PREDICTING BEHAVIOR OF HIGH RISK INFANTS AT AGE SIX YEARS

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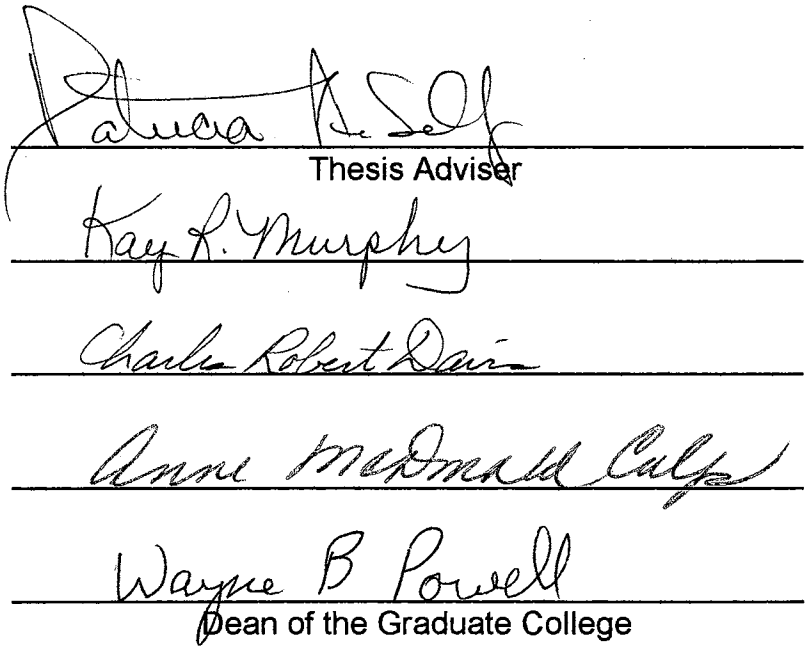

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CHAPTER ONE

INTRODUCTION

Differences in behavioral responsiveness, attentional level, and temperament of newborn infants hospitalized in the Neonatal Intensive Care Unit (NICU) infants versus healthy newborn infants has been a recent focus of research. Gardner, Garland, Merenstein, and Merenstein (1989) described life in the NICU as being characterized by deprivation of the normal sensory stimulation usually enjoyed by healthy full term infants including frequent contact with parents and pleasant touch. However, the NICU is also an environment loaded with sensory bombardment including constant light, noise, invasive procedures, disrupted sleep-wake cycles, and multiple caregivers. The neurological system of a preterm infant is not fully developed and therefore limits the preterm infant's ability to deal with stressful NICU environmental stimuli. The long term impact of this noxious environment on the fetus developing outside of the mother's womb is not fully understood. For at least the past decade it has been recognized that temperament of preterm infants is different than their full-term cohorts (Als, 1986). The infant is less able to tune-out the constant noise, bright light, or constant stimulation as a full term infant. Deep sleep is often interrupted by noise or a necessary procedure which awakens the infant.

A sick full-term infant who may be experiencing difficulty breathing, have cardiac complications, or a systemic infection is also limited in his or her ability to tolerate the environmental stimulation. While in the NICU, these infants must develop their own unique method of coping with stress. These amazing survivors develop the ability to cope with constant environmental stimuli, often noxious and painful, in the midst of their illness and lack of deep sleep.

Theories of Behavioral Development in Medically Fragile Newborns

Several theories of human development may be used to explain differences in behavior of NICU patients both during and following the neonatal period. Biosocial theory would suggest that the infant's ability to develop coping mechanisms is related to Darwin's concept of survival of the fittest (Darwin, 1859). If the organism is unable to develop the coping mechanisms necessary to deal with the negative stimulation while it is attempting to grow healthy and mature, then it will not survive. The surviving infants develop strategies for adaptation to the stress in the environment. The stress includes interaction with caretakers which may be unpredictable; comforting during one interaction and disruptive or painful at the next interaction depending on the procedure performed during interaction with the hospitalized infant. The infant's relationships with the primary caretakers during the period of hospitalization is

tentative and may be distrusting if the infant has endured multiple painful procedures.

The behavioristic models of classical and operant conditioning might also be used to describe the method by which NICU patients develop strategies to cope with stress. During the time these infants are critically ill, they experience repeated medical procedures which are painful and stressful for the infant. The infants quickly learn to associate the procedure with resulting pain with very few exposures to the stimuli. Lutes (1992) examined the premature infant's ability to anticipate a painful heel stick and found that the infant could predict, as evidenced by a decrease in heart rate and oxygen saturation level, the approaching heel stick following only three such procedures. Through conditioning, the infant also learns to associate pain or comfort with individual caregivers.

Many authors, including Als, Lester, Tronick, and Brazelton (1982a) have examined ways in which premature infants seek to help themselves decrease their own stress, such as hand to mouth activity, hand or foot clasping, closing their eyes to decrease visual stimulation, or placing their arm or hand over their eyes or ears to decrease stimulation. These are activities which the infant could easily accomplish in utero where gravitational forces did not limit movement and the uterine wall acted as a boundary to maintain the infant in a flexed position. The infant learns, through conditioning, in the womb that these methods are helpful to coping with stress. If the infant cannot successfully initiate self-calming behavior outside the womb then the infant will show signs of

distress ranging from frantic movements and crying to decompensation of pulmonary functioning, leading to serious health compromise. The Synactive Theory of Neurobehavioral Development (Als, 1982), addresses the effect of stress in a premature or neurologically underdeveloped infant. The theory explains that the effect of stress ripples through the infant's autonomic system if the infant is unable to self-calm or assistance to calm the infant is not offered by caregivers. The infant may develop visceral responses to the stimuli, including gagging, spitting up, or complete regurgitation. Caretakers may respond to an infant who has spit-up by decreasing the stimulation. The long-term NICU patient quickly learns that he/she can control and limit interaction with others through these behaviors. Infants who are hospitalized due to chronic illness related to prematurity often develop difficult temperaments including gaze and touch aversion, and seemingly intentional gagging or vomiting when approached by caretakers for routine management or social interaction. The behavior develops out of conditioned response between the infant and the caretaker.

The continued variability in behavior of NICU graduates can also be explained by examination of the parent's reaction to the stress of a critically ill newborn. Parents who are expecting the birth of a child anticipate the baby will be healthy. When a child is born prematurely or full-term with serious health problems, the family experiences a duel grief process (Affleck, Tennen & Rowe, 1990). The family grieves for the loss of the perfect baby which they had imagined they would have, and there is grief for the medically at-risk baby born with a host of known and unknown complications. Both immediate and extended

family are effected by the birth of a medically fragile baby. Family stress theory suggests that events occurring in a family, which are considered non-normative produce stress for the entire family. The reaction of the family members to the stressful event varies and is dependent on how the event is viewed by each family member in terms of impact and available resources (Hill, 1949; and McCubbin & Figley, 1983). Some families are better able to deal with the non-normative event if their available resources include those needed during the crisis. Their ability to access these resources impacts their view of the crisis as well as their view of the infant. Initial attachment between the parent and infant will be effected by the parent's view of the crisis and how well the parent is able to utilize resources to assist with coping with the stress (Affleck, Tennen, Allan, & Gershman, 1986).

Early research in psychosocial adjustment in families of ill children has reported that parents of chronically ill children sustain a variety of stressors unique to their relationship with the medically fragile child. Feelings of denial, guilt, isolation, dependency, overprotectiveness, and a lack of consistency are frequent dynamics in the parent-child interaction (Steinhauer, Mushin, & Rae-Grant, 1974). Research suggests that parents may continue to perceive their very low birth weight child as vulnerable as late as school age (Schraeder, Heaverly, O'Brien, & McEvory-Shields, 1992). The perception of vulnerability impacts several areas of day-to-day life. The parent may be slower to discipline a child who he/she perceives to be vulnerable. The child's autonomy will be effected by the amount of freedom the parent allows the child. The parent's

perception of a child as being fragile or vulnerable will effect the child's opportunities for growth and development as well as the child's behavior.

Research Questions

Differences in the behavior of NICU graduates could exist as a result of multiple factors including a predisposition and strength to survive, the neonate's adjustment to the early experience and trauma of the NICU environment, and parenting characteristics resulting from perception of vulnerability and a desire to protect the child. If the temperament and behavior of premature and sick full-term newborns is different from healthy newborns during the neonatal period, it is reasonable to assume that the child's behavior may be effected by these early childhood factors and these behaviors may be present at school age.

Do NICU graduates continue to exhibit behavior out of the range of normal at school age? The purpose of this study will be to examine the following research questions.

1. Is the behavior of NICU graduates different from the norms established by the Child Behavioral Checklist (Achenbach, 1991) at age 6 years?

2. Which medical and environmental variables predict the behaviors of the NICU graduate at age six years?

Rationale for the Study

Studies of the behavior of NICU graduates at school age are few. Since many of the studies of NICU graduates are generated through hospital developmental follow-up programs, attrition of subjects presents a threat to studying subjects at school age. In 1993, only 14% of the hospitals with existing NICU developmental follow-up clinics followed their graduates to school age (Sell, 1993). The lack of funding for follow-up programs and attrition of subjects limits many clinics in the ability to offer follow-up services beyond the preschool years. Research of the behavior of premature infants at school age has been examined by Hadders-Algra, Huisjes, and Touwen (1988) at age 6, by Hoy, Sykes, Bill, Halliday, McClure, and Reid (1992) at age 7, by Ross, Lapper, and Auld (1990) at age 7 to 8, and by Breslau, Klein, and Allen (1988) at age 9 years.

Research has focused on the behavior of NICU graduates during infancy. The relationship between maternal ratings of infant temperament and the mother-child dyad has been examined by several authors. English, Parry, & Donovan (1988) compared the mother-infant dyad in very low birth weight (VLBW) and control groups to ascertain whether the groups were different in behavior or development as measured by the Bayley Test of Infant Development (Bayley, 1969). Oberklaid, Prior, Nolan, Smith and Flavell (1987), and Ross (1987) examined temperament in premature infants at 12 months of age. Temperament of preterm infants at 3, 6, and 12 months was examined by

Washington, Minde, and Goldberg (1986). Medoff-Cooper (1986) evaluated the stability of temperament in preterm infants between 6 and 12 months using many of the same instruments as Oberklaid. Other studies have examined temperament by comparing preterm, small for gestational age, and full-term infants at 6 and 20 months (Watt, 1987).

Other studies have examined this population during preschool years. Goldstein and Bracey (1988), Pfeiffer and Alyward (1990), and Landry, Chapieski, Richardson, Palmer, and Hall (1990) all included subjects at age 3 years. Longitudinal studies to age 4 years have been conducted by Schraeder and Tobey (1989), and Schraeder, Heverly, O'Brien, and McEvory-Shields (1992). Oberklaid, Sewell, Sanson, and Prior (1991) used the same population reported by Oberklaid, et al. (1986) to examine behavior from 5 to 70 months. Hoy, Sykes, Bill, Halliday, McClure, & Reid (1992) measured the behavioral outcome of low birth weight children at age 8 years by surveying their teachers, classmates, and self-evaluation.

All of the studies of behavior from the infancy research through the school years differ greatly in variables examined, population included, aspects of behavior assessed, and method of measuring the dependent variable. Studies which have used the Child Behavior Checklist (Achenbach, 1991) at school age have focused on only the low birth weight rather than all NICU graduates. Additionally, none of the previously discussed studies examined length of stay as a predictor of behavior, utilized maternal age at first birth (MAFB) as a socioeconomic variable, or the NMI as severity of illness indicators. The

rationale of the current study was to examine length of stay, maternal age at first birth, and the Neonatal Medical Index as variables in predicting behavior of the NICU graduate at age 6 years.

Definition of Variables

Behavior:

The Child Behavior Checklist/4-18 (Achenbach, 1991) assesses the behavioral problems and competencies of children and adolescents. The four page questionnaire is completed by the parent or significant care-taker of the child. The instrument can be completed in approximately 15 minutes and is estimated to require a fifth grade reading level for comprehension of the questions. Scoring of the 112 items results in eight problem behaviors which include: Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior.

Severity of illness:

Although the impact of neonatal medical risk factors has been found to diminish over time (Bozynski, Nelson, Matalon, O'Donnell, Naughton, Vasan,

Meier, & Ploughman, 1987) the severity of illness effects the level of family stress, which is related to how the family interacts with the child. Therefore, severity of illness is important to the study of behavior of NICU graduates. The Neonatal Medical Index (Korner, et al. 1993) is computed using several medical risk factors including birth weight measured in grams, number of days on assisted mechanical ventilation, medications used for respiratory support resuscitation if needed while on respiratory medications, intraventricular hemorrhage graded on a scale of one to four, and the presence or absence of seizure activity. The NMI is a one through five level classification system and it does not include length of stay.

MAFB:

The mother's age at first birth (MAFB) is a less cumbersome measure of socioeconomic status than many of the measures which consider income, occupation, or educational attainment. This measure has been utilized as a measure of SES in other studies examining the relationship between SES and developmental outcome (Furstenberg, Brooks-Gunn, and Chase-Lansdale 1989). Schraeder, et al. (1992) found that the age of mother at first birth accounted for more than one-third of the variance in school achievement after controlling for birth weight status.

LOS:

The length of in-patient hospital stay (LOS) in the Neonatal Intensive Care Unit was computed by subtracting the day of admission from the day of discharge. Length of stay has been considered to an indicator of severity of illness because sicker patients are likely to have longer hospital stays. It is important to note that this variable is separate from the Neonatal Medical Index which does not use length of stay in the grading system. Assuming that the behavior of the NICU graduate can be explained through biosocial theory, conditioning, and family stress models, then length of stay was estimated be a positive predictor of behavioral differences between the NICU graduate and normed population.

Statement of the Problem

Increasing attention has been given to the environment of the NICU and the effect of the environment on the developing infant. Neonatal intensive care units are typically characterized by high levels of noise, light, and activity. The infant learns behavioral adaptations to cope with the level of stress experienced due to the environment and required procedures in medical treatment. For the

infant's family, the experience of giving birth to a medically fragile child is extremely stressful and the attachment to these infants is often altered. In comparing healthy to medically fragile newborns, research investigating behavioral outcome of these infants generally suggests that parents perceive these infants as behaving differently during infancy and the preschool years. If these behavioral differences exist, can the difference be explained by length of stay, mother's age at first birth, or severity of illness? The purpose of this study was to examine the behavioral differences of NICU graduates from those published in the norms of the CBCL at age 6 years and determine whether length of stay in the hospital following birth, severity of illness, or maternal age at first birth could predict differences in behavior.

CHAPTER TWO

REVIEW OF LITERATURE

Advances in the medical fields of perinatology and neonatology have lead to a higher survival rate for premature, medically fragile, and infants born with congenital disorders (Escobar, Littenberg, & Petitti, 1991; Resnick, Roth, Ariet, Carter, Emerson, Hendrickson, Packer, Larsen, Wolking, Lucas, Schenck, Fearnside, & Bucciarelli, 1992). With the increasing survival rates, there is a growing concern about the outcome of these infants on many dimensions of development. Behavior of the NICU graduate during infancy and early childhood has been a focus of study for the past two decades. The majority of these studies have focused on the premature born at less than 37 weeks gestation, or very low birth weight (VLBW) infant born at less than 1500 grams. Researchers have used a variety of medical and environmental factors in attempt to predict behavioral outcome of these infants.

Current literature related to the behavioral outcome of the NICU graduate was reviewed. Social, medical, and other risk factors predictive of later behavioral development, as well as important family characteristics, are discussed.

Behavior Development

Many studies have examined behavior of NICU graduates during infancy. The relationship between maternal ratings of infant temperament and the mother-child dyad has been explored by several authors. English, Parry, & Donovan (1988) compared the mother-infant dyad in very low birth weight (VLBW) and control groups to determine whether the groups were different in behavior/development as measured by the Bayley Test of Infant Development (Bayley, 1969). The results suggested that interaction between mothers and preterm infants was more tentative with mothers of preterm infants reporting more difficult temperaments in their infants.

In an effort to examine the stability of behavior, temperament of VLBW infants was examined on a longitudinal basis at ages one, two, three, and four years using the same research questionnaire for each age. This study indicated that VLBW children score significantly higher on arrhythmicity, low adaptability, and low persistence during the toddler and preschool years (Schraeder & Tobey, 1989). Infants with these characteristics are likely to have difficulty moderating sleep-wake cycles, be less able to adjust to changes in environment or routine, and have a low tolerance for frustration. A similar study by Washington, Minde, and Goldberg (1986) utilized parent report of temperament with results suggesting that preterm infants are significantly more often rated as "difficult" by their mothers than full term infants at 3, 6, and 12 months of age.

Some studies of NICU graduates have stratified the sample by birth weight. Very low birth weight has been studied to determine the effect of this single variable on behavioral outcome. Utilizing the data from the participants in the Infant Health and Development Program, McCormick, McCarton, Tonascia, and Brooks-Gunn (1993) stratified the subjects by birth weight and examined parental reports of the child's behavior at age 3. All of the 280 subjects had birth weights below 1500 grams and participated in one of eight NICU developmental follow-up sites in the United States. The results of this study indicate that children with low birth weights tend to have more behavior problems as reported by parents.

In another study exploring low birth weight NICU graduates, hyperactivity was a significant behavioral outcome at age 5 of Canadian infants with birth weights less that 1000 grams. This study concluded that extremely low birth weight children were higher risk for attention deficit disorder with hyperactivity, but not other psychiatric, conduct or emotional disorders (Szatmari, Saigal, Rosenbaum, Campbell, & King, 1990).

The stability of temperament from infancy to preschool behavior was examined in an Australian population by Oberklaid, Sanson, Pedlow, & Prior (1993). The question of whether behavior at age 4 and 5 could be predicted from maternal ratings of temperament during infancy was explored. In a sample of over 1500 subjects, the prediction of preschool behavior problems was stronger in males than females. Perinatal stress, along with difficult infant

temperament ratings also added to the prediction of behavioral problems at school age.

Some authors have suggested that cognitive functioning, rather than prematurity predicts behavioral outcome. Ross (1987) studied premature infant's temperament at one year and found their temperament did not differ significantly overall as compared to full term cohorts. However, the degree of respiratory distress was correlated with premature infants' scores on some of the temperament dimensions, as was low scores on the Bayley Scales of Infant Development (Bayley, 1969). Intelligence has been demonstrated to effect the results of social competence at school age in children born with low birth weight and high medical complications. Therefore, cognitive ability should be considered when evaluating behavioral outcome of medically high risk children (Landry, Chapieski, Richardson, Palmer, & Hall, 1990).

A study by Weiglas-Kuperus, Koot, Baerts, Fetter & Sauer (1993) supports the relationship between cognitive development and behavior. While there were significantly more behavioral problems reported in the VLBW population as compared to the matched full-term controls, the authors concluded that cognition had a direct influence on the occurrence of behavior problems in the VLBW group. Cerebral damage, early neurological dysfunction, or high levels of family stress were cited as possible explanations for the relationship between cognition and behavioral development.

The interaction between VLBW, intelligence, and socioeconomic status was explored by Sommerfelt, Ellertsen, & Markestad (1993). The subjects were

non-handicapped VLBW children at age 8 years. The mean IQ of the group was 93 and all were born to families of lower SES. Conduct problems were significant, but related to low SES. When SES was controlled, there remained a significant difference in the VLBW children having more learning difficulties and school coping problems.

Some studies have examined whether programs which offer early parent education to families of VLBW children impact the behavior of the children as they become school age. The results of these studies have been mixed. Two studies have reported fewer behavioral problems at age 3 in VLBW groups with early parent education (Infant Health and Development Program, 1990, & Brooks-Gunn, Klebanov, Liaw, & Spiker, 1993). The same population in the Infant Health and Development Program was examined at age five years, concluding that the behavioral difference between the intervention and non-intervention group had disappeared (Brooks-Gunn, McCarton, Casey, McCormick, Bauer, Bernbaum, Tyson, Swanson, Bennett, Scott, Tonascia, & Meinert, 1994).

Achenbach, Howell, Aoki, & Rauh (1993) studied low birth weight children receiving a parent education program, low birth weight children without the parent education program, and compared these two groups to normal birth weight children from birth through age nine. At early ages, the behavioral ratings were more favorable for the parent education program low birth weight group. However, by age 9 years there were no differences on any of the

outcome measures between the parent education low birth weight and normal birth weight groups.

Behavioral development of NICU graduates at school age has been examined by several authors. Ornstein, Ohlsson, Edmonds, and Asztalow (1991) reviewed twenty-five follow up studies published between 1980 and 1990 which examined behavioral outcome of VLBW and extremely low birth weight (ELBW) infants at school age. In this study, ELBW was defined as infants born with a birth weight of less than 1000 grams. In this overview, fifty-two percent of the studies reported behavior problems or attentional difficulties at school age. Inattention, hyperactivity and behavioral problems were reported to occur in thirty to fifty percent of the children.

In other studies of school age children, VLBW children at age eight years were rated by teachers as unforthcoming-unassertive compared to full term controls (Rickards, Kitchen, Doyle, Ford, Kelly, & Callanan, 1993). Robertson, Etches, & Kyle (1990) found that hyperkinesis, or excessive movement, was reported to be significant in the outcome of premature small for gestational age infants as compared to matched controls at age 8 years. Features representative of attention deficit disorder, including distractibility, poor attention, and high activity level were significant in a study by Hawdon, Hey, Kolvin, & Fundudis (1990). This study examined full term but small for gestational age boys who were born between 36 and 42 weeks gestational age as compared to matched controls at age 10 and 11 years.

Four study groups, consisting of children born preterm appropriate for gestational age, preterm small for gestational age, full term appropriate for gestational age, and full term small for gestational age were studied for behavioral outcome at age 6 years by Hadders-Algra, Huisjes, & Touwen (1988). Neurological condition, gender, and birth weight were slightly associated with behavioral problems reported by parents and teachers. Premature children were more often described as troublesome by teachers. Children who were born small for gestational age were described more often as timid by their parents, and disruptive physical activity at school was associated with minimal neurological dysfunction and with the male children.

Behavioral outcome using the CBCL

Hoy, Sykes, Bill, Halliday, McClure, & Reid (1992) conducted a study on 183 VLBW and 183 matched normal birth weight children in Northern Ireland at age eight years. This study was conducted through the school system and utilized multiple methods of rating the child's behavior. Teachers evaluated their class students and class members evaluated themselves as well as their classmates on measures of social competence. The teachers used the Child Behavior Checklist (CBCL) and students used the Selective Classmate Evaluation Procedure (Hoy, Bill, & Sykes, 1991). Neither teachers nor students were aware of the students' birth weights. The teacher's ratings on the CBCL

rated the VLBW students as significantly withdrawn as compared to the matched control group. The student ratings of their VLBW peers were significant for socially withdrawn. The VLBW students' self-ratings were significant on the dimension of "sad".

Also using the Child Behavior Checklist, Ross, Lipper, & Auld (1990) looked at social competence and behavior at age 8 of children born premature. In this study, premature boys scored significantly higher in total behavior problems, particularly the Hyperactivity, Aggressive, and Delinquent scales. In this study, the Behavior Problem score was found to be correlated with family stability. Hyperactivity has been significant in VLBW boys in other studies as well (Szatmari, et al. 1990).

Breslau, Klein, & Allen (1988) measured the behavioral outcome of VLBW children at age 9 years using the CBCL. The results indicated the VLBW boys had significantly more behavior problems, including emotional distress as well as conduct problems, than their matched full term cohorts. The VLBW boys also had significantly lower social adjustment. However, no difference was found between VLBW girls and matched controls. Additionally, IQ level did not impact behavioral scores. Other studies reported no significant difference between gender on the CBCL with premature children at age 8 years (Brandt, Magyary, Hammond, & Barnard, 1992).

Cohen, Parmelee, Sigman, & Beckwith (1988) examined premature children at age 8 years. These subjects were divided into learning problem and non-learning problem groups prior to assessment with the CBCL. While the

learning problem group had some difficulty with some portions of the IQ tests, they were not significantly different on the CBCL from the non-learning problem group. This study suggests that, as a group, all of the premature children scored similarly on the CBCL.

Other studies have reviewed behavioral outcome of children born with high risk medical factors include those experiencing extracorporeal membrane oxygenation (ECMO). ECMO is a heart lung bypass procedure used in term or near term newborn infants with certain medical conditions at high risk of fatality. In the study by Hofkosh, Thompson, Nozza, Kemp, Bowen, & Feldman (1991), the CBCL was used to examine behavioral outcome of 67 ECMO survivors during the past 10 years. Although the cognitive skills were comparable to the matched controls, attentional weakness and behavioral problems were noted in a significant number of the ECMO subjects.

The CBCL has been extensively used worldwide to research behavior in special populations. Schachter, Pless, & Bruck (1991) used the CBCL to determine the percentage of behavior problems reported by parents of learning disabled Canadian children. This study found 43% to have behavior problems, which is significantly higher than the 10% reported in the normal population. Canadian children were also used with the CBCL to examine the behavior outcome of children at age 9 to 11 years who were born with intrauterine growth retardation (Low, Handley-Derry, Burke, Peters, Pater, Killen, & Derrick, 1992). The subjects were noted to score higher on scales of introversion, which included withdrawn, anxious/depressed, and somatic complaints.

Oberklaid, et al. (1991) used the CBCL on Australian children born preterm to examine behavioral outcome at age 6 years. This study concluded that the term and preterm children did not differ greatly on temperament at age 6 in the absence of environmental or intrinsic variables.

Finnish children born with mild to severe medical risk factors, including complications of low birth weight, respiratory status, or neurological insults were examined for behavioral outcome at age 6 using the CBCL (Korhonen, Vaha-Eskeli, Sillanpaa, & Kero 1993). Like the studies by Szatmari, et. al, (1990) as well as Ross et al. (1990), hyperactivity was significant in the very low birth weight subjects and behavioral problems were noted more often in males.

Weislas-Kuperus et al. (1993) examined behavior of VLBW Dutch children at age 3 ½ years. Significantly more children scored as depressed on the behavior problem scales. The results correlated with both intelligence and the home environment.

Length of Stay as a Variable in Behavioral Studies of NICU Graduates

Few studies have used length of hospital stay as one of the variables to behavioral outcome. Gennaro, Medoff-Cooper, & Lotas (1992) used length of stay as one of the predictive variables in temperament of premature infants at age 1 year. This study was a re-analysis of the data from 3 previous studies. The subjects in the previous studies consisted of a 1983-1984 NICU cohort in

the Northeast United States, a 1985-1987 NICU cohort in the Midwest States, and a 1986-1987 NICU cohort in a single NICU in a Northeast State. The variables common to the three studies were examined for their predictive value. The variables common in all three studies were birth weight, gestational age, length of stay, and days on a ventilator. In one of the three studies, longer length of stay was correlated with lower threshold to stimuli, suggesting that these infants are less able to block stimuli. Across the three cohort studies, the overall results indicate that preterm low birth weight infants are more temperamentally difficult, however there were no variables able to significantly predict characteristics of temperament. No studies were found which used length of stay as a predictive variable to examine behavior of NICU graduates at school age.

Maternal Age as a Variable in Behavioral Studies of NICU Graduates

Socioeconomic status as measured by the age of the mother at first birth has been used in recent studies. Maternal age at first birth (MAFB) was found to have a significant correlation with all aspects of school achievement in first grade children (Schraeder, Heverly, O'Brien, & McEvoy-Shields, 1992). This study examined the school achievement of 71 children and their primary caregivers using the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983) and the Peabody Individual Achievement Test - Revised

(Markwardt, 1989). Of the 71 children studied, 39 were very low birth weight and 32 were normal birth weight. Children in both birth weight groups with lower achievement scores had mothers who were very young when they gave birth to their first child. Additionally, early childbearing was strongly associated with lower SES, increased use of public assistance, lower maternal education, single parent status, and a larger number of children. Early childbearing was also associated with a less emotionally and verbally responsive environment. This study found that age of mother at first birth accounted for more than one-third of the variance in school achievement after controlling for birth weight status.

Furstenberg, Brooks-Gunn, and Chase-Landsdale (1989) linked the age of the mother with risk of developmental problems in young children. Children born to teen age mothers were found to be at a higher risk for developmental delays throughout childhood than children who are born to mother's in their late twenties or thirties. In this study, early child bearing was associated with lower socioeconomic status, use of public assistance, and lower maternal education.

Hershberger (1994) used MAFB in examining language development at age three years in low birth weight children. This study correlated MAFB with other methods of measuring socioeconomic status including the use of public assistance, maternal education, and family structure. The MAFB was significantly correlated with use of public assistance (r=-.47), maternal education (r=.40), and family structure (r=.29). The combination of MAFB, SES, and severity of illness accounted for approximately 26% of the variability of language development of low birth weight children in this study.

Maternal age has been demonstrated to be a predictor to behavioral outcome. Results from the Infant Health and Development program indicated that behavior problems were more often reported by younger mothers of medically high risk infants at age 3 years (Ramey, Bryant, Wasik, Sparling, Fendt, & LaVane (1992).

The interaction between maternal education and income with behavioral outcome has been demonstrated in both normal and low birth weight children. One study concluded that both factors had large effects on behavior problems. However, low income had the greatest effect on behavior in low birth weight children and low maternal education increased the odds of behavior problems in normal birth weight children (McGauhey, Starfield, Alexander, & Ensminger, 1991).

Description of Measures

Child Behavior Checklist/4-18

The Child Behavior Checklist 4/18 (CBCL) (Achenbach, 1991) was developed on the belief that parents and parent surrogates are typically the most knowledgeable about their child's behavior across time and situations. Because parents are the most knowledgeable about their child's behavior, parental information in assessing behavior is critical. The instrument consists of a 4 page

form and takes approximately 15 minutes to complete. A fifth grade reading level is needed for completion of the items.

The CBCL is a multiaxial assessment of an individual child's behavior. The first two pages contain questions regarding the child's strengths and competencies. Parents answer questions about their child's activities, interests, ability and time invested in activities, peer and sibling relationships, and school functioning. Parents are asked to list the activities, organizations, and household chores for the child and rate, on a three point scale, how often the child engages in the activity and how well he/she does each activity compared to age mates.

The last two pages of the CBCL consist of 118 statement items which compose the eight problem scales. Parents are asked to rate how well each statement describes the child on a three step scale of 0, 1, or 2 interpreted as not true, somewhat or sometimes true, or very or often true, respectively. Examples of these items are "impulsive or acts without thinking", "cries a lot", and "unusually loud". The questionnaire asks the parent to rate the occurrence of physical problems such as "headaches", "nausea", "rashes or other skin problems". There is space for the parent to write in additional items or comments including physical problems without known medical cause other than those specified. Parents are also asked to describe other responses such as "speech problem" or "repeats certain acts over and over; compulsions" if the parent rates the item as a 1 or 2 response. Writing the description of these items assists the scorer in clarifying the intent of the parent on these items.

The CBCL can be either hand or computer scored using software obtained through the test publisher. Upon scoring the completed CBCL questionnaire, the eight problem scales are derived as well as internalizing and externalizing groupings of problem scales, and a total behavior problems score.

The eight problem scales of the CBCL are labeled: Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior. The first scale, Withdrawn, consists of descriptors including; would rather be alone, refuses to talk, secretive, shy or timid, under active, unhappy or sad or depressed, and withdrawn. The second scale, Somatic Complaints consists of descriptors including; feels dizzy, over tired, and aches or pains including headaches, nausea, eye problems, skin rashes, stomachaches, and vomiting. The third scale, Anxious/Depressed consists of descriptors including; lonely, cries a lot, fears impulses, needs to be perfect, feels unloved, feels persecuted, feels worthless, nervous or tense, feels too guilty, self-conscious, suspicious, unhappy or sad or depressed, and worries. The fourth scale, Social Problems, includes descriptors; acts too young, too dependent, doesn't get along with peers, clumsy, prefers younger kids, lonely, cries, feels unloved, feels persecuted, feels worthless, and accident prone. The fifth scale, Thought Problems, includes descriptors; can't get mind off thoughts, hears things, repeats acts, sees things, strange behavior, and strange ideas. The sixty scale, Attention Problems, includes descriptors; acts too young, can't concentrate, can't sit still, confused, daydreams, impulsive, nervous or tense, poor school work,

clumsy, and stares blankly. The seventh scale, Delinquent Behavior, includes descriptors; lacks guilt, bad companions, lies, prefers older kids, runs away from home, sets fires, steals at home, steals outside home, swearing or obscenity, truancy, alcohol or drugs, thinks about sex too much, and vandalism. The eighth scale, Aggressive Behavior, includes descriptors; argues, brags, mean to others, demands attention, destroys own things, destroys others' things, disobedient at school, jealous, fights, attacks people, screams, shows off, stubborn or irritable, sudden mood changes, talks too much, teases, temper tantrums, threatens, loud, and disobedient at home (Achenbach, 1993).

The eight syndrome scales were derived from groupings of items whose scores covaried with one another. For example, on the Withdrawn scale, items such as "rather be alone", "shy", "sulks" and others had a high covariance and were thus grouped together to form a problem scale characteristic of a child who is withdrawn. The other 7 scales were formed in the same manner. A few of the items, such as "sad" were found to covary with more than one problem grouping. The item, "sad", is included on both the Withdrawn and Anxious/Depressed scales.

The norms for the 1991 edition of the CBCL were formed through a re-analysis of the prior 1983 edition (Achenbach & Edelbrock, 1983). Added to the re-analysis of the 1983 norms were the addition of subjects referred for mental health services at one of the 52 participating settings including private and community psychiatric facilities, clinics operated by universities, military, religious groups, general hospitals, or special education programs. The

re-analysis involved new principal component analyses of each sex at ages 4 to 5, 6 to 11, and 12 to 18. The norms were established for each sex at each age group. The scores are reported in T-scores.

Reliability on the CBCL refers to the agreement between repeated measures of the same phenomena when the phenomena is presumed to remain constant. To assess reliability for the CBCL, inter-interviewer reliability, test-retest reliability, and the degree of agreement between mother and father is important.

Inter-interviewer reliability refers to situations in which a parent does not self-administer the questions, rather an interviewer administers it to the parent. The 1991 manual reports the inter-interviewer reliability between 2 interviewers with 241 subjects to be .959 for the 118 problem items.

Test-retest reliability was measured with one interviewer visiting 72 mothers of non-referred children. The time between the first and second test was 7 days. The test-retest reliability for the 118 problem items was reported to be .952.

The reliability between mother and father completing the instrument on their child was more difficult to assess. Parents may have different opportunity to view a child's behavior, may view the magnitude of any behavior differently, or may interpret the behavior differently. Nevertheless, many studies have sought to compare mother's and father's ratings of their child's behavior using the CBCL. As reported in the manual, parent comparisons range from the highest to the lowest agreement on Attention Problems (r=.79), Aggressive Behavior

(r=.79), Delinquent Behavior (r=.78), Social Problems (r=.77), Withdrawn (r=.66), Anxious/Depressed (r=.66), Somatic Complaints (r=.52), and Thought Problems (r=.48).

The validity of the CBCL pertains to the accuracy with which the instrument measures what it is supposed to measure. The author reports and discusses three types of validity; content, construct, and criterion.

The content validity of the CBCL refers to whether the questions regard characteristics of children referred to mental health clinics for specific problems. Children who had been referred to mental health clinics rated consistently higher in problem item scores than those who had not been referred for clinical services. The significant association of problem items with referral status for mental health services indicates that the items do reflect behavioral problems in children.

Construct validity has been measured by comparing the CBCL to other assessment procedures that may measure similar constructs. The CBCL manual reports correlations between the CBCL and the Conners Parent Questionnaire (1973). The Conners Parent Questionnaire is an instrument widely used in clinical and educational settings to assist in the diagnosis of Attention Deficit Hyperactivity Disorder (Conners, 1973). Five of the eight scales of the CBCL are represented also on the Conners. The correlations between the CBCL and Conners, respectively, are reported as: Attention Problems - Impulsive/Hyperactive (r=.59), Anxious/Depressed - Anxiety (r=.67), Somatic Complaints - Psychosomatic (r=.70), Delinquent Behavior - Antisocial (r=.77),

Delinquent Behavior - Conduct Problem (r=.72), and Aggressive Behavior - Conduct Problem (r=.86).

Construct validity is also assessed comparing the CBCL to the Quay-Peterson Revised Behavior Problem Checklist. Six of the eight CBCL scales compared with Quay-Peterson correlations, respectively, are reported as: Delinquent Behavior - Socialized Aggression (r=.59), Delinquent Behavior - Conduct Disorder (r=.73), Thought Problems - Psychotic (r=.64), Withdrawn - Anxiety/Withdrawn (r=.66), Anxious/Depressed - Anxiety/Withdrawn (r=.78), Attention Problems - Motor Excess (r=.66), and Attention Problems - Attention Problems (r=.77).

The criterion related validity of the CBCL is measured by the ability of the instrument to differentiate between children referred for mental health services and those not referred. The criterion related validity studies reported in the CBCL manual matched referred and non-referred samples demographically to prevent demographic differences in scores from being confounded with referral status. T-score cutoff points were established to distinguish between individual scores falling in the borderline and clinically significant ranges. An odds ratio analysis was used to compare the problem T-scores with referral to clinical services to verify whether those with clinically significant T-scores reflected the referred group. The odds ratio for each problem scale were reported to be: Withdrawn (8.3), Somatic Complaints (3.9), Anxious/Depressed (10.1), Social Problems (10.9), Thought Problems (8.5), Attention Problems (13.7), Delinquent Behavior (10.5), and Aggressive Behavior (10.2). The odds ratio is interpreted

as, e.g. children with a clinically significant score on the Withdrawn problem scale are 8.3 times more likely to be referred for mental health clinical services. Results of the criterion related validity study have indicated that, over a 3 year period, Attention Problems is the scale which is the best predictor of referral status.

Severity of illness:

Severity of illness has been used to predict developmental outcome of newborn infants in many studies. Molfese (1989) reviewed literature on perinatal risk scales and found that neonatal medical risk scales which include children below 1500 grams can be used in predicting later infant outcomes with results predictive until between age 2 and 3. Beyond age 2 or 3 years, the impact of neonatal medical risk factors has been found to diminish over time (Bozynski, Nelson, Matalon, O'Donnell, Naughton, Vasan, Meier, & Ploughman, 1987) as the impact of environmental factors becomes more influencial to development.

There are several single neonatal complications which have strong predictive value to long term outcome. Intraventricular hemorrhage (IVH) is a rupture of blood vessels in the germinal matrix of the brain. This rupture causes a pooling of blood into the ventricles and the risk of brain damage is due to excessive pressure on surrounding tissue or because of clotting of the blood.

The hemorrhage is measured on a four point scale corresponding to the number and location of ventricle spaces in which the blood pools. An IVH occurs in up to 45% of all preterm infants with birth weights less than 1500 grams (Blackman, McGuinness, Bale, & Smith, 1991). Grades III and IV are considered to be major causes of long term neurological dysfunction.

Mechanical ventilation is often a treatment for respiratory distress in new born infants. The lungs of premature infants are often not fully developed so that mechanical ventilation is necessary to sustain life until the lungs can develop. The length of time on a ventilator has been demonstrated to be a powerful predictor of poor developmental progress during the first 18 months of life in infants with birth weights less than 1200 grams (Bozynski, et al. 1987).

The Neonatal Medical Index (Korner, Stevenson, & Forrest, 1993) was developed as a method to classify the severity of the infant's medical condition as opposed to evaluating all of the complications and symptoms of the infant during the neonatal period. It is structured as a one through five level classification system which includes the infant's birth weight, presence and grade of intraventricular hemorrhage, length of assisted ventilation, major surgery, seizure activity, presence of apnea and bradycardia, and medications necessary to manage the aspects of the illnesses. It is particularly useful in classifying all NICU graduates because it considers variables pertaining to very low birth weight as well as larger or full-term infants born with severe medical complications such as seizure disorders or those conditions requiring surgery.

The medical information needed to assign the NMI can be readily obtained in the infant's hospital discharge summary.

Korner, et al. (1993) demonstrated the concurrent validity of the NMI in discriminating between the neurobehavioral performance of infants, as measured by the NAPI, who had experienced different degrees of illness. This suggests a correlation between neurological immaturity and degree of illness.

Predictive validity of the NMI was demonstrated by Korner, et al. (1993) with infants weighing less that 1500 grams at birth. This study, which was a part of an eight site study with the Infant Health and Development Program, suggested that socioeconomic status continues to be the best predictor of later development in infants born at higher weights, but the NMI was as good as SES for predicting the later development of infants at birth weights less than 1500 grams.

Length of stay:

The length of stay in the NICU following birth is computed by subtracting the day of admission from the day of discharge. While length of stay can be considered an indicator of severity of illness, the effect of this variable was not compounded because the NMI does not use length of stay in the grading system. Assuming that a child's difficult behavior can be explained through

biosocial theory, conditioning, and family stress models, then length of stay was assumed to be a positive predictor of high problem scores. There have been no research studies using length of stay as a predictor to behavioral outcome of high risk neonates at school age.

Mother's age at first birth:

Maternal age at first birth (MAFB) has been associated with school achievement of low and normal birthweight children at school age (Schraeder, et al. 1992), language development of low birth weight children (Hershberger, 1994), and a higher risk for developmental delay throughout childhood (Furstenberg, et al.1989). This variable has been highly correlated with other measures of socio-economic status (Hershberger, 1994; Schraeder et al. 1992). The MAFB is easily obtained in medical records and less cumbersome than other measures of SES which require computation of many factors.

Summary

Infant temperament studies have examined the effects of prematurity on the individual infant as well as the parent-infant dyad. Most studies suggest that premature infants have more difficult temperaments than full term infants.

A limited body of research focuses on behavior at school age of children born premature and those receiving technologically advanced procedures, such as ECMO. In general, these studies suggest some differences in behavior, with birth weight and SES linked to more behavioral problems. Maternal age at first birth, length of stay in the NICU, and severity of illness have not been used to predict behavioral outcome of NICU graduates at school age. The present study was an effort to examine the behavioral outcome of this population at age 6 years and determine which of the variables could be used to predict behavior.

CHAPTER THREE

METHOD

This chapter describes the subjects, instruments, procedures, and data analyses used to investigate the research questions. The subjects consisted of graduates of a neonatal intensive care unit, with birth dates from January 1989 to September 1991, who met the high risk criteria to be included in a developmental follow-up clinic.

Subjects

The participants for this study (N= 50) were graduates from a regional tertiary level neonatal intensive care unit born between January 1, 1989 and September 1, 1991. The subjects had met the criteria for inclusion in the developmental follow-up clinic of the NICU. To be eligible for the developmental follow-up clinic, each subject had one of the following birth conditions; birth weight below 1500 grams, neonatal seizures during the first 48 hours following birth, any grade of intraventricular hemorrhage, or ventilated assisted respiration for at least 48 hours following birth.

Records from the developmental follow-up clinic were reviewed to determine the subject pool who had attended the developmental follow-up clinic within the previous 3 years on whom IQ testing had been conducted. The total with attendance and who had IQ testing was 83. Two subjects were excluded due to previous intelligence testing yielding a full scale IQ of 85 or less as measured by the Weschler Preschool and Primary Scale of Intelligence - Revised (Weschler, 1989). The standardization procedure of the Child Behavior Checklist excluded intellectually handicapped children and these children were excluded from the present study to be consistent with the norms of the CBCL. Only singletons were included in the study sample, with elimination of twin or triplet births, which eliminated 13 children. The remaining 67 subjects were between 6 years, 0 months, 0 days and 6 years 11 months 29 days at the time of the study. This age was selected because 6 year old children have experienced one year of school. Of the 67 potential subjects, four were returned by the postal service with no forwarding address, thirteen failed to return the survey following phone contact requesting participation, and 50 (76%) completed and returned the survey instrument.

The Institutional Review Board of the hospital and the Institutional Review Board at Oklahoma State University reviewed the treatment of human subjects study protocol. The study was approved under an expedited status by both boards (see Appendix A).

Of the fifty subjects completing the study, 26 were male and 24 were female. The mean age was 76 months with a range of 72 to 83 months. Data of

the subjects birth consisted of a mean birth weight of 2189.94 grams (range 780 to 4430), gestational age ranging from 25 to 42 weeks with a mean of 34.12, and a mean length of hospital stay following birth 47.52 days (range 8 to 142). The Neonatal Medical Index (NMI) mean was 3.36 with a range of 2 to 5. The maternal age at first birth ranged from 14 to 37 years with a mean of 24.36 years. Twenty-five or 50% of the subjects were the first born child in the family and the remaining 50% had from one to three older siblings. Forty-four of the subjects listed Caucasian as their race with four Native American, one Hispanic, and one African American.

Procedure

The 83 potential subject pool was identified and assigned a random subject number. The developmental follow-up clinic records were examined for each subject to determine whether they meet possible exclusion criteria. Of the 83 potential subjects who had attended the follow-up clinic within the past 3 years and therefore IQ testing was available, 2 of the subjects had full scale IQ's measured at less than 85, and 5 sets of twins and 1 set of triplets were identified. After exclusion of these subjects, the remaining number of subjects was 67.

Beginning in January, 1996, survey packets were mailed to the parents of the 33 eligible subjects located through the developmental follow-up clinic

records with birth dates in 1989. Packets were mailed to the 34 subjects born in 1990 and the 16 subjects born in 1991 within 2 months following the child's sixth birthday. The packet included the parent information letter (see Appendix B) which explained the purpose of the study as well as procedures and information to be gathered. Two identical consent forms to participate in the study (see Appendix C), one to be signed and returned and one for parents to retain, were in the packet. The demographic data form (see Appendix D), Child Behavior Checklist, and self addressed stamped envelope were in the packet. A telephone number was provided on both the information letter and the consent form for parents to receive additional information. Two parents called the researcher requesting additional information and they requested a copy of the study results following completion.

Of the 67 packets mailed, 4 were returned by the postal service with no known address and were lost to follow-up. Of these four, one was in each of the 1989 and 1991 cohorts and two were from the 1990 cohort. If surveys had not been returned within one month of mailing, a telephone call was made to the parent to request participation. Thirteen of the parents telephoned responded that they had received the survey, wanted to participate, would return the surveys but did not follow through with returning the survey. Of these 13, six were in each of the 1989 and 1990 birth years, and one was in the 1991 birth cohort. A second telephone call to request the completed survey was not made.

After the completed surveys were returned, medical data was obtained on all subjects participating in the study by examining the child's hospital records

and discharge summary of the neonatal period. The data was recorded on the Medical Records Review Form (see Appendix E). The medical information was then used to assign a Neonatal Medical Index (NMI) classification.

A data base using the subject number was created. The Child Behavior Checklist was scored with the CBCL computer scoring software. The scores from the CBCL, medical records form, and demographic data form were assembled and entered into the data base. Subject names were not included in this data base.

Data were analyzed by two methods. To answer research question number one; Is the behavior of NICU graduates different from the norms established by the Child Behavioral Checklist (Achenbach, 1991) at age 6 years, the sample and population means were compared using student t-tests. To answer research question number two; Which medical and environmental variables predict the behaviors of the NICU graduate at age six years, the three predictor variables and the problem scales were analyzed using SAS with regression procedures.

Instruments

The instruments used in this study consisted of the Child Behavior Checklist/4-18 (Achenbach, 1991) and two data collection forms developed by the Hershberger (1994). A demographic information form was designed to obtain information regarding the child's mother and family characteristics. The

medical records review form was used to document medical risk variables and to obtain information needed to assign an NMI classification.

Child Behavior Checklist/4-18

The subjects were assessed on the Parent Report Form of the Child Behavior Checklist (Achenbach, 1991). The CBCL was developed on the belief that parents and parent surrogates are typically the most knowledgeable about their child's behavior across time and situations. Because parents are the most knowledgeable about their child's behavior, parental information in assessing behavior is critical. The CBCL is a multiaxial assessment of an individual child's behavior which includes strength and competencies and 118 statement items which compose the eight problem scales. Upon scoring the completed CBCL questionnaire, the eight problem scales are derived. The test can be further analyzed to determine groupings of syndromes and a total behavior problems score. For the purposes in this study, only the eight problem scales were utilized.

The original items which developed the CBCL were derived from studies performed in the 1960's (Achenbach, 1966; Achenbach & Lewis, 1971) wherein parents of children being evaluated in three child guidance clinics in Connecticut were asked to rate their children on several behavioral statements. The behavioral statements were issues of concern to the parents of the children receiving services at the clinic and concerns of the mental health professionals.

In the 1983 edition of the CBCL (Achenbach & Edelbrock, 1983), the items had been clustered to form problem scales. The norming of these scales involved administration to a broader population. The norms for the 1991 edition of the CBCL were formed through a re-analysis of the prior 1983 edition. Added to the re-analysis of the 1983 norms were subjects referred for mental health services, since the 1983 edition, at one of 52 participating settings. The re-analysis involved new principal component analyses of each sex at ages 4 to 5, 6 to 11, and 12 to 18. The norms are established for each sex at each age group. The total number of subjects reflected by the 1991 norms in the 4 to 11 years age group is 1,200.

The names of some of the eight problem scales were revised between the 1983 and 1991 editions of the CBCL. The scales of Withdrawn, Somatic Complaints, Delinquent Behavior, and Aggressive Behavior remained consistent. The Anxious/Depressed scale is a compilation of the 1983 Depressed and Anxious-Obsessive scales. The Social Problems scale is the counterpart to the 1983 Social Withdrawal scale. The 1991 Thought Problems scale is a rough counterpart to the 1983 Schizoid scale for girls and the Obsessive-Compulsive scale for boys. The 1991 Attention Problems scale is a counterpart to the 1983 Hyperactive syndrome.

The eight problem scales of the 1991 edition consist of; Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior. The scales were constructed to help identify syndromes of problems that occur together.

The items were derived from studies in which problem behaviors were identified by parents and mental health professionals (Achenbach, 1966; Achenbach & Lewis, 1971). The instructions ask parents to rate their child's behavior during the past 6 months on each behavior item. The response scale consists of 3 possible choices, not true, somewhat or sometimes true, and very true or often true for each of the 118 behavior items. There is space on some of the items, such as "speech problem" or "hears sounds or voices that aren't there" for the parents to describe the specific behavior. A final item, number 113, is blank as an opportunity for parents to write in additional behaviors not addressed in the previous items. Scoring the completed CBCL can be accomplished through either hand or computer scoring using the software published by the test author.

The validity of the CBCL pertains to the accuracy with which the instrument measures what it is supposed to measure. As noted with the test description in Chapter Two, the CBCL has adequate content, construct, and criterion validity for use with school age children (Achenbach, 1991).

The reliability of the CBCL refers to the agreement between repeated measures of the same phenomena when the phenomena is presumed to remain constant. To assess reliability for the CBCL, inter-interviewer reliability, test-retest reliability, and the degree of agreement between mother and father is important. Specific reliability measures were reviewed in Chapter Two and are adequate for this test to be used with school aged children.

Demographic Information Form

Characteristics of the child's mother and family were obtained through use of the demographic information form. To identify the subject and protect confidentiality, this form was coded with the subject number in the upper right hand corner of the paper. Information obtained included the mother's race, current age, age at first birth, birth order of the study subject, number of children in the home, highest level of maternal education, current marital status, head of household, occupation and educational level of head of household, annual income and use of public assistance. The current study used race, birth order, and number of children in the home for demographic information. Predictor variables included maternal age at first birth and medical variables.

Neonatal Medical Index Classification

The Medical Records Review Form was designed to obtain information regarding the child's medical history from the hospital records. The records were reviewed by the examiner to obtain labor and birth history, neonatal hospital course, and re-hospitalizations. The information was archival at the time it was gathered. The information was used to assign a Neonatal Medical Index (NMI) classification (Korner, et al. 1993). This classification system measures the severity of illness of newborns from birth through their neonatal

hospitalization. It includes birth weight, necessary interventions or medications, and complications.

The classification system is based on a 5 point scale in which 1 is the least severe and 5 is the most severe medical status. The scoring is based on two principals: 1) Infants with birth weights more than 1000 grams would be assigned an NMI classification of I or II depending on their oxygen requirements or additional medical complications such as meningitis which could increase the classification to a III, IV, or V; and 2) the need for and duration of mechanically assisted ventilation. The use of mechanical ventilation as a marker of severity of illness is based on the assumption that, in most cases, infants with a compromised respiratory status tend to be more ill and have longer length of hospital stays.

Data Analysis

Data analysis was accomplished by two methods relative to the two research questions. The first research question concerned whether the behavior of NICU graduates was different from the norms established by the Child Behavioral Checklist at age 6 years This question was answered by comparing the mean scores of the 8 problem scales in the study sample to the average mean scores of the standardization population using student t-tests.

The second research question concerned which medical and environmental variables would predict the behaviors of the NICU graduate at age six years. This analysis was accomplished using the SAS program with a full regression model and forward stepwise regression with the various predictors for the eight problem scales.

CHAPTER FOUR

RESULTS

Introduction

This chapter presents demographic information and the results of the data analysis. Initially, the demographic information about the sample is presented. This if followed by the comparison of these NICU graduates with population norms for the CBCL. Finally the medical and environmental variables are used to predict the children's scores on the CBCL.

Demographic and Descriptive Information

Table I presents social demographic information including subject gender, age at time of participation in the study, race, maternal age at first birth (MAFB), and placement in sibling order for the current sample.

Table I

Social Demographic Data

Gender - n	Race - n	Sibling Order - n
Male=26 (52%)	Caucasian=44 (88%)	No older sibs=25 (50%)
Female=24 (48%)	American Indian=4 (8%)	One older sib=20 (40%)
	Hispanic=1 (2%)	Two older sibs=3 (6%)
	Black=1 (2%)	Three older sibs=2 (4%)

	Mean	Sd	Range
Age at participation (months)	76.92	3.35	72-83
Maternal age at first birth (years)	24.36	5.44	14-37

Of the 50 subjects participating in the study, twenty-six were male and twenty-four were female. For the current sample, forty-four of the subjects were Caucasian (90%) while four were Native American, one Hispanic, and one African American. Twenty-five (50%) of the subjects were the first born child in the family, twenty (40%) were the second child, three were the third child, and two were the fourth child in the family.

All of the subjects were 6 years old at the time of the study and had attended at least their kindergarten year of public school. The subjects were contacted between January, 1996 and September, 1997. The average age of the subjects at the time of the study was 76.92 months. The median age was 76

months or 6 years, 5 months. The range of age was from 6 years one month to 6 years eleven months.

The maternal age at first birth ranged from 14 to 37 years with mean of 24.36 years and median age of 25 years. Eight (16%) of the 50 mothers were below age 20 when the first child was born and eleven (22%) were in their thirties.

Table II represents medical descriptive information including birth weight, gestational age, length of stay (LOS) in the hospital NICU, and the neonatal medical index (NMI) rating.

Table II

Medical Description

	Mean	Sd	Range
Birth weight (grams)	2189.94	1001.13	780-4430
Males	2215.81	985.7	980-4430
Females	2161.92	1016.84	780-4300
Gestation (weeks)	34.12	4.54	25-42
Males	34.04	4.34	27-42
Females	34.21	4.74	25-41
Length of Stay (days)	47.52	34.1	8-142
Males	45.27	33.2	9-142
Females	49.96	34.88	8-142
NMI classification	3.36	.79	2-5
Males	3.19	.73	2-5
Females	3.54	.82	2-5
Maternal age at first birth (years)	24.36	5.44	14-37
Males	24.73	5.33	14-32
Females	23.96	5.53	15-37

The mean birth weight of the 50 subjects was 2189.94 grams. The range of birth weight was from 780 to 4430 and the median birth weight was 1835 grams. The gestational age of the subjects ranged from 25 to 42 weeks with a mean of 34.12 and median gestational age of 33 weeks. The subject's LOS in

the hospital following birth ranged from 8 to 142 days with a mean of 47.52 and median of 35 days.

The NMI severity of illness is classified from 1 to 5, corresponding from least to most severe. The population from which the sample was drawn were all participants in the developmental follow-up clinic of the NICU. The developmental follow-up clinic is designed to follow the most severely ill babies through their preschool years. The criteria for inclusion in the follow-up clinic eliminated potential subjects with the lowest severity of illness. Therefore, the range of the subjects on the NMI was 2 to 5 with a mean of 3.36. This means that the average participant in the study was on assisted ventilation for 3-14 days and had additional cardio-respiratory illness which required treatment with medication or had increased levels of bilirubin in their blood which required blood transfusions. Six of the subjects had an NMI rating of 5 (most severe), ten (20%) had an NMI rating of 4, thirty (60%) had an NMI rating of 3, and four subjects had an NMI rating of two. There were no subjects in the pool for selection with an NMI rating of one.

Comparison of the NICU Graduates with Population Norms

The first question concerned whether the behavior of the NICU graduate different from the norms established by the Child Behavioral Checklist (Achenbach, 1991) at age 6 years, was answered by comparing the means of

the subjects to the means published in the CBCL. Table III depicts the subject's scores on the eight problem scales of the CBCL as compared to the published scores of the CBCL. The norms and standard deviations published in the CBCL manual are divided by gender. The difference in the means for males and females ranged from 0 to .2 . On five of the eight scales, the mean scores were the same for males and females and there was a .2 difference on one scale. The standard deviations are also published as separate numbers for males and females. The difference in the standard deviations for males and females ranged from no difference to a difference of .3. The current study uses the midpoint between both the mean and standard deviation published in the CBCL for comparison of the study subjects' mean.

Table III

Sample and Published CBCL Mean Scores

Scale	Present sample Scores (N=50)	Present Sample Sd (N=50)	Published Scores (N=1200)	Published Sd (N=1200)
Withdrawn	54.82	6.29	54.0	5.65
Somatic Complaints	55.4	7.47	53.85	5.75
Anxious/Depressed	54.92	6.87	54.0	5.8
Social Problems	55.4	7.0	53.95	5.75
Thought Problems	55.86	7.53	53.3	5.6
Attention Problems	56.4	8.22	54.0	5.85
Delinquent Behavior	54.9	6.11	53.8	5.7
Aggressive Behavior	55.02	7.0	54.05	5.9

Table IV depicts the student t-test scores and probability of significance when comparing the present sample's mean scores to the published mean scores. Since eight t-tests were computed, a Bonferroni test was employed yielding an overall significance level of .0062 (Dunn, 1961).

Table IV

Student t-test scores and probability of significance

Scale	t-test	probability
I. Withdrawn	1.001	p< = 0.317
II. Somatic Complaints	1.843	p< = 0.066
III. Anxious/Depressed	1.09	p< = 0.276
IV. Social Problems	1.731	p< = 0.084
V. Thought Problems	3.118	p< = 0.002*
VI. Attention Problems	2.789	p< = 0.005*
VII. Delinquent Behavior	1.333	p< = 0.183
VIII. Aggressive Behavior	1.133	p< = 0.258

df=1248

In answering research question number one; Is the behavior of the NICU graduate different from the norms established by the Child Behavioral Checklist (Achenbach, 1991), two of the eight scales are significantly different at better than the .01 level; the scales measuring Thought Problems and the scale measuring Attention Problems. Somatic Complaints and Social Problems neared significance with .06 and .08, respectively. The t-test analysis of the

remaining scales suggest no difference between the means of the NICU subjects and the population on which the CBCL was standardized.

Environmental and Medical Prediction of Behaviors

The second question examined which medical and environmental variables predict the behaviors of the NICU graduate at age 6 years. The data were analyzed by two models of regression, a full model and a forward stepwise model. The full model consisted of the total of three prediction variables, length of stay (LOS), maternal age at first birth (MAFB), and neonatal medical index (NMI) to predict the outcome of behavior on each of the eight CBCL problem scales. Table V reflects the data from the analyses of the full model.

Table V

Model including LOS, MAFB, & NMI on each CBCL scale

Scale	Adjusted R-Square	p =
Withdrawn	0.0647	0.375
Somatic Complaints	0.0452	0.542
Anxious/Depressed	0.0980	0.187
Social Problems	0.0079	0.947
Thought Problems	0.0226	0.785
Attention Problems	0.0352	0.645
Delinquent Behavior	0.0182	0.837
Aggressive Behavior	0.0708	0.332

The results of the full model suggest that the predictor variables predicted less than one-tenth of the behavioral outcome of NICU graduates on the CBCL.

Table VI illustrates the forward regression of each of the three variables on the eight outcome scales. Forward stepwise regression is a method in which the computer enters the variables one at a time and computes the amount of variance with each added variable. In this stepwise model, MAFB was entered first, then LOS and NMI. The default setting for inclusion of predictor variables in the forward regression was .5. That is, those variables whose contributions exceeded the .5 specified level were included in the analysis.

Table VI

Forward Stepwise Regression of MAFB, LOS, & NMI on the CBCL

Scale Variable	R-Square Increment	Model R-Square	F	p >F
Withdrawn				
MAFB	0.0520	0.0520	2.634	0.1112
LOS	0.0117	0.0637	0.588	0.4470
NMI	ns			
Somatic Complaints				
MAFB	ns			
LOS	0.0294	0.0294	1.46	0.2336
NMI	ns			
Anxious/Depressed				
MAFB	ns			
LOS	0.0942	0.0942	4.99	0.0302
NMI	ns			
Social Problems				
MAFB	ns			
LOS	ns			
NMI	ns			
Thought Problems				
MAFB	0.0183	0.0183	0.597	0.3435
LOS	ns			
NMI	ns			
Attention Problems				
MAFB	0.0304	0.0304	1.507	0.2256
LOS	ns			
NMI	ns			
Delinquent Behavior				
MAFB	ns			
LOS	ns			
NMI	0.0156	0.0156	0.762	0.38
Aggressive Behavior				
MAFB	ns			
LOS	0.0627	0.0627	3.21	0.0795
NMI	ns			

ns = p>.05

In this table, the semipartial correlation of each variable is represented by the R-Square increment while the cumulative variance is represented in the Model R-Square. In only two of the scales did the variables meet or approach significance in predicting outcome; Anxious/Depressed and Aggressive Behavior. Surprisingly, it was not MAFB but LOS that predicted the greatest variance in these two scales. Maternal age at first birth had the greatest prediction in Withdrawn, Thought Problems, and Attention Problem scales, but none of these reached significance. Length of Stay was a significant predictor on the Anxious/Depressed scale at the .03 level. The NMI predictor was predictive in only the Delinquent Behavior scale. Social Problems was not predicted at even the .5 level by any of the predictor variables.

Summary

This chapter presented demographic and descriptive medical data on the research subjects in addition to the data analysis for the two research questions. The first research question, Is the behavior of the NICU graduate different from the norms established by the Child Behavioral Checklist (Achenbach, 1991) at age 6 years, was answered by comparing the means of the subjects to the means published in the CBCL. Analysis of this data indicates that two of the eight scales were significantly different; Thought Problems and Attention Problems. The second research question concerned whether maternal age at

first birth, length of stay, or neonatal medical index could predict the behaviors of the NICU graduate at age 6 years. This question was answered by two models of regression; a full model and a forward stepwise model. Analysis of this data indicates that LOS was helpful in predicting 4 of the outcome scales with a significance level of .03 on the Anxious/Depressed scale. The MAFB was a significant predictor in 3 of the 8 scales and NMI significant in only one scale.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

Discussion

This study compared the scores of NICU graduates to published norms on the CBCL. It also examined the predictability of maternal age at first birth, length of stay in the NICU, and the neonatal medical index on behavior at the age of six years. The results are discussed in terms of how these results relate to published literature, implications of the research, and suggestions for additional research.

The first research question examined whether the behavior of the Neonatal Intensive Care Unit graduate might be different from the norms established by the Child Behavioral Checklist (Achenbach, 1991) at age 6 years. The review of literature indicated that temperament and behavior of NICU graduates are different than healthy newborns during infancy (English et al. 1988; Washington, et al. 1986; & Medoff-Cooper, 1986). Some studies have noted differences during preschool and early school age (McCormick et al. 1993;

Schraeder & Tobey, 1989; Oberklaid et al. 1991; Ornstein et al. 1991; Rickards et al. 1993; Hadders-Algra et al. 1988; & Hoy et al. 1992). The purpose of this question was to compare the means of the current study with the means of the CBCL by student t-test, and to determine if the selected medical and maternal variables can predict variance in behavior.

Significant differences were found in the means on two of the eight problem scales. Thought Problems and Attention Problems were the two scales on which the study subjects' test means were significantly higher than the published norms. Other studies have reported Attention Problems as significant in the low birth weight population at school age (Szatmari, et al. 1990; Ornstein, et al. 1991; Ross et al. 1990; & Robertson, et al. 1990). Infants born with conditions resulting in oxygen deprivation and the need for assisted mechanical ventilation may suffer from mild neurological problems to which a short attention span may be observed.

The significant difference in the Thought Problems scale was a surprising outcome. None of the studies examining behavior of NICU graduates with either the CBCL or other measures, suggested that this scale or a comparable scale might be elevated. According to the test author, this scale is the most controversial of the eight problem scales (Achenbach & Edelbrock, 1983). For example, young children play pretend with people and objects not actually present. There may be conversation and the child may emphatically insist that the person is really present. It may be difficult to discriminate between age

appropriate fantasies and pathological thought. Many of the items which form this scale request a description of the behavior by the parent. An analysis of the scoring on each of the items composing the Thought Problem scale might be helpful to determine which descriptors are common to this population.

The second research question investigated which medical and environmental variables predict the behaviors of the NICU graduate at age 6 years. The predictive variables examined were maternal age at first birth (MAFB), length of stay (LOS) in the hospital following birth, and the neonatal medical index (NMI). A full regression model and a forward stepwise regression model was used with the three predictor and each of the eight criterion variables of the CBCL.

Analyzing the prediction using the full model, LOS, MAFB, and NMI combined explained approximately 10% of the variance in the Anxious/Depressed scale, 7% of the variance in Aggressive Behavior, 6% of variance in the Withdrawn scale, 4% in Somatic Complaints, 3% in Attention Problems, 2% in Thought Problems, and approximately 2% in both Delinquent Behavior and Social Problems.

A second analysis examined the forward stepwise regression of each predictor variable on the eight criterion scales. Based on the research previously reviewed in Chapter 2 which indicated that socioeconomic variables are more predictive of outcome beyond the early preschool years, MAFB was selected as the first variable for entry into the stepwise analysis followed by LOS and NMI.

Interestingly, MAFB was the only variable which reached the .5 criterion level for entry into the regression model on the two scales which were significantly different in research question one. Length of stay reached the .5 level for entry in four of the scales. Three of these scales; withdrawn, somatic complaints, and anxious/depressed are considered to be descriptive of internalizing affect.

The NMI variable was entered in only one criterion scale. One reason NMI may not have been useful is because of the narrow range of this variable. The subjects were selected from the developmental follow-up clinic participants. The criteria for admission to the developmental follow-up clinic excludes those infants who would have the lowest rating of illness. Therefore, the range was restricted to a rating of 2-5, only a 4 point range. A severity of illness rating which has a broader range potential may be more appropriate to examining the predictive ability of this variable.

The results of this study suggest that additional research is needed to fully understand the behavior of NICU graduates at school age. The data indicates that Thought Problems and Attention Problems were significantly higher in this sample than in the normal sample. While other studies have also resulted in increased Attention Problems in the low birth weight population, none of the literature reviewed mentioned elevated scores in Thought Problems.

Additional research is needed to determine whether the elevated scores in Thought Problems were due to the parent's lack of knowledge of normal development in fantasy or pretend play. The maternal perceptions of normal

development of a child's imaginative play may influence responses to items on the Thought Problems scale. In this study, the maternal ages at first birth ranged from 14 to 37 years. For maternal ratings of a child's behavior, a teenage mother's expectation of normal child development may be vastly different than a mother who has had opportunity for more experience and education in development of young children. Younger mother's or those unaware of normal fantasy play in children might tend to rate a child high on these items. A regression of maternal age and analysis of items on this scale would be useful to determine if younger mothers responded positively to these items.

The CBCL manual indicates that Thought Problems has the lowest inter-rater reliability of all the eight scales (r=.48). In the current study, the parent completing the CBCL in 49 of the 50 cases was the child's mother. The results may have been different if the children's father had completed the survey.

The small sample size compared to the sample size of the CBCL may have effected the results of the study. Large sample sizes in NICU follow-up research are difficult to obtain. Combining cohorts from different hospitals presents several problems. Hospitals may not offer the same treatment options or care facilities for their patients. Protocols differ for determining the administration of procedures, medication, or the level of medical stability necessary prior to consideration for discharge. Some NICU's practice a variety of developmental care techniques in which babies are positioned, handled, and

stimulation is moderated depending on the baby's developmental needs. Other NICU's have no protocols for developmental care, thereby increasing the baby's stress level and increasing rates of morbidity.

Combining birth cohorts from the same hospital over several years also presents methodological concerns. Medical interventions are advancing rapidly and it is difficult to obtain enough subjects of comparable birth cohort to include in one study. Including subjects from a range of birth years adds the uncertainty of comparing infants who may have had vastly different medical procedures available to them at birth.

Increasing the sample size in NICU research is difficult because of variances in demographic and socioeconomic factors. The current sample was predominantly Caucasian and from a NICU where the majority of families had private insurance and are considered middle to upper middle socioeconomic class. Drawing a sample from a NICU where the majority of families utilize public assistance might result in different outcomes.

This study used NICU graduates who had been participating in a developmental follow-up program since hospital discharge. They received information regarding normal development, handling and care techniques specifically for premature infants, and behavior management information. Additionally, all had equal access to the State early intervention program. If the study were replicated using NICU graduates who had not participated in a developmental follow-up program, the behavioral results may have been different than those in this study.

Length of stay met the criterion level (.5) for entry into the stepwise regression model in four of the eight scales. It was a significant predictor on the Anxious/Depressed scale (r=.09) and came close to significance in the prediction of Withdrawn, Somatic Complaints, and Aggressive Behavior. The theories of NICU infant development reviewed in Chapter One suggested that adverse conditioning due to necessary medical procedures may impact the behavior of the NICU graduate. According to the reviewed literature, these infants develop their own unique coping mechanisms, the process of enduring multiple disruptive or painful experiences. The Withdrawn, Somatic Complaints, and Anxious/Depressed scales are descriptors of affective problems which could have been impacted by length of stay and more exposure to unpleasant experiences. Although not included as a part of the current study, the CBCL can be further analyzed to determine a child's internalizing and externalizing clusters. These clusters are polarized and descriptive of emotional versus behavioral problems. The internalizing cluster is composed of the three scales predicted by LOS. This suggests that LOS may have an impact on emotional problems of NICU graduates at age 6 years. Further research is necessary to determine whether improvement in developmental care techniques will lessen the impact of LOS.

The research reviewed in Chapter Two indicated that medical variables are more powerful predictors of developmental outcome in NICU graduates until age 3 years when SES variables become more predictive. Length of stay is determined by the health of the infant and comparable to a medically related

variable rather than an SES variable. In this regard, the current study with LOS predictive of behavior at age 6 is contrary to the other literature suggesting that medical variables are less significant than SES beyond the preschool years.

Conclusions

Children who are born prematurely or with serious medical complications are surviving at increasing rates. The developmental outcome of these survivors is an area of concern for parents, the medical community working with these children, and the educational system who will receive these children in the school system. The impact of specific medical and environmental variables on behavioral outcome is poorly understood. The combination of medical procedures, family stress factors, and altered early bonding increases the possibility that behavior of these children may be affected.

This study has been an effort to examine the behavioral outcome of NICU graduates at school age and determine whether three specific medical and environmental variables are useful in predicting behavior. The results suggesting that Attention Problems are more prevalent in this population is consistent with other studies. An unexpected result, the significance of Thought Problems in this population, merits further investigation. Item analysis is necessary to determine whether the elevated scores on Thought Problems could

be due to young mothers with relatively little knowledge of normal child development.

The findings on length of stay as a predictor in the affective behavior problem scales raises several questions about the developmental care techniques employed in the NICU's and the long term impact on the infant. Additional research is needed to determine how changes in the NICU environment might affect the long term behavior of these young survivors.

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APPENDIXES

APPENDIX A

Institutional Review Board Approval

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 11-29-95 **IRB#:** HE-96-023

Proposal Title: PREDICTING BEHAVIOR OF HIGH RISK INFANTS AT AGE 6 YEARS

Principal Investigator(s): Patricia Self, Mary Jo Faulkner

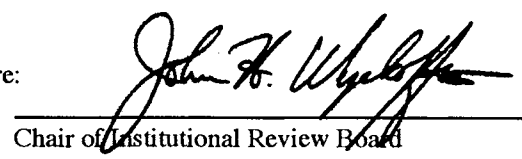
Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Provisions received and approved.

Signature:  Date: January 12, 1996

Chair of Institutional Review Board

APPENDIX B

Parent Information Letter

Saint Francis Hospital

Eastern Oklahoma
Perinatal Center

George P. Giacoia, M.D.
Director

Dear Parents:

I am currently beginning research for my doctoral degree. I am studying the behavior of EOPC graduates at age 6 years. After the research is complete, I hope to be able to determine whether factors such as degree of illness at birth, length of hospitalization, or family characteristics impact the behavior of EOPC graduates. The information will be helpful to medical staff and parents of critically ill newborns.

As a prior participant in the EOPC Developmental Follow-Up Clinic, I am requesting your participation to include your child in the study. Your participation is entirely voluntary and your responses will remain confidential. I will enter the data by a subject number, rather than by name, in my personal computer. You or your child will not be identified by name. As with other Developmental Follow-Up Clinic records, your answers on the questionnaires will become part of the child's confidential file, and will remain at EOPC.

If you choose to participate in this study, please complete the enclosed "Consent for Study Participation" form, the "Demographic Information" form, and the "Child Behavior Checklist". It usually takes about 20 to 25 minutes to complete all three of these forms. The behavior questionnaire should be completed by the parent who is most familiar with the child's behavior. Please return the completed forms to me in the enclosed self-addressed envelope. If you do not wish to participate, mail the blank forms back to me.

If you have any questions, please do not hesitate to call me at 918-494-2278. In advance, thank you for helping me with this project.

Sincerely,

Jody Faulkner

Jody Faulkner, MS, LPC
EOPC Developmental Follow-Up Clinic

JF:mkbr
Enclosure

Eastern Oklahoma
Perinatal Center
6161 South Yale Avenue
Tulsa, Oklahoma 74136
918 494-2277

Founded by The
William K. Warren

APPENDIX C

Consent Form

Saint Francis Hospital
January 1, 1996

SFH IRB# 1194-95
OSU IRB# HE-96-023

CONSENT FOR STUDY PARTICIPATION

I, _____ authorize Jody Faulkner, M.S., LPC, to utilize information obtained on my child, _____ for the study "Predicting Behavioral Outcome of High Risk Infants at Age 6 Years".

I understand the study will review my child's medical records, existing developmental records, and responses to the behavioral questionnaire and demographic data. I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director. I understand that information, which could potentially identify my family or my child, will not be a published part of the study. I understand that the information obtained through this study will become a part of my child's file within the Developmental Follow-Up Clinic of the Eastern Oklahoma Perinatal Center at Saint Francis Hospital. The personal data will be held confidential according to hospital policy.

I may contact Jody Faulkner at 918-494-2278 for further information regarding this study. I may also contact Jennifer Moore, IRB Executive Secretary, at 305 Whitehurst, Oklahoma State University, Stillwater, Ok 74078, telephone number (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Signed:_____ Relationship to child _____

Date: _____ Witness: _____

APPENDIX D

Demographic Data Form

Saint Francis Hospital
January 1, 1996

SFH IRB# 1194-95
OSU IRB# HE-96-023

SUBJECT CODE:_____

DEMOGRAPHIC INFORMATION

Below is information requested to assist with the completion of this study. Note that your name or other identifying information is not requested, and does not appear on this form. Please answer all questions to the best of your ability. If you have any questions or concerns about any of the items, please feel free to discuss these with the examiner.

Information from the child's mother:

13) Mother's current age: _____

14) Race: (Choose One) White _____ African-American _____ Hispanic _____ American Indian _____ Other _____

15) Mother's age at birth of her first child: _____

16) The child in this study is #_____ (1st, 2nd, 3rd child, etc).

17) Number of children in the home: _____ (including foster children, stepchildren, etc.).

18) Mother's education: (Circle One). Less than 7th grade, some high school, high school diploma, some college, college degree, some graduate work, graduate degree.

19) Current marital status: (Circle One). Single, divorced, widowed, married, separated.

20) Head of Household: (First Name) _____

21) Education of Head of Household: _____

22) Father's current occupation: _____

23) Mother's current occupation: _____

24) Use of public assistance: (Circle all that apply) AFDC, Medicaid, Food Stamps, SSI, Other _____.

25) Annual Income:

_____ Below $15,000

_____ $15,001 to $20,000

_____ $20,001 to $25,000

_____ $25,001 to $30,000

_____ $30,001 to $40,000

_____ $40,001 to $60,000

_____ above $60,001

APPENDIX E

Medical Records Review Form

SUBJECT CODE_____

Medical Records Review

1. Birthweight_____grams
2. Gestational age_____
3. Length of stay_____
4. Rehospitalization days_____
5. Days on mechanical ventilation_____
6. IVH/grade_____
7. Surgeries_____
8. Respiratory medications_____
9. Maternal age_____ G/P_____
10. MAFB_____
11. NMI Classification_____
12. Hollingshead classification_____

VITA

Mary Jo Simpson

Candidate for the Degree of

Doctor of Philosophy

Thesis: PREDICTING BEHAVIOR OF HIGH RISK INFANTS AT AGE SIX YEARS

Major Field: Human Environmental Sciences

Biographical:

Personal Data: Born in Okmulgee, Oklahoma, October 7, 1958, the daughter of Richard and Esther Moore of Morris, Oklahoma. Currently living in Dewey, Oklahoma. Married to Donald G. Simpson. Children: Katheryn Rae and Melinda Jean.

Education: Graduated from Morris High School, Morris, Oklahoma in May, 1976; received Bachelor of Science degree in Home Economics and a Master of Science degree in Applied Behavioral Studies in Education from Oklahoma State University, Stillwater, Oklahoma, in December 1979 and December 1984, respectively. Received a Master of Public Administration degree from the University of Oklahoma, Norman, Oklahoma, in December 1990. Completed the requirements for the Doctor of Philosophy degree from Oklahoma State University in December, 1997.

Professional: Licensed Professional Counselor #981.