Improving General Developmental Screening and Surveillance Using ASQ-3 at a Pediatric Primary Care Practice

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Abstract

Identifying early developmental delays in early childhood is paramount to enable timely provision of early intervention services or further evaluation by subspecialty professionals for improved outcomes. In its 2006 policy statement, the American Academy of Pediatrics (AAP) recommends screening all children for general development at ages 9, 18, and 24 or 30 months using a validated screening instrument. The Ages and Stages Questionnaire, third edition, (ASQ-3) is a parent-completed and validated developmental screening tool recognized by the AAP and widely used due to its excellent psychometric properties. The purpose of this project is to incorporate the ASQ-3 into a pediatric primary care practice at targeted ages of 9, 18, and 24 months. Pre/post-education test scores were analyzed after an ASQ-3 in-service education was conducted to the participants. Four-week pre/post-ASQ-3 intervention aggregate data were analyzed and compared. There was a significant increase in the level of knowledge acquired by the participants with an average 36% ($p < .001$) increase on post-test scores, and in the number of referrals made post-ASQ-3 intervention ($p = .05$). Raw data showed 100% of the pediatric provider participants (n=8) used ASQ-3. Limitations include low count data attributed to the COVID-19 global pandemic. A 73% increase in the number of patients seen post-ASQ-3 intervention may signify the increase in referrals was due to chance. Statistically significant findings provide evidence of the advantage of using ASQ-3 to recognize potential developmental delays in discrete ages. Early intervention is critical for a lifetime of gain. This project can help expand the integration of a valid developmental screening tool such as the ASQ-3 to the pediatric primary care practice to improve health outcomes.

Keywords: ASQ-3, developmental screening, developmental delay, early intervention services, developmental surveillance, validated developmental screening tool

Improving General Developmental Screening and Surveillance Using ASQ-3 at a Pediatric Primary Care Practice

Developmental surveillance and screening are fundamental in pediatric health care. The first five years of childhood provide a significant foundation for brain development and functioning that persists throughout a lifetime (Singh et al., 2017). Birth to five years is a pivotal period for cognitive, language, social, and emotional development (Lehr et al., 2016). Early childhood is the most dynamic time to ensure that children develop to their utmost potential (Lehr et al., 2016). Therefore, early detection of developmental delay should prompt timely referral for formal evaluation and interventions to specialized services and programs that can lead to early treatment, enhanced long-term outcomes, and improved quality of life (Lehr et al., 2016; Singh et al., 2017).

Developmental delay essentially means a child is falling behind in at least one developmental domain, such as cognition, behavior, language, and gross/fine motor skills (Gellasch, 2016). Developmental delays suggest a failure to achieve age-appropriate developmental milestones in children under 5 years of age (Lamsal et al., 2018). Recommendations from the American Academy of Pediatrics (AAP), in its 2006 policy statement, advocate for the necessity of developmental screening (the use of a validated developmental screening instrument), in addition to developmental surveillance (a healthcare professional's detection of delay during the course of routine care) in identifying potential developmental delay in children (Hodges et al., 2016). The AAP 2006 policy statement emphasized the use of a validated screening tool to all children at well-child encounters of 9, 18, and 24 or 30 months of age (Gellasch, 2016). The policy statement also stressed the importance of using a validated screening instrument whenever a developmental concern arises on

surveillance, and whenever a parent or caregiver raises a developmental problem outside of the established well-child schedule (Gellasch, 2016; Hodges et al., 2016). The US Administration for Families, Office Planning, Research, and Evaluation indicated that screening should start early and repeated through childhood to be effective, which entails more frequent developmental screening given that developmental and behavioral risks increase with age (Lipkin et al., 2019).

An estimated 10% to 20% of young children will experience developmental problems, but approximately half are recognized before they start school (Singh et al., 2017). The US Centers for Disease Control and Prevention (CDC), in 2014, reported that only 21% of children were subjected to developmental screening between 2007 and 2008 (Gellasch, 2016). Developmental screening using a standardized instrument has been shown to recognize 2 to 6 times more children with concern for developmental delay compared to surveillance alone (Hodges et al., 2016). Moreover, clinical assessments alone would miss approximately 45% of children who may be eligible and can benefit from early intervention services (Gellasch, 2016). If utilized early, appropriate intervention services could address and hopefully improve many developmental problems (Hodges et al., 2016). Literature has reported approximately 54% to 62% of children who engaged in early intervention services were able to leave the programs manifesting age-appropriate behaviors and developmental milestones in cognition and social relationships, as well as enhanced activities of daily living (Gellasch, 2016). Children who benefitted from early intervention programs are more likely to complete their education and become positive contributors to society (Gellasch, 2016).

The AAP, in its 2006 policy statement, stated an acceptable general developmental screening instrument as having a sensitivity and specificity of 70%-80%, and endorsed a combination of developmental surveillance and periodic screening to improve the detection of

early developmental delays ("Identifying infants and young children," 2006). Parent-generated screening tools have grown in use since parent's reports of the child's achievement of developmental tasks are shown to be reliable, accurate, and they foster parental awareness and involvement in the child's development which could lead to more willingness to accept specialized intervention services when appropriate (Singh et al., 2017; Zirakashvili et al., 2018).

The Ages and Stages Questionnaire (ASQ) was created and designed in 1995 by Diane Bricker, Ph.D. and Jane Squires, Ph.D., both professors at the Early Intervention Program Center on Human Development at the University of Oregon, and has undergone revisions (*Meet the developers*, 2021; Singh et al., 2017). The Ages and Stages Questionnaire, currently on its third edition (ASQ-3), is a parent-completed developmental screening tool recognized by the AAP for detecting developmental delays in infants and young children (Zirakashvili et al., 2018). The ASQ-3 is shown to have strong psychometric properties: 92% test-retest reliability, 87.4% sensitivity, and 95.7% specificity (Singh et al., 2017). This screening tool consists of a set of 21 age-specific questionnaires, and each questionnaire consists of 30 items covering five domains: personal-social, communication, gross motor, fine motor, and problem-solving for children ages 2 to 66 months (Singh et al., 2017; Zirakashvili et al., 2018). The ASQ-3 is globally accepted, translated into many languages, and easy to administer, with illustrations that provide a clear format and a reading level from fourth to eighth grade (Singh et al., 2017).

The selected project site is a pediatric primary care clinic. Currently, there is no standardized developmental screening instrument in place that healthcare practitioners use. Developmental monitoring is primarily based on elicited information from the parent or caregiver about the child's attainment of age-appropriate developmental tasks at scheduled well-child visit, in addition to clinical observation and evaluation (Valla et al., 2015). Given the lack

of a standardized approach, the interaction can be affected by time constraints, patient load, and language barrier. The ASQ-3 is intended to optimize the care rendered at the pediatric primary care clinic in improving early detection of developmental delays with subsequent initiation of appropriate referrals to specialized intervention services or subspecialty professionals for formal evaluation.

Project Question

In a group of healthcare providers at a pediatric primary care clinic, will the use of ASQ-3, compared to current practice, improve and increase the early recognition of developmental delays in a four-week time frame?

The PICOT format: Population, Intervention, Comparison, projected Outcome, Time needed to demonstrate an outcome (Reavy, 2016) was used to formulate the project question.

Population

The population of interest is the healthcare providers working at a pediatric primary care clinic consisting of pediatricians, nurse practitioners, and medical assistants. Pediatric healthcare professionals have the responsibility to identify conditions critical to the early and long-term developmental well-being of children, and prompt detection is key (Lipkin et al., 2019). The "watch and wait" attitude prevalent in primary care could deprive the child of the benefits of early recognition and intervention (Gellasch, 2016, p. 357; Lipkin et al., 2019).

Intervention

The intervention chosen through a review of literature is the use of ASQ-3 as a standardized instrument for general developmental screening at the 9-, 18- and 24-month health supervision visits as recommended by the AAP (Lipkin et al., 2019). The ASQ-3 is a validated tool recognized by the AAP (Zirakashvili et al., 2018). The ASQ-3 has demonstrated a strong

evidence of validity and reliability and boosts the engagement of parents in the developmental screening process of their children (Zirakashvili et al., 2018).

Comparison

The use of ASQ-3, as supported by experts, is compared to the current practice of healthcare practitioners at a pediatric primary care clinic of not utilizing a validated tool for initial level developmental screening at the recommended 9-, 18-, and 24-month well-child visits. Chart reviews are conducted pre/post-ASQ-3 implementation for comparison.

Outcome

The desired outcomes for this evidence-based practice change are: 1) an increase in the percentage of pediatric professionals at a pediatric primary care clinic that used ASQ-3 at the 9-, 18-, and 24-month wellness visits that denotes compliance through enhanced knowledge about its application; 2) an increase in the early detection of developmental delays at the targeted ages; and 3) an increase in the referrals to early intervention services or subspecialty pediatric professionals once a developmental delay is identified.

Time

The four-week time frame is sufficient in measuring the outcomes. This time frame is sufficient to determine ASQ-3 pre/post-education test scores amongst participants, the percentage of pediatric professionals that used ASQ-3 at the targeted age groups, the difference in the number of developmental delays identified pre/post-ASQ-3 intervention, and the difference in the number of referrals made to early intervention programs and subspecialty pediatric providers pre/post-ASQ-3 implementation.

Search Methods

A search for pertinent literature was conducted using databases at Touro University Nevada and the American Academy of Pediatrics website. The electronic literature search included the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, ProQuest One Academic, and Science Direct Health and Life Sciences College Edition. The keywords used were ages and stages questionnaire, ASQ-3, developmental screening, developmental surveillance, validated developmental screening tool, developmental delays, and early intervention services. The Boolean operators "AND" and "OR" were used to narrow down the search and yield relevant results.

Inclusion/Exclusion Criteria

Inclusion criteria included peer-reviewed journals within the last five years (2015-2020), English only, free full text, and national recommendation. The literature search focused primarily on ASQ-3 and early detection of developmental delays. Articles older than five years found to be pertinent to the project were also included, such as national guidelines not updated from the AAP and validity studies conducted on ASQ-3. Exclusion criteria included articles older than five years, ASQ: SE (Social-Emotional), and developmental disabilities.

The ASQ: SE is excluded because it is a focused screening on emerging social, emotional, and behavioral problems in ages 3 to 65 months (Marks et al., 2019). Articles on developmental disabilities, such as autism, were excluded because this project's focus is on the early recognition of developmental delays. Developmental disability is not synonymous with developmental delay (Singh & Anekar, 2018). Developmental disability is a health issue that may linger on, but progress can be made, whereas a developmental delay is mostly a short-lived issue that a child can outgrow with the help of early intervention services (Singh & Anekar, 2018).

The literature search resulted in 210 articles from ProQuest One Academic, 116 articles from CINAHL, 364 articles from PubMed, and 398 articles from Science Direct Health and Life Sciences. Additional filters such as PDF full text further narrowed down the yield of articles. From the criteria, 17 of the most relevant journals from the US and other countries were then chosen. The AAP website yielded four articles about general developmental screening and surveillance recommendations from birth to five years that have evolved over time and were used for this project.

Review Synthesis

Impact of the Problem

The child's early years, specifically the first three years of life, are considered critical periods that lay the foundation for physical, cognitive, social, and emotional development (Singh & Anekar, 2018). A developmental delay may be a result of a short-lived problem, such as a physical delay caused by an extended stay at the hospital, or a speech delay from hearing loss caused by an ear infection, or delays may signify early warnings of attention and learning issues (Singh & Anekar, 2018). Failure to recognize early signs of developmental delays in early years can result in profound challenges in children that can lead to poverty and exclusion later in life (Singh & Anekar, 2018). Prompt intervention can often support these children in meeting their specific milestones (Singh & Anekar, 2018).

Addressing the Problem with Current Evidence

Early intervention programs have been shown to positively change a child's developmental direction and improve outcomes socially and academically (Barger et al., 2018; Singh & Anekar, 2018). Increasing evidence suggests developmental monitoring or surveillance alone is insufficient in recognizing children at risk for developmental delays (Barger et al.,

2018). Developmental screening using a standardized tool in tandem with developmental surveillance is suggested (Barger et al., 2018).

Literature Theme Development

Relevant Background. Given that developmental delay at the preschool age is an important target for health care due primarily to its potential for lifelong negative impact, early recognition and referral to early intervention services provide the greatest benefits (Hernandez-Mekonnen et al., 2016). Based on economic evaluation, there is a high return on investments for developmental programs and services indicated for ages 0 to 5 years, and the earlier and younger the provision of such services, the higher the rate of return (Marks et al., 2019). This economic evaluation is deemed one of the many reasons the AAP recommends universal screening for an array of problems, particularly for developmental delays at specified age groups (9, 18, 24 or 30 months) (Marks et al., 2019). Despite the known benefits, however, a vast majority of children in need of early intervention assistance are not detected until they enter school age (Barger et al., 2017).

What is Currently Understood. The pediatric primary care office is the best place for developmental screening because it is the only place where most of the pediatric population younger than five years are seen ("Developmental surveillance," 2001). Parents rely on pediatric professionals to be knowledgeable and experts not only in pediatric diseases but more so in childhood development ("Developmental surveillance," 2001). However, it is estimated that only about 30% of children with developmental delays are detected without the use of valid screening tools (Agarwal et al., 2020). Likewise, research suggests that no more than 50% of pediatric professionals in the US routinely use validated screening tools in their practice despite their recommendation (Schonhaut et al., 2018).

Current Recommendations. The AAP released a developmental screening algorithm in its 2006 policy statement to assist pediatric professionals on how to address developmental concerns in children from birth to 3 years of age ("Identifying infants," 2006). The AAP 2006 policy statement suggested developmental surveillance at every well-child preventive encounter, and any developmental problem during surveillance should be followed with a standardized developmental screening test ("Identifying infants," 2006). More importantly, the AAP 2006 policy statement emphasized developmental screening tests using a validated instrument performed regularly at the 9-, 18-, and 24- or 30-month well-child visits and any concerns should prompt early intervention ("Identifying infants," 2006). According to the AAP, a combination of developmental surveillance and screening using a valid tool heightens the probability of detecting early developmental delays ("Identifying infants," 2006). For reimbursement purposes, developmental screening test can be performed at 24 months of age in lieu of the 30-month visit, since the 30-month wellness check is not part of the preventive care system and not reimbursable by third-party payers ("Identifying infants," 2006). In addition, since the frequency of regular wellness visits decreases after 24 months, the pediatric provider should conduct developmental screening during the 24-month wellness encounter ("Identifying infants," 2006).

An update to the AAP 2006 policy statement was released in December of 2019 and published in the January 2020 *Pediatrics*. The updated policy emphasized performing a regular developmental screening test to all children at the 9-, 18-, and 24- or 30-month health supervision visits using a valid instrument (Lipkin et al., 2019). At the specified intervals, periodic regular developmental screening with a valid tool is more likely to detect problems than a single screening, particularly in milestones that develop later, such as language (Lipkin et al., 2019). If the child misses a 9-, 18-, 24-, or 30-month visit, a general developmental screening

test should be performed at the next earliest opportunity (Lipkin et al., 2019). Developmental surveillance should carry on throughout childhood, with particular attention to surveillance at the 4- to 5- year well-child encounters before entry to school, and screening with a valid instrument performed when a delay is suspected (Lipkin et al., 2019).

The updated AAP statement also reinforced the engagement of families as collaborative partners in the developmental surveillance and screening of their children, as well as input from other professionals such as childcare providers, preschool teachers, and developmental therapists (Lipkin et al., 2019). In addition, pediatric professionals should perform or refer a child with developmental concern for a complete developmental and medical evaluation to pediatric subspecialists (Lipkin et al., 2019). The updated statement also reinforced referral to early intervention programs or preschool special education as necessary (Lipkin et al., 2019).

ASQ-3 as a Validated Tool. Review of research on the ASQ in the US and internationally (North America, South America, Asia, and European countries) demonstrated the usefulness of the ASQ-3 to increase early identification of developmental delays and improve outcomes before developmental delays and disabilities become apparent in children less than five years of age (Singh et al., 2017). The ASQ-3 was found to be acceptable as a valid instrument to identify potential problems in child development at ages 2 to 2.5 years before entry to nursery school in England (Kendall et al., 2019). The mixed-method qualitative study by Kendall et al. (2019) demonstrated an enhanced relationship between parents and healthcare professionals by enabling parents to assess their children and work in partnership with pediatric professionals using ASQ-3.

A cross-sectional study by Abo El Elella et al. (2017) showed a correlation between children in preschool age with suspected developmental delay and parental concerns using ASQ-

3. The study suggested ASQ-3 to be a useful component in pediatric preventive and wellness care (Abo El Elella et al., 2017). Lamsal et al. (2018) conducted a prospective cohort study that analyzed data from the National Longitudinal Survey of Children and Youth in Canada restricted to ages 4 to 5 years. The ASQ has demonstrated a sensitivity of 83.6% at 24 months for detecting early neurodevelopmental disorder and a high negative predictive value of 92.9% to 97.6% at all time points in identifying children not at risk for developing neurodevelopmental disorder (Lamsal et al., 2018).

A prospective cohort study by Valla et al. (2015) used the ASQ to investigate the prevalence of suspected developmental delays at ages 4, 6, and 12 months in Norwegian infants. The study showed prevalence rates between 5.7% and 7% in ages 4 and 12 months and delay in the gross motor area is most frequent during the first year of life (Valla et al., 2015). Agarwal et al. (2020), in a longitudinal cohort study as part of the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) research project, found that ASQ-3 had a good correlation between its domains and internal consistency, and ASQ-3 was shown to be a beneficial and valid screening tool for a multi-ethnic, low-risk cohort in Singapore. In another longitudinal cohort study by Schonhaut et al. (2019), the Spanish ASQ-3 administered at 24- and 48-month intervals proved to be reliable for developmental screening and out-patient follow-up in children born late-preterm (34-36 weeks gestation) and term (37-41 weeks). At the 24-months screening, two or more domains at the referral zone indicated risk for developmental delay at 48 months (Schonhaut et al., 2019).

A validity study by Mezawa et al. (2019) quantified the psychometric properties of the Japanese translation of 10 ASQ questionnaires (J-ASQ-3) at every six months interval from age six to 60 months. The validity of J-ASQ-3 was demonstrated in comparison with the Kyoto Scale

for Psychological Development (KSPD) and the Japanese version of the Denver Developmental Screening Test (J-Denver II) (Mezawa et al., 2019). Compared with KSPD, J-ASQ-3 had an overall sensitivity of 92.1% to 96% and specificity of 48.8% to 74.9% (Mezawa et al., 2019). Compared with J-Denver II, the J-ASQ-3 overall sensitivity was 56.3% to 75.6% and the specificity was 74.7% to 93% (Mezawa et al., 2019).

Another validity study by Halbwachs et al. (2013) based on a population of children born preterm (less than 35 weeks gestation) at five years of age demonstrated the usefulness of ASQ in detecting severe developmental impairment (sensitivity of 0.85 and specificity of 0.54) when compared with a formal standardized test, the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) administered by a professional (Halbwachs et al., 2013). The WPPSI is the most widely used psychometric evaluation instrument for measuring intelligence quotient (IQ) and intellectual functioning in preschool children who had cardiac surgery, born preterm, or suffered from severe neonatal illness (Halbwachs et al., 2013). In addition, a critical finding in this study showed that ASQ results were not influenced by maternal educational levels (Halbwachs et al., 2013).

ASQ-3 Compared with Bayley-III. The Bayley Scales of Infant Development, currently in its third edition (Bayley-III), is considered the gold standard tool that is most often used to formally assess and evaluate infant development (Kerstjens et al., 2015). The Bayley-III is also the gold standard in the structured follow-up care of and research on children born very-preterm and in other groups considered to be high risk (Kerstjens et al., 2015). However, this instrument is lengthy, costly, and requires a trained professional such as a psychologist to administer (Agarwal et al., 2017).

The ASQ-3 was compared to Bayley-III in children with congenital heart disease (CHD) who had cardiac surgery during infancy and are at increased risk for developmental challenges (Noeder et al., 2017). The comparative study revealed that ASQ-3 manifested accuracy in screening for delays in children with CHD than relying on clinical risk factors alone (Noeder et al., 2017). On the same note, Kerstjens et al. (2015) demonstrated the ability of ASQ-3 to detect or exclude neurodevelopmental impairment in very preterm-born children (born at less than 32 weeks gestation) at the corrected age of two, using Bayley-III as a comparison instrument. In this comparison, the ASQ-3 demonstrated excellent sensitivity at 100%, its specificity was acceptable at 76%, and its negative predictive value at 100% (Kerstjens et al., 2015).

Agarwal et al. (2017) evaluated the diagnostic agreement of ASQ-3 with the gold standard Bayley-III in a cohort of infants born preterm with very-low-birthweight (less than or equal to 1250 grams), without major congenital malformations and at risk for neurodevelopmental impairment, at the corrected age of 24 months. The result showed that at 24-months screening, the ASQ-3 had high sensitivity and negative predictive value (NPV) for overall assessment (>90% NPV for communication, motor, and overall assessment), and high sensitivity and specificity for domain-specific evaluations (86% sensitivity and 80% specificity for motor domain; 89% specificity for communication), indicating its diagnostic agreement with Bayley-III, and its utility in neurodevelopmental screening of high-risk infants (Agarwal et al., 2017).

Evidence Gaps and Controversies

In 2015, the U.S. Preventive Services Task Force (USPSTF) declared that there is not enough evidence to determine that screening for speech and language delay in asymptomatic children ages 0 to 5 years is beneficial or harmful and did not endorse universal developmental

screening (Albano & Noritz, 2016). Despite this claim, the AAP and the CDC continue to endorse screening for general development to all children, regardless of overt symptoms, using a standardized tool at recommended intervals (9-, 18-, and 24- or 30-month well-child visits) and on surveillance when a delay is suspected, given that one in four children at the early years of 0 to 5 has a risk for developmental delay (Albano & Noritz, 2016). The AAP stands by its 2006 policy guidelines and stated that no harm has resulted in the efforts to detect early delays using valid screening instruments that provide the opportunity for early treatments (Albano & Noritz, 2016).

Contextual Evidence

Children achieve development in spurts, and mild delays and deviations from the norm are challenging to recognize in many cases ("Developmental surveillance," 2001). Development in children is a vigorous process that is often hard to measure and waiting until a child misses a developmental milestone may culminate in late rather than early detection ("Developmental surveillance," 2001). Suboptimal care, therefore, can have profound negative consequences in a child's life and future. Delays in intervention can be costlier, less effective, and burden families with stress and uncertainty (Albano & Noritz, 2016).

As such, there is undoubtedly a need to increase the utilization of validated instruments to screen children for developmental delays in the primary care setting. Literature has significantly emphasized using developmental screening tools which promotes the mechanism of early detection that can assist those children with emerging developmental delays (Barger et al., 2017; Marks et al., 2019). The ASQ-3 is a general developmental screening tool with established reliability and validity and recognized by the AAP ("Identifying infants," 2006; Mezawa et al., 2019). The ASQ-3 has been widely used in research and clinical settings globally (Mezawa et al.,

2019). Periodic developmental testing using a valid screening instrument and consistent surveillance in the early years of life are necessary to recognize emanating delays as the child grows (“Developmental surveillance,” 2001). Developmental monitoring in combination with developmental screening using a valid tool may recognize more children with developmental delays that require early intervention services than either developmental monitoring or developmental screening performed separately (Barger et al., 2018).

Project Aim

The aim of this DNP project is to incorporate a validated screening tool, the ASQ-3, in the regular screening for general development to all children at the 9-, 18-, and 24-month well-child visits at a pediatric primary care clinic. Incorporating the ASQ-3 into the clinical practice of a group of pediatric professionals aligns with the current national guideline from the AAP that can lead to early recognition of developmental delays and referral to early intervention programs or subspecialty pediatric professionals for formal evaluation. Given that surveillance has its limits, periodic developmental screening with a valid instrument performed at the 9-, 18-, and 24-month wellness encounters can detect a developmental problem not recognized by surveillance or an earlier screening test (Lipkin et al., 2019).

Project Objectives

In the 4-week timeframe of this DNP project, the pediatric primary care clinic will have:

1. Implemented a validated screening tool, the ASQ-3, in the regular screening for general development at the 9-, 18-, and 24-month health supervision visits.
2. An improved knowledge of the participants about ASQ-3 after an in-service education is administered with a minimum rate of 80% on test scores.

3. An increase in the percentage of pediatric professionals that used ASQ-3 at the 9-, 18-, and 24-month wellness check in compliance with AAP guidelines to a minimum of 90%.
4. A significant increase in the number of developmental delays detected at ages 9, 18, and 24 months using ASQ-3 relative to pre-intervention.
5. A significant increase in the number of referrals made to early intervention services or subspecialty pediatric providers using ASQ-3 at ages 9, 18, and 24 months relative to pre-intervention.

Theoretical Framework

The guiding theory for this DNP project is Kurt Lewin's Change Theory (see Appendix A). Lewin's theory pioneered today's modern-day change theories and models and has three stages: unfreezing, moving/changing, and refreezing (Allen, 2016). The unfreezing stage involves assessing the current situation and procuring the necessary resources and support for the change; the moving/changing stage is the implementation stage; and the refreezing stage involves institutionalizing the change, so it is sustained over time (Allen, 2016).

Change is evolutionary and integral to progress (Mitchell, 2013). A systematic approach to change is vital (Allen, 2016). Planned change, merited to Kurt Lewin, that is purposeful, calculated, and collaborative is essential in order to overcome the challenges in its implementation and sustainability (Mitchell, 2013). Evidence dictates suboptimal management of a proposed change can lead to negative effects that include heightened resistance to future changes, increased stakeholder turnover, hostility, and low morale (Allen, 2016). Kurt Lewin's Change Theory was chosen for this DNP project due to its simplicity and influence on many contemporary theories.

Historical Development of the Theory

Professionals in the field of psychology have long considered Kurt Lewin (1890-1946) to be the father of social psychology (Coghlan & Brannick, 2003). His contribution and influence, particularly in planned change, is well-documented and widely accepted (Coghlan & Brannick, 2003). The development of Lewin's Change Theory is traced back to his research in changing meat-eating habits due to a meat shortage in the US during the First World War (Coghlan & Brannick, 2003). The research involved changing women's habits in the forms of meat they provided to their families by learning new habits that included serving the meat they previously would not serve and found to be inferior (Coghlan & Brannick, 2003). It was through this research that Lewin conceptualized people change when they encounter the need for change (unfreezing), move to a new practice or behavior (moving), and stabilize the changed behavior over time (refreezing) (Coghlan & Brannick, 2003). Since then, Lewin's work has been implemented in a range of domains: work design, training, team development, running meetings, systems change, participative methods, leadership styles, consultation skills, change theory and action research, and survey feedback methods (Coghlan & Brannick, 2003).

Major Tenets of the Theory and Application to the DNP Project

A major tenet of Lewin's Change Theory emphasized helping people realize the need for change and take ownership of it creates the motivation and the driver for the change to occur (Coghlan & Brannick, 2003). Decreasing the threats and barriers and establishing psychological safety enable stakeholders to engage in the change process and ensure it survives (Coghlan & Brannick, 2003). Thus, the main elements of Lewin's three-stage change theory are used to implement change effectively at a pediatric primary care setting.

Unfreezing. The first stage in the change process, unfreezing, is crucial because it establishes the foundation for the change project (Allen, 2016). The unfreezing stage involves

steps deemed necessary in preparing for the change: (1) situational analysis views the current situation and why change is desirable; (2) stakeholder analysis identifies the different levels of power or influence stakeholders have in the change process; (3) resource analysis identifies the project's resource needs and considers the resources already in place; (4) developing a business case delineates the potential benefits and drawbacks of the project, particularly operational finances and hidden costs; (5) securing senior management support beneficial and essential for the planned change; (6) forming an implementation team responsible for the project's implementation; (7) ensuring readiness for change that reflects the extent of the organization's inclination to accept the change project; and (8) developing a communication plan that outlines the reasons for the change tailored to the different stakeholders (Allen, 2016).

At a pediatric primary care clinic, the current practice of not utilizing a validated screening instrument in evaluating general development in the first five years of life is found by literature to render suboptimal care (Singh et al., 2017). The pediatric professionals are the main stakeholders in this change project. Influencing these stakeholders to utilize a validated screening instrument involves obtaining support from the Chief Executive Officer, the Medical Director, and the office manager, and includes acquiring the necessary resources needed for the project. The pediatric providers and medical assistants comprise the implementation team. Educational training on ASQ-3 with a synopsis of the most recent recommendations from the AAP are critical for the success of this quality initiative.

Changing/Moving. The second stage, changing/moving, is the project implementation, which involves performing all the necessary processes and activities to actualize the change (Allen, 2016). Appropriate stakeholder education and training are important in this stage as it arms them with adequate knowledge and resources to implement the project (Allen, 2016).

Implementing the ASQ-3 at this stage requires active participation and communication of the different stakeholders. Coaching and educational reinforcement may be needed.

Refreezing. The final stage, refreezing, involves evaluating and sustaining the change (Allen, 2016). The project is evaluated on its effectiveness in addressing the problem and achieving the desired outcome (Allen, 2016). Sustainability of the change is also determined, and adjustments made to institutionalize the change to minimize the "improvement evaporation effect," whereby the change dwindles over time (Allen, 2016, p. 66). Evaluating the effectiveness of this DNP project constitutes a pre- and post-change comparison that also determines the potential for sustainability, what worked, and what needs to be improved (Allen, 2016).

Setting

The project site is a privately-owned, medium-suburban, pediatric primary care practice located in Southern Nevada. The clinic serves a pediatric population from birth to 18 years of age, representing a diverse range of cultural and racial backgrounds. The clinic serves this population for health and wellness and non-emergent sickness visits. Patients are placed on scheduled appointments, and same-day walk-in encounters are also accommodated. Most of the patients utilize Medicaid health insurance to pay for services, while the rest have private insurances or pay the cost out-of-pocket. The clinic utilizes an electronic medical record (EMR), Practice Fusion, that enables electronic prescribing. Data from the EMR will be utilized pre-and post-project implementation for statistical analyses. Structurally, the clinic has two triage cubicles, ten exam rooms, front office, waiting lobby, a billing section, a referral section, an in-house laboratory, the clinic manager's office, the CEO's office, and provider rooms.

Population of Interest

The population of interest is the pediatric professionals and medical assistants directly engaged in the implementation of ASQ-3 at the 9-, 18-, and 24-month wellness visits. Currently, there are three pediatricians, five nurse practitioners, and seven medical assistants providing care at the pediatric primary care clinic. Inclusion criterion includes healthcare personnel directly involved in patient care. These healthcare personnel are currently employed at the pediatric practice and actively credentialed to perform direct patient care as outlined on their specific job descriptions. Exclusion criterion includes clinic staff not directly associated with patient care. The billing personnel, referral personnel, clinic manager, and assistant clinic manager are excluded.

The population indirectly impacted by this quality improvement initiative are the children ages 9, 18, and 24 months. The AAP has specified for these ages to be periodically screened for general development which is the focus of this DNP project (Lipkin et al., 2019). Inclusion criterion includes pediatric population ages 9, 18, and 24 months seen for health and wellness visits. Exclusion criteria include sick visits and pediatric population greater than five years of age.

Stakeholders

The key stakeholders in this project include the medical director, the CEO, the office manager, the pediatric healthcare providers, as well as the pediatric population ages 9, 18, and 24 months indirectly impacted. The medical director is the content expert, supporter, and facilitator. The medical director is consulted on the interpretation of current evidence-based literature about the project and advises on the accuracy of the content. The medical director also monitors the cooperation of the pediatric providers in the implementation of this quality improvement initiative. Support from the administration is elicited from the CEO, the office manager, and the

assistant office manager for the necessary resources needed. The office manager and the assistant office manager are the facilitators that ensure the cooperation of the medical assistants in the implementation process. The ASQ-3 is provided to and completed by parents of children ages 9, 18, and 24 months and scored by medical assistants. The pediatric health care providers comprise the implementation team and will interpret the screening results.

As previously pointed out, the recognition of developmental problems is an essential component of well-child health supervision ("Identifying infants," 2006). Parents expect their children's pediatric providers to be knowledgeable and fully engaged in their children's continuous and comprehensive care ("Identifying infants," 2006). Implementing the ASQ-3 to regularly screen children at ages 9, 18, and 24 months for general development complies with the guidelines set forth by the AAP for developmental screening and aligns with the pediatric practice's mission to provide safe, current, and equitable care to all patients (Lipkin et al., 2019). The involvement and efforts of the key stakeholders in the implementation of this project are profoundly integral to its success. There is current and existing affiliation agreement between the project site and Touro University Nevada (see Appendix B). The CEO has also given his consent for the implementation (see Appendix C).

Interventions

The integration of ASQ-3 to the practice of pediatric providers will serve as a quality improvement initiative and an educational update on the current evidence-based guidelines set forth by an esteemed and trusted organization such as the American Academy of Pediatrics. The AAP recommends regular screening of all children for general development using a validated instrument such as ASQ-3 at ages 9, 18, and 24 months (Lipkin et al., 2019). A week prior to the project implementation, the ASQ-3 in-service training will be made known to the pediatric

providers and clinic staff as a flyer (see Appendix D) posted at the provider's bulletin board, clinic staff's bulletin board, and staff lounge.

For the first week, the ASQ-3 in-service training will be performed at the staff lounge on a lunch break using a PowerPoint presentation. This PowerPoint presentation will also be disseminated to the providers via email to serve as reference. A pre/post-education test will be performed to gauge comprehension of ASQ-3 and determine the application of concepts learned. A one-month pre-implementation retrospective EMR chart review will be done using the following key parameters: well-child visits at 9, 18, and 24 months; developmental delays identified at ages 9, 18, and 24 months on any of the five domains (communication, fine motor, gross motor, problem solving, and personal-social) using International Classification of Diseases (ICD) codes; and referrals made to early intervention services or subspecialty pediatric providers. These data will be pulled from the current EMR application, Practice Fusion, at the pediatric clinic's password protected computers. Project implementation will begin the day after the in-service education.

For the subsequent three weeks, the age-appropriate ASQ-3 questionnaire will continue to be given to parents of children ages 9, 18, and 24 months at their well-child encounters by the medical assistants. The medical assistants will explain the dynamics of the questionnaire to the parents and will score the test before the child is seen by the provider. The pediatric provider will then interpret the scores of the five domains based on the interpretation scale embedded in each age-specific ASQ-3 questionnaire. Support and coaching will be provided to the pediatric providers and medical assistants throughout the implementation period. Rapport and professionalism will be maintained. Upon completion of the wellness visit, the completed age-specific ASQ-3 questionnaire will be scanned to the EMR by the medical assistants and stored as

part of the patient's medical record. If a referral to early intervention services or subspecialty pediatric professionals is needed based on the ASQ-3 score interpretation and clinical judgement by the pediatric provider, the referral department will contact the parent or caregiver of the child using available contact information once eligibility is confirmed.

For week five, a post-implementation EMR chart review will be performed. The parameters for the EMR review will include children ages 9, 18, and 24 months screened using ASQ-3; developmental delays identified using ASQ-3 in ages 9, 18, and 24 months in any of the five developmental areas (communication, fine motor, gross motor, problem solving, and personal-social) using ICD codes; and referrals made to subspecialty pediatric providers or early intervention programs. Debriefing of the results to the pediatric clinic staff will commence once a statistical analysis is generated.

Tools

In-Service Training PowerPoint Presentation

The in-service training is conducted using a formulated PowerPoint presentation (see Appendix E) delineating the ASQ-3 questionnaire and its application. Embedded in the PowerPoint presentation are step by step instructions on how the ASQ-3 is performed, referral strategies to outside entities as applicable, and billing codes. The PowerPoint presentation also discussed the significance of incorporating ASQ-3 in the practice of screening for early developmental delays as endorsed by the AAP (Singh et al., 2017). A flowchart is presented that outlines the steps in performing developmental surveillance and screening of children from birth to five years and incorporates ASQ-3 to screen all children at ages 9, 18, and 24 months (*Free resources,* 2021; Lipkin et al., 2019).

Pre/Post-education Questionnaire

A pre/post-education questionnaire (see Appendix F) is formulated and administered to pediatric providers and medical assistants. The formulated questionnaire is composed of 10 multiple choice questions with low to moderate level difficulty and only one best answer. The questionnaire tests each participant on ASQ-3 significance, scoring, and interpretation, as well as knowledge of expected developmental milestones at ages 9, 18, and 24 months. The questionnaire is conducted to evaluate the knowledge, comprehension, application, and analysis of concepts learned. The passing score is set at 80%. In the event a participant fails, a review is provided, and second testing implemented.

Content validity index (CVI) is used to examine the relevance of the formulated test questions to the ASQ-3. This is achieved by having a panel of content experts rate the formulated test questions and calculating the CVI (see Appendix G). Ratings from the three experts were between 3 (moderately relevant) to mostly 4 (highly relevant) that resulted to I-CVI (item-content validity index) of 1 (excellent) for each question, and hence, all ten questions were used for the questionnaire (L'Ecuyer et al., 2020).

9-, 18-, 24-month ASQ-3 Developmental Screening Tool

The 9- (see Appendix H), 18- (see Appendix I), and 24-month (see Appendix J) ASQ-3 questionnaires will be used as instruments for screening the general development of children at these ages. This follows the current guideline issued by the AAP (Lipkin et al., 2019). As previously noted, the ASQ-3 is an established tool validated by numerous studies all over the world and available in several languages including Turkish, Norwegian, Dutch, Persian, Arabic, English, Hindi, French, Thai, Korean, Spanish, Chinese, and Vietnamese (Singh et al., 2017). The Ages and Stages questionnaires were normed on 2008 children from different ethnic and

socioeconomic backgrounds that resulted in a sensitivity of 0.70 to 0.90 (moderate to high) and a specificity of 0.76 to 0.91 (moderate to high) (“Identifying infants,” 2006).

Each ASQ-3 questionnaire has 30 items, six items in each of the five domains: personal-social, fine motor, gross motor, communication, and problem-solving (Singh et al., 2017). Each item has three response options of “yes,” “sometimes,” and “not yet” that are given scores of 10, 5, and 0, respectively (Agarwal et al., 2020). The total scores on each developmental area are obtained and compared to established “cut-off points” at one or two standard deviations used to categorize children at risk for developmental delay (Lamsal et al., 2018). Risk categorization of “above cutoffs” or “typical development” is indicated by developmental area total scores higher than one standard deviation (SD) cutoff; the child’s development is monitored if the score on any area falls within the one SD and two SD cutoff points; and referral for further evaluation is advised when the score in any developmental area is below the two SD cutoff, or “positive screen” (Agarwal et al., 2020; Lamsal et al., 2018). The developers of ASQ-3 recommend rescreening the child in two to four months when a developmental area score falls in the monitoring zone (gray area) (*Free resources,* 2021). When the screening result is concerning, the child can be referred to federally funded early intervention programs under the Individuals with Disabilities Education Act (IDEA) Part C, preschool special education under IDEA Part B, Early Head Start, Head Start, or multidisciplinary team for further evaluation (Lipkin et al., 2019).

As previously stated, parents complete the age-appropriate questionnaire in 10 to 15 minutes with a reading level from fourth to eighth grade, and illustrations help clarify the questions to parents (Abo El Elella et al., 2017; Singh et al., 2017). The Ages and Stages questionnaire was designed and developed by Jane Squires, Ph.D. and Diane Bricker, Ph.D. and was first published in 1995 (*Meet the developers,* 2021; Singh et al., 2017). The ASQ-3 is

copyrighted and purchased from *Paul H. Brookes Publishing Co.* website at *www.brookespublishing.com* that implied permission for use. The ASQ-3 is purchased (see Appendix K) in English and Spanish to align with the project site's patient demographics.

EMR Chart Audit Tool

A formulated EMR chart review tool (see Appendix L) is used to gather data. Parameters for the EMR chart audit tool include "screened vs. not screened" pre/post-implementation, and "referred vs. not referred" pre/post-implementation at ages 9, 18, and 24 months. Specific ICD codes are used to filter data.

SPSS Software

Data is analyzed and generated using Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics include 95% confidence interval, mean, frequencies, and standard deviation. Paired samples t-test is used for pre/post-education test score analysis, and independent chi-square test is used to compare pre/post-ASQ-3 intervention data. Statistical significance is set at $p </= .05$.

Data Collection

Demographics

Demographic information of the participants will be collected including age, gender, ethnicity, and employment position. Ethnicity is reported as Caucasian, Asian-American, African American, American Indian, Hispanic, or other. Gender is reported as male or female. Employment title is disclosed as a pediatric provider or medical assistant.

Pre/Post-education Test Scores

Author-generated pre/post-education test questionnaire (see Appendix F) will be administered to the participants on the scheduled day of the in-service education. Data collection

will include pre-education test questionnaire administered immediately prior to the education intervention and scores obtained, and post-education test questionnaire administered immediately after ASQ-3 education is provided and scores gathered. A score of 80% or greater on the post-test is set as the benchmark for significant knowledge acquired after an in-service education is provided. Testing will be done anonymously, and no identifying data will be linked to the participants to ensure privacy and confidentiality.

EMR Chart Review

Retrospective one-month EMR chart review will be performed for ages 9, 18, and 24 months for data collection using the following ICD codes: Z00.129 (encounter for routine child health examination without abnormal findings); Z00.121 (Encounter for routine child health examination with abnormal findings); Z13.40 (Encounter for screening for unspecified developmental delay); Z13.42 (encounter for screening for global developmental delays); Z13.49 (Encounter for screening for other developmental delays); F80.9 (developmental disorder of speech); F80.1 (expressive language disorder); F80.2 (mixed receptive-language disorder expressive language disorder); F82 (specific developmental disorder of motor function); R47.9 (unspecified speech disturbances); R62 (delayed milestone in childhood); R62.5 (Unspecified lack of expected normal physiological development in childhood); R62.59 (other lack of expected normal physiological development in childhood). The same ICD codes will be used for the post-implementation data to generate statistical analyses, the objective of which is to determine if there is an increase in the detection of developmental delays and referrals to early intervention services using ASQ-3.

Ethics/Human Subjects Protection

This DNP project is evaluated as a quality improvement project, and hence, did not require an IRB submission nor approval from both the academic institution and the project site. The project site does not have an Institutional Review Board (IRB). The DNP project aims to incorporate the ASQ-3 in the clinical practice of a group of pediatric providers at 90% compliance rate. The participants are pediatric providers and medical assistants. Participation in this project is designed to improve the quality of patient care the clinic delivers to the pediatric population. Participation poses no risk for the participants. There will be no patient interaction between the author and the patients, and no patient identifiers will be used.

The mission of the clinic is to provide equitable care to all patients. To align with this mission, the clinic conducts clinical education activities and quality improvement initiatives to stay up to date. The in-service education on ASQ-3 is an educational update on current guidelines that will benefit the providers and clinic staff involved in direct patient care; thus, participation is mandatory. Participants will be provided free lunch as an incentive. No other compensation will be rewarded. Anonymity is maintained during the conduction of the pre/post-education test to ensure privacy and confidentiality. No personal identifiers will be used in the data collection and analyses.

Measures/Plan for Analysis

The demographic data of the fifteen participants will be analyzed using descriptive statistics (SD, mean, range, and frequencies). Paired samples t-test will be used to compare pre- and post-education test scores. A mean of 80% or greater is the benchmark established that signifies the acquisition of a significant degree of knowledge after an educational intervention is provided. For assumptions to be addressed, the normality of distribution of the data will be

examined using the Kolmogorov-Smirnov test, Shapiro-Wilk test, and visual inspection of the Normal Q-Q plot (Pallant, 2016). Outliers will be assessed using the boxplot (Pallant, 2016).

Four-week pre-implementation data involve counting the number of patients seen for wellness visit at ages 9, 18, and 24 months from chart reviews. The number of patients referred for suspected developmental delay will be derived from this data for analyses. Four-week post-implementation data involve counting the number of patients ages 9, 18, and 24 months seen for wellness check and categorizing the data to "screened" (used ASQ-3) and "not screened" (did not use ASQ-3); "referred" (for suspected developmental delay) and "not referred" (normal findings). The data will be examined using chi-square test for independence. Assumption to be investigated includes the minimum expected cell frequency which should be 5 or greater, or 80% of cells should have frequencies of 5 or more (Pallant, 2016). If this assumption is violated, the Fisher's Exact Probability value will be used instead (Pallant, 2016). A p </= .05 is considered to be statistically significant.

As mentioned, the SPSS software version 27 will be used to perform the statistical analyses in consultation with and under a statistician's guidance to ensure accuracy of reports. A preliminary consultation was sought from Cheryl Vanier, Ph. D., Chief Research Officer, and Chairperson of the IRB at Touro University NV. Dr. Vanier recommended the above-mentioned statistical analyses to be used for this project (see Appendix M).

Analysis of Results

ASQ-3 in-service education using a formulated PowerPoint presentation was conducted on the first week of the implementation stage at lunch break at the staff lounge. Prior to the in-service education and to ensure confidentiality, each participant was assigned a four-digit numeric code only known to the author. The four-digit numeric code was used to obtain

demographic data from each participant and to match the pre-education test score to the post-education test score. Apart from the four-digit numeric code, each participant was also assigned a numbering system from "1 to 15" that matches the assigned individual codes for the purpose of statistical analyses. Participants were given five to ten minutes to complete the pre-education questionnaire, and upon completion, the questionnaires were placed in an envelope and labeled "pre-education test."

The ASQ-3 in-service education lasted for about 30 minutes. Questions and concerns were addressed. At the conclusion of the in-service education, the participants were given five to ten minutes to answer the post-education questionnaire. Once the post-education test was completed, the questionnaires were placed in an envelope labeled "post-education test." Demographic data and test scores from the pre/post- education questionnaires were manually entered into a Microsoft Excel file for analysis using the author's password and facial recognition protected laptop. The scored pre/post-education test questionnaires were securely locked in a file cabinet at the medical director's office. The implementation of the age-specific ASQ-3 transpired for four weeks.

Participant Demographics

Descriptive statistics were used to analyze the participants' demographic data. The participants' mean age was 43 years (SD=8.86) ranging from 25 to 54 years. Of the 15 participants, 73.3% were female (n=11) and 26.7% were male (n=4). There were 53.3% (n=8) identified as pediatric providers and 46.7% (n=7) as medical assistants.

Pre/Post-education Intervention Analysis

Paired samples t-test was used to determine if there was a statistically significant mean difference between participants' test scores before and after the education intervention. No

outliers were detected based on inspection of the boxplot (see Appendix N). The difference between pre- and post-test scores was normally distributed as assessed by Kolmogorov-Smirnov test (p= .183), Shapiro-Wilk test (p= .349) (Table 1) and visual inspection of the Normal Q-Q Plot (see Appendix N). Participants' pre-intervention scores were less (M= .60, SD= .19) compared to their post-intervention scores (M= .96, SD= .05) (Table 2). The educational intervention led to a significant average increase in test score by 36%, 95% CI [27.4%, 44.6%], SE= .040, $t(14) = 9$, $p < .001$, d= 2.32 (Table 3 & 4). There is evidence to support that the project's objective to increase the participants' knowledge about ASQ-3 was achieved and a significant difference exists between the participants' test scores after the educational intervention. Cohen's d of 2.32 (Table 4) demonstrated a large effect size depicting the educational intervention's significance (Pallant, 2016).

Table 1

Results of Test of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Score Difference	0.18	15.00	0.18	0.94	15.00	0.35

Table 2

Mean Difference Pre/Post-education Intervention

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post-education score	0.96	15.00	0.05	0.01
	Pre-education score	0.60	15.00	0.19	0.05

Table 3

Results of Test of Difference

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Post-education score/Pre-education score	0.36	0.15	0.04	0.27	0.45	9.00	14.00	0.00

Table 4

Results of Effect Size

					95% Confidence Interval	
			Standardizer	Point Estimate	Lower	Upper
Pair 1	Post-education score/Pre-education score	Cohen's d	0.15	2.32	1.32	3.30
		Hedges' correction	0.16	2.26	1.29	3.21

Pre/Post-ASQ-3 Intervention Analysis

Data collected from the chart review conducted four weeks pre- and post-implementation were manually entered into a Microsoft Excel file (see Appendix O) in the author's password and facial recognition protected laptop for analysis. The aggregate count data taken from the targeted age groups (see Appendix O) resulted in 100% of the pediatric providers (n=8) using the age-specific ASQ-3 on at least one of the age groups during the implementation stage. Aggregate data was the basis of the statistical analyses due to the low count brought about by the current COVID-19 pandemic. Of the 30 patients seen for wellness visits four-weeks pre-implementation,

two patients were referred in the target patient population of 9, 18, and 24 months. Subsequently, of the 52 patients seen for wellness visit in the same age groups and by the same pediatric provider participants four-weeks post-implementation, 45 patients were screened using age-specific ASQ-3, seven patients were not screened using the ASQ-3, and 10 patients were referred using ASQ-3. The low count data resulted in performing a paired samples t-test in lieu of the chi-square test to test for difference in consultation with and under a statistician's guidance.

Paired samples t-test was used to examine the mean differences in provider referrals before and after ASQ-3 intervention. There were no outliers in the data as assessed by inspection of a boxplot (see Appendix P). The differences between the number of referrals before and after the ASQ-3 intervention were not normally distributed as assessed by Shapiro-Wilk's test (p= .041) (Table 5). However, as this did approach significance and because the paired samples t-test is robust to violations of normality with respect to Type I errors, the author chose to move forward recognizing the data were not normally distributed (Fradette et al., 2003; Wiedermann & von Eye, 2013). An increase in referrals was observed for participants after the ASQ-3 intervention (M= 1.25, SD= 1.39) versus before (M= .25, SD= .46) (Table 6). The intervention led to a mean increase in 1 referral. It elicited a statistically significant increase in the number of referrals when compared to the same participants before receiving the ASQ-3 intervention, 95% CI [.001, 2.00], $t(7) = 2.366$, p= .05, d = .84 (Table 7 & 8). There is evidence to suggest the project's objective to increase the number of identified developmental delays and referrals was achieved and a significant difference exists between the number of referrals made by the same pediatric provider participants after using ASQ-3. Cohen's d of .84 (Table 8) depicted a large effect size that validates the use of ASQ-3 to significantly increase the detection of developmental delays and concurrent referrals (Pallant, 2016).

Table 5

Results of Test of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Referral Difference	0.30	8.00	0.03	0.81	8.00	0.04

Table 6

Mean Difference in Referrals Pre/Post- ASQ-3 Intervention

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post-ASQ-3 Referral	1.25	8.00	1.39	0.49
	Pre-ASQ-3 Referral	0.25	8.00	0.46	0.16

Table 7

Results of Test of Difference

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Post-ASQ-3 Referral/Pre-ASQ-3 Referral	1.00	1.20	0.42	0.00	2.00	2.37	7.00	0.05

Table 8

Result of Effect Size

			95% Confidence Interval	
	Standardizer	Point Estimate	Lower	Upper

Pair 1	Post-ASQ-3 Referral/Pre-ASQ-3 Referral	Cohen's d	1.20	0.84	0.00	1.63
		Hedges' correction	1.26	0.79	0.00	1.54

Discussion of Findings

The aim of this project was to incorporate the ASQ-3 into the clinical practice of a group of pediatric providers to improve and increase the detection of early developmental delays and subsequently refer these patients to early intervention services or subspecialty pediatric providers as appropriate. The targeted population were patients ages 9, 18, and 24 months as recommended by the AAP ("Identifying infants," 2006; Lipkin et al., 2019). The variables measured were pre/post-education test scores, compliance of the pediatric providers, and pre/post-ASQ-3 referrals that implied recognition of developmental delays.

Data on the pre/post-education test scores suggested the proposed outcome of increased knowledge of the healthcare providers after administering an education intervention was met. Primary data on post-test scores showed 100% of the participants (n=15) scored 80% or greater (see Appendix Q). This achieved the benchmark of 80% or greater on post-test scores. Statistical analysis revealed a mean increase from 60% pre-test to 96% post-test. This finding concluded the ASQ-3 in-service education resulted in significantly increasing the level of knowledge acquired by the participants by 36% ($p < .001$).

Raw data on pre/post-ASQ-3 intervention (see Appendix O) showed 100% of the pediatric providers (n=8) used the ASQ-3 to screen for general development on at least one of the targeted ages of 9, 18, and 24 months after the ASQ-3 in-service education. The finding exceeded the objective of compliance rate at 90%. The AAP and organizations external to the AAP have been focused on improving developmental screening methods amongst pediatricians and other child health care professionals, and efforts have been put forth to enhance

implementation (Lipkin et al., 2019). The AAP surveys report an increase in the practice rate of standardized developmental screening in pediatric primary care at 23% in 2002, 45% in 2009, and 63% in 2016 (Lipkin et al., 2019). However, the goal of universal screening is yet to be achieved (Lipkin et al., 2019). Hopefully, the current project can bridge the quality gap in clinical practice amongst a small group of pediatric professionals in alliance with the AAP's initiative.

Data comparing referral counts pre/post-ASQ-3 intervention revealed a significant increase in the number of referrals made with the use of ASQ-3, from two to ten (p= .05). Concurrently, the finding implied an increase in the number of developmental delays recognized by the pediatric providers that prompted the referrals satisfying the project's objectives. The large effect size (d= .84) emphasized developmental screening using a valid tool such as the ASQ-3 enhances the precision of the surveillance process since formal screening makes children's developmental status more accurate ("Identifying infants," 2006). Pre-implementation, the pediatric providers at the project site were only employing developmental surveillance to identify potential developmental delays. However, there is mounting evidence only a small proportion of children who may be at risk for developmental delays are identified early enough with developmental monitoring or surveillance alone (Barger et al., 2018). Developmental surveillance and developmental screening using a valid screening tool such as the ASQ-3 should be used together to maximize the sensitivity to detect potential developmental delays, which this project has illustrated (Barger et al., 2018).

Significance/Implication to Nursing

The doctoral-prepared nurse is in the position to effect change in the healthcare community, big or small. The inclusion of the ASQ-3 to the pediatric practice upheld the

doctoral-prepared nurse's leadership in facilitating change in healthcare delivery to meet the current and future needs of patients that demands safety and quality (Chism, 2019). The foundation of the doctoral-prepared nurse supports the ability to critically appraise existing literature using informatics to identify gaps in quality to improve the practice setting (Chism, 2019). Multiple studies have shown the use of evidence-based, standardized instruments to screen for general development in children to increase the rate of identification of potential developmental concerns from 16% to 62% (Agarwal et al., 2020). As such, implementing the ASQ-3, recognized by the AAP due to its simplicity, reliability, and valid psychometric properties reported at 75% sensitivity and 81% sensitivity when compared to the gold standard Bayley Scale of Infant Development, has proved the position (Agarwal et al., 2020).

The doctoral-prepared nurse is expected to effectively communicate and collaborate with the rest of the healthcare workforce to improve patient health outcomes (Chism, 2019). Throughout the course of this project, the author engaged in communication and collaboration with the participants to establish and maintain rapport necessary in team building and project implementation and sustainability. Lastly, clinical prevention is a long-term goal in the industry of healthcare that comprises health promotion and disease prevention, and the doctoral-prepared nurse has the foundation to impact the health status of people to improve population health (Chism, 2019). This project was contemplated to improve the recognition of early developmental delays at targeted ages to intervene promptly for favorable outcomes. The early detection of developmental delays in the first 1000 days of life is critical to enable timely intervention that can result in the improvement of academic and cognitive abilities (Agarwal et al., 2020). Reports have shown no more than 30% of children with developmental problems can be recognized without the use of standardized instruments, possibly delaying much-needed early intervention

services (Agarwal et al., 2020). Hence, findings in this doctoral-nurse-led project have provided evidence in the use of a valid instrument such as the ASQ-3 to screen for general development in early childhood that is supportive of improving the health status of the pediatric population and detrimental to the life course of the individual.

Limitations

There were limitations to this project. The current global health crisis (i.e., COVID-19) coupled with a short time period of four weeks pre/post-ASQ-3 intervention resulted in a lower number of patients coming to the clinic and therefore insufficient count data. Specifically, a 50% to 60% drop in the patient census at the project site was attributed to the global pandemic, hence, the low count data pre/post-ASQ-3 intervention. The low count data culminated in a change in the statistical analysis employed for the pre/post-ASQ-3 referrals, from the recommended chi-square test for independence to paired samples t-test to test for the difference.

Another limitation is the significant increase in referrals after the ASQ-3 intervention (p= .05) may be due to chance. In comparing the aggregate number of patients seen for wellness visits at the target age groups four weeks pre/post-ASQ-3 intervention, there was a 73% increase, from 30 to 52 (see Appendix O). Mean analysis showed there was an increase by approximately three patients per provider after the ASQ-3 intervention (M= 6.50, SD= 5.21) versus before (M= 3.75, SD= 3.77) (see Table 9). This increase in the number of patients seen may have resulted in the statistically significant number of referrals made post-ASQ-3 intervention. A second-time point may increase the probability the significant difference in pre/post-ASQ-3 intervention referrals was not merely due to chance. A second-time point may also show the strength and sustainability of the statistically significant results.

Table 9

Mean Difference in the Number of Patients Seen Pre/post-ASQ-3 Intervention

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Patients seen post-ASQ-3	6.50	8	5.21	1.84
	Patients seen pre-ASQ-3	3.75	8	3.77	1.33

Dissemination and Sustainability

The prompt recognition of early developmental delays is an important approach to ensure optimal development in early childhood and relies on developmental screening (Singh et al., 2017). Developmental screening detects those children who may need further evaluation or eligibility for early intervention services (Singh et al., 2017). Additionally, an effective screening instrument should be simple, valid, reliable, and inexpensive (Singh et al., 2017). As such, the findings of this quality improvement project were presented to the pediatric providers and staff at a scheduled staff meeting. In disclosing the results, the pediatric providers and clinic staff were expected to find encouragement to purportedly institutionalize the ASQ-3 to the host site.

This doctoral project can be translated and replicated at any pediatric primary care clinic. As previously discussed, the AAP has put forth multiple efforts to improve developmental screening methods and implementation in the primary care setting (Lipkin et al., 2019). This project has responded to such efforts. Additionally, the project will be submitted to the doctoral project repository of the Doctor of Nursing Practice website and the *Journal of Doctoral Nursing Practice* to disseminate the findings. It is desired that the findings from this project be made available so other pediatric providers can follow suit and comply with the recommendations from a reputable organization such as the AAP.

Conclusion

The current quality improvement project aided in the recognition of a quality gap in identifying early developmental delays in a pediatric primary care clinic. As a national guideline, the AAP recommends screening all children for general development using a valid screening instrument at ages 9, 18, and 24 months, in addition to surveillance, to detect early developmental delays (Lipkin et al., 2019). A literature review showed the ASQ-3 is a standardized screening tool used globally for its simplicity and, most importantly, for its valid psychometric properties (Singh et al., 2017).

The ASQ-3 was incorporated into the practice of the pediatric providers at the project site. An in-service education using a PowerPoint presentation was used to deliver the intervention to the participants that increased their knowledge about ASQ-3. Data analysis revealed the objectives for this project were generally achieved. Findings of the project were shared with the participants, and the ASQ-3 will continue to be institutionalized to the pediatric practice over time. Additionally, this project can be used to guide other pediatric primary care clinics towards improving the pediatric population's health outcomes by integrating a valid developmental screening tool, such as the ASQ-3, to their practice.

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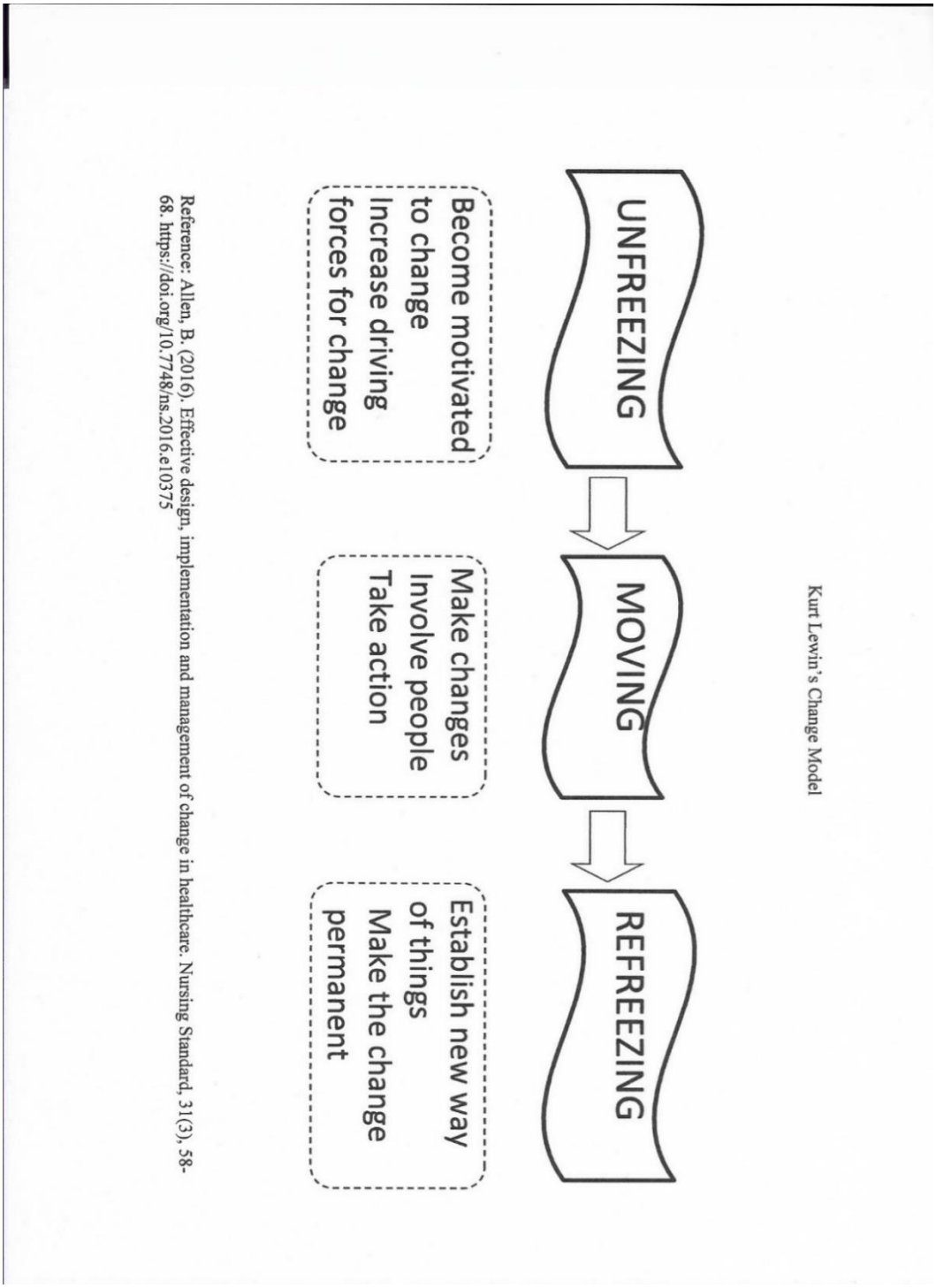
Appendix A


Kurt Lewin's Change Model
UNFREEZING
Become motivated to change
Increase driving forces for change
MOVING
Make changes
Involve people
Take action
REFREEZING
Establish new way of things
Make the change permanent
Reference: Allen, B. (2016). Effective design, implementation and management of change in healthcare. Nursing Standard, 31(3), 58-68. https://doi.org/10.7748/ns.2016.e10375

Appendix B

TO TUN: Touro University Nevada
874 American Pacific Drive
Henderson, Nevada 89014
Attention: Raymond Alden III, PhD

TO INSTITUTION: Sunrise Pediatrics
3061 S. Maryland Parkway
Las Vegas, NV 89109

Attn: Judi Moran

J. Remedies. The various right, options, elections, powers, and remedies of the respective parties hereto contained in, granted, or reserved by this Agreement, are in addition to any others that said parties may be entitled to be law, shall be construed as cumulative, and no one of them is exclusive of any of the others, or of any right or priority allowed by law.

K. Severability. The provisions of this Agreement shall be deemed severable and if any portion shall be held invalid, illegal or unenforceable for any reason, the remainder of this Agreement shall be effective and binding upon the parties.

L. Waiver. Any waiver of any terms and conditions hereof must be in writing and signed by the parties hereto. A waiver of any term or condition hereof shall not be construed as a future waiver of the same or any other term or condition hereof.

10. EXECUTION

The signatories below warrant they have authority to bind their entity in contract. This contract applies to core and non-core clinical experiences.

FACILITY

Date: 12/19/17 By: _____
<SIGNATORY>
<SIGNATORY TITLE>

TOURO UNIVERSITY NEVADA

Date: 12/22/17 By: _____
Raymond Alden III, Ph.D
Provost

Date: 12-21-17 By: _____
Andrew Priest, Ed.D, PT
Dean, College of Health and Human Services

Appendix C

I authorize the implementation of DNP project titled " Improving General Developmental Screening and Surveillance Through the Use of ASQ-3 at a Pediatric Primary Care Clinic" at Sunrise Pediatrics by Mildred Balotro, DNP student of Touro University Nevada.

Sanjay Kandoth, MD 12/17/20 11:20 am

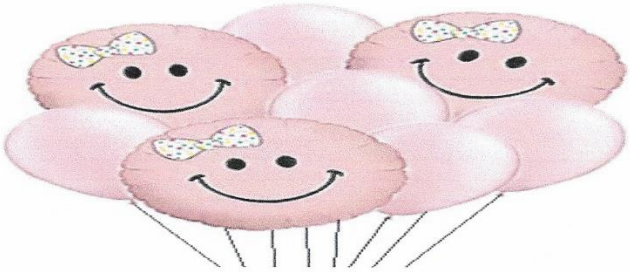
CEO/Owner

Appendix D

ASQ-3 IN- SERVICE TRAINING

WHEN: March 3, 2021 @ 1200

WHERE: STAFF LOUNGE



LUNCH WILL BE SERVED

SEE YOU THERE!!!

Appendix E

2/22/2021

ASQ-3 (AGES AND STAGES QUESTIONNAIRE, THIRD EDITION)

1

Why Screen?

- To detect delays early
- To improve child outcomes
- To encourage parent involvement
- Because screening is recommended by the American Academy of Pediatrics

2

Why screen?

- The American Academy of Pediatrics recommends screening **all children** for general development at the 9-, 18-, and 24- or 30-month wellness visit using a validated tool such as the ASQ-3.
- The American Academy of Pediatrics also recommends performing a developmental screening using a validated instrument such as the ASQ-3 at any visit (birth to 5 years) whenever a developmental concern is elicited on surveillance.
- **For reimbursement purposes,** the American Academy of Pediatrics recommends performing developmental screening at **24 months** in lieu of the 30-month visit, since the 30-month visit is often not reimbursable by third-party payers and the frequency of wellness visits decreases after 24 months of age.

3

Why screen at 9, 18, and 24 or 30 months?

- The **9-month wellness** visit gives an opportunity to look at the child's motor, visual, hearing abilities, early communication skills, and social and nonverbal communication (vocalizations, gestures). Social and emotional delays may qualify for early intervention services (Part C, IDEA, 0-36 months).
- At the **18-month wellness check**, delays in fine motor, communication, and language development are evident, as well as previously undetected gross motor delays.
- The **24- or 30-month visit** provides the opportunity to detect motor, language, and cognitive problems.

4

What Is ASQ-3?

- The third edition of widely used developmental screening tool
- A series of illustrated parent- or caregiver-completed questionnaires

5

What Is ASQ-3?

- Used to accurately identify children who may be at risk for developmental delays
- Designed to encourage parent involvement
- Low-cost, reliable, and rigorously tested

6

How Was ASQ-3 Developed?

- ASQ initiated in 1980 at University of Oregon
- Authors reviewed other standardized tests and studied the literature extensively to design a better tool for screening
- ASQ skills were selected because they are easily observed or elicited by parents at home
- First edition published in June 1995
- ASQ-3 published in June 2009

7

Validity and Reliability

- New standardization - based on 18,572 questionnaires for 15,138 children (an exceptionally large standardization sample)
- The sample mirrors the demographic mix of the U.S. population and includes underserved populations and children of all socioeconomic statuses
- The strong technical data improved even further with 3rd edition
  - Reliability
    - Test-retest: 0.92 (excellent)
    - Inter-rater: 0.93 (excellent)
  - Validity: 0.82 to 0.88 (excellent)
  - Sensitivity: 0.86 (excellent)
  - Specificity: 0.85 (excellent)

8

Elements of ASQ-3: Areas & Questions

- 5 developmental areas (**Communication, Gross Motor, Fine Motor, Problem Solving, Personal-Social**)
- 6 questions in each area
- Questions are in hierarchical order
- Questions #5 and #6 are average skills for children of that age interval
  - i.e., a 12-month skill for a 12-month child, not a 16-month skill for a 12-month-old
- Response options: ***Yes, Sometimes, Not Yet***
- Written at 4th- to 5th-grade reading level

9

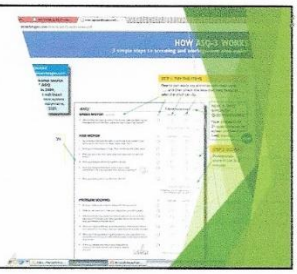
Steps to screen with ASQ-3

- Step 1: Parent or caregiver answers the questions
  - 3 simple responses: *Yes (10), Sometimes (5), or Not Yet (0)*
- Step 2: Score the questionnaire
  - Professionals score in just 2–3 minutes
- Step 3: Get the results
  - Copy the child's scores to the Information Summary page
  - Interpret results and determine follow-up

10

Step 1: Parent or caregiver answers the questions

- Parents complete the items of the questionnaire alone, or a professional can help guide the parent through completion if there are literacy or language learning problems
- Most parents can complete a questionnaire in 10–15 minutes



11

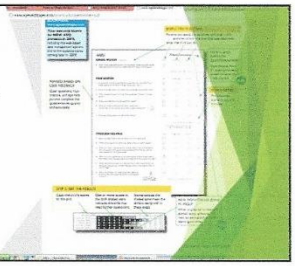
Step 2: Score the questionnaire

- Professionals score the questionnaires with a simple 0 **(NOT YET), 5 (SOMETIMES), and 10 (YES)** point scoring system
- Scores from the 5 areas are transferred to the Information Summary page
- Scoring can be completed in 2–3 minutes

12

Step 3: Get the results

- Review child's scores and compare to standardized cutoffs on the **Information Summary page**
- Interpret results
- Determine follow-up actions as appropriate



13

The Overall Section

- This is an un-scored section
- Looks at quality of skills (e.g., speech)
  - Example: "Does your baby use both hands equally well?"
    - "No" response indicates possible cerebral palsy. Important to follow up.
  - Example: "Concerns about vision?"
    - "Yes" response could mean a possible vision problem. Important to follow up.
- Parent concerns are very predictive
- Any concerns or questionable responses require follow-up

14

Referral

- When scores fall in the **monitoring zone (gray area):**
  - rescreen the child in **2-4 months** per ASQ developer recommendations
  - encourage parents to try age-appropriate activities to support the child's development
- Refer to early intervention/early childhood special education (EI/ECSE) services under the Individuals with Disabilities Education Act (IDEA) Part C and Part B programs when scores are **below the cutoff in the ASQ-3 (black zone)** as appropriate
- If the child does not meet eligibility criteria, consider all community resources that provide support services such as Early Head Start or Head Start

15

Billing

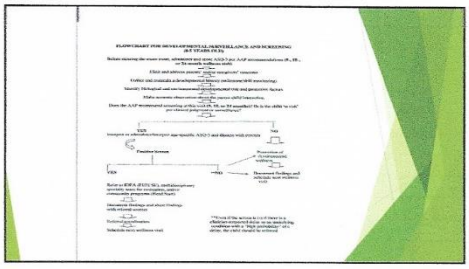
- ***CPT Code 96110 (developmental testing, limited)***
  - does not include payment for medical provider services
  - nonphysician administers screening tool to parent and scores responses
  - provider reviews and interprets screening results
- *CPT Code 96111 (developmental testing, extended)*
  - includes medical provider work
  - medical provider observes the child perform a task and demonstrate specific developmental skill

16

Flowchart

- Flowchart delineates developmental surveillance and screening in the pediatric population 0 to 5 years of age.

17



18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19

Appendix F

PRE/POST-EDUCATION QUESTIONNAIRE

1. The ASQ-3 is a validated tool that is recommended by the American Academy of Pediatrics to regularly screen all children for developmental delays at ages:
   a. 9, 18, and 24 or 30 months
   b. 6, 12, and 24 months
   c. 12, 24, and 48 months
   d. 6, 18, and 24 months

2. The ASQ-3 screens the child in which 5 developmental areas?
   a. Communication, fine motor, gross motor, personal-social, problem-solving
   b. Communication, physical, psychosocial, learning ability, developmental milestones
   c. Gross-motor, speech, developmental delay, psychosocial, cognitive impairment
   d. Speech, fine motor, gross motor, developmental milestones, problem-solving

3. When a parent or caregiver answers "YES" to a developmental area question, the score given is:
   a. 10
   b. 5
   c. 0
   d. 15
4. When a parent raises a concern in the Overall Questions even if the total scores in the 5 developmental areas are in the white zone, what should the provider do **first**?
   a. Refer the child immediately.
   b. Have a discussion with the parent or caregiver to evaluate the concern.
   c. Tell the parent/caregiver to make a follow-up appointment in 2 months.
   d. Do nothing; the scores are in the white zone anyways.

5. The total score in each developmental area is obtained and used to classify the child based on the interpretation zone/area. The zone/area that recommends the child to be monitored and make a follow-up appointment in 2-4 months is:
   a. Gray zone
   b. Black zone
   c. White zone
   d. Blue zone

6. The developmental area described in the 9-month questionnaire: Does your baby make sounds like "da," "ga," "ka," and "ba"?
   a. Communication
   b. Personal-social
   c. Problem-solving
   d. Social-emotional

7. The developmental area described in the 18-month questionnaire: Does your child move around by walking, rather than by crawling on her hands and knees?
   a. Gross motor
   b. Fine motor
   c. Mobility
   d. Personal-social

8. The developmental area described in the 9-month questionnaire: While holding a small toy in each hand, does your baby clap the toys together (like "pat-a-cake")?
   a. Gross motor
   b. Fine motor
   c. Problem solving
   d. Behavioral

9. The developmental area described in the 24-month questionnaire: Does your child turn the pages of a book by herself?
   a. Personal-social
   b. Problem solving
   c. Gross motor
   d. Fine motor

10. Each item in the ASQ-3 questionnaire has a choice of three responses that the parent/caregiver marks and then scored by the provider. These three responses are:
    a. Yes (10), Sometimes (5), Not yet (0)
    b. Yes (10), No (5), Maybe (0)
    c. Yes (10), No (5), Sometimes (0)
    d. Yes (10), Sometimes (5), Never (0)

Test Item Development, Expert Rating, and CVI Calculation

Purpose

The purpose of the in-service education is to introduce the Ages and Stages Questionnaire, 3rd edition (ASQ-3), to pediatric providers and medical assistants at a pediatric primary care clinic and incorporate this instrument into their practice. The ASQ-3 is a validated screening tool recommended by the American Academy of Pediatrics in screening for general development to all children at ages 9, 18, and 24 months that will improve the detection of early developmental delays and referral to early intervention services (Lipkin et al, 2019). This education will increase the professional knowledge and training that can eventually lead to practice change amongst the pediatric providers.

Learning Objectives

Upon completion of the in-service education on ASQ-3:

1. The pediatric providers and medical assistants will be able to score the age-appropriate ASQ-3 questionnaires in each developmental area: communication, fine motor, gross motor, problem-solving, and personal-social.
2. The pediatric providers will be able to interpret the results of the scores in each developmental area based on the interpretation scale provided in each age-appropriate ASQ-3 questionnaire.
3. The pediatric providers and medical assistants will be able to educate parents about ASQ-3 and its significance.
4. The pediatric providers and medical assistants will have a review of developmental milestones achieved at 9, 18, and 24 months.

Population

The population is pediatric providers (pediatricians and nurse practitioners) and medical assistants.

Length of the Test

The test is composed of 10 questions.

Difficulty and Discrimination Levels of Test Items

The test is aimed to evaluate the learner's comprehension of ASQ-3 for implementation at the practice site. The ASQ-3 has a reading level from fourth to eighth grade accompanied by illustrations (Singh et al., 2017). The educational attainment between the pediatric providers and medical assistants must be considered. Therefore, low to moderate difficulty is used.

Scoring Procedures to be Used

The test will be answered directly on the test questionnaire. A computerized analysis will be generated for report.

Item Format

The test format will be multiple choice with only one selected answer per question.

Test Blueprint

	Level of Cognitive Skill				
Objective	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Total**
ASQ-3 scoring			**2**		**2**
ASQ-3 interpretation			**1**	**1**	**2**
ASQ-3 significance	**1**	**1**			**2**
Knowledge of developmental	**4**				**4**

milestones at 9, 18, 24 months					
Total	**5**	**1**	**3**	**1**	**10**

ASQ-3 Questions

Comprehension

1. The ASQ-3 is a validated tool that is recommended by the American Academy of Pediatrics to regularly screen all children for developmental delays at ages:
    a. 9, 18, and 24 or 30 months
    b. 6, 12, and 24 months
    c. 12, 24, and 48 months
    d. 6, 18, and 24 months

Answer: A

Rationale: The American Academy of Pediatrics recommends a periodic developmental screening using a standardized test to all children at 9, 18, and 24 or 30 months ("Identifying infants," 2006; Lipkin et al., 2019). At 9 months, issues with motor skills can be identified; at 18 months, delays in communication and language can be identified; at 24 or 30 months, motor, language, and cognitive delays may be identified ("Identifying infants," 2006).

Knowledge

2. The ASQ-3 screens the child in which 5 developmental areas?
    a. Communication, fine motor, gross motor, personal-social, problem-solving
    b. Communication, physical, psychosocial, learning ability, developmental milestones
    c. Gross-motor, speech, developmental delay, psychosocial, cognitive impairment

d. Speech, fine motor, gross motor, developmental milestones, problem-solving

Answer: A

Rationale: The ASQ-3 is a parent-completed initial level developmental screening that consists of five developmental areas: communication, personal social, gross motor, fine motor, and problem solving, each area with 30 items (Singh et al., 2017).

Application

3. When a parent or caregiver answers "YES" to a developmental area question, the score given is:
   a. 10
   b. 5
   c. 0
   d. 15

Answer: A

Rationale: Item responses are scored as: YES=10, SOMETIMES=5, NOT YET=0 ("Home," 2019).

Analysis

4. When a parent raises a concern in the Overall Questions even if the total scores in the 5 developmental areas are in the white zone, what should the provider do **first**?
   a. Refer the child immediately.
   b. Have a discussion with the parent or caregiver to evaluate the concern.
   c. Tell the parent/caregiver to make a follow-up appointment in 2 months.
   d. Do nothing; the scores are in the white zone anyways.

Answer: B

Rationale: The provider should first have a discussion with parents or caregiver about the concerns noted in the Overall questions and refer as appropriate even when scores are above the cutoff (white zone) ("Home," 2019).

Application

5. The total score in each developmental area is obtained and used to classify the child based on the interpretation zone/area. The zone/area that recommends the child to be monitored and make a follow-up appointment in 2-4 months is:
    a. Gray zone
    b. Black zone
    c. White zone
    d. Blue zone

Answer: A

Rationale: If the baby's total score in any of the developmental areas is in the gray zone, provide learning activities and monitor; rescreen the child in 2-4 months per ASQ developer recommendations ("Home," 2019).

Knowledge

6. The developmental area described in the 9-month questionnaire: Does your baby make sounds like "da," "ga," "ka," and "ba"?
    a. Communication
    b. Personal-social
    c. Problem-solving
    d. Social-emotional

Answer: A, Communication (ASQ-3 9-month questionnaire)

Rationale: At this age, infant's vocalization improves and begins to imitate specific sounds (Burns et al., 2017). Infants begin to articulate single-sound units that may be consonants, vowels, or blends, such as "ba," "ah," "ga," "bl" and slowly progress to double-consonant sounds, such as "dada" (Burns et al., 2017).

Knowledge

7. The developmental area described in the 18-month questionnaire: Does your child move around by walking, rather than by crawling on her hands and knees?
    a. Gross motor
    b. Fine motor
    c. Mobility
    d. Personal-social

Answer: A, Gross motor (ASQ-3 18-month questionnaire)

Rationale: Gross motor skills indicate the use of the large muscles, and by 18 months, the child should be able to walk well independently (Burns et al., 2017).

Knowledge

8. The developmental area described in the 9-month questionnaire: While holding a small toy in each hand, does your baby clap the toys together (like "pat-a-cake")?
    a. Gross motor
    b. Fine motor
    c. Problem solving
    d. Behavioral

Answer: C, Problem solving (ASQ-3 9-month questionnaire)

Rationale: Infant's curiosity at this age blossoms, and they develop their own games or try different ways of playing with familiar objects or toys (Burns et al., 2017).

Knowledge

9. The developmental area described in the 24-month questionnaire: Does your child turn the pages of a book by herself?
    a. Personal-social
    b. Problem solving
    c. Gross motor
    d. Fine motor

Answer: D, Fine motor

Rationale: Fine motor skills involve hand and finger development, and at 24 months, the child is able turn pages one at a time (Burns et al., 2017).

Application

10. Each item in the ASQ-3 questionnaire has a choice of three responses that the parent/caregiver marks and then scored by the provider. These three responses are:
    a. Yes (10), Sometimes (5), Not yet (0)
    b. Yes (10), No (5), Maybe (0)
    c. Yes (10), No (5), Sometimes (0)
    d. Yes (10), Sometimes (5), Never (0)

Answer: A.

Rationale: For each item, there is a choice of three responses by the parent/caregiver: "Yes," "Sometimes," or "Not yet" and scored as 10, 5, 0, respectively (Abo El Elella et al., 2017).

Appendix G

CONTENT VALIDITY INDEX TABLE

Item	Expert 1	Expert 2	Expert 3	Mean	I-CVI	Interpretation
1	4	4	4	4	1	excellent
2	4	4	4	4	1	excellent
3	4	4	4	4	1	excellent
4	4	4	3	3.67	1	excellent
5	4	4	4	4	1	excellent
6	4	4	4	4	1	excellent
7	4	4	4	4	1	excellent
8	4	4	4	4	1	excellent
9	4	4	4	4	1	excellent
10	4	4	4	4	1	excellent

The mean total of all the means is 3.97 indicating that all questions are moderately/highly relevant.

I-CVI = E/N

Where:

I-CVI= item-content validity index

E= number of judges who rated the item 3 (moderately relevant) or 4 (highly relevant)

N= total number of judges

CVR= content validity ratio

CVR=[E-(N-2)/(N-2)]

=[3-(3/2)/(3/2)]

= 1.5/1.5= 1

Interpretation: A cut-off score of 0.80 is used to determine item validity and relevancy (L'Ecuyer et al., 2020).

Appendix H

ASQ-3

9 Month Questionnaire

9 months 0 days through 9 months 30 days

On the following pages are questions about activities babies may do. Your baby may have already done some of the activities described here, and there may be some your baby has not begun doing yet. For each item, please fill in the circle that indicates whether your baby is doing the activity regularly, sometimes, or not yet.

Important Points to Remember:

- ☑ Try each activity with your baby before marking a response.
- ☑ Make completing this questionnaire a game that is fun for you and your baby.
- ☑ Make sure your baby is rested and fed.
- ☑ Please return this questionnaire by _____.

Notes:

_____

_____

_____

_____

COMMUNICATION

	YES	SOMETIMES	NOT YET	
1. Does your baby make sounds like "da," "ga," "ka," and "ba"?	○	○	○	___
2. If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?	○	○	○	___
3. Does your baby make two similar sounds like "ba-ba," "da-da," or "ga-ga"? *(The sounds do not need to mean anything.)*	○	○	○	___
4. If you ask your baby to, does he play at least one nursery game even if you don't show her the activity yourself (such as "bye-bye," "Peek-a-boo," "clap your hands," "So Big")?	○	○	○	___
5. Does your baby follow one simple command, such as "Come here," "Give it to me," or "Put it back," *without* your using gestures?	○	○	○	___
6. Does your baby say three words, such as "Mama," "Dada," and "Baba"? *(A "word" is a sound or sounds your baby says consistently to mean someone or something.)*	○	○	○	___

COMMUNICATION TOTAL ___

GROSS MOTOR

	YES	SOMETIMES	NOT YET	
1. If you hold both hands just to balance your baby, does she support her own weight while standing? 	○	○	○	___
2. When sitting on the floor, does your baby sit up straight for several minutes *without* using his hands for support? 	○	○	○	___

E101090200

ASQ-3

Cuestionario de 9 meses

9 meses 0 días a 9 meses 30 días

En las siguientes páginas Ud. encontrará una serie de preguntas sobre diferentes actividades que generalmente hacen los bebés. Puede ser que su bebé ya pueda hacer algunas de estas actividades, y que todavía no haya realizado otras. Después de leer cada pregunta, por favor marque la respuesta que indique si su bebé hace la actividad regularmente, a veces, o todavía no.

Puntos que hay que recordar:

- ☑ Asegúrese de intentar cada actividad con su bebé antes de contestar las preguntas.
- ☑ Complete el cuestionario haciendo las actividades con su bebé como si fueran un juego divertido.
- ☑ Asegúrese de que su bebé haya descansado y comido.
- ☑ Por favor, devuelva este cuestionario antes de esta fecha: _____.

Notas:

_____

_____

_____

_____

_____

COMUNICACION

	SI	A VECES	TODAVIA NO	
1. ¿Hace su bebé sonidos como "da", "ga", "ka", y "ba"?	○	○	○	___
2. Si Ud. imita los sonidos que hace su bebé, ¿ella los repite?	○	○	○	___
3. ¿Puede hacer dos sonidos similares como "ba-ba", "da-da", o "ga-ga"? *(No es necesario que los sonidos tengan significado.)*	○	○	○	___
4. Cuando Ud. se lo pide, ¿puede su bebé jugar a algún juego infantil sin que Ud. se lo demuestre primero (por ejemplo, decir adiós, esconderse tapándose los ojos, aplaudir, o indicar que tan grande es algo)?	○	○	○	___
5. ¿Sigue su bebé instrucciones sencillas, como por ejemplo, "ven acá", dámelo", o devuélvelo" *sin* que Ud. le haga gestos para que entienda lo que le está pidiendo?	○	○	○	___
6. ¿Dice su bebé tres palabras como "mamá", "dada", y "baba"? *(Una "palabra" se define como un sonido o un grupo de sonidos que siempre repite su bebé al referirse a alguien o a alguna cosa concreta.)*	○	○	○	___

TOTAL EN COMUNICACION ___

MOTORA GRUESA

		SI	A VECES	TODAVIA NO	
1. Si Ud. agarra las manos de su bebé para ayudarle a mantener el equilibrio, ¿él puede sostener su propio peso mientras está de pie?		○	○	○	___
2. Al estar sentado en el suelo, ¿su bebé puede sentarse derecho por varios minutos *sin* usar las manos para apoyarse?		○	○	○	___

Appendix I

ASQ-3

18 Month Questionnaire

17 months 0 days through 18 months 30 days

On the following pages are questions about activities babies may do. Your baby may have already done some of the activities described here, and there may be some your baby has not begun doing yet. For each item, please fill in the circle that indicates whether your baby is doing the activity regularly, sometimes, or not yet.

Important Points to Remember:

- ☑ Try each activity with your baby before marking a response.
- ☑ Make completing this questionnaire a game that is fun for you and your child.
- ☑ Make sure your child is rested and fed.
- ☑ Please return this questionnaire by _____.

Notes:

_____

_____

_____

_____

At this age, many toddlers may not be cooperative when asked to do things. You may need to try the following activities with your child more than one time. If possible, try the activities when your child is cooperative. If your child can do the activity but refuses, mark "yes" for the item.

COMMUNICATION

	YES	SOMETIMES	NOT YET	
1. When your child wants something, does she tell you by *pointing* to it?	○	○	○	___
2. When you ask your child to, does he go into another room to find a familiar toy or object? *(You might ask, "Where is your ball?" or say, "Bring me your coat," or "Go get your blanket.")*	○	○	○	___
3. Does your child say eight or more words in addition to "Mama" and "Dada"?	○	○	○	___
4. Does your child imitate a two-word sentence? For example, when you say a two-word phrase, such as "Mama eat," "Daddy play," "Go home," or "What's this?" does your child say both words back to you? *(Mark "yes" even if her words are difficult to understand.)*	○	○	○	___
5. Without your showing him, does your child *point* to the correct picture when you say, "Show me the kitty," or ask, "Where is the dog?" *(He needs to identify only one picture correctly.)*	○	○	○	___
6. Does your child say two or three words that represent different ideas together, such as "See dog," "Mommy come home," or "Kitty gone"? *(Don't count word combinations that express one idea, such as "bye-bye," "all gone," "all right," and "What's that?")* Please give an example of your child's word combinations:	○	○	○	___

COMMUNICATION TOTAL ___

E101180200

ASQ-3

Cuestionario de 18 meses

17 meses 0 días a 18 meses 30 días

En las siguientes páginas Ud. encontrará una serie de preguntas sobre diferentes actividades que generalmente hacen los niños. Puede ser que su niño/a ya pueda hacer algunas de estas actividades, y que todavía no haya realizado otras. Después de leer cada pregunta, por favor marque la respuesta que indique si su niño/a hace la actividad regularmente, a veces, o todavía no.

Puntos que hay que recordar:

- ☑ Asegúrese de intentar cada actividad con su niño/a antes de contestar las preguntas.
- ☑ Complete el cuestionario haciendo las actividades con su niño/a como si fueran un juego divertido.
- ☑ Asegúrese de que su niño/a haya descansado y comido.
- ☑ Por favor, devuelva este cuestionario antes de esta fecha: _____.

Notas:

_____

_____

_____

_____

_____

A esta edad, muchos niños no cooperan cuando se les pide hacer cosas. Quizás Ud. tenga que intentar hacer las actividades más de una vez con su niño/a. Si es posible, intente hacer las actividades cuando su niño/a tenga buena disposición. Si su niño/a puede hacer la actividad, pero se niega a hacerla, marque "sí" en la pregunta.

COMUNICACION

	SI	A VECES	TODAVIA NO	
1. Cuando su niño quiere algo, ¿lo *señala con el dedo* para comunicárselo a Ud.?	○	○	○	___
2. Cuando Ud. se lo pide, ¿va su niña a otro cuarto a buscar un juguete u objeto conocido? *(Puede preguntarle, "¿Dónde está la pelota?", o decirle "Tráeme tu abrigo", o "Busca tu cobija".)*	○	○	○	___
3. ¿Dice su niño ocho o más palabras además de "mamá" y "papá"?	○	○	○	___
4. ¿Imita su niña una oración de dos palabras? Por ejemplo, cuando Ud. dice "Mamá juega", "Papá come", o "¿Qué es?", repite ella la misma frase? *(Marque "sí" aun si sus palabras sean difíciles de entender.)*	○	○	○	___
5. Sin enseñarle primero, ¿puede *señalar con el dedo* el dibujo correcto cuando Ud. le dice, "Enséñame dónde está el gatito", o le pregunta, "¿Dónde está el perro?" *(Solamente tiene que identificar un dibujo correctamente.)*	○	○	○	___
6. ¿Puede decir dos o tres palabras juntas que representen ideas diferentes, como: "Veo perro", "Mamá llega casa", o "¿Se fue gatito"? *(No cuente las combinaciones de palabras que expresen una sóla idea como "se acabó", "está bien", y "¿qué es?")* Escriba un ejemplo de una combinación de palabras que dice su niño:	○	○	○	___

TOTAL EN COMUNICACION ___

E102180200

Appendix J

ASQ-3

24 Month Questionnaire

23 months 0 days through 25 months 15 days

On the following pages are questions about activities children may do. Your child may have already done some of the activities described here, and there may be some your child has not begun doing yet. For each item, please fill in the circle that indicates whether your child is doing the activity regularly, sometimes, or not yet.

Important Points to Remember:

- ☑ Try each activity with your child before marking a response.
- ☑ Make completing this questionnaire a game that is fun for you and your child.
- ☑ Make sure your child is rested and fed.
- ☑ Please return this questionnaire by _____.

Notes:

_____

_____

_____

_____

At this age, many toddlers may not be cooperative when asked to do things. You may need to try the following activities with your child more than one time. If possible, try the activities when your child is cooperative. If your child can do the activity but refuses, mark "yes" for the item.

COMMUNICATION

	YES	SOMETIMES	NOT YET	
1. Without your showing him, does your child *point* to the correct picture when you say, "Show me the kitty," or ask, "Where is the dog?" *(She needs to identify only one picture correctly.)*	○	○	○	___
2. Does your child imitate a two-word sentence? For example, when you say a two-word phrase, such as "Mama eat," "Daddy play," "Go home," or "What's this?" does your child say both words back to you? *(Mark "yes" even if her words are difficult to understand.)*	○	○	○	___
3. Without your giving him clues by pointing or using gestures, can your child carry out at least *three* of these kinds of directions?	○	○	○	___
○ a. "Put the toy on the table." ○ d. "Find your coat."				
○ b. "Close the door." ○ e. "Take my hand."				
○ c. "Bring me a towel." ○ f. "Get your book."				
4. If you point to a picture of a ball (kitty, cup, hat, etc.) and ask your child, "What is this?" does your child correctly *name* at least one picture?	○	○	○	___
5. Does your child say two or three words that represent different ideas together, such as "See dog," "Mommy come home," or "Kitty gone"? *(Don't count word combinations that express one idea, such as "bye-bye," "all gone," "all right," and "What's that?")* Please give an example of your child's word combinations:	○	○	○	___

E101240200

ASQ-3

Cuestionario de 24 meses

23 meses 0 días a 25 meses 15 días

En las siguientes páginas Ud. encontrará una serie de preguntas sobre diferentes actividades que generalmente hacen los niños. Puede ser que su niño/a ya pueda hacer algunas de estas actividades, y que todavía no haya realizado otras. Después de leer cada pregunta, por favor marque la respuesta que indique si su niño/a hace la actividad regularmente, a veces, o todavía no.

Puntos que hay que recordar:

- ☑ Asegúrese de intentar cada actividad con su niño/a antes de contestar las preguntas.
- ☑ Complete el cuestionario haciendo las actividades con su niño/a como si fueran un juego divertido.
- ☑ Asegúrese de que su niño/a haya descansado y comido.
- ☑ Por favor, devuelva este cuestionario antes de esta fecha: _____.

Notas:

_____

_____

_____

_____

_____

A esta edad, muchos niños no cooperan cuando se les pide hacer cosas. Quizás Ud. tenga que intentar hacer las actividades más de una vez con su niño/a. Si es posible, intente hacer las actividades cuando su niño/a tenga buena disposición. Si su niño/a puede hacer la actividad, pero se niega a hacerla, marque "sí" en la pregunta.

COMUNICACION

	SI	A VECES	TODAVIA NO	
1. Sin enseñarle primero, ¿puede *señalar con el dedo* el dibujo correcto cuando Ud. le dice, "Enséñame dónde está el gatito", o le pregunta, "¿Dónde está el perro?" *(Solamente tiene que identificar un dibujo correctamente.)*	○	○	○	____
2. ¿Imita su niña una oración de dos palabras? Por ejemplo, cuando Ud. dice "Mamá juega", "Papá come", o "¿Qué es?", repite ella la misma frase? *(Marque "sí" aun si sus palabras sean difíciles de entender.)*	○	○	○	____
3. Sin darle pistas señalándole o usando gestos, ¿puede su niño seguir al menos *tres* de las siguientes instrucciones?	○	○	○	____
○ a. "Pon el juguete en la mesa".				
○ b. "Cierra la puerta".				
○ c. "Tráeme una toalla".				
○ d. "Busca tu abrigo".				
○ e. "Dame la mano".				
○ f. "Agarra tu libro".				
4. Si Ud. señala un dibujo de una pelota (gatito, vaso, gorro, etc.) y le pregunta a su niña "¿qué es?", ¿puede *identificar y nombrar* al menos un dibujo?	○	○	○	____
5. ¿Puede decir dos o tres palabras juntas que representen ideas diferentes, como: "Veo perro", "Mamá llega casa", o "¿Se fue gatito"? *(No cuente las combinaciones de palabras que expresen una sóla idea como "se acabó", "está bien", y "¿qué es?")* Escriba un ejemplo de una combinación de palabras que dice su niño:	○	○	○	____

Appendix K

Email: dredd7181@gmail.com
Phone: (702)340-7351

Status: Waiting to Ship

Method: Standard

Item		ISBN	Price	Quantity	Total
 (../Ages-Stages-Questionnaires-in-Spanish-Third-Edition-ASQ-3-Spanish-P570.aspx)	Ages & Stages Questionnaires® in Spanish, Third Edition (ASQ®-3 Spanish)	978-1-59857-003-8	$240.00	1	$240.00
 (../ASQ-3-Starter-Kit-P574.aspx)	ASQ®-3 Starter Kit	978-1-59857-041-0	$295.00	1	$295.00
	Standard	SHIPPING	$69.55	1	$69.55

Appendix L

CHART AUDIT TOOL

Age (in months): _____

Date of Audit: _____

Week of: _____

No. of charts reviewed: _____

	SCREENED	NOT SCREENED
PRE-IMPLEMENTATION (ICD codes)		
POST-IMPLEMENTATION (ICD codes)		

	REFERRED	NOT REFERRED
PRE-IMPLEMENTATION (ICD codes)		
POST-IMPLEMENTATION (ICD codes)		

Appendix M

From: Mildred Balotro mbalotro@student.touro.edu
Subject: Fwd: FW: DNP project statistics plan worksheet
Date: Feb 9, 2021 at 17:21:16
To: dredd7181@gmail.com

---------- Forwarded message ---------
From: **Manognya Murukutla** <mmurukut@touro.edu>
Date: Wed, Dec 16, 2020 at 10:18
Subject: FW: DNP project statistics plan worksheet
To: Mildred Balotro <mbalotro@student.touro.edu>

Hi Mildred,

Please see Cheryl's feedback below. I'm happy to answer any questions you have.

Sincerely,

Mano

From: Cheryl Vanier <cvanier@touro.edu>
Sent: Wednesday, December 16, 2020 8:56 AM
To: Manognya Murukutla <mmurukut@touro.edu>
Subject: Re: DNP project statistics plan worksheet

Hi. Mano. My comments:

Pre-post knowledge- overall score? Paired t-test within subject; A Pearson

correlation isn't the best choice here

To obtain questionnaire validity, it needs to be correlated with some type of 'gold standard'. I don't see a 'gold standard'.

For the chart review to look at implementation and referrals:

The dependent variable is dichotomous (screened vs not screened; referred vs not referred, per patient or per screen patient?)

The independent variable is also dichotomous (before and after training)

You can make a 2x2 table with counts. For example:

	Screened	Not screened
Before	#	#
after	#	#

If all of the # are > 5, you can test for differences using a chi-square test. Otherwise, use a Fisher's exact test. For descriptive statistics, report the % screened before and after, with the 95% confidence interval, which can be calculated here (http://vassarstats.net/prop1.html).

Same thing for referrals; just substitute 'referred' for 'screened'.

Cheryl Vanier, Ph.D.

Chief Research Officer

Department of Research

Institutional Review Board (IRB) Chair

Touro University Nevada

874 American Pacific Drive

Appendix N

Figure 1

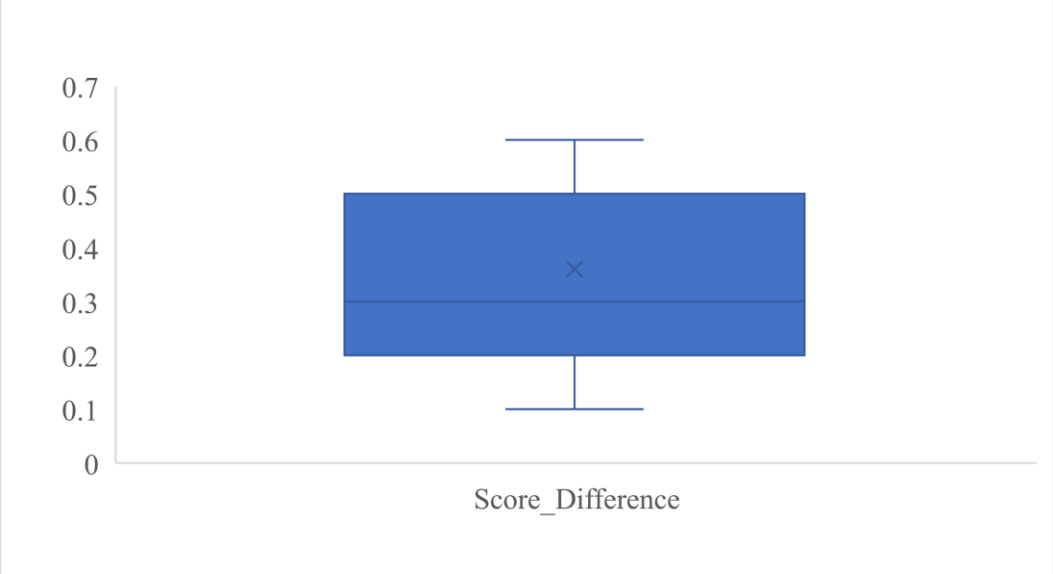
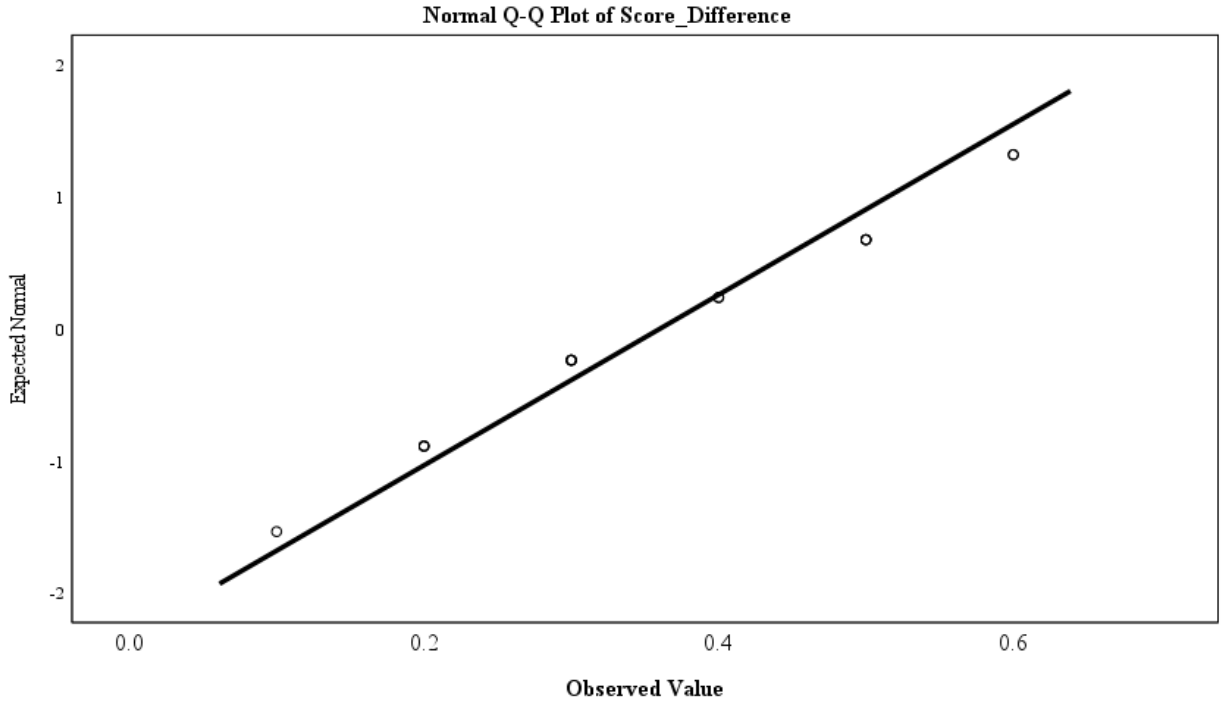


Figure 2



Appendix O

PRE-IMPLEMENTATION NUMBER OF PATIENTS SEEN FOR WELLNESS VISIT

PEDIATRIC PROVIDERS	9 MONTHS	18 MONTHS	24 MONTHS	TOTAL	PATIENTS REFERRED
PARTICIPANT 9	0	0	1	1	1
PARTICIPANT 12	0	2	0	2	0
PARTICIPANT 10	0	0	1	1	0
PARTICIPANT 8	7	3	1	11	0
PARTICIPANT 13	5	3	0	8	1
PARTICIPANT 11	1	1	0	2	0
PARTICIPANT 7	1	0	0	1	0
PARTICIPANT 15	1	2	1	4	0
TOTAL	15	11	4	30	2

POST-IMPLEMENTATION NUMBER OF PATIENTS SEEN FOR WELLNESS VISIT

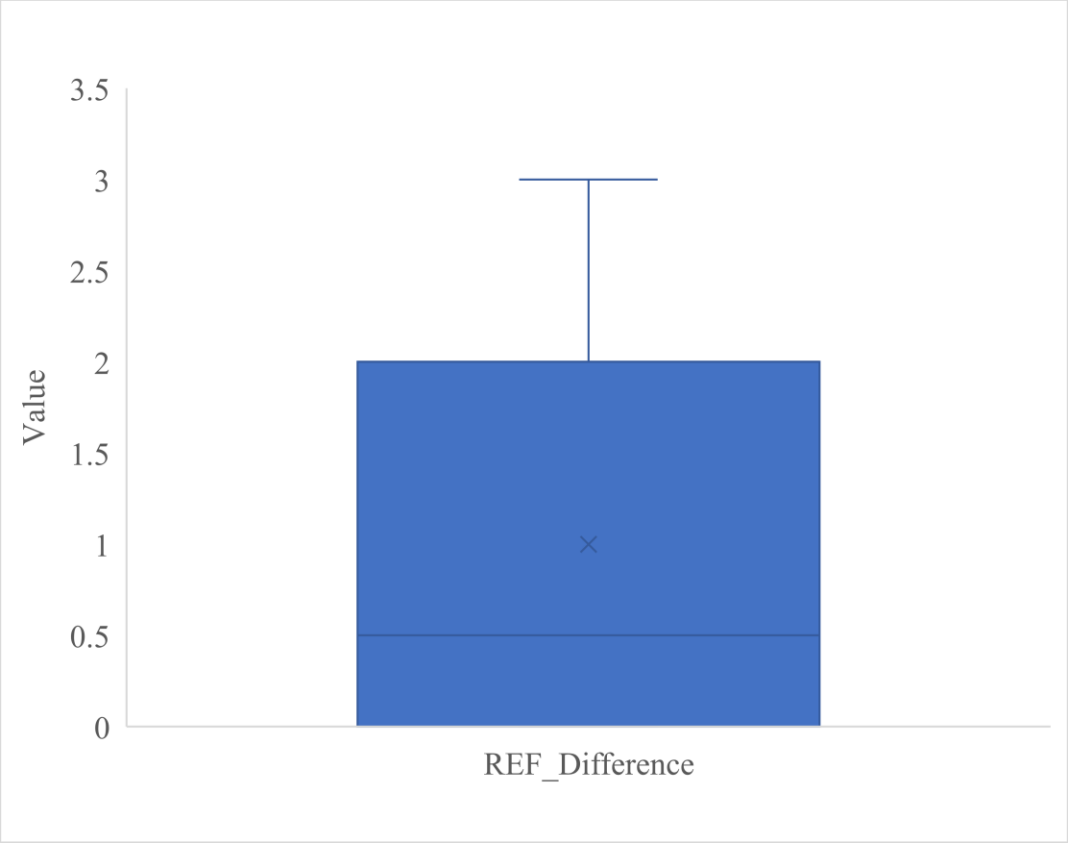
PEDIATRIC PROVIDERS	9 MONTHS (USED ASQ-3)	9 MONTHS (DID NOT USE ASQ-3)	18 MONTHS (USED ASQ-3)	18 MONTHS (DID NOT USE ASQ-3)	24 MONTHS (USED ASQ-3)	24 MONTHS (DID NOT USE ASQ-3)
PARTICIPANT 9	3	0	3	0	1	0
PARTICIPANT 12	0	0	1	0	0	1
PARTICIPANT 10	1	0	1	0	1	0
PARTICIPANT 8	5	2	1	1	7	0
PARTICIPANT 13	5	0	4	1	1	1
PARTICIPANT 11	0	0	0	0	1	0
PARTICIPANT 7	1	0	2	0	3	1
PARTICIPANT 15	1	0	0	0	3	0
TOTAL	16	2	12	2	17	3

POST-IMPLEMENTATION NUMBER OF PATIENTS SEEN FOR WELLNESS VISIT

PEDIATRIC PROVIDERS	TOTAL NUMBER OF PATIENTS SEEN	PATIENTS REFERRED AFTER USING ASQ-3
PARTICIPANT 9	7	2
PARTICIPANT 12	2	0
PARTICIPANT 10	3	2
PARTICIPANT 8	16	3
PARTICIPANT 13	12	3
PARTICIPANT 11	1	0
PARTICIPANT 7	7	0
PARTICIPANT 15	4	0
TOTAL	52	10

Appendix P

Figure 3



Appendix Q

PRE/POST-ASQ-3 EDUCATION TEST SCORES

	Pre-education test score	Post-education test score
Participant 1	30%	90%
Participant 2	60%	90%
Participant 3	40%	90%
Participant 4	70%	100%
Participant 5	50%	90%
Participant 6	40%	90%
Participant 7	80%	100%
Participant 8	80%	100%
Participant 9	90%	100%
Participant 10	80%	100%
Participant 11	50%	100%
Participant 12	60%	100%
Participant 13	70%	100%
Participant 14	30%	90%
Participant 15	70%	100%