



Review

Factors influencing healthcare providers' behaviors in the care of infants with neonatal abstinence syndrome (NAS): An integrative review

Allison Adrian

295 Seven Farms Drive, C-174, Charleston, SC, 29492, USA



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ABSTRACT

Due to a significant increase in the number of infants diagnosed with neonatal abstinence syndrome and the lengthy hospitalization often required for their pharmacologic treatment, a comprehensive understanding of the factors that influence healthcare providers' behaviors in implementing nonpharmacological interventions for infants with neonatal abstinence syndrome is needed. The Whittemore and Knafl methodology guided an integrative review of literature on the current knowledge of the individual and contextual factors that influence healthcare providers' behaviors in implementing nonpharmacological interventions that decrease the length of stay for infants with neonatal abstinence syndrome through the lens of the Theoretical Domains Framework. Results of this review may provide knowledge to inform future interventions and assist in the development and implementation of best practice standards, clinical practice guidelines, and protocols to improve the care of this vulnerable and rapidly-growing patient population: the neonatal abstinence syndrome maternal-infant dyad.

The number of expectant mothers using opiates during pregnancy has increased alarmingly over the past decade, rising nearly five-fold from 2000 to 2009 (Patrick et al., 2012). Among neonates with in-utero exposure to opioids, an estimated 60–90% experience drug withdrawal, a condition defined as neonatal abstinence syndrome (NAS) (Ebner et al., 2007). NAS is characterized by a wide array of bothersome symptoms and complications, including increased irritability, hypertonia, tremors, feeding intolerance, emesis, watery stools, seizures, and respiratory distress, and often results in prolonged hospitalization and extensive pharmacological therapy (American Academy of Pediatrics Committee on Drugs, 1998). According to the National Institute on Drug Abuse, 21,732 infants were born with NAS in the United States (US) in 2012, equivalent to one infant suffering from opioid withdrawal born every 25 min (Patrick et al., 2012).

In a retrospective analysis, Patrick et al. (2015) determined that from 2009 to 2012 the aggregate hospital costs attributed to the care of infants with NAS increased from \$732 million to \$1.5 billion ($p < .001$), with 81% allocated to state Medicaid programs. Their analysis also revealed that the national incidence of NAS increased from 3.4 to 5.8 per 1000 hospital births during the same time period (Patrick et al., 2015). Based on the 2012 estimates, Patrick et al. (2015) determined that decreasing infants' lengths of stay by 2 days could result in a nationwide savings of an estimated \$170 million in hospital charges per year.

In addition to the high healthcare cost of NAS, mothers and infants

encounter negative outcomes as a result of NAS. Hospitalization for NAS most commonly results in an admission to a Neonatal Intensive Care Unit (NICU), disrupting maternal and infant bonding (Patrick et al., 2015). Mitigating the clinical complications of NAS may improve the outcomes that are more challenging to measure, including maternal attachment (Eapen et al., 2014). The significant healthcare costs associated with NAS and the negative impact long hospital stays have on the maternal-infant bond warrant research dedicated to identifying interventions aimed at reducing the infant's length of stay (LOS) while maintaining standards of care.

Extensive research has been conducted on pharmacologic treatment for infants with NAS. Specifically, researchers agree that opiates (oral morphine, methadone) should be first-line treatment (American Academy of Pediatrics Committee on Drugs, 1998). However, the assessment and care management of infants with NAS varies widely among hospitals in the US, and existing assessment and management protocols have been based on minimal empirical data (Bagley et al., 2014). In a recent survey of accredited US neonatology fellowship programs, only 55% had implemented a written NAS protocol, and only 69% used a published abstinence scoring system to determine the severity of withdrawal, which in turn informs the treatments provided (Sarkar and Donn, 2005). The American Academy of Pediatrics (AAP) Committee on Drugs recommends the establishment of a protocol guiding the assessment and management of infants diagnosed with NAS or those at high risk for withdrawal (Hudak and Tan, 2012).

E-mail address: adrian@musc.edu.

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Although nonpharmacological nursing care is critical in decreasing withdrawal symptoms in infants with NAS, minimal research identifying developmentally appropriate nursing interventions exists. Murphy-Oikonen et al. (2010) advise that nurses providing care for infants with NAS receive specialized training that addresses all facets of nursing care, including providing detailed information on addiction and drug use during pregnancy. A central goal of this training is to increase nursing knowledge of NAS and empathy for mothers of infants with NAS, as well as improve nursing morale and interdisciplinary collaboration when caring for challenging cases that require extensive resources (Murphy-Oikonen et al., 2010). According to Velez and Jansson (2008), nonpharmacologic nursing care consists of the careful assessment of mother and infant, provision of caregiving interventions, and the adaptability of environmental and social interactions that support neurodevelopment and physiological stability. Additional examples of nonpharmacologic nursing interventions include swaddling, providing quiet and low-stimulation environments, rooming-in, skin-to-skin holding, breastfeeding (unless contraindicated), and infant positioning (Ryan et al., 2018). Nonpharmacologic nursing care is not intended to be a substitute for pharmacologic treatment; rather, it should be considered the standard of care for substance-exposed infants (Velez and Jansson, 2008). Velez and Jansson (2008) posit that an essential component of nonpharmacologic care is nurses educating mothers on how to properly comfort and care for their infant with NAS.

Due to a significant increase in the number of infants diagnosed with NAS and the lengthy hospitalization often required for their pharmacologic treatment, a comprehensive understanding of the factors that influence healthcare providers' behaviors in implementing nonpharmacological interventions for infants with NAS is needed. The Whittemore and Knafl (2005) methodology guided an integrative review of literature on the current knowledge of the individual and contextual factors that influence healthcare providers' behaviors in implementing nonpharmacological interventions that decrease the LOS for infants with NAS through the lens of the Theoretical Domains Framework (TDF). Results of this review may provide knowledge to inform future interventions and assist in the development and implementation of best practice standards, clinical practice guidelines (CPGs), and protocols to improve the care of this vulnerable and rapidly-growing patient population: the NAS maternal-infant dyad.

1. Theoretical framework

The Theoretical Domains Framework (TDF) provides a structure for assessing and evaluating the factors that affect the behavior of healthcare providers and the implementation of evidence-based practice (Cane, O'Connor and Michie, 2012). The TDF was developed to aid in the simplification and application of various behavior change theories for interdisciplinary use (Cane et al., 2012). The developers of the TDF identified 33 theories and 128 key theoretical constructs associated with *behavior change* and synthesized them into one framework that can be used to assess implementation and other behavioral issues and inform the development of interventions in clinical practice (Cane et al., 2012). The TDF consists of 14 domains of theoretical constructs: 'Knowledge,' 'Skills,' 'Social/Professional Role and Identity,' 'Beliefs about Capabilities,' 'Optimism,' 'Beliefs about Consequences,' 'Reinforcement,' 'Intentions,' 'Goals,' 'Memory, Attention, and Decision Processes,' 'Environmental Context and Resources,' 'Social influences,' 'Emotion,' and 'Behavioral Regulation' (Cane et al., 2012).

The TDF has been used previously to frame a systematic review of interventions aimed at improving the implementation of CPGs in post-fracture care management (Little et al., 2015). Little et al. (2015) explored the clinician behavioral factors targeted by the interventions in the systematic review and how they related to the size of the effect on rates of bone mineral density scanning and osteoporosis treatment. In addition, in a 2014 study, Tavender et al. (2014) examined the factors perceived to influence the uptake of four key evidence-based practices

Table 1
Available databases on the EBSCOhost platform.

EBSCOhost databases
CINAHL Complete; Academic Search Premier; Agricola; Alt HealthWatch; NewsWires; Applied Science & Technology Full Text (H.W. Wilson); CINAHL Plus with Full Text; Computer Source; Criminal Justice Abstracts with Full Text; eBook Collection (EBSCOhost); Education Full Text (H.W. Wilson); ERIC; European Views of the Americas: 1493 to 1750; Fuente Académica; Funk & Wagnalls New World Encyclopedia; GreenFILE; Health Source - Consumer Edition; Health Source: Nursing/Academic Edition; History Reference Center; Library Literature & Information Science Index (H.W. Wilson); Library, Information Science & Technology Abstracts; MAS Ultra - School Edition; MasterFILE Premier; MEDLINE; Middle Search Plus; Military & Government Collection; Newspaper Source Plus; Primary Search; Professional Development Collection; PsycARTICLES; Psychology and Behavioral Sciences Collection; PsycINFO; Regional Business News; Religion and Philosophy Collection; Science Reference Center; Teacher Reference Center; TOPICsearch; Vocational and Career Collection; Web News; AHFS Consumer Medication Information; American Doctoral Dissertations, 1933–1955; eBook Academic Collection (EBSCOhost); Consumer Health Complete - EBSCOhost;

for managing mild traumatic brain injury by using the TDF as the guiding framework. This study was the first step in developing and identifying a targeted, theory- and evidence-informed intervention to improve the management of mild traumatic brain injury in Australian emergency departments (Tavender et al., 2014). The TDF, therefore, is an appropriate theory-based framework to aid in the identification of behavioral factors to target when implementing evidence-based interventions.

2. Methods

Whittemore and Knafl (2005) modified Cooper's framework (Cooper, 1998) to address the challenges of integrating various data sources inherent to conducting integrative reviews. They also identified the following stages to increase reliability of findings and methodological rigor: *Problem Identification, Literature Search, Data Evaluation, Data Analysis, and Presentation* (Whittemore and Knafl, 2005). With these stages in mind, the literature search began by consulting a medical reference librarian at an academic medical center. The following electronic databases were determined to be the most appropriate for this integrative review: Scopus, PubMed, and EBSCOhost (see Table 1). Each database was searched using the following key terms: "Neonatal Abstinence Syndrome" AND "complementary therapy" OR "non-pharmacological interventions" OR "non-pharmacological interventions" OR "nursing interventions" AND "length of stay."

During the first search of the electronic databases, 277 articles were retrieved. After citations were reviewed, 93 articles were determined to be duplicates and were therefore removed. The abstracts of the remaining 184 articles were examined for relevance based on the inclusion criteria: English language, publication in peer review journals, and studies with human subjects. The reference lists of selected articles were also examined for primary sources and additional pertinent articles. Research articles specific to healthcare provider-based individual and contextual factors that decrease the LOS for infants with NAS were included. Articles were excluded if they contained findings that were greater than 10 years old, were not specific to the inpatient NAS population, were not conducted within the US or Canada, did not address provider nonpharmacological interventions as a variable, or did not include the LOS as an outcome measure ($n = 166$). Of the remaining 18 full-text articles, 12 studies were excluded for being reviews ($n = 8$), surveys identifying variation in protocols ($n = 2$), specific to one assessment tool ($n = 1$), and a clinical report ($n = 1$). Six studies met the inclusion criteria for the study sample, and one study was identified through a review of references for a total of 7 studies (see Appendix A). An integrative review matrix (Appendix B) was created to organize the selected articles by author, date, study purpose, study design, setting, sample description, size, data collection methods, and results.

Table 2
Literature/TDF domains/influential factors matrix.

Author, Date	Study Purpose	TDF Domains	Influential Factors
Asti et al. (2015)	Multidisciplinary Task Force created to implement a standardized treatment protocol, discuss strengths and weaknesses of the current medical and nursing management of NAS, and improve communication among staff. Sample: 92 infants; Nationwide Children's Hospital in Columbus, Ohio.	Knowledge, Skills, & Social/Professional Role & Identity	<ul style="list-style-type: none"> • Development of educational program for nursing staff regarding the use of the Finnegan scoring tool. • Use of instructional video, “train the trainer” approach, and super-users. • Multidisciplinary task force improved education, communication, and dissemination of treatment information.
Casper et al. (2014)	A review and analysis of the literature and interviews with neonatal experts guided the development of a nursing CPG for infants with NAS in a level IV NICU. Sample: 56-bed level IV NICU, employing more than 170 RNs; Cincinnati Children's Hospital Medical Center, Ohio.	Social/Professional Role & Identity	<ul style="list-style-type: none"> • Education and interdisciplinary approach was an integral component in revising CPG guidelines and improving neonatal outcomes.
Grossman et al. (2017)	An initiative to improve the quality of care of infants with NAS. Sample: 287 infants; Yale New Haven Children's Hospital.	Skills, Social/Professional Role & Identity	<ul style="list-style-type: none"> • Identified four key factors instrumental in decreasing LOS: nonpharmacologic interventions, simplified assessment of infants, decreased use of morphine, and effective communication between care units. • Formed multidisciplinary team and included parents as integral part of care team.
Murphy-Oikonen et al. (2012)	To evaluate the effectiveness of a CPG on increasing identification of neonates with NAS symptoms based on a toxicology screening protocol, decreasing the mean NAS score and average LOS. Sample: 90 Neonates; Regional Hospital in a mid-size Canadian city.	Knowledge	<ul style="list-style-type: none"> • Identified three significant results post-implementation of CPGs: increased identification of newborns with NAS, decreased NAS severity using the Finnegan scoring tool, and decreased LOS.
Nelson (2016)	The purpose of the focused ethnography was to describe the culture of care and nonpharmacologic nursing interventions performed by NICU nurses for infants with NAS. Sample: 12 full-time nurses; a 44-bed NICU at a Children's Hospital in the southeastern US.	Social/Professional Role & Identity	<ul style="list-style-type: none"> • Six themes were identified in the culture of care for infants with NAS: learn the infant, core team relationships, role satisfaction, grief, making a difference, and education and care of the mother.
Patrick et al. (2016)	Designed and implemented a multicenter quality improvement collaborative for infants with NAS. The objective was to determine if the collaborative was effective in standardizing hospital policies and improving patient outcomes. Sample: 3458 infants; 199 participating centers in the multicenter, multistate quality improvement collaborative.	Knowledge	<ul style="list-style-type: none"> • LOS decreased post-implementation of evidence-based potentially better practices, which were supported by interactive webinars, real-time feedback of outcomes, and sharing improvement practices through electronic forums.
Saunders et al. (2014)	An evidence-based, multidisciplinary NAS protocol was developed using a step-wise continuous quality improvement approach with the goal of standardizing care procedures for infants with NAS. Sample: 413 infants; 60-bed, level III NICU at East Tennessee Children's Hospital.	Knowledge, Skills, & Social/Professional Role & Identity	<ul style="list-style-type: none"> • LOS reduced post-implementation of pharmacologic weaning protocol. • Refined NAS assessment skills, standardized clinical care protocols, including communication with parents.

The primary goal of the data analysis stage is to provide a “thorough and unbiased interpretation of primary sources, along with an innovative synthesis of the evidence” (Whittemore and Knaf, 2005). In this integrative review, the primary sources were first divided into subgroups according to study design and then analyzed for content. Next, data was extracted and coded according to specific themes informed by constructs of the TDF, allowing for the comparison and contrasting of specific issues, variables, or characteristics (Whittemore and Knaf, 2005). Finally, a synthesis of findings was developed to identify key elements, relationships, and frequency of phenomena, and to address conflicting findings.

This integrative review, through the lens of the TDF, identified specific domains that have been addressed in each of the selected studies. A majority of the studies addressed the following key domains from the TDF; *Knowledge* (n = 4), *Skills* (n = 3), and *Social/Professional Role and Identity* (n = 4), (see Table 2). The intent of the data presentation stage is to synthesize the depth and breadth of the subject matter and contribute to a new understanding of the phenomenon of interest, as well as to identify implications for practice, research, and policy initiatives (Whittemore and Knaf, 2005). The conclusions of this integrative review have been reported through text, tables, and matrices.

3. Results

The studies included in this sample (n = 7) were conducted in

hospitals; five studies utilized a quality improvement design (Asti et al., 2015; Casper and Arbour, 2014; Grossman et al., 2017; Patrick et al., 2016; Saunders et al., 2014), one study utilized a retrospective cohort design (Murphy-Oikonen et al., 2010), and one study utilized a focused ethnography design (Nelson, 2016). All studies were evaluated for quality and included in this integrative review due to their data relevance and to the value of information each study provided. Data for the selected studies included historical maternal and neonatal medical record information, including LOS, length of treatment (LOT), interviews, nursing assessments, and withdrawal indexes from NAS scoring tools. A majority of the articles (n = 6) addressed the effects of standardized protocols, CPGs, and provider-based management and treatment of NAS on the severity of NAS and LOS. In addition, Asti et al. (2015) incorporated *The Model for Improvement Methodology* in their quality improvement project, Nelson (2016) used *Roper and Shapira's Framework* for analysis in her focused ethnography, and none of the selected studies incorporated the TDF to inform the study design or implement the intervention(s).

Knowledge, Skills, and Social/Professional Role and Identity were identified as the most influential domains relevant to modifying healthcare providers' behaviors regarding the implementation of non-pharmacological interventions specifically aimed at decreasing the LOS for infants with NAS. The primary themes identified within these domains included knowledge of NAS and AAP recommendations regarding the management of NAS, nursing competence (assessment skills and effective utilization of the Finnegan scoring tool), ability to develop

interpersonal relationships with parents within professional boundaries, ability to establish role and collaboratively work within a multidisciplinary team, and ability to lead in the management and care of infants with NAS. Table 2 identifies the influential factors and TDF domains addressed by each article.

3.1. TDF Domain: knowledge

Modifying the behavior of healthcare providers is critical to achieving the objectives of evidence-based medicine and to ensuring that research findings are translated into clinical practice to improve patient outcomes (Little et al., 2015). The *Knowledge* domain of the TDF includes the following constructs: knowledge, knowledge about condition/scientific rationale, schemas + mindsets + illness representations, and procedural knowledge (Atkins et al., 2017). The following studies addressed the constructs of the TDF *Knowledge* domain that align with the influential factors determined to decrease the LOS for infants with NAS.

In several of the studies, researchers found that the consistent use of standardized protocols for the treatment of, supported by educational interventions for staff, had a significant impact on decreasing the infants' LOS and length of pharmacologic treatment and improving patient outcomes (Asti et al., 2015; Murphy-Oikonen et al., 2012; Patrick et al., 2016; Saunders et al., 2014). In two separate quality improvement projects, Saunders et al. (2014) and Asti et al. (2015) determined the most influential factors on LOS for infants with NAS were the development of formal educational programs for nursing staff regarding the proper use of the Finnegan scoring system and the implementation of a standardized treatment protocols. After implementing a stringent pharmacologic weaning protocol and standardizing the Finnegan scoring tool, Asti et al. (2015) reported a reduction in LOS from 36 days to 18 days for infants with NAS. Saunders et al. (2014) sought to evaluate the effectiveness of an evidence-based, multidisciplinary continuous quality improvement approach and found the LOS was reduced by 10.35 days ($p = .002$) after the implementation of a pharmacologic weaning protocol as the foundational first step of the continuous quality improvement project.

In another quality improvement study, Patrick et al. (2016) developed a multicenter, multistate quality improvement collaborative followed by a retrospective analysis to determine if the collaborative was effective in standardizing hospital policies and improving patient outcomes. The development of evidence-based, potentially better practices was supported by interactive webinars, real-time feedback of outcomes, and sharing improvement practices through electronic forums (Patrick et al., 2016). These educational, collaborative support strategies were effective in standardizing hospital care and improving infant outcomes (Patrick et al., 2016). The researchers found a decrease in the median LOS from 21 days (14–33 days) to 19 days (15–28 days; $p = .002$) and LOT from 16 days (10–27 days) to 15 days (10–24 days; $p = .02$) post implementation of potentially better practices (Patrick et al., 2016).

Comparable to the other studies by Asti et al. (2015), Saunders et al. (2014), and Patrick et al. (2016), Murphy-Oikonen et al. (2012) identified two significant results post-implementation of CPGs: decreased NAS severity using the Finnegan scoring tool and decreased LOS. CPGs provide clinicians with the knowledge of explicit recommendations that assist in the comprehensive care of the maternal-infant dyad (Murphy-Oikonen et al., 2012). Prior to the implementation of CPGs there was wide variation among clinicians in treating infants with NAS. The use of nonpharmacological nursing interventions was incorporated in the CPGs as a first step in the clinical management of infants with NAS.

3.2. TDF domain: skills

The *Skills* domain of the TDF includes the following constructs: skills, competence/ability/skill, assessment, practice/skills development, interpersonal skills, and coping strategies (Atkins et al., 2017).

The following studies addressed the constructs of the TDF *Skills* domain that most relate to factors determined to decrease the LOS for infants with NAS.

The AAP recommends the use of a standardized tool such as the Neonatal Abstinence Scoring System (Finnegan) for evaluation of NAS (Hudak and Tan, 2012). The AAP also recommends the incorporation of an inter-observer reliability educational program for the Finnegan Scoring System to increase clinician competence and overall quality improvement (Bagley et al., 2014). The utilization of standardized assessment tools aids clinicians in determining the severity of neonatal withdrawal, thereby providing data to determine therapeutic pharmacological decisions.

Several of the studies found that specific training for nursing staff regarding the use of the Finnegan scoring tool, refinement of assessment skills, and inclusion of nonpharmacological interventions and parent engagement decreased the infant's LOS and improved communication among care providers and parents (Asti et al., 2015; Grossman et al., 2017; Saunders et al., 2014). For example, in a quality improvement project, Asti et al. (2015) determined that excessive variability in the Finnegan scores documented by the neonatal nurses complicated the treatment and management of infants with NAS. To mitigate the variability, they sought the assistance of a nursing expert in the management of NAS patients and the application of the Finnegan scoring tool (Asti et al., 2015). Through the use of an instructional video and a "train the trainer" approach, "super users" were taught how to assign Finnegan scores based on the signs and symptoms of NAS (Asti et al., 2015). The specific aim of this study was to decrease the LOS from 31 to 24 days; however, the intervention resulted in an even greater decrease in the LOS to 18 days (Asti et al., 2015). The significant decrease in LOS was attributed to the retraining of nursing staff on the utilization of the Finnegan scoring tool (Asti et al., 2015).

Grossman et al. (2017) identified four key factors instrumental in decreasing the average LOS for infants with NAS: nonpharmacologic interventions, simplified assessment of infants, decreased use of morphine, and effective communication between care units. The researchers standardized four nonpharmacologic interventions: 1) Infants were placed in a low-stimulation environment, 2) Staff engaged parents continuously in the care of their infants, 3) Nurses were trained to view nonpharmacologic interventions as equivalent to medications, and 4) The care team encouraged human milk feedings for infants for whom there were no contraindications (HIV, illicit drug use) (Grossman et al., 2017). Contrary to AAP recommendations, Grossman et al. (2017) advised the care team to discontinue the use of the Finnegan scoring tool and develop their own assessment criteria based on the infant's ability to eat, sleep, and to be consoled. By modifying how nurses assessed and treated infants with NAS, the infants' average LOS was reduced from 22.4 to 5.9 days, far below the national average of 23 days for infants requiring pharmacological treatment (Grossman et al., 2017).

Similarly, Saunders et al. (2014) developed and implemented an evidence-based, multidisciplinary NAS protocol using a stepwise continuous quality improvement approach with the objective of standardizing care procedures for the NAS patient population. As part of this protocol, the multidisciplinary team of caregivers refined their NAS assessment skills and focused primarily on: a) standardizing clinical care protocols, including the approach for communicating with parents and the delivery of care to infants; b) ensuring the consistency of clinical staff's use of the Finnegan assessment tool; c) modifying care interventions and the care environment to assist infants with autonomic regulation and sensory integration; and d) implementing measures to optimize feeding tolerance and nutritional status (Saunders et al., 2014). The development of standardized, multidisciplinary clinical care protocols clarified the treatment plan and objectives among all members of the multidisciplinary care team, including the parents, and resulted in a reduction of 10.35 days ($p = .002$) in the infant's LOS (Saunders et al., 2014). An unanticipated positive finding of the Saunders et al. (2014) study was the improvement of the quality of

communication between care providers and parents.

3.3. TDF domain: Social/Professional Role and Identity

The *Social/Professional Role and Identity* domain of the TDF includes the following constructs: identity, professional identity/boundaries, role, group/social identity, social/group norms, and alienation/organizational commitment (Atkins et al., 2017). The following studies addressed the constructs of the TDF *Social/Professional Role and Identity* domain that align with factors identified as decreasing the LOS for infants with NAS.

In a majority of the selected studies, a multidisciplinary treatment approach led to an overall improved outcome for opioid weaning and symptom management for infants with NAS. A study by Saunders et al. (2014) included a multidisciplinary NAS task force including: hospital and community stakeholders, representatives from medicine (neonatology, perinatology, pediatric, and rehabilitation medicine), nursing, pharmacy, social work, hospital administrative staff, volunteers (cuddlers), developmental follow-up therapists, rehabilitation therapists (physical therapy, occupational therapy, and speech-language pathology), child life specialists, and child protective service providers who facilitated community support programs for this vulnerable maternal-infant dyad. The NAS task force facilitated collaborative problem solving, the development of educational programs, new community-based services for infants with NAS and their families, and the redesign of systems targeted towards the improvement of outcomes in existing community services (Saunders et al., 2014). Similarly, Asti et al. (2015) also created a multidisciplinary NAS taskforce that sought to develop and implement a standardized treatment protocol, discuss the strengths and weaknesses of the existing medical and nursing management, and improve communication among staff. Asti et al. (2015) viewed the taskforce as an essential intervention as it facilitated the improvement of education, communication, and the dissemination of critical treatment information among clinical staff.

Like Saunders et al. (2014) and Asti et al. (2015), Grossman et al. (2017) formed a multidisciplinary team that included attending physicians, residents, staff nurses, nursing leadership, child life specialists, and social workers to develop interventions aimed at improving the care and reducing the LOS for infants with NAS. Parents were included as an integral part of the treatment team; therefore, nurses and physicians supported and educated parents on caring for their infants (Grossman et al., 2017). This approach changed the dynamic from one where parents were merely allowed to visit their infants to one in which they were empowered to be the most important part of their infant's care (Grossman et al., 2017). Nelson (2016) presented a similar finding: educating and caring for the mother in a non-judgmental way was essential to mitigate the potential barrier between the healthcare provider and mother to enhance maternal self-efficacy in caring for her infant with NAS.

Similar to Grossman et al. (2017) and Nelson (2016), Casper and Arbour (2014) posited that this complex maternal-infant dyad required parental and clinician education and a multidisciplinary approach to improve maternal and neonatal outcomes. They reviewed and implemented evidence-based, nurse-driven interventions in the revision of their CPGs (Casper and Arbour, 2014). To ensure the revised CPGs addressed the needs of key stakeholders, infants, and their families, multidisciplinary collaborative discussions were scheduled periodically (Casper and Arbour, 2014). Casper and Arbour (2014) found the implementation of CPGs provided nurses with clear direction when caring for their patients resulting in a decrease in the LOS and improved outcomes for infants with NAS.

4. Discussion

The purpose of this integrative review was to explore, critique, and synthesize the current knowledge of the individual and contextual

factors that influence healthcare providers' behaviors in implementing nonpharmacological interventions that decrease the LOS for infants with NAS. The TDF provided a structure for identifying the domains and constructs that align with the influential factors determined to decrease the LOS for infants with NAS.

The primary finding of this integrative review is that the development and implementation of evidence-based, standardized CPGs improves the overall health and developmental outcomes of the NAS maternal-infant dyad as well as reduces the LOT and LOS for the infant (Asti et al., 2015; Casper and Arbour, 2014; Grossman et al., 2017; Murphy-Oikonen et al., 2012; Patrick et al., 2016; Saunders et al., 2014). Several of the studies in this review addressed the constructs of the TDF *Knowledge* domain by demonstrating that the implementation of CPGs and educational training programs for clinicians in the assessment, utilization of scoring tools, treatment, and management of infants with NAS aids in the translation of evidence to clinical practice and improves maternal-infant outcomes (Asti et al., 2015; Murphy-Oikonen et al., 2012; Patrick et al., 2016; Saunders et al., 2014). In addition, the implementation of CPGs clarified the treatment plan and objectives among all members of the multidisciplinary care team, including the parents (Saunders et al., 2014).

Another key finding of this review is that the consistent, skillful use of a standardized withdrawal scoring tool substantially reduces the LOT and LOS for infants with NAS. Several of the studies in this review addressed the constructs of the TDF *Skills* domain by showing that the inclusion of nonpharmacologic nursing interventions, refinement of NAS assessment skills, and accurate scoring of NAS withdrawal symptoms significantly reduced the severity of withdrawal, LOT, and LOS and improved maternal and infant outcomes (Asti et al., 2015; Grossman et al., 2017; Saunders et al., 2014). This is important because inaccurate assessments and utilization of withdrawal scoring tools can lead to unnecessary pharmacologic treatment, which will prolong drug exposure and the duration of hospitalization to the possible detriment of maternal-infant bonding (Hudak and Tan, 2012).

Maguire (2014) suggests that nurses who regularly care for infants with NAS refine their assessment skills and establish high levels of inter-rater reliability using the withdrawal scoring tool, as well as gain expertise in establishing relationships with parents with very specific needs. In addition, Velez and Jansson (2008) posit that the implementation of comprehensive assessments and interventions of the mother in treatment, her infant, and the maternal-infant dyad can improve early maternal nurturing interactions, a critical component of early infant development, particularly in this vulnerable population.

An additional finding of this review is that the development of NAS multidisciplinary teams substantially improves education, communication, and the dissemination of critical treatment information among team members as well as ensures that each team member has the opportunity to present concerns that can be addressed in a collaborative, problem-solving manner (Asti et al., 2015; Casper and Arbour, 2014; Grossman et al., 2017; Saunders et al., 2014). Studies that addressed the constructs of the TDF *Social/Professional Role and Identity* domain indicated a multidisciplinary approach to caring for infants with NAS and their families is an effective strategy to address the healthcare needs of this vulnerable maternal-infant dyad (Saunders et al., 2014). In addition, the healthcare provider has a critical role in the evaluation, treatment, and management of care for this vulnerable and complex maternal-infant dyad; however, the most integral part of a successful treatment plan for the infant is the inclusion of the parents in their infant's care (Grossman et al., 2017; Maguire, 2014; Nelson, 2016). NAS is a rapidly growing, complex health concern with infants, families, and healthcare providers all having individual needs that must be thoroughly addressed to ensure the best outcomes for this vulnerable maternal-infant dyad (Saunders et al., 2014).

5. Limitations

This integrative review focused on the current knowledge of the individual and contextual factors influencing healthcare providers' behaviors in implementing nonpharmacological interventions that decrease the LOS for infants with NAS; therefore, articles that were greater than 10 years old were excluded from this review. In addition, studies that were conducted outside of the US and Canada were excluded due to concerns of generalizability. Although great care was taken to ensure the key terms used would identify the most appropriate studies and publications, it is possible alternate terms could produce findings not included in this review.

One of the studies included in this review had a small sample size, which also may potentially limit generalizability. In addition, one of the studies had limited data or differences in maternal antenatal drug use, which can affect the NAS LOT and LOS (Patrick et al., 2016). Similarly, the retrospective design study was unable to identify neonates who were only exposed to methadone (Murphy-Oikonen et al., 2012). The focused ethnography is a qualitative study, and due to its contextual nature is considered less generalizable; however, due to the rich, thick descriptions of the findings, the data is easily transferable to similar contexts (Nelson, 2016).

Finally, the utilization of the TDF in this context provided challenges because not all domains are necessarily mutually exclusive, with some sharing certain constructs (Little et al., 2015). Given the inferential nature of coding the constructs and themes, there were instances when identifying a targeted domain proved to be difficult (Little et al., 2015). This challenge has been noted in other studies with regard to the lack of clear boundaries within the TDF (Little et al., 2015).

6. Literature gaps

Despite the fact that nonpharmacological nursing care is critical in decreasing withdrawal symptoms in infants with NAS, minimal research identifying developmentally appropriate nursing interventions exists. Further, current NAS assessment and management protocols are based on limited empirical data and more research is needed to identify best practices in the standard of care for the NAS maternal-infant dyad (Bagley et al., 2014). More studies are needed to explore and quantify the effect of parental involvement in the care of their infant with NAS (Grossman et al., 2017). Additionally, further research is needed to understand the long-term developmental implications for infants with early drug exposure (Asti et al., 2015). Finally, this review identifies the factors that have been shown to have the most influence on healthcare providers' behaviors in implementing nonpharmacological interventions and the TDF domains that most closely align with these factors. Additional studies are needed to investigate other domains that may be targeted for future implementation of interventions.

7. Conclusion

Translating the AAP recommendations to practice is important because unnecessary pharmacologic treatment will prolong drug exposure and the LOS to the possible detriment of maternal-infant bonding (Asti et al., 2015; Hudak and Tan, 2012). The significant increase in infants diagnosed with NAS has led to a critical need for the utilization of a standardized, objective, and validated assessment tool to guide the treatment of NAS. Proactive educational strategies targeted to multidisciplinary healthcare providers may be necessary to successfully implement evidence-based recommendations and to ensure changes in clinical practice regarding the management of NAS is consistent with published guidelines (Ambalavanan et al., 2004). The significant healthcare costs associated with NAS and the negative impact long hospital stays have on the maternal-infant bond warrant research dedicated to identifying interventions aimed at reducing the infant's LOS.

Conflicts of interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jnn.2019.07.006>.

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