive functioning tasks per parent report than do non-exposed children? Are there gender differences in executive functioning of children with PCE?	Cohort Study No theoretical framework discussed	338 12-year old children (169 with PCE and 169 non-exposed children).	Children recruited from birth based on maternal self report of cocaine use and by positive urine test. Blood lead levels tested at ages 2 and 4. Behavior Rating Inventory of Executive Functioning (BRIEF) was completed by primary caregiver at 12 year old visit.	T-tests and Wilcoxon-Mann Whitney test used for continuous data. Pearson Chi-Square and Fischer test used for categorical variables. ANOVA used compare executive functioning by cocaine status and	Girls with PCE had higher BRIEF scores, indicating more issues with executive functioning than non-exposed girls. Higher PCE exposure was associated with increasing problems with the categories of initiation, working memory, and organization of materials.

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
						gender. Post hoc tests performed.	Head circumference did not have an association with BRIEF scores and did not account for differences between PCE girls and non-exposed girls. Foster/adoptive placement was not significantly associated with scores.
(Minnes et al., 2011)	Patho-physiology Developmental effects Therapeutic interventions	What are the developmental effects caused by prenatal exposure to tobacco, marijuana, stimulants, and opiates? What are the best treatment options for substance using pregnant women? What are effective therapeutic interventions for substance exposed children?	Literature review. Theoretical framework: Neuro-behavioral Teratology	Unclear (process for inclusion not discussed)	Not specified	Not specified	Maternal drug use affects the fetus directly and indirectly (through vasoconstriction in the placenta which decreases blood flow and nutrients to the baby) Major effects of cocaine in the fetus include prematurity, decreased birth weight, length and head circumference, increased risk of intraventricular hemorrhage, problems with perceptual reasoning, attention, and externalizing behavior in children over age 4. Effects of methampheta-mine include small for gestational age, decreased birth weight,

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
							Effects of opioids include prematurity, decreased birth weight, length and head circumference, fetal and neonatal abstinence syndrome, and increased risk of SIDS. Interventions include in-home early intervention services, and maintaining a stable, nurturing home environment.
(Platt-Mills et al., 2016)	Videos as educational tools	Does an educational video improve knowledge about pharmacologic and non-pharmacologic treatment of acute musculoskeletal pain?	Pilot study (pre/post-tests) No theoretical framework discussed	40 patients with musculoskeletal pain	Patients viewed video and completed pre and post-tests (14 multiple choice content questions and 6 questions pertaining to patient preparedness and confidence using 5-Point Likert Scale)	Wilcoxon-Signed Rank Test Mean, SD 80% Power Two-sided alpha 0.05	Viewing the video significantly increased knowledge scores on multiple choice questions as well as scores on confidence questions. 93% found video useful and all patients recommended use of video for others. Video is viable educational tool.
(Ross et al., 2015).	Patho-physiology Developmental effects	What are long-term developmental consequences of prenatal substance exposure? What are the mechanisms by which	Literature Review No theoretical framework discussed	Unknown (no mention of systematic approach)	Specific approach and inclusion criteria not delineated. Human and animal model studies included.	No analysis mentioned.	Opioid exposure is associated with decreased dendritic branch length, attenuated myelination of neurons, preterm delivery, neonatal

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		prenatal substance exposure affects fetal brain development?					abstinence syndrome (withdrawal), lower IQ, ADHD, and behavior problems later in childhood. Prenatal exposure to psychostimulants such as cocaine and methamphetamine is associated with somatic growth deficits (short and long term), preterm delivery, brain abnormalities as shown by neuroimaging studies, problems with attention and memory, behavior problems (aggression and delinquency), and social/emotional effects (depression, anxiety). (Effects of caffeine, nicotine, cannabis, and alcohol also evaluated but not delineated in this table because they do not directly relate to the purpose of this DNP project).
(Richardson et al., 2015)	Developmental effects	Do effects of PCE persist into adolescence? What are effects of PCE on adolescent	Longitudinal cohort study No theoretical framework discussed.	295 mother/child dyads at start and 219 evaluated at 15 year mark.	Children recruited from birth based on criteria. Initial sample of 300 women included half that used	Multiple stepwise regression Logistic regression	First semester PCE was significantly associated with delinquent behavior, poor problem solving and abstract

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
		behavior, cognition and physical growth? What effect does the child's environment have on their growth and development? Hypothesis: There will be detrimental effects on growth and development that extend into adolescence.			cocaine during pregnancy and other half that did not. At 15 year follow up, weight, height, and head circumference were measured. Cognitive performance measured by Wechsler Scale of Intelligence, Children's Category Test, and Children's Memory Scale. Behavior was assessed using the Self-Reported Delinquency Scale Administrators of test and measurements were blind to cocaine exposure status		reasoning skills, reduced height, weight and head circumference at age 15. However, first trimester PCE was not associated with global cognitive development.
(Smith et al., 2015).	Developmental effects	What are short and long term developmental and behavioral consequences of prenatal methamphetamine exposure?	Longitudinal cohort study (larger IDEAL study composed of a series of smaller studies) No theoretical framework discussed	412 mother-infant dyads (204 meth-exposed and 208 non-exposed)	Neonates were assessed using the NICU Network Neurobehavioral Scale At 1, 12, and 36 months of age, infants assessed using Brief Symptom Inventory and caregivers were assessed using Beck Depression Inventory. At age 5 ½, the Connors' Kiddie Continuous	Analysis methods not included in summary of findings.	Withdrawal requiring pharmacologic intervention is not associated with methamphetamine exposure, however, neonates do exhibit higher stress responses. Delays/deficits in fine motor skills were noted in exposed 1 year olds. Heavy exposure was associated with poor inhibitory control and

Citation	Concepts Addressed	Research Question/ Hypothesis	Design/ Theoretical Framework	Sample (N)	Methods	Analysis	Findings
					Performance Test was administered. Weight, head circumference, and length/height were also recorded at each visit (1, 12, 24, 30, 36, 60, 66, 78, 84, and 90 months old). Results from exposed group was compared to that of matched non-exposed group. Participants from both US and New Zealand were included and results were compared between two participants from each county.		executive functioning in preschoolers and school-aged children.

APPENDIX B:

VIDEO SCRIPT

INTRODUCTION

Hello! My name is Marie Smith. I am a pediatric nurse practitioner student at the University of Arizona and a registered nurse in the neonatal intensive care unit. The purpose of this video is to discuss how prenatal exposure to cocaine, methamphetamines, and opiates affect fetal development and later impact children after birth. My hope is that this video will provide you with an increased understanding of your child's development and behavior and show how you as a parent or caregiver can make a positive impact. Speaking from experience as a foster parent, caring for substance-exposed children can be challenging at times, and I want to encourage you that your commitment to them can make a huge difference in their lives. My goal is to provide you with tools for managing the behavioral and developmental challenges often posed by substance-exposed children, so that you will feel empowered in your ability to produce positive change in your child's life.

This video will be divided into two sections. In the first segment we will discuss the basic physiology of how prenatal exposure to opiates, cocaine, and methamphetamines affects fetal brain development. This information is important for understanding why certain long term effects of prenatal exposure continue later in childhood. In the second section we will go through the stages of early childhood, starting in infancy and going through the preschool years, and I will discuss some common developmental and behavioral effects that you might see in your child. Every child is different and is affected by many factors including their environment so the severity of these effects varies greatly. However, this video is designed to prepare you for things that you MIGHT see in your child and to show you how you can intervene to promote healthy physical, psychological, and social development.

SECTION 1: PATHOPHYSIOLOGY

Opiates

Opiates are a class of drugs that include prescription medications such as Percocet, Vicodin, morphine and Dilaudid, as well as illegal drugs such as heroin. Methadone and Suboxone also fall under this category, and are the most commonly used drugs to treat opioid dependence. However, they can have many similar effects on the fetus. Opioids are central nervous system depressants, meaning that they inhibit certain activity in the brain and spinal cord by acting on specific receptors. Because of this action, opioids are commonly used to treat pain, since they prevent transmission of signals in the pain pathways. Other effects of opioids include pupil constriction, constipation, and a slowed breathing rate known as respiratory depression.

In the fetus, studies indicate that opioid exposure may affect the development of brain cells. Opioid exposure may cause shortening of a portion of the brain cell called the dendrite, which may interfere with the ability of the cell to send signals to other brain cells. Additionally, studies show that prenatal opioid exposure may cause increased brain cell death, particularly in an area of the brain known as the hippocampus, which is responsible for memory formation and emotional responses. Other studies indicate that overall brain growth may be affected by prenatal opioid exposure in a variety of ways.

Cocaine

Cocaine is a central nervous system stimulant, meaning that it increases brain activity producing increased alertness, pupil dilation, and increased heart rate. It mainly acts to prevent the brain from taking the chemical dopamine back into the cells, resulting in higher levels of dopamine circulating in the brain, which continually activates the reward circuit. In the fetus, exposure to cocaine may change the development of dopamine and other neurotransmitter pathways, resulting in problems with attention and cognition later in childhood. The prefrontal cortex, responsible for processing social interactions and personality development, seems to be particularly affected by prenatal cocaine exposure, which could explain why cocaine exposed children show more tendencies towards violent behavior.

Methamphetamines

Like cocaine, methamphetamine is also a central nervous system stimulant and thus it produces many similar effects in the user. However, it works in a slightly different way than cocaine. Instead of inhibiting the ability of the brain cells to take dopamine back in, METH causes cells to release more dopamine, thus increasing the stimulation of the reward circuit. According to studies, METH seems to affect an area of the brain known as the caudate nucleus, which plays a role in motor functioning, attention, memory, and impulse control. METH also seems to affect the hippocampus, which as we discussed before, helps to regulate emotional responses and plays a role in memory formation, and the thalamus, which communicates sensory information from the eyes, ears, mouth and skin. However, since METH use is a relatively recent phenomenon, more studies are needed to provide more specific information related to how METH affects fetal development.

Indirect Effects

In addition to the direct effects we have just discussed, all three types of drugs also appear to affect the fetus indirectly by causing narrowing of the blood vessels in the placenta, which decreases blood flow and oxygen to the fetus. This can inhibit fetal growth overall. Consequently, substance exposed newborns are more at risk for being low birth weight, smaller in length, and having smaller heads.

SECTION II: DEVELOPMENTAL AND BEHAVIORAL EFFECTS

Newborn period:

Arguably, some of the most dramatic effects in substance exposed children can be seen in the newborn or neonatal period immediately following birth. Opiate exposure in particular often results in withdrawal in newborns that may cause effects such as fussiness, a high pitched cry, difficulty sleeping, faster breathing, sweating and fevers, vomiting and diarrhea, muscle stiffness, poor sucking and feeding, tremors, and seizures (in severe cases). If newborns with severe withdrawal do not receive proper treatment, they are at risk for permanent brain damage and

even death. Consequently, opioid-exposed newborns are monitored closely in the hospital for at least five to seven days to assess the severity of their withdrawal. Doctors and nurses may use a scoring tool to determine how severely your baby is withdrawing. If your baby exhibits many signs of withdrawal resulting in a high score, he or she may need treatment with medication. However, even before medicine is considered, it is important for you as a parent or caregiver to start using the other interventions that we will discuss in this section to help decrease your baby's stress. The following interventions have been carefully studied in substance exposed newborns and are effective in reducing the severity of withdrawal. They can and should be used both in the hospital and after the baby goes home. While methamphetamine and cocaine exposure are not associated with a severe withdrawal period like that caused by opioids, newborns exposed to these substances do experience stress, and would benefit from the following interventions. They may be more irritable than normal children, and have a harder time eating due to poor sucking,

Swaddling is a basic, but very important intervention that helps the newborn to feel secure. Substance-exposed newborns tend to be more sensitive to lights and sounds and consequently startle more easily. Swaddling can help to minimize their startle reflex and can help them to calm easier and sleep better. Swaddling in a tucked position mimics the womb environment and eases the infant's transition to the outside world.

Because swaddling can be such a useful intervention for decreasing stress in substance exposed infants, I will provide a step by step demonstration. Begin by folding one corner of the blanket down, forming an upside-down triangle. Place the infant on the blanket so that his or her neck is at the top crease. With one hand, hold the infant's hands together just below his chin and use the other hand to fold one corner of the triangle across the infant, tucking it in snugly. Next, hold the infant's hands secure while folding the bottom of the blanket up over the infant's legs, making sure that the knees are bent so that the baby is in a tucked position. The last step is folding the other corner of the blanket over and pulling it snugly around the baby. It is important to swaddle the baby snugly enough to help them feel secure. Loose swaddling may not provide optimal comfort for the infant and may pose a safety hazard if the baby pulls the blanket over his or her head. It is also recommended to supervise your baby closely when swaddled to make sure that they do not suffocate.

Other important interventions include vertical rocking, skin-to skin contact known as kangaroo care, breastfeeding (if you are able and are not taking illegal drugs), positioning the baby in a c-shape (also known as the fetal position), providing slow, contained movement, singing to your baby or playing soft lullabies, and infant massage. While I will not be providing specific instruction about infant massage in this video, I encourage you to look into taking an infant massage class in your area.

Infants who experience gastrointestinal issues such as poor feeding, vomiting, and discomfort due to gas, may need to be fed smaller amounts more frequently such as every 2-3 hours instead of every 4 hours. If your baby is formula fed, you can also talk to his or her healthcare provider about using a gentle formula that may be easier to digest.

It is also important to minimize stimulation for the baby initially. As I stated before, substance exposed infants are extra sensitive to bright lights and loud noises, and too much stimulation can cause them to become stressed. Such stress not only results in a fussy baby, but it may also place an actively withdrawing infant at greater risk for seizures. Thus, it is recommended to keep the baby's environment relatively dim and quiet during the first few weeks and to avoid crowded, noisy places. If the baby becomes fussy and does not appear to be hungry or need a diaper change, he or she may be getting overstimulated, especially if there is a lot going on in the room. Try taking the baby to a dark or dim, quiet space and hold him with a firm touch. Gentle vertical rocking may help but resist the urge to bounce the baby quickly or forcefully as this will only make him or her more overstimulated and upset. Soft shushing or singing may help to calm him down, but he may just need silence, swaddling, and slow, contained movement.

While low stimulation environments may continue to be useful when the baby is upset, it is important to gradually introduce your baby to lights and sounds to increase tolerance as he or she grows, since this encourages healthy brain development. Placing your baby near a window during the day and gently talking to him is a good way to introduce him to light and sound, as natural light is more easily tolerated than harsher artificial light from lamps. As he grows, he will gradually be able to tolerate more stimulation from toys and people, but as always, it is important to read your baby's cues and determine if he or she is becoming overstimulated. Signs of overstimulation include quicker breathing, sneezing or yawning multiple times in a row, and fussiness.

Later Infancy and Toddlerhood

Some of the effects seen in the newborns such as irritability and sensitivity, muscle stiffness, and abdominal discomfort can persist into later stages of infancy. Fine and gross motor tremors may also persist for several weeks or even months. Infants with persistent tremors and muscle stiffness are more at risk for motor delays, and caregivers should closely monitor their baby's development and discuss progress with his or her healthcare provider. Here is a brief overview of important developmental milestones. By 2 months, an infant should be able to smile, coo, hold his head up when on his tummy, and maintain good head control when supported in a sitting position. A 4-month old infant should babble, push chest up to elbows, and begin to learn to roll and reach for objects. By 6-months babies should be able to roll over and are starting to sit on their own for brief periods of time. 6-month old babies also should begin to string sounds together and will add consonants to vowels, creating sounds such as "ba," "ma," and "da." At approximately 6 to 7 months, babies should start to get on hands and knees and rock back and forward and also should start to rotate in a sitting position. Crawling typically starts between 6 and 9 months. Babies usually start with scooting on their bellies and then move to hands and knees crawling, though every infant is different. Babies typically start pulling to stand at approximately 9 months, though some may accomplish this sooner. 9-month-olds also should be able to participate in games such as peekaboo. Infants usually start walking between 12 and 15 months, though some do walk earlier. In terms of fine motor, babies should be able to pick up objects with their thumb and pointer finger by their first birthday and should be able to self-feed soft table food.

Babies who have persistent muscle stiffness are also at risk for contractures and it is recommended that caregivers routinely gently stretch tight muscles. One example is opening clenched fists and gently massaging palms. If you are concerned about your child's development, please speak with their healthcare provider, who may order early intervention services or physical therapy.

Language development may also be impacted by prenatal substance exposure, and delays may be detected in late infancy and toddlerhood. One-year olds should be able to say single words to identify what they want or need, and by age 2 they should be starting to put 2-word phrases together. Reading to your baby has been shown to vastly improve language development, and a daily reading routine should be started as early as possible.

Opioid, cocaine, and METH exposure are all associated with potential problems with cognitive functioning. Areas commonly affected are attention, memory, and impulse control, collectively known as "executive functions." Harvard University published a guide for parents containing activities that bolster development of executive functions starting from 6 months of age and going through adolescence. Though these activities are not specific to substance-exposed children, they may help improve development. Activities for older infants include lap games such as peekaboo and pat-a-cake, simple conversations and storytelling, and for older toddlers, sorting games and puzzles as well as imaginary play. Again, if problems in any area of development are noticed early on, prompt intervention can help to correct problems and help children catch up.

Preschool Years

As children enter preschool, cognitive and behavioral effects may become more apparent. In some studies, opiate-exposed preschoolers performed poorer on tests of verbal, reading, and math skills, as well as those requiring sustained attention. It is also possible that opioid exposure may cause motor and language delays as well. Cocaine exposure also may cause attention problems and language delays as well as effect perceptual reasoning. Growth restrictions associated with cocaine exposure at birth also appear to persist well beyond infancy even into adolescence. Methamphetamine exposure may cause the child to exhibit more externalizing or aggressive behaviors and emotional instability. METH exposed preschoolers and school-aged children tend to have a harder time with paying attention and with memory tasks. When children begin school, problems with paying attention for longer periods of time may cause them to struggle in the classroom. It is important to talk to your child's healthcare provider about screening for Attention Deficit Hyperactivity Disorder and learning disabilities, as substance-exposed children have an increased risk of developing these conditions. Early evaluation and diagnosis can help children get the help they need sooner in order to be successful in school.

Caregivers can help to enhance attention, memory, and inhibitory control skills by engaging with their children in imaginary play, storytelling, games such as Simon Says, puzzles, and teaching their child to cook.

Behavior issues can be challenging to deal with as a parent, but the PRIDE model may offer some support. This model is designed to be used when the child is behaving appropriately. The steps of the PRIDE model include "praising the child, reflecting, or repeating the child's statements, imitating the child's play, describing the child's behavior, and using enthusiasm." Too often, we as parents only acknowledge bad behavior, but it is very important to let your child know when they are doing the right thing!

For unsafe, or unacceptable behavior, the CDC and the American Academy of Pediatrics recommends using time-out as a discipline tool. Some key steps to using time-out effectively include giving your child a warning that if they do not stop the unwanted behavior that they will have to have a time-out; telling your child why they have to go to time out (make it simple and clear); have your child sit while they are in time out and do not engage with them while they are in time out (if they get up, calmly put them back in time out); and end the time out after 2-5 minutes, or 1 minute per year old the child is, if the child has been calm for at least 5 seconds.

To recap, pour all your energy and enthusiasm into good, safe behavior, and praise your child often for making good choices. Unsafe behavior needs an intervention, but try to refrain from getting angry or upset. Instead, calmly but firmly tell your child that the action needs to be stopped and give an appropriate consequence if he or she keeps doing it.
Using the PRIDE steps for acknowledging positive behavior in addition to establishing clear boundaries and consequences for negative behavior have been shown to help reduce aggression and may keep the peace at home!

CONCLUSION
This brings us to the end of our training. It is my hope that you will come away with a better understanding of how prenatal exposure to opioids, cocaine, and methamphetamine affect children's brains and ways that you can positively impact their behavior and development. If you have questions regarding the information presented today, I encourage you to speak with your child's healthcare provider. No matter what your title is, you play an instrumental role in your child's life and have the potential to set them up for success!

APPENDIX C:

FOSTER PARENT HANDOUT

Quick Guide to Prenatal Substance Exposure for Foster Parents

Newborn:

- Possible Effects of Opioids: Fussiness, poor sleeping, high pitched cry, easily overstimulated (does not tolerate bright lights and loud noises), trouble making eye contact, tremors, rapid breathing, poor sucking, poor feeding, spitting up and diarrhea, fever, sweating, repetitive sneezing and yawning, stuffy nose, stiff muscles, seizures (in severe cases), small for gestational age (weight, length and head circumference)
- Possible Effects of Cocaine: Fussiness, poor sucking and feeding, sleepiness/not wanting to wake for feeds, poor muscle tone, jitteriness, small for gestational age (weight, length and head circumference)
- Possible Effects of Methamphetamine: Fussiness, poor sucking and feeding, sleepiness/not wanting to wake for feeds, poor muscle tone, small for gestational age (weight, length and head circumference)

- Interventions: Swaddling, dim, quiet environment (gradually increase lights and sounds as baby tolerates it), pacifier, singing lullabies, skin to skin contact, smaller/more frequent feedings, infant massage, vertical rocking, c-positioning ("fetal position"), use of lavender scented baby wash and lotion, taking time for yourself to reduce you own stress!

Older Infants/Toddlers:

- Possible Effects of Opioids: Muscle stiffness, tremors, motor delays, smaller in length and weight, and head circumference.
- Possible Effects of Cocaine: Possible developmental delays, smaller in weight, length and head circumference, poor feeding may continue.

- ❖ Possible Effects of Methamphetamine: Possible fine motor delays (delayed grasping), smaller in weight, length, and head circumference, poor feeding may continue.

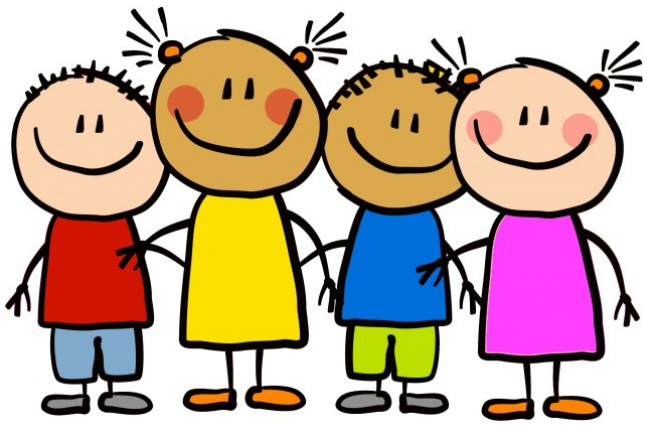
- ❖ Interventions: Lap games (peekaboo, patacake, nursery rhymes), hiding games (hide toys under blankets, cups, etc. and ask baby to find it), imitation/copying games (follow the leader), roll playing activities (such as sweeping/dusting), narrating what the child is doing, reading books, inhibition games (such as freeze dance), taking time for yourself to reduce you own stress!

Preschool:

- ❖ Possible Effects of Opioids: Problems paying attention, hyperactivity, possible cognitive delays, poor impulse control.
- ❖ Possible Effects of Cocaine: Smaller in size, language delays, problems paying attention, aggressive behaviors, poor impulse control.
- ❖ Possible Effects of Methamphetamine: Problems paying attention, problems with memory, aggressive behaviors, poor impulse control.

❖ Interventions: Physical exercise (such as running around outside), reading books, storytelling (encourage children to tell stories about pictures they see in books), repetitive songs (such as "She'll Be Comin' Round the Mountain," the Alphabet Song, "Five Green and Speckled Frogs"), sorting games, puzzles, cooking together, taking time for yourself to reduce you own stress, PRIDE Model to encourage positive/appropriate behavior

- **P**raising the child
- **R**eflecting the child's statements
- **I**mitating the child's play
- **D**escribing the child's behavior
- **E**nthusiasm



APPENDIX D:

DISCLOSURE OF RESEARCH

Project Title: Caring for Children with Prenatal Substance Exposure: An Educational Video and Pilot Study

Principle Investigator: Marie Smith, MS, RN, DNP Candidate

In order to assist in educating foster parents and caregivers on the effects of prenatal exposure to cocaine, opioids, and/or methamphetamine, principle investigator (PI) Marie Smith created a short film. This video's content is aimed at increasing caregiver knowledge and building confidence in one's ability to care for and meet the needs of substance exposed children. This project is in partial fulfillment of the Doctor of Nursing Practice Degree for Marie Smith.

If you choose to take part in this project, you will be asked to view the video and fill out the Patient Educational Materials Assessment Tool for Audio/Visual, evaluating the video you viewed. It will take approximately 15 minutes to complete this survey. There are no foreseeable risks associated with participating in this project and you will receive no immediate benefit from your participation, other than any knowledge you may take away from viewing the video. Survey responses are anonymous.

If you choose to participate in the project, participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw at any time from the project. In addition, you may skip any question that you choose not to answer. By participating, you do not give up any personal legal rights you may have as a participant in this project. For questions about your rights as a participant in this project or to discuss other project-related concerns or complaints with someone who is not part of the project team, you may contact the Human Subjects Protection Program online at http://rgw.arizona.edu/compliance/human-subjects-protection-program.

For questions, concerns, or complaints about the project, you may call Marie Smith, MS, RN, DNP candidate, at (520) 260-8600, or at mbrobeck@email.arizona.edu

APPENDIX E:

CLINICAL EXPERT EVALUATIONS

Expert Evaluation Form

Expert Reviewer: Ahmed Saleem, MD

1. The concepts addressed in the pathophysiology section are factual easy to follow.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
2. The concepts addressed in the developmental and behavioral effects section are factual and easy to follow.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
3. The script is written in language that would be easily understood by a community member who is not a healthcare provider.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
4. The information and recommendations provided in the script represent safe, evidenced-based care of substance-exposed children.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
5. How many years have you been in practice? **15 years**

6. In what capacity have you worked with substance-exposed children? **Treatment of neonates undergoing withdrawal 2^0 to maternal use of drugs.**

7. Please provide any additional concerns/comments that you have regarding the video script (i.e. any additional test information or caregiving recommendations/interventions that should be included, changing wording, etc). **None.**

Expert Evaluation Form

Expert Reviewer: Renee Burrous, CPNP

1. The concepts addressed in the pathophysiology section are factual easy to follow.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
2. The concepts addressed in the developmental and behavioral effects section are factual and easy to follow.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
3. The script is written in language that would be easily understood by a community member who is not a healthcare provider.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
4. The information and recommendations provided in the script represent safe, evidenced-based care of substance-exposed children.
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree
5. How many years have you been in practice? **22 years PNP, 3 years NICU nurse**

6. In what capacity have you worked with substance-exposed children? **As nurse in NICU, as PNP in largest newborn nursery in US Dallas, TX. Foster mom, adoptive parent.**

7. Please provide any additional concerns/comments that you have regarding the video script (i.e. any additional test information or caregiving recommendations/interventions that should be included, changing wording, etc). **Research on brain developmental, does drugs in utero alter brain growth. Is brain damaged for life? Do these kids respond to normal behavior modification? Can they respond to normal parenting? Are there brain scan comparisons? Does trauma research apply? Any brain interventions helpful? Neurofeedback?**

APPENDIX F:

PEMAT-A/V EVALUATIONS

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 1/Licensed Foster parent
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	1
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	NA
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	NA

**A very short audiovisual material is defined as a video or multimedia presentation that is under 1 minute, or a multimedia material that has 6 or fewer slides or screenshots.*

UNDERSTANDABILITY SCORE	**100%**
ACTIONABILITY SCORE	**100%**

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 2/Licensed Foster parent
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	1
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	NA
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	NA

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UNDERSTANDABILITY SCORE	100%
ACTIONABILITY SCORE	100%

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 3/Licensed Foster parent
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	NA
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	NA
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	NA

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UNDERSTANDABILITY SCORE	**100%**
ACTIONABILITY SCORE	**100%**

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 4/Licensed Foster parent
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	1
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	NA
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	NA

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UNDERSTANDABILITY SCORE	100%
ACTIONABILITY SCORE	100%

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 5/Licensed Foster parent
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	1
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	1
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	1

**A very short audiovisual material is defined as a video or multimedia presentation that is under 1 minute, or a multimedia material that has 6 or fewer slides or screenshots.*

UNDERSTANDABILITY SCORE	**100%**
ACTIONABILITY SCORE	**100%**

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 6/Licensed Foster parent and kinship caregiver
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	1
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	NA
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	NA

**A very short audiovisual material is defined as a video or multimedia presentation that is under 1 minute, or a multimedia material that has 5 or fewer slides or screenshots.*

UNDERSTANDABILITY SCORE	100%
ACTIONABILITY SCORE	100%

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V)

Title of Material: Caring for Children with Prenatal Substance Exposure: Opioids,...
Reviewer #/ Role: 7/Unlicensed Adoptive Parent
Date of Review: September 28, 2017

Each question has specific response options. Select your response option from the dropdown in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: **CONTENT**		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
TOPIC: **WORD CHOICE & STYLE**		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: **ORGANIZATION**		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: **LAYOUT & DESIGN**		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1 Video = NA	1
13. Text on the screen is easy to read.	Disagree = 0 Agree = 1 No text or all text is narrated = NA	1
14. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree = 0 Agree = 1 No narration = NA	1
TOPIC: **USE OF VISUAL AIDS**		
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	1
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	1

**A very short audiovisual material is defined as a video or multimedia presentation that is under 1 minute, or a multimedia material that has 6 or fewer slides or screenshots.*

UNDERSTANDABILITY SCORE	**100%**
ACTIONABILITY SCORE	**100%**

25

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