CHILD PASSENGER SAFETY KNOWLEDGE

OF SELECTED CAREGIVERS

A Dissertation

By

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ABSTRACT

Child Passenger Safety Knowledge of Selected Caregivers. (August 2007)

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Caregivers are responsible for installing and using child restraint systems in motor vehicles. Adequate knowledge is necessary to choose and install child restraint systems. There are few studies that investigate the knowledge levels of caregivers or the sources of the information that they use to make child passenger safety decisions.

The purpose of this study was to describe the knowledge level of selected caregivers regarding child passenger safety by comparing the scores on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire to demographic and descriptive factors that are representative of Orem's basic conditioning factors. A goal of this study was also to identify sources of information that were used or would be used by selected caregivers to obtain information regarding child passenger safety. Further, this study identified information that pediatric providers gave to caregivers about child passenger safety. The conceptual framework that guided this study was Orem's theory of self-care.

A convenience sample of 209 caregivers in southeastern Virginia was surveyed to collect information on demographics; descriptive information; child passenger safety knowledge; sources of information that were used or would be used to make decisions regarding purchasing, installation, or utilization of a child restraint system; and the type of information received from pediatric healthcare providers on child passenger safety. The results of the study indicate that Orem's Self-Care Framework was useful for the study of child passenger safety. Caregivers do not have the knowledge necessary to correctly use a child restraint system every time their child travels in a motor vehicle. There is a need for additional anticipatory guidance on all areas of child passenger safety. Being single, belonging to a younger age group, having a lower educational level, living in a smaller household, indicating less fluency in English, representing a lower income group, belonging to an African American ethnicity, having fewer vehicles in the household, or riding unbelted as a back seat passenger predict a lower score on child passenger safety knowledge. There are gaps in healthcare guidance for child passenger safety and unidentified barriers that prevent caregivers from receiving information from recognized authorities.

DEDICATION

This dissertation is dedicated to my precious children, Erynn Noelle Daniels and Shannon Michelle Daniels who have tolerated years of "Daddy is studying" and riding in car seats long beyond their peers. They represent all of the children who have lost their lives and futures because caregivers did not understand the dangers of motor vehicles.

This effort is also dedicated to Marilyn. Distant yet always close, you are my source of strength and patience. For all of the time you just watched while I worked, thank you.

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CHAPTER I

INTRODUCTION

Motor vehicle collision are the single leading cause of unintentional death and injury to children (SafeKids Worldwide, 2007). Motor vehicle collision deaths are also the single leading cause of all deaths from ages 5 to 34 years and the second leading cause of death for ages 1 to 4 years (Centers for Disease Control and Prevention, 2005). Society bears the cost of motor vehicle trauma in excess of $150 billion annually (U.S. Department of Health and Human Services, 2000).

Children are particularly at risk for injury and death from motor vehicle crashes. Death and injury of children in motor vehicle collisions can be prevented through the use of child restraint systems, which reduce fatal injury by 71% for infants and by 54% for toddlers in passenger cars (SafeKids Worldwide, 2007). Yet, national surveys of occupant restraint use and the misuse of child restraint systems indicated that 80% of child restraint systems were misused (Glassbrenner, 2003) with 72.6% having one or more critical misuses (National Highway Traffic Safety Administration, 2004a).

Statement of the Problem

The responsibility for child passenger safety lies with the caregiver transporting the child. The child is totally dependent upon the decisions that the caregiver makes in regard to the child's safety during transportation. One of the factors associated with misuse was a lack of knowledge about child passenger safety (National Highway Traffic Safety Administration, 2004b). To this point, there are few studies that measure the child

passenger safety knowledge levels of caregivers (Vaca, Anderson, Agran, Winn, & Cheng, 2002). There are also very few studies that investigate the sources of information that caregivers use to make decisions about child passenger safety.

In the most recent nationwide survey of misuse (National Highway Traffic Safety Administration, 2004a), it was found during visual inspections that 80% of child restraint systems were misused. There were also one or more critical misuses found in 72.6% of all child restraint systems observed. The results of this survey compared similarly with the National Occupant Protection Use Survey conducted in 2002 (Glassbrenner, 2003). In Virginia, the reported misuse rate was 90% during hands-on inspections (Center for Injury and Violence Prevention, 2003).

Background

The focus in reducing death and injury of children from motor vehicle crashes is the prevention of trauma by increasing the engineered safety of motor vehicles and child restraint systems, the use of child restraint systems, appropriate positioning of children in motor vehicles, and the consistent use of appropriate child restraint systems by caregivers for children (National Highway Traffic Safety Administration, 2001). This arena of research and programs is classified under the term child passenger safety. The background necessary to understand the issues of child passenger safety includes global, national, and regional impact; as well as the history of the development of child passenger safety, the terminology involved, the organizations or key players in the field, data sources, current general recommendations for child passenger safety, and the concepts of use versus misuse.

Global Impact

Around the world, approximately 16,000 people die every day from injuries. Classified by the World Health Organization as a disease, injuries represent 12% of the global burden of disease (World Health Organization, 2004). Injuries are the third most important cause of mortality worldwide and the leading cause of death among 1- to 40-year-olds. According to the World Health Organization data, 25% of all injuries are the result of road crashes. Estimates of the annual number of road deaths vary as a result of the limitations of data collection techniques, underreporting, and differences in interpretation. The estimated range is approximately 750,000 to 1,183,492, based on 1998 data and is most likely an underestimation. These numbers represent over 3,000 lives lost daily worldwide in road crashes. Also noteworthy is the disproportionate impact on low- and middle-income countries. These countries represent 85% of all road crash deaths, 90% of all life years lost, and 96% of all children killed in road crashes worldwide. The impact of road crashes on the economy is disproportionate in that 50% of all road crash deaths are among the 15- to 44-year-olds, the most productive component of society. The impact on children is even greater as road traffic injuries are the second leading cause of death worldwide for children 5 to 14 years of age and young adults 15 to 29 years of age (World Health Organization, 2004).

The economic impact of road crashes worldwide is also substantial. It is estimated that $518 billion is the annual direct economic cost of injuries resulting from road crashes. The total cost in low-income countries is estimated at $65 billion annually, an amount that exceeds all economic aid to those countries (World Health Organization, 2004).

National Impact

In the United States, the statistics are similar, but the United States has one of the worst injury death rates for children in the world among developed nations (Ramsay, 2001). Of the 26 richest nations, the United States ranked 23rd in injury death rates. The terminology used in the United States is slightly different from that of WHO, but the components are the same. Unintentional injury represented the leading cause of death of all ages from 1 to 34 years for the years 2000 and 2001. In 2002, it became the leading cause of death for all ages from 1 to 44 years (Centers for Disease Control and Prevention, 2003) and has remained the leading cause of death for ages 1 to 44 years through the most recent reporting year of 2004 (Centers for Disease Control and Prevention, 2005).

Even though there has been a 29% decrease in motor vehicle occupant deaths per 100,000 children since 1975 (Insurance Institute for Highway Safety, 2002), motor vehicle collisions are still the single leading cause of death of children ages 5 to 15 years, with 2,542 deaths to children under 15 years reported by the National Highway Traffic Safety Administration (NHTSA) in 2002 (National Center for Statistics & Analysis, 2002). This figure decreased slightly to 2,165 in 2005. Motor vehicle collisions also accounted for 180,744 known injuries to children under the age of 15 years (Centers for Disease Control and Prevention, 2005). This number under represents the true impact of motor vehicle injuries as there is no mandated reporting system for trauma, and many, if not most injuries from motor vehicle crashes, go unreported (Committee on Injury and Poison Prevention, 1999).

Motor vehicle traffic deaths are also the leading cause of lost life years. For 2004, the Center for Injury Prevention and Control of the Centers for the Disease Control estimates that 2,219,044 years of potential life were lost in the United States due to unintentional injury. This is all the more devastating as it predominantly affects those who are the most productive with the most potential for contributing to society, the young (Centers for Disease Control and Prevention, 2005). Motor vehicle collision deaths are not limited to the young. They are also the leading cause of unintentional injury deaths for all ages 1 to 64 years in 2004 (Centers for Disease Control and Prevention, 2005).

Healthy People 2010 established a goal of reducing motor vehicle deaths in Chapter 15, Goal 15, by almost 50% of the 1999 levels based upon population and miles traveled. In Chapter 15, Goal 20, the target is 100% of children 4-years-old and under will be transported in a child safety seat (U.S. Department of Health and Human Services, 2000). These goals illustrate the priority that the United States government places on motor vehicle injury reduction.

Yet, these priorities in public health are not perceived by the public to be important. Former Surgeon General of the United States, C. Everett Koop, once remarked:

> If some infectious disease came along that affected one out of every four children in the United States, there would be a huge public outcry and we would be told to spare no expense to find the cure...[pause] and to be quick about it (Koop, 1989, p. 2).

Ian Roberts, Professor of Epidemiology and Public Health, said about the epidemic of road death and injury:

> It is unusual to encounter a serious analysis of road danger in national news media. By 2020, road crashes will have moved from ninth to third place in the world disease ranking. If we overlook this carnage, it will be the propaganda coup of the new millennium. (U.K. National Charity for Road Crash Victims, 2007, p. 1)

History

"This must never happen again" said the coroner at the inquiry into the first road traffic death, Crystal Palace, London, UK, August 17, 1896 (U.K. National Charity for Road Crash Victims, 2007, p. 1). He could not have known the epidemic this first incident would foretell. In the United States, the most significant changes in motor vehicle safety began with the 1966 report to Congress entitled "Accidental Death and Disability: The Neglected Disease of Modern Society" (National Academy of Sciences, 1966). This landmark report was the culmination of 3 years of effort by multiple units of the National Academy of Sciences – National Research Council to review the status of initial care and emergency medical services afforded to the victims of unintentional injury in the United States.

The development of child passenger safety in the United States follows a series of improvements in technology, legislation, and public attitude since the release of the 1966 report. The cyclic stages of this development included recognition of the problem, legislation to improve technology, introduction of technology, reengineering of safety

features, increasing public education, and enactment of public safety laws and enforcement of those laws. These cycles occurred concurrently and sequentially as improvements were made and new problems arose.

The first federal law regulating child seats for use in motor vehicles was placed into effect in April of 1971. The child seats manufactured up to that time were not designed to protect children in a crash, but only to provide a convenience for the parents. These first regulations were found to be entirely inadequate and revised standards were implemented in September of 1975 (Shelness & Charles, 1975). The National Highway Traffic Safety Administration (NHTSA) is the regulatory agency of the federal government that enforces the law and provides public education on motor vehicle safety. The regulations for child restraint systems (Federal Motor Vehicle Safety Standard 213: Child restraint systems, 2004) have been revised many times in the last 3 decades since they were enacted in 1971. Each change was in response to new research and changing technology. The American Academy of Pediatrics became involved in setting guidelines as a result of a 1975 landmark editorial that outlined and urged pediatrician involvement in this vital area of preventative medicine (A. Shelness, personal communication, April 17, 2004.)

For the first 25 years of child passenger safety, the emphasis was on the child under 4 years of age. In the 1990's the emphasis changed to include the older child. As deaths and injuries to infants and small children decreased, the impact on older children became apparent. The most comprehensive study on child passenger safety is an ongoing project of State Farm Insurance Company and Partners for Child Passenger Safety, a project of the Children's Hospital of Philadelphia. While advocates recommend the use

of child safety seats for children under 4-years-old and booster seats for children over 4 years of age, children are prematurely graduated to the seat belt. The partnership between State Farm Insurance Company and Partners for Child Passenger Safety allows a real world look at data from crashes. Between December 1, 1998 and November 30, 1999, the collisions of customers of State Farm Insurance Company in 15 states and the District of Columbia that involved children were studied. Of 13,853 children in the sample, 98% were restrained, but nearly 40% were only in seat belts. The study determined that these children were at significantly greater risk for head injuries as well as other injuries (Winston, Durbin, Kallan, & Moll, 2000).

Terminology

The term *accidental* has been used to describe preventable injuries. In the 1960's, a public health physician in the New York State Department of Health, William Haddon, Jr., introduced the concept of childhood injuries being preventable and not unavoidable (Haddon, 1999). It was not until the 1990's that the term accident was expressly reserved for those events causing injury or damage that were totally unavoidable and unpreventable (Girasek, 1999). The term *unintentional preventable injury* is used today to describe these types of events. C. Everett Koop first voiced this concept in 1983 at the Press Conference to inaugurate the American Academy of Pediatrics' Injury Prevention Program (Koop, 1983). While not everyone agrees with the ban on the word accident, commonly referred to as the *A word*, there is a general move in the injury prevention community to ban the word accident from common use to describe these preventable, injury producing events (Evans, 2001). The eradication of the term accident from the vocabulary used in motor vehicle safety community was an effort driven by the first

physician administrator of the National Highway Traffic Safety Administration during the Clinton administration in the 1990's. The agency strove to remake the entire industry accident free even to the point of changing the FARS report for police officers from Fatal Accident Reporting System to Fatality Analysis Reporting System (R. Martinez, personal communication, June 9, 1999). Participants in the Standardized Child Passenger Safety Program, which is a 32-hour course developed by the National Highway Traffic Safety Administration to prepare child passenger safety technicians, have become accustomed to the tradition of anteing up a quarter for every time they use the word accident in the course. The World Health Organization has also adopted the philosophy of Road Safety is No Accident in the organization's literature and has developed strategies to reduce vehicular collision morbidity and mortality (Peden & Sminkey, 2004).

This terminology change is indicative of a mindset change within the community of researchers of trauma injury and death. As the effects of different mechanisms of injury have been explored by the medical community with the goal of correcting the injuries, advocates of prevention in the engineering, medical, psychology, sociology, public health and nursing fields have sought to prevent the injuries or mitigate the effects of trauma.

The literature and the interest of injury researchers appear to be divided along the lines of intentional injury in contrast to unintentional injury and preventable versus unpreventable. There are no specific documents that divided the research into these areas but the majority of the research appears to focus on the categories of unintentional preventable injuries and intentional preventable injuries. This concept of preventable versus unpreventable divides research into measurable and distinct categories, or

variables, that help to define research and allocate program dollars. Researchers appear to focus on one of these areas and while the researcher may vary within a category, researchers rarely venture into another category of research. For example, a researcher who studies unintentional injuries of children riding in motor vehicles may conduct a study on playground safety but would not venture into the intentional injury realm of child abuse and neglect and vice versa.

The terms *child safety seat* and *child restraint* are used almost interchangeably in the literature with a minor difference between the two. Booster seats, used to properly position an older child in an adult seat belt system, do not restrain a child but allow the restraint system of the vehicle to work properly for a child too short to safely use an adult seat belt. They are therefore considered child safety seats and not child restraints. Child restraints include a harness system that secures the infant or child in the child safety seat (National Highway Traffic Safety Administration, 2004b). Child restraints must be secured into the vehicle using the vehicles lap and shoulder belt or the new Lower Anchors and Tethers (LATCH) systems. For the purpose of this study, a child restraint system is comprised of the complete system of the child restraint or safety device installed in the vehicle restraint system and the child installed in the child restraint device.

There are four major types of child safety seats and several minor special situation devices (National Highway Traffic Safety Administration, 2004b). Infant seats are seats designed to be used rear facing only and usually accommodate an infant up to 20 pounds in weight. Convertible seats are designed to be used rear facing until the weight and height limit recommended by the manufacturer is reached. Most convertible seats today

are rated to 30 pounds for a rear-facing child. Convertible seats can then be turned around forward facing until a child reaches a weight and height limit determined by the manufacturer, usually 40 pounds, but there are several seats on the market that will accommodate a child up to 65 pounds.

Booster seats are seats designed to raise a child up to a position where the child can safely use an adult seat belt. There are two types of booster seats. High back boosters are designed with a back that can be used to provide additional neck protection, especially if the vehicle seat does not include a neck restraint. Low back boosters consist of only a *pan* or seat without a back that is especially useful if the child's head does not exceed the height of the vehicle seat. Both the high back booster and the low back booster require the use of a lap and shoulder belt. The lap belt crosses over the thighs of an adult and the shoulder belt crosses across the shoulder and chest of the adult. The third type of booster seat is the shield booster. This seat, which is no longer on the market, was designed for vehicles with lap belts only. The lap belt crosses over the shield which is in front of the child's abdomen.

The fourth type of seat is a combination forward-facing seat and high back booster seat. These are known by various descriptors, including forward-facing only seat, toddler seat, and combination seat (National Highway Traffic Safety Administration, 2004b). There is no one universal descriptor of these seats but they all are designed to function the same way. The seat includes a harness that is used until the child reaches the maximum weight limit of the seat and then the harness is removed and the seat is used as a high back booster.

Some motor vehicles include integrated child safety seats built into the adult seats. These are most commonly available in mini-vans and have been available for many years as an option. These seats are only used for forward-facing toddlers and have harnesses rated to approximately 40 pounds and can then be converted to a built-in booster that requires the use of an adult seat belt.

There are other types of child passenger safety devices that serve a variety of special purposes. Travel vests are child restraints designed to be used on a temporary basis for children who may travel forward facing when the child's safety seat cannot be transported with the child such as when traveling by plane or bus. There are also vest systems designed for children with behavioral issues, body casts, or other medical problems that prevent the use of a traditional child safety seat (American Academy of Pediatrics, 2004). For the purpose of this study, the term child restraint system is used to designate any system designed to secure a child in a motor vehicle.

Organizations

Two additional organizations are recognized nationally as central to the child passenger safety program. The National Child Passenger Safety Board is an advisory body that provides support and recommendations to the National Highway Traffic Safety Administration (National Child Passenger Safety Board, 2002) and to SafeKids Worldwide, which serves as the certifying agency for child passenger safety technicians and instructors. This organization is an outreach of Children's National Medical Center and is the leading childhood injury prevention advocacy organization in the world (SafeKids Worldwide, 2007).

Data Sources

The statistics on child passenger safety are usually categorized by injury and death data and use of restraint data. Injury and death data are maintained by the Centers for Disease Control and Prevention and are available to the public through the Web-based Injury Statistics Query and Reporting System (WISQARS™), an online public use database (Centers for Disease Control and Prevention, 2005). This system allows the user to designate search criteria and retrieve data from fatal and non-fatal injury records maintained by the Centers for Disease Control and Prevention. The only probability-based observed data collection survey on the use of child restraints on the nation's roads is the National Occupant Protection Use Survey. This survey is conducted by the National Center for Statistics and Analysis (NCSA) in the National Highway Traffic Safety Administration (Glassbrenner, 2003).

General Recommendations for Child Passenger Safety

The current general recommendations for transporting children in motor vehicles include recommendations for 0 to 1 years of age (infants), 1 to 3 years of age (toddlers), 4- to 7-year-olds, and 8-years-old and older. These ages are guidelines as it has been determined that age, weight, and height as well as behavioral, physical and motor development, and any combinations of these factors have to be considered when selecting an appropriate child restraint. To make it complicated for the consumer, every seat on the market has a different height and weight limit. Every child should be secured appropriately in an appropriate restraint device, which is selected based upon the fit of the seat in the vehicle, the fit of the child in the seat, and the ability of the caregiver to use the seat consistently and every time the child rides in a motor vehicle (National Highway

Traffic Safety Administration, 2004b). In general, infants should ride rear facing as long as possible and children should ride in either a forward-facing seat with a harness or a booster seat until they are 4-foot 9-inches tall. Infants should never be placed rear facing in front of an airbag (Centers for Disease Control and Prevention, 1993) and children should ride in the rear seat until 13 years of age (Weber, 2000). These general recommendations are the starting point for determining the best practices for transporting children. If it were only this simple, the nation would not be experiencing one or more critical misuse errors in 72.6% of child restraint systems as determined in a nationwide study (Decina & Lococo, 2004).

The parent or caregiver must consider the age and size of the child to determine where and in what direction the child will sit. An appropriate seat that will fit the child and the vehicle must then be selected. The seat must be installed according to the child safety seat manufacturer's recommendations and the vehicle manufacturer's recommendations. The child must be correctly installed in the seat. Then the seat must be used correctly and consistently every time the child rides in a motor vehicle. In order to accomplish this series of steps, the parent must access information from reliable and accurate sources that include the child safety seat instructions, the vehicle instructions, the child's height and weight, the medical recommendations for the appropriate transportation direction, and any other sources of information. This obscure information can include how to dress the child appropriately to ride in a restraint device, what types of sunshades should be used to protect the child's eyes, whether to use a mirror behind the child, what seating position is best, how to level a rear-facing child safety seat to

protect the infant's airway, and numerous other details not readily available to the typical consumer (National Highway Traffic Safety Administration, 2001).

Another factor affecting misuse is the trend for recommendations to remain in force even after being updated with newer information. The most prevalent and serious recommendation in this category is the question of when to turn an infant from rear facing to forward facing. Prior to 1996, the general recommendation was to turn infants forward facing when they reached 20 pounds in weight or 1 year of age. In 1995, recommendations were beginning to circulate that it was better to keep infants rear facing as long as possible, to the weight limits of the seat (American Academy of Pediatrics, 1996). Earlier literature recommended that infants could be placed forward facing as soon as they were able to sit upright (National Highway Traffic Safety Administration, 2001). Around 1995, convertible seats rated to 30 pounds rear facing were entering the market for the first time. The earlier recommendations may have been driven by the manufacturing industry as there were no seats available to rear-face infants weighing over 22 pounds. Even as late as 2004, the language was vague on this recommendation with little emphasis on keeping the infant rear facing as long as possible. It was not until 2004 that additional language was added to the statement "Convertible seats are used rear-facing for infants until they have reached at least 1 year of age and weigh at least 20 pounds (American Academy of Pediatrics, 2004, p. 1)." The added language in 2007 was "It is best for children to ride rear-facing to the highest weight or height allowed by the manufacturer (American Academy of Pediatrics, 2007, p. 1)."

Another difficulty with this language is the frequent inversion of the logical structure of the statement. Commonly heard by caregivers is the statement "turn infants

around when they reach 20 pounds or 1 year of age," which was actually meant as "do not turn infants around until they reach *at least* [italics added] 20 pounds and 1 year of age" (American Academy of Pediatrics, 2007, p. 1). This concept has also been frequently misstated as "car seats should face the rear for infants under 20 pounds *and* [italics added] younger than 1 year of age" (Murphy, 1999, p. 139). This is a totally different statement that has the word *and* inappropriately used for *or*.

Besides the vehicle and child safety seat manufacturer, there are two organizations that set standards for the transportation of children. The National Highway Traffic Safety Administration is the agency of the United States government that is responsible for the regulation of child safety seats and motor vehicles. The National Highway Traffic Safety Administration administers the federal regulations governing the performance of child safety seats (Federal Motor Vehicle Safety Standard 213: Child restraint systems, 2004). The American Academy of Pediatrics has established recommendations for the safe transportation of children in motor vehicles (American Academy of Pediatrics, 2002).

Use versus Misuse

It has been established that child restraint systems reduce fatal injury by 71% for infants and 54% for toddlers. Booster seats reduce the risk of injury by 59% compared with the use of adult safety belts. In 2004, 451 lives were saved as a result of the use of child restraint systems, 15,434 due to seat belts, and 2,647 due to airbags (SafeKids Worldwide, 2007). In order to attain these advantages in a crash, the child must be using a child restraint device.

Data on use is usually reported in the categories of whether or not restraints are used and whether the child was improperly positioned in the vehicle. The National Occupant Protection Use Survey study for 2002 indicated that use rates were 99% for infants (birth to 1 year of age), 94% for toddlers (1 to 3 years of age) and only 83% for 4- to 7-year-olds. The study found that 15% of children in child safety seats were still riding in the front seat. The study also found that this is down from 49% in 2000 (Glassbrenner, 2003).

Misuse is determined to be any error made in the installation of a child restraint, any deviation from child restraint or vehicle manufacturers' instructions, or any use that is contradicted by law. Also included in the definition of misuse is any alteration in use that is recognized by crash history or industry practice as potentially endangering a child (National Highway Traffic Safety Administration, 2004b). The misuse of child safety seats is extremely high. Nationally, 83.9% of infant seats (rear facing only), 83.5% of rear-facing convertible seats, 81.9% of forward-facing convertible seats, and 79.3% of forward-facing seats with harnesses, have one or more critical misuses. Even the parents using the simplest seats, belt-positioning boosters (39.5%) and shield boosters (60.5%) made critical errors a significant proportion of the time (National Highway Traffic Safety Administration, 2004a). In Virginia, it is estimated that 90% of all child safety seats are misused (Center for Injury and Violence Prevention, 2003). While it appears that Virginia has a higher reported misuse rate, there were differences in the studies that need to be distinguished. The National Occupant Protection Use Survey study is a controlled intersection survey in which trained observers look into vehicles stopped at red lights or stop signs and check for misuse. The Virginia study is a review of child safety seat

inspection forms from seat check events conducted by certified child passenger safety technicians. The technicians were able to get into the vehicle and remove a child safety seat, which allowed them to check for misuse in greater detail. The National Occupant Protection Use Survey study was limited to specific misuses. The Virginia study counted any misuse. It is also significant to recognize that the National Occupant Protection Use Survey study questioned anonymous participants in a random fashion. The Virginia study utilized data collected from participants that sought help with their installation problems. Regardless of the method used, both studies indicate that children are at risk for injury in motor vehicles even when parents or care givers are conscientious and vigilant. The installation of child safety seats is extremely complicated. Probably the most potent illustration of this problem is an anecdotal account of an extremely experienced child safety seat technician, M. A. Rayment, starting the process to check the seat of a couple during a seat check near a National Aeronautics and Space Administration laboratory. The couple stepped out of the car and the father exclaimed in a rather frustrated voice "We really are rocket scientists and we cannot get this … seat into this car (personal communication, several occasions, 1998 to 2004)."

Significance of the Problem

In order for child restraint systems to be effective, they must be installed correctly, the child must be placed in the system correctly, and the system must be used consistently for every transport of the child (National Highway Traffic Safety Administration, 2001). Due to a multitude of factors including, but not limited to, incompatibility between child restraint systems and automobiles, difficulty with the use

of child restraint systems, lack of knowledge about child restraint systems, and caregiver attitudes about the need for child restraint systems, misuse of child restraint systems is extremely high.

Motor vehicle trauma is the single leading cause of death of children from 5 to 15 years of age in the United States and the single leading cause of death among unintentional injury deaths for ages 1 to 64 (Centers for Disease Control and Prevention, 2005). To prevent these deaths and non-fatal injuries associated with motor vehicle collisions, caregiver knowledge of appropriate transportation options for their dependent children is necessary. Child passenger safety educational programs have been adversely affected by recent governmental budget changes. In 2004, the budget of the National Highway Traffic Safety Administration designated for educational program grants in child passenger safety was eliminated (National Highway Traffic Safety Administration, 2004c). In 2000, the funding amount was $7,500,000 (National Highway Traffic Safety Administration, 2000). In order to make the most effective use of the remaining funding for child passenger safety programs, it would assist program administrators to know not only which populations and population characteristics are in need of educational interventions but to also know the nature of the knowledge deficits in those populations. It would also assist program administrators to know where parents and legal guardians, herein called caregivers, seek, receive, or would seek information for the safe transportation of their children so that appropriate audiences could be targeted.

Statement of Purpose

The purpose of this study was to describe the knowledge level of selected caregivers regarding child passenger safety and to compare the scores on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire to factors that are representative of Orem's basic conditioning factors. The purpose of this study was also to identify sources of information that were used or would be used by selected caregivers to obtain information regarding child passenger safety. Further, the purpose of this study was to identify information that pediatric providers gave to caregivers about child passenger safety.

CHAPTER II

REVIEW OF THE LITERATURE

Pertinent Literature

The literature for child passenger safety falls into six general groups or foci. These groups cross several disciplines and frequently overlap. The groups, or foci, include injury statistics or population data, kinematics of trauma or injury patterns, engineering or equipment specifications, programs for injury prevention, use and misuse, and behavioral or knowledge research. A frequently cited source of information for data involving injuries in the United States is the Web-based Injury Statistics Query and Reporting System (WISQAR™) of the Centers for Disease Control and Prevention (CDC), an online public use database (Centers for Disease Control and Prevention, 2005). Kinematics of trauma or injury pattern literature for child passenger safety is found most frequently in medical journals. Engineering or equipment specifications are frequently published by the Society of Automotive Engineers or the Juvenile Products Manufacturers Association and may also be found in the medical literature as the specifications pertain to injury patterns. Programs for injury prevention cross many disciplines and can be found in a broad variety of literature in nursing, medicine, public health, public safety, and law enforcement. Use and misuse of child restraint systems information is published frequently as supporting data for program or research activities. The most frequently cited source for use and misuse information is the National Occupant Protection Use Survey conducted approximately every 4 years by the National Highway Traffic Safety Administration. Use and misuse literature discusses correct and

incorrect utilization of a child safety seat or other occupant protection device and the processes used to correct the misuse. Behavioral and knowledge research is most often reported in medical, nursing, and public health literature as it pertains to reasons for misuse and non-use and methods for changing behaviors. While there is a considerable amount of literature about each of these foci, there is substantial duplicate reporting of a very few significant research findings. There is also a considerable amount of reporting about programs to change behavior or to decrease misuse with very little outcome measurement.

Injury Statistics

The WISQARS™ provides raw data in a database with access through user defined queries (Centers for Disease Control and Prevention, 2005). The output of a common query found in injury prevention literature is the table commonly referred to as The Big Blue Line (see Table 1). When the table is presented with the cells color coded, unintentional injury is usually coded blue, providing a very visible blue line in the first row, for ages 1 to 44 years. This table illustrates the impact of unintentional injury as a leading cause of death. In every age group, from 1 to 44 years, unintentional injury is the leading cause of death. In every age group, from 1 to 34 years of age, injuries exceed the next leading cause by a multiple of 2 to 3. Unintentional injuries are broken down by specific causes (see Table 2). Comparing these two tables, in 2004, motor vehicle collision deaths were the single largest cause of death for the 5 to 34 age group.

Table 1. The big blue line.

10 Leading Causes of Death, United States 2004, All Races, Both Sexes										
Rank	Age Groups									
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
1	Congenital Anomalies 5,622	UI* 1,641	UI* 1,126	UI* 1,540	UI* 15,449	UI* 13,032	UI* 16,471	Malignant Neoplasms 49,520	Malignant Neoplasms 96,956	Heart Disease 533,302
2	Short Gestation 4,642	Congenital Anomalies 569	Malignant Neoplasms 526	Malignant Neoplasms 493	Homicide 5,085	Suicide 5,074	Malignant Neoplasms 14,723	Heart Disease 37,556	Heart Disease 63,613	Malignant Neoplasms 385,847
3	SIDS 2,246	Malignant Neoplasms 399	Congenital Anomalies 205	Suicide 283	Suicide 4,316	Homicide 4,495	Heart Disease 12,925	UI* 16,942	Chronic Lower Respiratory Disease 11,754	Cerebro-vascular 130,538
4	Maternal Pregnancy Comp. 1,715	Homicide 377	Homicide 122	Homicide 207	Malignant Neoplasms 1,709	Malignant Neoplasms 3,633	Suicide 6,638	Liver Disease 7,496	Diabetes Mellitus 10,780	Chronic Lower Respiratory Disease 105,197
5	UI* 1,052	Heart Disease 187	Heart Disease 83	Congenital Anomalies 184	Heart Disease 1,038	Heart Disease 3,163	HIV 4,826	Suicide 6,906	Cerebro-vascular 9,966	Alzheimer's Disease 65,313
6	Placenta Cord Membranes 1,042	Influenza & Pneumonia 119	Chronic Lower. Respiratory Disease 46	Heart Disease 162	Congenital Anomalies 483	HIV 1,468	Homicide 2,984	Cerebro-vascular 6,181	UI* 9,651	Diabetes Mellitus 53,956
7	Respiratory Distress 875	Septicemia 84	Benign Neoplasms 41	Chronic Lower. Respiratory Disease 74	Cerebro-vascular 211	Diabetes Mellitus 599	Liver Disease 2,799	Diabetes Mellitus 5,567	Liver Disease 6,569	Influenza & Pneumonia 52,760
8	Bacterial Sepsis 827	Perinatal Period 61	Septicemia 38	Influenza & Pneumonia 49	HIV 191	Cerebro-vascular 567	Cerebro-vascular 2,361	HIV 4,422	Suicide 4,011	Nephritis 35,105
9	Neonatal Hemorrhage 616	Benign Neoplasms 53	Cerebro-vascular 34	Benign Neoplasms 43	Influenza & Pneumonia 185	Congenital Anomalies 420	Diabetes Mellitus 2,026	Chronic Lower Respiratory Disease 3,511	Nephritis 3,963	UI* 35,020
10	Circulatory System Disease 593	Chronic Lower Respiratory Disease 48	Influenza & Pneumonia 33	Cerebro-vascular 43	Chronic Lower Respiratory Disease 179	Septicemia 328	Influenza & Pneumonia 891	Septicemia 2,251	Septicemia 3,745	Septicemia 25,644
*UI Injury – Unintentional Injury										

Note. From the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS™) [online]. (2005) Accessed May 20, 2007. Available from URL: www.cdc.gov/ncipc/wisqars. Used under the public use guidelines of the Centers for Disease Control.

Unintentional injuries were the second leading cause of death for ages 1 to 4 during the same period. There were 8,529 deaths of motor vehicle occupants from birth to 19-years-old in motor vehicle collisions during 2004 (Centers for Disease Control and Prevention, 2005). Of these, 5,113 were sustained by 15- to 19-year-olds. In 2004, the population for which child safety seats are designed, birth to 9-years old, sustained 2,494 deaths from collisions.

Table 2. Leading causes of unintentional injury deaths.

10 Leading Causes of Unintentional Injury Deaths, United States 2004, All Races, Both Sexes										
Rank	**Age Groups**									
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
1	Suffocation 725	MV* Traffic 520	MV* Traffic 584	MV* Traffic 922	MV* Traffic 10,757	MV* Traffic 6,834	MV* Traffic 6,451	MV* Traffic 6,088	MV* Traffic 3,936	Fall 14,899
2	MV* Traffic 139	Drowning 430	Fire/burn 169	Drowning 138	Poisoning 2,259	Poisoning 3,641	Poisoning 6,444	Poisoning 6,033	Poisoning 1,577	MV* Traffic 7,175
3	Drowning 62	Fire/burn 228	Drowning 131	Fire/burn 87	Drowning 574	Drowning 385	Fall 659	Fall 1,184	Fall 1,393	Unspecified 4,868
4	Fire/burn 28	Suffocation 125	Suffocation 45	Other Land Transport 87	Other Land Transport 284	Fall 320	Drowning 435	Fire/burn 504	Suffocation 443	Suffocation 3,369
5	Fall 23	Pedestrian, Other 113	Other Land Transport 37	Suffocation 68	Fall 241	Fire/burn 245	Fire/burn 320	Suffocation 468	Fire/burn 427	Fire/burn 1,125
6	Unspecified 21	Fall 47	Pedestrian, Other 36	Poisoning 47	Fire/burn 186	Other Spec., classifiable 219	Suffocation 315	Drowning 444	Unspecified 335	Poisoning 901
7	Natural/ Environment 20	Natural/ Environment 39	Struck by or Against 21	Firearm 35	Firearm 172	Other Land Transport 216	Other Spec., classifiable 290	Unspecified 346	Drowning 271	Other Spec., 485
8	Poisoning 13	Unspecified 22	Four Tied 13	Fall 26	Other Spec., classifiable 154	Other Transport 209	Unspecified 245	Other Spec., classifiable 316	Other Transport 189	Natural/ Environment 483
9	Other Spec., classifiable 10	Other Spec., classifiable 18	Four Tied 13	Pedestrian, Other 25	Suffocation 153	Suffocation 180	Other Transport 230	Other Transport 295	Other Spec., classifiable 186	Drowning 424
10	Struck by or Against 4	Poisoning 18	Four Tied 13	Other Transport 21	Unspecified 145	Unspecified 160	Other Land Transport 208	Natural/ Environment 232	Natural/ Environment 185	Machinery 209
* MV – Motor Vehicle										

Note. From the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS™) [online]. (2005) Accessed May 20, 2007. Available from URL: www.cdc.gov/ncipc/wisqars. Used under the public use guidelines of the Centers for Disease Control.

This statistic represents 6.8 children who lost their lives each day from motor vehicle collisions in the United States during 2004. For children ages 1- to 4-years-old in 2004, motor vehicle collisions accounted for the second leading cause of death (n = 384) amongst all causes behind congenital anomalies (n = 400). African American children were killed in motor vehicle collisions (n = 114) after homicide (n = 163) and congenital anomalies (n = 132). An important finding in this data is that motor vehicle collisions were the single leading cause of death for ages 1 to 34 in 2002. This represents an improvement in child safety for 1- to 4-year-olds in 2003 and 2004.

There is also a difference between people of different ethnicities for unintentional injury deaths in the United States. The unintentional motor vehicle traffic death rate in 2004 for White Americans was 9.53 per 100,000 while the rate for American Indian/Alaskan Natives was 13.47. The rate for African Americans was 6.98 (see Table 3).

Table 3. Unintentional motor vehicle traffic death rates per 100,000 of the population.

	Year				
	2000	**2001**	**2002**	**2003**	**2004**
All Races, Both Sexes, All Ages	14.92	14.89	15.30	14.90	14.79
All Races, Both Sexes, Ages 0-19	9.32	9.10	9.47	9.02	8.93
White, Both Sexes, Ages 0-19	9.89	9.48	10.06	9.59	9.53
African American, Both Sexes, Ages 0-19	7.36	7.81	7.41	6.73	6.98
American Indian/Alaskan Native, Both Sexes, Ages 0-19	14.56	15.94	15.40	16.23	13.47
Asian/Pacific Islander	4.37	4.85	4.82	5.11	4.28

Note. From the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS™) [online]. (2005) Accessed May 20, 2007. Available from URL: www.cdc.gov/ncipc/wisqars. Used under the public use guidelines of the Centers for Disease Control.

The difference in unintentional injury deaths from all causes is quite different. American Indian/Alaskan Natives had the highest death rates from both unintentional motor vehicle and all causes (see Tables 3 and 4). African Americans had the next highest death rate from all unintentional injuries (see Table 4). Whites had a higher unintentional motor vehicle death rate (see Table 3). It is also noteworthy that the death rate of African Americans and American Indian/Alaskan Native children between the ages of 0 and 4 years from overall unintentional injury causes is substantially higher than the death rate for White children of the same age.

Table 4. Unintentional injury deaths per age group - 2004.

	0- to 4-Year-Olds			**5- to 9-Year-Olds**			**10- to 14-Year-Olds**		
	Deaths	***N***	**Rate**	**Deaths**	***N***	**Rate**	**Deaths**	***N***	**Rate**
African American	627	3,254,362	19.27	269	3,168,704	8.49	301	3,553,258	8.47
American Indian/ Alaskan Native	65	219,410	29.62	22	268,212	8.20	39	299,492	13.02
Asian/ Pacific Islander	53	958,057	5.53	43	910,978	4.72	39	914,594	4.26
White	1,948	15,628,843	12.46	792	15,266,142	5.19	1,161	16,364,107	7.09

Note. From the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS™) [online]. (2005) Accessed May 20, 2007. Available from URL: www.cdc.gov/ncipc/wisqars. Used under the public use guidelines of the Centers for Disease Control.

In Tennessee, a study was conducted to determine if there may be a difference in child safety seat use between races (Gunn, Phillippi, & Cooper, 2005). The findings of this study found in a comparison of child restraint use between 244 White and 204 African American children that 24% of African American children and 13% of White children between 4 and 10 years of age were completely unrestrained. Of those who were restrained, 64% of African American and 58% of White children were inappropriately restrained.

A study published in 2004 (Vaughan, Anderson, Agran, & Winn, 2004), evaluated White and Hispanic children for injury risk. By interviewing mothers and reviewing demographics, acculturation, housing quality, child temperament, injury history of the child, and injury-risk behaviors, several conclusions were reached. Hispanic and White mothers differed on several sociodemographic factors that have been linked to increase child injury occurrences. These included mother's educational level and acculturation. Acculturation also indicated a difference between injury levels between Hispanics. There were also significant group differences in injury history. White mothers reported a greater number of unintentional injuries for a young child within the previous 6 months. Regression analysis was conducted with testing for bias, and it was determined that being the child of a White mother versus a less acculturated Hispanic predicted an increase in unintentional injury.

The WISQARS™ query system can also be used to look at non-fatal injuries. The difficulty with non-fatal injury reporting is the lack of a mandatory reporting system. All injury data are estimated from voluntary reports and are believed to be underreported. An estimated 597,976 injuries were sustained by motor vehicle occupants between birth

and 19-years-old in motor vehicle collisions during 2005 (Centers for Disease Control and Prevention, 2005). Of these, 430,787 were sustained by 15- to 19-year-olds. The population, for which child safety seats are designed, 0 to 9 years of age, sustained 74,287 injuries from motor vehicle collisions in 2005. This represents 203 children injured each day from motor vehicle collisions in the United States during 2004.

Injury Patterns

The Partners for Child Passengers Safety, a joint project between State Farm Insurance Company and The Children's Hospital of Philadelphia/University of Pennsylvania, has implemented the first real-world surveillance system for evaluating the risk of injury to children from motor vehicle collisions (Winston et al., 2000). Before this project, all injury risk data were accumulated through instrumented dummies in crash test facilities. These dummies are placed in child safety seats on crash sleds with bench seats reminiscent of a 1960's sedan or are placed in vehicles crash tested in extremely controlled situations (National Highway Traffic Safety Administration, 2004b). The Partners for Child Passenger Safety project evaluates a representative sample of children age's birth to 15-years-old in crashes involving 1990 and newer vehicles reported to State Farm Insurance Companies in 15 states and the District of Columbia. Through telephone interviews, survey data were collected on driver reports of crash circumstances and parental reports of child occupant injuries. During the period of December 1, 1998 to November 30, 1999, 2,077 children 2- to 5-years-old were included in the study. These numbers were weighted to represent 13,853 children. Of these children, 98% were restrained, but nearly 40% were restrained with seat belts alone. The results of this study indicate that children in seat belts were more likely to suffer a considerable injury and

were at a particular risk of major head injuries than children in child restraint systems. This project is still in existence, and additional data and results are being obtained on an ongoing basis.

A specific set of injuries from seat belts has been reported for several decades (Kulowski & Rost, 1956). When a child is prematurely graduated from a child restraint system to a seat belt system, the seat belt tends to ride up onto the abdomen. The anterior superior iliac spines of children are not well developed and do not provide a sufficient anchor point for the seat belt. The tendency of the child to slouch until the knees bend comfortably at the edge of the seat exacerbates this problem. This positioning places the child at risk of *submarining*, a term for sliding out of the seat belt or jackknife bending around the poorly positioned seat belt. Poor positioning increases the risk of intra-abdominal or spinal cord injuries, known as seat belt syndrome; it also increases the risk of brain injury, resulting from head impact with the child's knees or vehicle interior (Gotschall, Dougherty, Eichelberger, & Bents, 1998).

The research on injury patterns has continued with Partners for Child Passenger Safety, an organization providing substantial input into many areas of child passenger safety. Other research organizations have also contributed real-world data to the body of knowledge with several noteworthy comparisons. In a study comparing child restraint systems with seat belts in passenger vehicles, one study compared cases involving a fatality with children in tow-away crashes between 1998 and 2003. Utilizing data from the U.S. Department of Transportation Fatality Analysis Reporting System and data from the Partners for Child Passenger Safety Study, it was determined that children 2- to 6-

years-old in child restraint systems that were not extensively misused had a 28% reduction in risk for death than children in seat belts (Elliott, Kallan, Durbin, & Winston, 2006).

In another survey of national motor vehicle collision data, a study was conducted to determine the correlation between the relative risk of pediatric brain injury and the use of child safety seats (Muszynski, Yoganandan, Pintar, & Gennarelli, 2005). This study used a medically accepted injury scale to examine head injuries for age categories: infant, toddler, young child, and adolescent. These categories were compared with four restraint categories: unrestrained, properly restrained, improperly restrained, and other. It was determined that the proper use of a child restraint system substantially reduced the risk of sustaining a head injury in a motor vehicle collision with the most dramatic reduction seen in the infant population.

Equipment Specifications

The design and manufacturing of child restraint systems and automobile restraint systems is outside the scope of this study. However, there are several issues related to equipment specifications, which are influenced by advocates for child passenger safety. One issue is the readability of the child restraint system instructions that are written by manufacturers and distributed with child restraint systems. The National Highway Traffic Safety Administration provides a CD-ROM containing the child restraint system instructions for most child restraint systems on the market. In a study to evaluate the readability of these instructions (Wegner & Girasek, 2003), the instructions were subjected to Simplified Measure of Gobbledygoop (SMOG) testing to determine the grade level of the instructions. In addition, available pricing information was obtained

for the child restraint systems evaluated for readability of their instructions. The study discovered that the readability of instructions ranged from 7th to 12th grade (M = 10.34), and the child restraint systems had a price range of $58 to $270 ($M$ = $109). There was no significant difference in readability between three price categories. The study determined that the readability of the instructions were too high based upon recommendations from experts in the field of health literacy; they recommended that materials be targeted at 5th- or 6th-grade reading levels.

Governmental regulations, based upon current automotive safety standards, are the most visible of equipment issues. The National Highway Traffic Safety Administration of the Department of Transportation (Federal Motor Vehicle Safety Standard 213: Child restraint systems, 2004) is an agency that governs the performance standards for child restraint systems for children up to 65 pounds. In effect since 1971, the regulations for child restraint devices was amended in 2003 as a result of new legislation (Transportation Recall Enhancement, Accountability, and Documentation [TREAD] Act, 2000). This regulation governs the manufacture and testing of child restraint systems. This revision incorporated the latest science in the field of child protection and increased the upper weight limits of the standards along with other technical changes to testing criteria. Another set of regulations (Federal Motor Vehicle Safety Standard 208: Occupant crash protection, 2004) governs vehicle safety restraint systems, including the requirements that lap and shoulder belts are required in all outboard seating positions. The system known as Lower Anchors and Tethers (LATCH)

is governed by yet another set of regulations (Federal Motor Vehicle Safety Standard 225: Child restraint anchorage systems, 2004). Introduced in 2002, this system is designed to prevent misuse from incorrect use of seat belt systems for securing child restraint systems into vehicles.

All of these regulations are designed to regulate performance of systems. Unfortunately, there are no uniform designs for child restraint or vehicle anchor systems. Despite all of these design regulations, incompatibility between child restraint systems and vehicle anchorage systems remains a problem. With seven vehicle anchorage system designs, over 900 vehicle models on the road, and over 50 models of child restraint systems on the market, compatibility will continue to be a problem for caregivers (National Highway Traffic Safety Administration, 2004b).

Injury Prevention Programs

Injury prevention programs are reported throughout the literature and across disciplines. There are many descriptions and outcomes of programs. For the purpose of this study, the role of healthcare providers was most important. The guiding definition of a role in the medical arena is established by the American Academy of Pediatrics (AAP). In the policy statement regarding child passenger safety (American Academy of Pediatrics, 2002), pediatricians are given specific recommendations for the safe transportation of children and are advised to keep abreast of current technology. This document establishes the medical best practice for the safe transportation of children. Pediatricians are also advised that state laws may not reflect best medical practice.

The Society for Pediatric Nurses has established a Position Statement on Pediatric Injury Prevention. This document states “Pediatric nurses, employed in a variety of

settings, have the opportunity to develop and implement or 'participate' in injury prevention programs, and educate parents and children about the importance of injury prevention." (Society of Pediatric Nurses, 2004, p. 1).

All healthcare personnel are involved in the total health of the nation and are directed in direct or indirect ways by *Healthy People 2010* (U.S. Department of Health and Human Services, 2000). This plan for the improvement of the health of the nation as a whole has several sections specifically related to injury prevention and motor vehicle collision-related death and disability. It identifies motor-vehicle-related deaths as a leading health indicator while establishing access to appropriate health information as a primary goal.

Pediatric providers are a group that has been identified by the American Academy of Pediatrics (American Academy of Pediatrics, 2002) and the U. S. Department of Health and Human Services (2000) as having a role in the education of the public in child passenger safety. Cohen and Runyan (1999) conducted a study of physicians to determine associations between physician characteristics and physician perceptions of barriers. Residents in the study thought child passenger safety was important, but felt that they lacked time to provide information to parents. They also did not think to ask parents about injury prevention or they had more important things to do. Researchers found that the more importance the residents placed on injury prevention, the less barriers were perceived. Barriers were perceived to a greater extent by residents who did not feel that their preceptors expected them to provide counsel about injury prevention. Residents with a lack of confidence about the effect of counseling on parents or felt uncomfortable with the process of counseling parents about injury prevention also perceived higher

barrier levels. The study also found that knowledge, residency year, training, and previous injury experience were not related to perceived barriers. One barrier that is not discussed in the literature, but frequently discussed informally between clinicians, is the lack of reimbursement from third party payers for injury prevention counseling.

Researchers in Canada mailed questionnaires to all community pediatricians affiliated with the Hospital for Sick Children in Toronto (Rothenstein, Howard, Parkin, Khambalia, & Macarthur, 2004). This 16 item questionnaire gathered information on knowledge of governmental recommendations for child restraint system use, general counseling patterns in relation to child passenger safety, and demographic information. The study found that the majority of pediatricians (92%) correctly identified the recommended weight for transition to a forward-facing car seat, but fewer pediatricians (63%) identified the recommended weight for graduation to a booster seat and only one third identified the recommended weight for transition to a seat belt. The study also found that many (46%) pediatricians did not offer any resources on child passenger safety to parents. Just over half of the pediatricians (55%) recommended to parents that children should be transitioned from child safety seats to booster seats before being placed in a seat belt. Very few pediatricians (31%) asked about the use of a rear-facing child safety seat at the first well child visit and fewer discussed the tightness of harness straps (29%). Only a little over a third (36%) of the pediatricians discussed the risks of premature graduation to a seat belt.

Injury prevention counseling priorities were addressed by Cohen, Runyan, Downs and Bowling (1997). In a modified Delphi study with 23 childhood injury prevention experts nationwide, an open-ended questionnaire was distributed asking what the

participants believed should be included in office-based injury prevention counseling on prevention strategies and prioritization methods. Seventeen injury problems and 23 strategies were suggested that were then studied in a closed-ended questionnaire based upon the results of the first. Participants based their decisions on the severity of the injury, frequency of occurrence and environmental strategies. Time constraints and parents' inability to retain information led the researchers to come to the conclusion that the number of injury prevention strategies offered in any office visit should be limited to four. Motor vehicle trauma was unanimously given high priority by all participants.

The most momentous program to correct misuse is the Standardized Child Passenger Safety Technician program implemented in the 1990's. In 1996, NHTSA developed and piloted the standardized child passenger safety training curriculum (National Highway Traffic Safety Administration, 2004b). In 1998, AAA began certifying technicians and instructors for this curriculum. The purpose of this curriculum is to establish a cadre of trained technicians throughout the country to assist parents and caregivers in selecting, installing, and using child restraint devices. A child restraint system is a child safety seat, booster seat, or other device used to fit a child into a motor vehicle restraint system designed for use by an adult (National Highway Traffic Safety Administration, 2001). The focus of the curriculum is to train the technicians to provide the information necessary for the parent or caregiver to select, install, and use a child restraint device on their own.

This cadre of technicians represents the core group of individual experts who perform detailed, hands-on inspections, education, and advisement for parents and caregivers seeking help with their child restraint device selection and installation.

However, not every parent or caregiver seeks this assistance. Those who fail to seek the assistance of experts may do so because they are unaware of the availability of the experts, do not feel as if they need assistance, do not think that the importance of the problem is great enough to worry about, or some other unknown reason.

Most child passenger safety programs are aimed at reducing misuse through educational activities targeted at demonstrated misuse issues. The most common activity reported is the child passenger safety check-up event or inspection station. Child restraint device inspection events and stations concentrate on thorough inspections and educational interventions to correct misuse. These strategies require considerable time and resources to conduct.

In the healthcare environment, parents and caregivers are accorded minimal time during healthcare visits to receive anticipatory guidance on a number of topics depending upon the child's age. Information and education must be focused, to the point, and easy to remember among the plethora of topics presented in well child visits (Bull & Sheese, 2000). Traditionally, programs targeted at improving child restraint device use relied upon the actual misuse findings to determine the information to be included in educational programs for parents and caregivers. Health care providers are unlikely to have actual performance information obtained by a detailed inspection of the child restraint system of a child. Instead, they must target knowledge deficits of parents and caregivers for educational interventions in a brief well child visit. Even if misuse information was obtained and available, the underlying knowledge deficit that resulted in

the misuse may be missed. In order to make the most of limited time, knowing where a parent or caregiver lacks information may increase the effectiveness of office interventions.

In a report by the Centers for Disease Control and Prevention on school health guidelines to prevent unintentional injury and violence, a council was established to make recommendations for prevention activities in schools (Barrios et al., 2001). Throughout the document, there was mention of counseling, psychological, social, and health services; however, at no point is the term nurse used. The council is composed of a representative of the American Nurses Foundation and the publication lists the American Nurses Association and the National Association of School Nurses. The document describes activities that are within the role of the school nurse, yet the profession is slighted tremendously through omission.

Regardless of the type of counseling, duration of counseling or venue, counseling of any type is better than none at all. In a study of purchase behavior, Stevens found that counseling did influence purchase decisions (Stevens, 2000). This study supports counseling of any type as an effective tool to implement change. The change indicated in the study was the adoption of a safety product. The conclusions of the study also report an attempt in 1996 to have traffic safety professionals change their terminology from child restraint device to child safety seat, a concept that does not take into account the difference in the terms and the current use of child safety seats as a subset of child restraint devices.

One of the barriers to counseling parents on correct child restraint device use is the inability to witness the parents during the entire process of preparing their child for

transport during an office visit. Since the vehicle is outside and the appointment is inside, valuable information and teaching opportunities are lost. One innovative study utilized nurses and nursing students in outside activities at day care centers to observe and correct misuse. The program was expanded to malls, amusement parks, conventions on child health, and health fairs. The conclusions of the study included the ability of nurses to replicate this program and the ability of nurses to contribute to transportation safety by training others (Gaines, Layne, & DeForest, 1996).

The Haddon Matrix is the primary theoretical framework used in public health for injury prevention and intervention. This work is the landmark approach to describing methods to decrease the trauma associated with unintentional injury. This framework describes three phases of social concern in the sequence of events leading to the end result or amount of trauma received from an unintentional injury. During these phases, causative factors are active, and countermeasures can be taken (Haddon, 1999).

The first phase countermeasures involve the prevention of an etiologic agent from reaching a susceptible host. Haddon (1999) used polio as an example in the disease arena. The first phase for polio prevention would involve keeping children out of swimming pools and movie theatres. For injury prevention, the countermeasures are described as techniques used to prevent mechanical forces from reaching above the injury producing thresholds of the vehicles and people.

The second phase in the framework involves the interaction of the etiologic agents and the susceptible structures. The arrival of the polio virus in the host and its interaction with the cells of the intestinal tract and the central nervous system are examples in the disease arena. In injury prevention, the phase begins when mechanical forces above

structurally tolerated levels of both the vehicle and occupants begin to be exerted on vehicles and people. For motor vehicle occupant injury prevention, countermeasures would include better packaging of the human cargo.

The third phase in this framework involves maximizing salvage once damage has been done to susceptible vehicles and people. Following the medical example of polio, this phase would include preventing death once paralysis has occurred. For injury prevention, this phase would include the emergency medical response, intermediate care, and rehabilitation for the victim of a motor vehicle collision. In this phase, the additional issue of timeliness of the response is introduced.

Haddon (1999) further charts these phases against the component that is involved in each phase. The framework has evolved since its inception, with a refinement of the components into the host, agent/vehicle, physical environment, and social environment (Runyan, 1998). The host or human is the person involved in the event or the recipient of trauma. For a motor vehicle collision, this would be the driver or occupant. For a house fire, this would be the burn victim. The agent/vehicle or carrier is the device involved in the event. A vehicle or its components would be the device in a motor vehicle collision. A cigarette, a pan of grease, or faulty wiring in the home would be the devices in a house fire. There are two environments in which the collision occurs, the physical environment and the social environment. The physical environment is the place in which the event occurs. For a motor vehicle collision, this would be the street or highway. For a house fire, it would be the house. Finally, the social environment is a component. This describes the community norms, policies, rules, laws, and socially acceptable behavior that influence the likelihood of a preventable event. The underlying application of this

framework is that an intervention can be planned and implemented in any phase and component to influence the trauma outcome. Not all parts of the matrix are equal in influence on outcomes, and some combinations of phase and component interventions can affect the outcome more than others (see Figure 1).

Phase	Host/Human (child in vehicle and safety seat)	Agent/Vehicle (vehicle and child safety seat)	Physical	SocioEconomic
Pre-event (before the collision) ⇩	Judgment, intoxication, driver vision	Brakes, tires, seat installation	Road conditions, visibility, seat condition	Attitudes about speed limits and traffic laws, support for injury prevention projects
Event (collision) ⇩	Child's physical condition, use of child safety seat	Vehicle size, automatic restraints, passive safety engineering, speed capability	Guard rails, embankments, median barriers, speed limits	Attitudes about child safety seat use, enforcement of traffic laws and child restraint laws
Post-event (after the collision)	Age and physical condition	Fuel system integrity	Emergency communications systems, distance to and quality of emergency medical services (EMS)	Support for trauma care and training of EMS personnel

Figure 1. The two-dimensional Haddon matrix applied to child passenger injury.

Runyan (1998) further expanded the Haddon Matrix by including a third dimension involving decision criteria. This third dimension expands the matrix by introducing effectiveness, cost, freedom, equity, stigmatization, preferences, feasibility, and other identified criteria as a third dimension. This dimension explores additional social issues related to the reduction of the injury outcome of an event through the incorporation of value criteria in the decision-making process. While the two-dimensional Haddon matrix is often cited in the literature, the three-dimensional matrix is relatively new and not as well utilized (see Figure 2).

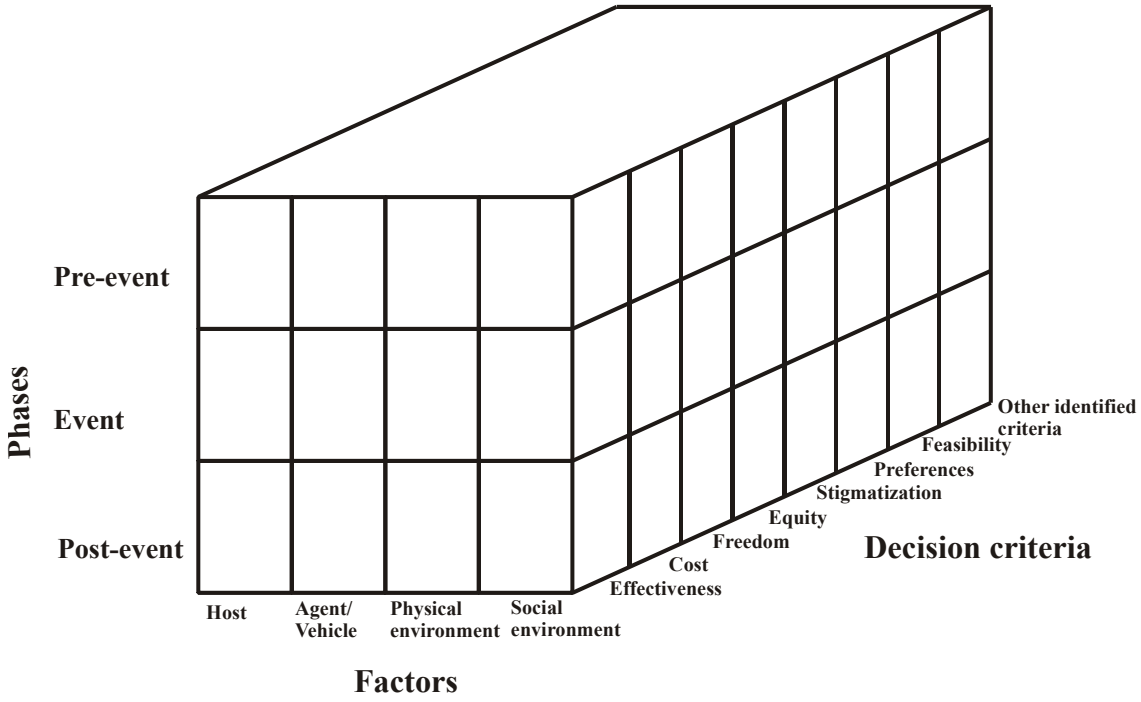

Figure 2. The three-dimensional Haddon matrix.

The use of other theories to direct child passenger safety programs was not found in the literature; however, a study specifically using a theoretical model to direct a bicycle safety program was found. Hendrickson and Becker (1998) studied the impact of a theory based intervention to increase bicycle helmet use in low-income children. This study compared several groups of low-income students in an experimental research project. This project involved a pretest, intervention, and posttest scenario to determine which educational intervention worked best to increase bicycle helmet use among lower income, higher minority population school children. Based upon the predisposing, reinforcing, and enabling constructs in educational/environmental diagnosis and evaluation (PRECEDE) model, the study addressed the following research question:

How much do predisposing, enabling, reinforcing factors, and participation in an educational intervention add to the prediction of reported bicycle helmet use after controlling for helmet ownership?

There were three groups in the study in several schools. The three groups included a control group, a classroom only intervention group, and a classroom with a parent/child intervention group. The study used an injury prevention model, PRECEDE, which focused on predisposing, enabling, and reinforcing educational factors. The study found that students with both classroom and parental involvement performed better on a safety self-assessment than the other groups.

This study may be considered family-related research as the study measured the influence parents have on children in the performance of safety behavior. The vulnerable populations involved include lower income and minority children. The study involved school nurses providing two educational interventions in the intervention groups. The first followed a baseline assessment using a 31 question survey of self-reported injury prevention behaviors. The second session included practice on such issues as refuting peer pressure to use a bicycle helmet. Approximately one month later, the survey was repeated without an intervention. All groups received the survey at the same time.

The literature review included relevant material. The search found two previous studies using the PRECEDE model for helmet use studies out of 607 articles using the PRECEDE model. One of these two articles also included lower socioeconomic groups as participants and found a significant increase in helmet use as a result of the intervention.

The study used the PRECEDE model as a theoretical framework. In essence, the PRECEDE model predicts that changes in predisposing, enabling, or reinforcing factors can change injury prevention outcomes. Predisposing factors include knowledge, attitude, beliefs, values, and perceptions that provide the motivation for behavior. Enabling factors support a desired behavior change (in this study, helmet ownership was a prerequisite for helmet use). Reinforcing factors provide reward, incentive, or punishment for a behavior to be perpetuated or terminated. These components of the model come before behavioral change and were implemented in this study. This model linked the enabling and reinforcing factors to their instrument. The enabling factors included making helmets available through a give away program. Lack of a helmet could also be considered a predisposing factor. The enabling factors also included peer pressure recognition and the development of refuting techniques. The reinforcing factors were influenced by the second session and the parental intervention in the parental intervention group.

The data were analyzed using multiple regression techniques to account for the influence of each of the variables. The findings were significant ($p < 0.05$). The methodology for data analysis was appropriate for the instrument. The study found that children can be reached through schools to increase preventative behaviors. It also found that parental intervention increases this behavior even further. There was no significant difference between genders in helmet use, which indicates that boys, who are more frequently injured, may be as receptive to interventions as girls. This study found a slight difference in use of helmets based upon ethnicity, which warrants further inquiry before any conclusions are made. One unique discovery of the study was the common

conception of rural parents that helmets were for heavy traffic areas. Since the children rode on their own land, there was less of a need for helmets. This indicated the continuing need for education and interventions to emphasize the risk of non-helmet use for parents.

Use and Misuse

Use and misuse literature included the current recommendations for the safe transportation of children. These recommendations were published and amended regularly by the American Academy of Pediatrics and the National Highway Traffic Safety Administration based upon the best practices from medicine and engineering. Use and misuse literature also included incorrect utilization of a child safety seat or other occupant protection device. Besides describing what determined misuse, the literature documented rates and types of misuse. A classic article on misuse, published in 1976, reported that only 7% of children less than 10 years of age were restrained (Williams, 1976). The study also reported that researchers observed 79% of devices were misused. This statistic is similar to the current misuse rate of 80% (Glassbrenner, 2003).

The most commonly documented misuse study was the National Occupant Protection Use Survey conducted approximately every 4 years by the National Highway Traffic Safety Administration (Glassbrenner, 2003). This study was conducted in select locations around the country, and trained observers were stationed on the side of streets where they could observe occupants in passing vehicles. Misuse was then identified by visual inspection only. Through this technique, it was estimated that 80% of all child restraint systems were misused.

Behavior and Knowledge

The first significant study that investigated the behavior of parents in regard to the transportation of their children was published in 1972 (Pless, Roghmann, & Algranati, 1972). Pless investigated the frequency with which parents took appropriate precautions when traveling with their children. It also surveyed pediatricians on the regularity that they discussed auto safety with parents, the presence of auto safety literature in the office, the pediatrician's views on the use of seat belts, and the role of the pediatrician in advising parents on child passenger safety.

The study utilized the technique of using roadside observations for the evaluation of restraint use. Children who appeared to be under 12-years-old were noted to be in the front or back, standing or sitting, and restrained or unrestrained. The type of car and number of passengers were also noted. The most significant findings from the observations were that only 68% of children were seated during the observations; the rest were standing in the vehicle. The current use of child safety seats is between 83% and 99% and is an extremely significant improvement in use rates.

Parents were also surveyed by telephone about their auto safety practices. They were also asked about their usual source of advice on safety practices for their child and how often their pediatrician discussed auto safety with them. The most common source of information was the news media (50%). The percent of parents who denied any recollection of receiving any auto safety advice from their pediatrician was 96% although 21% indicated that they recalled seeing literature in the office. The study also compared parental answers with the answers of pediatricians about how often they provided advice

on child safety. By matching the parents with their pediatrician, it was possible to compare the data. There was no correlation between pediatricians' frequency of advice and parental behavior.

In one of the few reports that actually looked at injury patterns and child restraint system use, Winston, Chen, Smith and Elliott (2006) studied child restraint system use with parents of children under age 9 involved in crashes. A sample of 3,818 crashes involving 5,146 children was obtained and an in-depth telephone interview was conducted. In this study, it was found that the independent variables non-Hispanic Blacks, less educated, and lower income, represented a higher risk for sub-optimal restraint use.

The behaviors of caregivers were also important in predicting the outcome of a crash involving a child. The National Center for Statistics and Analysis investigated fatal crashes between 1991 and 2001 (Starnes, 2003). For fatally injured passengers from birth to 3 years of age, 68% were unrestrained in vehicles in which the driver was unrestrained, while only 29% were restrained. In vehicles in which the driver was restrained, 68% were restrained while 28% were unrestrained. The remaining fatalities were unable to be classified. When the driver was unrestrained, 84% of fatally injured children 4- to 7-years-olds were also totally unrestrained while only 14% were restrained. When the driver was restrained, 36% of fatally injured 4- to 7-year-olds were unrestrained and 58% were restrained. For fatally injured children ages 8 to 15 years, if the driver was unrestrained, 91% of the children were unrestrained. Only 7% were restrained. The remaining fatalities were unable to be classified. Parental driver behavior is indicative of child restraint system use.

In an exhaustive search of the literature, three studies were found that explored the knowledge level of parents and caregivers about child passenger safety. One additional study was found that explored the correlation between survey data from parents and caregivers and actual hands-on inspections of child restraint devices. There were no studies found that explored the sources of information that parents and caregivers used to obtain information about child passenger safety.

Vaca et al. (2002) presented a family-related research study on the knowledge level of parents about child passenger safety. The authors presented a survey to 655 users of a southern California emergency department to determine their knowledge of child passenger safety and the appropriate use of child passenger safety devices. The majority of the subjects were Hispanic. The study found that there was a significant difference between English and Spanish speaking participants.

The report does not explicitly define a conceptual model or framework for the research. No hypotheses are identified for the research; however, an objective for the research is identified:

> The objective of our study was to determine the level of child safety seat (CSS) and airbag safety knowledge in parents who utilize emergency care services for their children and determine factors that may influence knowledge associated with safe transportation of children. (Vaca et al., 2002, p. 1)

This objective was twofold. The first part of the study attempted to describe the level of child safety seat and airbag knowledge possessed by parents. There was no

implied or expressed theory or hypothesis about the level of knowledge and any contributing factors. The goal of the second part of the study was to identify contributing factors.

The methodology included a closed-ended survey administered by a research assistant to the participant in their primary language. Interpreters were used as necessary for Spanish or Vietnamese speaking subjects. The survey was created by the researchers and validity testing was not reported in the article.

There was a distinct use of logical structure found in the survey and in the report. The American Academy of Pediatrics (2002) and the National Highway Traffic Safety Administration (2004b) have established that an infant should not be turned from rear facing to forward facing until the child is at least 1 year of age and 20 pounds. This is an absolute minimal standard and not the best practice. The survey uses the following language in the first two questions: "For a child weighing <20 lb and <1 year of age, how should the child ride in the car?" and "For a child weighing <20 lb and <1 year of age, the infant car seat should face which direction when placed in a car?" As an example, this language asks a caregiver if it is appropriate to place a 22 pound child who is less than 1-year-old in a forward-facing child safety seat. The authors' wording gives the caregiver respondent a very clear question without ambiguity.

If a change of wording from the standard is seen in the literature as a recommendation, the safety of infants can be placed at risk. The wording "car seats should face the rear for infants under 20 pounds *and* [italics added] younger

than 1 year of age" (Murphy, 1999) is a change in logical structure from the standard. This recommendation would allow an infant of 11 months and 22 pounds to be placed forward facing, contrary to the recommended standard.

An evaluation of the Vaca (2002) study indicated that fluency in English positively affected knowledge scores. Hispanic ethnicity predicted a lower test score as well as lower income. These correlations are presented ambiguously in the article. The wording could be implied to represent these findings as the result of either theory generating or theory testing research. The literature review, problem statement, and objectives do not indicate that this was an intended question in the research so it is more likely that these are resultant theories to be tested by later research.

The heterogeneity of this population and other disparities in knowledge level presented by income level, English proficiency, and Hispanic ethnicity raise questions that are important to healthcare providers as they deliver anticipatory guidance. It would also be interesting to look at the availability of a medical home and knowledge level in different populations. This study was geographically and ethnologically small. Before any deductions are made from the results, the research would have to be repeated on a larger scale. The researchers recognized the limitations of the heterogeneity of their population and the inability to draw generalizations from the research. The ambiguity of the statement of purpose and lack of a conceptual theoretical empirical model leaves the reader with questions as to the application of the results.

Snowdon, Polgar, Patrick, and Stamler (2006) conducted a study of families of children aged 0 to 9 years in southwestern Ontario through the distribution of surveys to parents. They received 1,263 completed surveys reporting on 2,199 children. The survey

examined the use of child restraint systems, parents' knowledge, and decision-making processes relative to child restraint system use. The questions were designed to elicit responses about how child restraint systems were used by families and how decisions were made in choosing the way child restraint systems were used. Likert scales were used to determine how important certain considerations were to the parents in their decision-making process. This study examined the knowledge level based upon the actual use of child restraint systems through a self-reporting mechanism. The study found that 74.3% (n = 1,586) of the children were seated in the correct safety seat for their height, weight, and age. Knowledge was determined by asking the parents to rate the importance of a number of factors affecting the decision to purchase a safety seat for their child or to transition their child from one safety seat to another. The results were used to determine the priority parents placed on factors in the decision making process. The fit of the child in the car seat was the most important factor followed by weight. Age and child's resistance were not considered important.

Parents were asked to describe sources of information they routinely accessed to support their decisions about the use of child restraint systems. The majority of parents used pamphlets and magazines, and manufacturers' instructions as their primary sources of information, which were followed by friends and family. Healthcare professionals and car seat clinics were not common sources of information.

Spanier, Mercante, and Barkemeyer (2002) performed a study to help direct future educational efforts. They studied the knowledge and attitudes related to child

safety seat use in an urban postpartum population. Utilizing an oral survey administered to postpartum patients at two urban hospitals (one private and one public), the researchers collected demographic information and knowledge of proper child safety seat use.

In this study, the majority of the mothers enrolled were of African American descent (86.8%), with a high school education, and an income of less than $15,000 annually. Most owned a child safety seat (88.8%), lacked a driver's license, and did not own a car. In this population, the majority reported using a seat belt always (63.7%), with fewer reporting using a seat belt most of the time (21.2%), and the fewest reporting using a seat belt some of the time or never (15.1%). The study compared multiparous patients with uniparous participants for child safety seat use and found that of 118 multiparous participants, most (76.3%) reported using a child safety seat always, and the percentage of those who reported using one most of the time (13.6%) and using one some of the time or never (10.1%) were similar. Nine knowledge based questions assessed their knowledge level with correct responses ranging from 21.2% to 81.6%. The mean number of correct responses for participants from a private hospital was 7.6, with the mean from the public hospital at 6.9 and a total mean for all participants was 7.1. Their conclusions indicated that the most important factors relating to knowledge were maternal education and previous child safety seat education reported by the mothers. Having had a child previously had no significant influence on the mothers' knowledge level.

Jones (2004) performed a pre- and post-survey associated with child safety seat checkup events conducted from May 2002 to October 2002. The study showed increased knowledge, but, more importantly, there was increased self-efficacy. The study

concluded that child safety seat checkup events made an impact on proper use. They further concluded that a parent's lack of confidence may be a reason for misuse.

Family-Related Research

A family is a complex unit with discrete and definable characteristics of its own that is made up of individuals, dyads, and/or triads that combine to form the family unit (Gilliss, 1983). The family can be interrelated through biological, legal, or functional means and can take the forms of nuclear, intergenerational, or extended (Kristjanson, 1992). A family is a group formed by individuals to meet the basic needs of life, and it is individualistic to those who form it. As it relates to this research, a family is a group in which children depend on their caregivers to provide the necessities for living.

To identify a family for this research, a review of the definitions of family was conducted. Two systems in which family is defined were identified. These were the legal system and the healthcare system. The use of family in the common vernacular is closely tied to the definitions that the courts of the United States have used to define the term. As early as 1974, the United States Supreme Court (Village of Belle Terre et al., v. Bruce Boraas et al., 1974) and many state courts, including the State of New York Court of Appeals (City of White Plains v. Ferraioli, 1974), examined the question of the definition of family, both in enforcement proceedings and in declaratory judgment actions. This line of family definition cases has followed a path of analysis that is very traditional. The definitions have usually been very restrictive and specific to regulations, with many based upon zoning laws.

The American Academy of Pediatrics is the recognized standard setter for the safe transportation of children (American Academy of Pediatrics, 2002). They also have

established a policy for the implementation of family-centered care (American Academy of Pediatrics; Committee on Hospital Care; Institute for Family-Centered Care, 2003). It is interesting to note that there was no definition of the word family in the policy despite it being used throughout the policy.

Social work has long attempted to identify the family and define the term (Gelbert, 1979). The profession is still struggling with the concept and definition of family and realizes that the definition of family is variable, dynamic, nebulous, and inconsistent. Social work is also closely tied to the legal definitions due to limitations in resources while healthcare is tied to the broader definitions of family found in that field. In medicine, it is common to find that the term family is undefined in the literature, as illustrated by the American Academy of Pediatrics (American Academy of Pediatrics; Committee on Hospital Care; Institute for Family-Centered Care), and left to the interpretation of the reader (Tomlinson, 2003). Perspectives on the family are important to this research as the legal system uses the definition of family to award funds to assist caregivers in protecting their children, and medical providers are charged with providing appropriate anticipatory guidance in child passenger safety to meet family needs.

In nursing literature and education, especially that dealing with family and family-related research, family has been defined broadly (Hanson, Heims, & Julian, 1992). The family consists of individuals, dyads, and triads in the contexts of households, neighborhoods, communities, and the greater society that is diverse and based upon relationships that are dynamic, interactive, and change over time (Denham, 2003). Friedman's family health model as used by Denham focuses on the health household as the health location without identifying specific roles and caregiving was described as a

concern for other family members that came from close intimate relationships and member affections. In addition to Denham, Billingsly (1992) and Devore and London (1999) commonly describe the family in a very dynamic sense, but definitions of family that work within the context of this research can be found in these descriptions: A family is a group formed by individuals to meet the basic needs of life and is individualistic to those who form it; a family is a group in which the children depend on their elders to provide the necessities for living; and a family can be an intimate relationship shared by those who have a bond via blood, marriage, adoption, or appropriation. For the purpose of this research, the family is defined as a dependent child by blood, adoption, or guardianship and the caregiver parent or legal guardian.

The focus of this study was on the relationship between the individual caregiver as a dependent-care agent (Orem, 2001) and the dependent child. In identifying this research as family research or family-related research, variables were evaluated in context. According to Janet Deatrick (personal communication, May 21, 2007), cognition is an individual concept. This study described individual cognition or knowledge, and behaviors or attributes of individual caregivers in a relationship with another family member dependent upon them. The family is not measured as a unit. Therefore, the research is family related research.

Conceptual Framework

This study of caregiver knowledge of child passenger safety and the caregiver's sources of information involved both qualitative theory generating methodology and quantitative theory testing methodology. The study was descriptive for both of these components. The underlying conceptual model used to guide this study was Orem's self-care framework (Orem, 2001). This study involved investigating the relationships within and between groups for demographic and descriptive data versus child passenger safety knowledge as well as developing theory generating data about the sources for information that caregivers use for the installation of the child's restraint system. While the Haddon Matrix is commonly used to guide injury prevention research, this study utilized an instrument that fits into Orem's framework. This provided an opportunity to test current nursing theory in injury prevention and to develop potential middle-range nursing theory for further study.

Conceptual Model

Orem's self-care framework was selected to guide this study. The use of Orem's self-care framework was tested for appropriateness using the research rules developed by Fawcett (1999). There are six rules to be applied.

The first rule is the phenomena to be studied encompasses theoretical and practical components of self-care; dependent-care; self-care agency; dependent-care agency; the universal, developmental, and health deviation self-care requisites that make up the therapeutic self-care demand; self-care deficits; dependent-care deficits; nursing agency; nursing systems; and methods of helping. The phenomena investigated within this study were dependent care and dependent-care deficits. Based upon the nature of the

relationship between a caregiver (dependent-care agent) and a child who depends upon the decisions of the dependent-care agent for care and prevention of injuries, the first rule is met for a component of dependent-care. The prevention of injuries is a component of the theory of self-care (Orem, 2001), and according to Orem, persons seek to maintain their health. The decisions that are made to maintain health are based upon many basic conditioning factors. The central idea of her theory is that self-care must be learned, and it must be deliberately performed continuously in time and in conformity with the regulatory requirements of associated individuals. Experiences of persons in the provision of self-care or dependent-care, and scientific knowledge available and communicated to them enable them to accumulate and structure bodies of experiential knowledge about kinds of care, when care is needed, and methods of providing care (Orem, 2001). Orem also defines the theory of self-care deficit as the expression of why persons require nursing. The presuppositions of this theory include the explanation that the engagement in self-care and dependent-care are affected by a person's limitations in knowing what to do under existing conditions and circumstances or how to do it. Both methods fit Orem's framework under this rule (Fawcett, 1999).

The second rule is that the clinical problems to be studied are those that reflect actual or predictable self-care or dependent-care deficits. The ultimate purpose of research is to identify the effects of nursing systems of regulatory care on the exercise of self-care agency or dependent-care agency. The clinical problems to be studied include 1) the relationships between basic conditioning factors and the dependent-care agent's knowledge about appropriate child passenger safety actions and 2) developing a theory about the sources of information that dependent-care agents use to increase their

knowledge about child passenger safety. Through inadequate use of child restraint systems, dependent-care agents increase the risk that health will be impaired. The ultimate results of this study on caregiver knowledge of child passenger safety may be an increase in knowledge about which nursing interventions will be most effective to maintain the health of children (Fawcett, 1999).

The third rule is that research participants are people who may be considered legitimate patients of nursing. For this study, the participants were dependent-care agents or caregivers of children under the age of 10 who have a legal responsibility to secure children in motor vehicles during transport. The inclusion of child passenger safety education into the anticipatory guidance education of caregivers as a standard of care (American Academy of Pediatrics, 2002) provides a direct provider-patient responsibility and relationship. The counseling of patients on safety is within the scope of the practice of nurses (American Nurses Association, 2004), and, therefore, the relationship of these dependent-care agents as patients of nursing is met (Fawcett, 1999).

Rule 4 states that inductive and deductive research using both qualitative and quantitative research designs and associated instrumentation is appropriate. This study uses both designs. Instrumentation measures components of the framework used to guide this study (Fawcett, 1999).

Rule 5 specifies that the data analysis techniques associated with both qualitative and quantitative research designs are appropriate (Fawcett, 1999). The data analysis for the theory testing component of the study included univariate and multivariate statistical analysis between basic conditioning factors and the scores on the Knowledge of Child

Safety Seat and Occupant Air Bag Safety Questionnaire. The data analysis for the theory generating component of the study was a descriptive, qualitative technique with the development of exclusive or non-overlapping categories.

Rule 6 states that research will advance knowledge by enhancing understanding of patient and nurse variables, which affects the exercise of continuing therapeutic self-care and dependent-care (Fawcett, 1999). The knowledge levels of participants in relationship to their demographic and descriptive information will assist in targeting specific populations for programs in the most efficient method possible. Through the development of theories about the sources of information used by participants, appropriate targeting and educational programs can be developed.

Middle-Range Theory

The central idea of the theory of self-care is that self-care must be learned, and it must be deliberately performed continuously in time and in conformity with the regulatory requirements of associated individuals. Orem (2001) proposed the proposition that self-care or dependent-care, performed by persons with the intention of doing good for self or others, may fall short of the focal conditions and goals sought because of a lack of knowledge, skills, or physical limitations. The theory of self-care deficit expresses the reason that persons require nursing, and a lack of knowledge presents a self-care deficit that nursing systems can correct. The theory of nursing systems identified the function of the nurse in providing knowledge for patients to meet self-care requisites.

Orem's universal self-care requisites included the need to prevent hazards to human life, human functioning, and human well-being (Orem, 2001). According to Orem, the goal of preventing hazards to human life may be influenced by a lack of

knowledge. Dependent care is the ability of one individual to provide care to another individual who is unable to perform self-care. Orem also identified factors, internal and external to individuals, which affect their abilities to engage in dependent care. These factors are identified as basic conditioning factors. The basic conditioning factors are age, gender, developmental state, health state, sociocultural orientation, healthcare system, family system, pattern of living, environmental factors, resource availability, and adequacy. This study tested the relationship between selected basic conditioning factors and the child passenger safety knowledge of caregivers.

Specifically for the theory testing component of this study, the theory of self-care deficit was utilized. Knowledge levels for the ability to perform dependent care were related to basic conditioning factors. There were 18 questions that described different aspects of the caregiver's basic conditioning factors and 21 questions that measured knowledge of current child passenger safety issues. The scores on the 21 knowledge questions were compared with each of the 20 variables, developed from the 18 basic conditioning questions to determine if there were relationships within and between groups. The relationships between the conceptual model, the middle-range theory, and the empirical structure are illustrated below (see Figure 3).

Concepts

The concepts related to basic conditioning factors, specifically measured by the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire were age, gender, developmental state (years of education of the caregiver), pattern of living (use of seat belt while driving, use of a seat belt while a front seat passenger, use of a seat belt

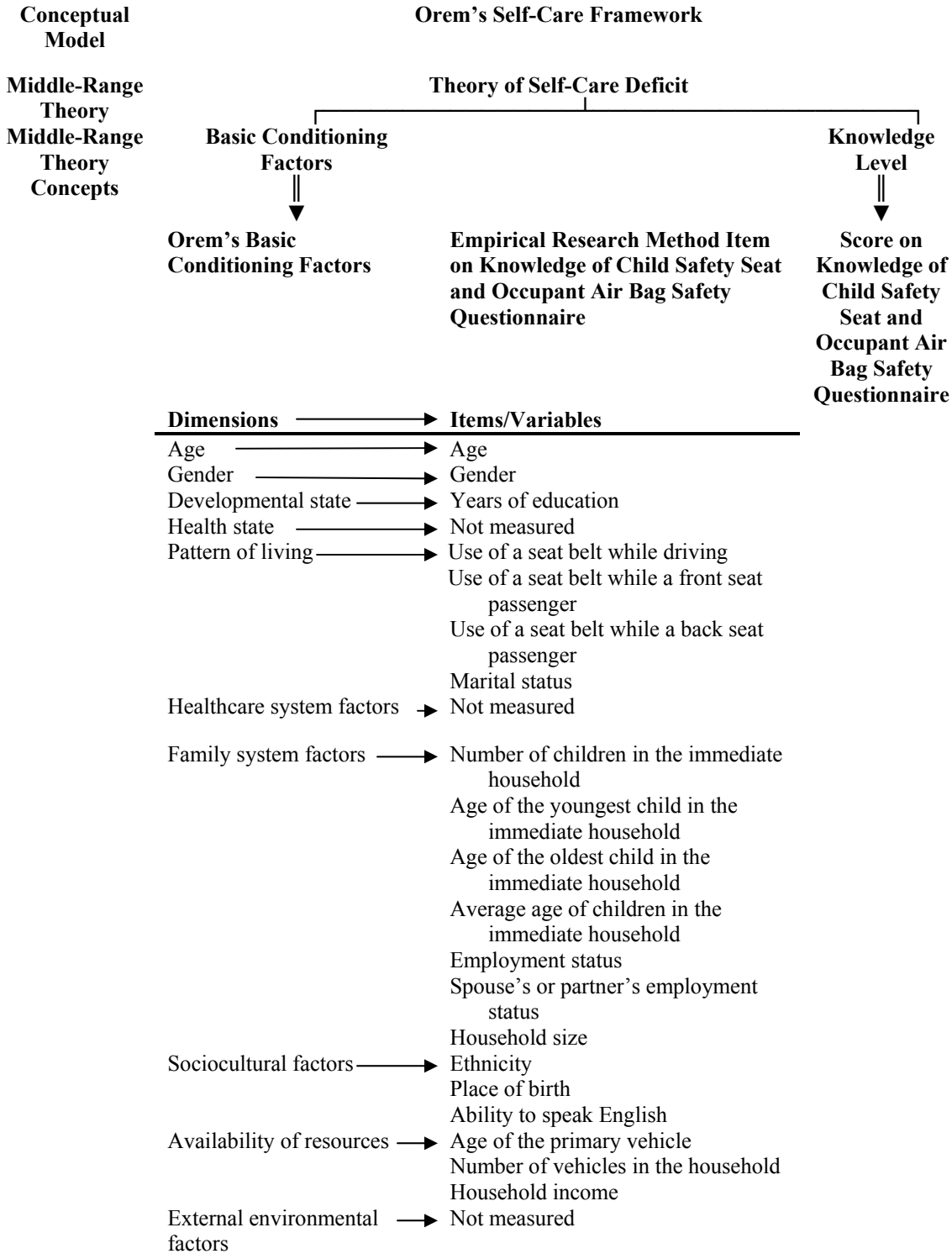

Figure 3. Conceptual-theoretical-empirical-structure: Theory testing component.

while a back seat passenger, marital status), family system factors (number of children in the immediate household, age of the youngest child in the immediate household, age of the oldest child in the immediate household, average age of children in the immediate household, employment status, spouse's or partner's employment status, and household size), sociocultural factors (ethnicity, place of birth, and the ability to speak English), and availability of resources (age of the primary vehicle, number of vehicles in the household and household income). These concepts were defined by the caregiver through self-report. The score on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire items represented knowledge level and corresponded to knowledge level in Orem's theory (Fawcett, 1999).

The concept of gender was defined as male or female. The total number of children in the household was defined by a self-reported answer to the question "How many children are in your immediate household?" The years of education of the caregiver was defined by the self-reported answer to the question "How many total years of school did you complete?" The age of the youngest child and the age of the oldest child were defined by determining the youngest and the oldest from the list of ages and genders of the children in the immediate household self- reported by the caregiver. The age of the caregiver's primary vehicle was defined by subtracting the year of the vehicle from the year 2007. The concepts of how often the caregiver used a seat belt when driving, how often the caregiver used a seat belt when riding as a front seat passenger in a car, and how often the caregiver used a seat belt when riding as a rear seat passenger in a car were defined by the response to a scale of items labeled as always, most of the time, seldom, rarely, and never. How many vehicles were in the household was defined by a

self-report of the number by the caregiver. The age of the caregiver was defined by self-report. The caregiver's marital status was defined by the response to the categories: married, living together, single, in a relationship but not living together, divorced, widowed, separated, or other. The caregiver's ethnicity was defined by the response to the categories: Hispanic, non-Hispanic White, Black or African American, Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaskan Native, or other. The location of the caregiver's birth was defined as either inside or outside of the United States based upon the caregiver's answer to the question "Where were you born?" The caregivers self-reported ability to speak English defined English ability. The possible responses were very well – English is my primary language, well – I can hold a conversation in English, not so well – English is my secondary language, and poorly – I always need translation assistance to communicate in English. The caregiver's employment status and the caregiver's partner's employment status were defined by self-report by the caregiver in the categories of full-time, part-time, no, and other. The household income was defined by the response to a scale of $5,000 increments to $20,000, then $10,000 increments to $50,000, then $25,000 increments to $100,000, and over $100,000. Finally, the yearly household income was defined by a response to the question "How many people does your yearly household income support?"

The final concept was the knowledge of the caregiver about child passenger safety. This was defined by the score on the knowledge questions contained in the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire. The total of correct answers, based upon current recommendations and guidelines, defined the score on the knowledge questions.

Propositions

From Orem's theory, it was proposed that knowledge levels for the ability to perform dependent care may be related to basic conditioning factors. This study proposed that there was a relationship between the selected basic conditioning factors and child passenger safety knowledge. Whereas Orem (2001) proposed that self-care or dependent-care performed by persons with the intention of doing good for themselves or others may fall short of the focal conditions and goals sought because of their lack of knowledge and skills or other action limitations, the basic conditioning factors may be related to knowledge levels of child passenger safety. It may be inferred from these propositions that predictions about groups who may benefit the most from targeted educational programs on child passenger safety may be made after analyzing potential relationships between these measurable basic conditioning factors and child passenger safety knowledge levels.

Concept and Theory Generation

The study also aimed at developing additional information, including concepts, propositions, and theory, as to the healthcare system factors related to child passenger safety. Five open-ended questions were included in the survey to determine where dependent-care agents received or would receive information regarding child passenger safety. This was intended to identify components of the healthcare system, which caregivers utilized or would utilize, to develop knowledge about child passenger safety. The relationship between the conceptual model, the empirical structure, and the middle-range theory concepts is illustrated below (see Figure 4).

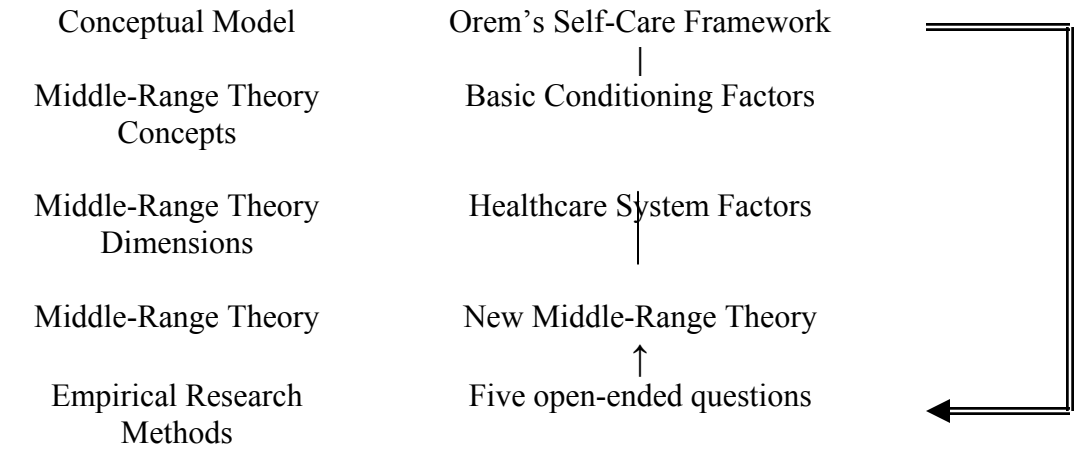

Figure 4. Conceptual-theoretical-empirical-structure: Theory generating component.

Empirical Structure

The theory testing component of the study investigated the relationship between basic conditioning factors and knowledge level. Factors in 7 of the 10 basic conditioning factors identified by Orem (2001) were measured by the criteria identified in Figure 3. The relationship between specific, basic conditioning factors and the score on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire was analyzed using appropriate statistical methods. The basic conditioning factors were represented by specific concepts in the instrument.

Additional information about conditioning factors and potential theory will be developed from the five open-ended questions included in the survey. The relationship between the conceptual model and the empirical methodology is illustrated in Figure 4.

Descriptive qualitative analysis was utilized to determine common exclusive or non-overlapping categories within and between groups for the data developed from these questions. Further empirical testing will need to be conducted after exclusive or non-overlapping categories are developed to test the validity of the data.

CHAPTER III

METHODOLOGY

Research Questions and Hypotheses

Determining if there is a relationship between child passenger safety knowledge and Orem's basic conditioning factors was the overriding research question for the theory testing component of this study. In addition, five open-ended questions were used to generate new information about the caregiver's sources of information that were used or would be used when making decisions regarding child passenger safety. The theory generating, or qualitative, component of the study was designed to generate new information or middle-range theory within healthcare system factors, a basic conditioning factor in Orem's framework and child passenger safety. These questions are presented as the following distinct questions and hypotheses:

1. What is the child passenger safety knowledge of selected caregivers?
2. Is there a relationship between child passenger safety knowledge and the individual caregiver's basic conditioning factors of age, gender, or developmental state (years of education)?

    H_0: There is no relationship between child passenger safety knowledge and the selected variable representing a basic conditioning factor.

    H_A: There is a relationship between child passenger safety knowledge and the selected variable representing a basic conditioning factor.

3. Is there a relationship between child passenger safety knowledge and the caregiver's pattern of living factors (use of a seat belt while driving, use of a seat belt while a front seat passenger, use of a seat belt while a back seat passenger, or marital status)?

    H_0: There is no relationship between child passenger safety knowledge and the selected variable representing the caregiver's pattern of living factors.

    H_A: There is a relationship between child passenger safety knowledge and the selected variable representing the caregiver's pattern of living factors.

4. Is there a relationship between child passenger safety knowledge and the caregiver's family system factors (number of children in the immediate household, the age of the youngest child in the immediate household, the age of the oldest child in the immediate household, the average age of the children in the immediate household, employment status, spouse's or partner's employment status, or household size)?

    H_0: There is no relationship between child passenger safety knowledge and the selected variable representing the caregiver's family system factors.

    H_A: There is a relationship between child passenger safety knowledge and the selected variable representing the caregiver's family system factors.

5. Is there a relationship between child passenger safety knowledge and the caregiver's sociocultural factors (ethnicity, place of birth, or ability to speak English)?

    H_0: There is no relationship between child passenger safety knowledge and the selected variables representing the caregiver's sociocultural factors.

    H_A: There is a relationship between child passenger safety knowledge and the selected variables representing the caregiver's sociocultural factors.

6. Is there a relationship between child passenger safety knowledge and the availability of resources (age of the primary vehicle, number of vehicles in the household or household income)?

    H_0: There is no relationship between child passenger safety knowledge and the selected variables representing availability of resources.

    H_A: There is a relationship between child passenger safety knowledge and the selected variables representing availability of resources.

7. When you last purchased a child safety seat, who did you ask for assistance?
8. When you last installed a child safety seat, who did you ask for assistance?
9. If you had a question about child safety seats, where would you get your answer?
10. If you had to ask any one person for help with your child safety seat, who would it be?
11. What has your child's pediatric provider told you about child safety seats?

Research Design

This study used a mixed method (qualitative and quantitative) methodology design approach to capture the experience of selected caregivers about their child passenger safety knowledge level and sources of information that were used or would be used to obtain information regarding child passenger safety. A descriptive research design was used for the theory testing or quantitative component of this study. Descriptive research has been defined as a method of discovering new meaning and describing what has existed. Descriptive data are usually collected through a questionnaire, survey, an interview, or observation (Burns & Grove, 2001).

A descriptive qualitative technique was used to generate data. Data included sources of information that caregivers used to answer questions prior to purchasing a child restraint system, the sources of information for caregivers prior to installing a child restraint system, the sources of information caregivers would access if they had a question about child restraint systems, the one person they would ask for help with a child restraint system, and what information they had received from the child's pediatric primary care provider. In this study, limited to a survey format, open coding, axial coding and selective coding were implemented to develop additional descriptive information.

Sample/Setting

A convenience sample was surveyed for this study and consisted of 209 caregivers. For inclusion in this study, the participant caregivers had to be parents or legal guardians of children who were less than 10 years of age, and the participant caregivers had to be at least 18 years of age. Age 10 years was selected as the upper age

for the child of a caregiver to participate in the study for convenience based upon several issues. There are no state laws that mandate child safety seats for children over age 10 years. The 97th percentile for boys to reach the recommended height for graduation to seat belts is age 9 years, and for girls, it is 8.8 years of age. The 50th percentile for boys to reach the recommended height for graduation to seat belts is age 11.5 years, and for girls, it is 11.1 years of age. The age groups for fatality statistics reported by the National Highway Traffic Safety Administration and the Centers for Disease Control are based on 5 year increments for children (Centers for Disease Control and Prevention, 2005). In the event that the caregiver did not speak English well enough to understand the questions, an interpreter from the same family was used to administer the surveys orally. The caregivers had to be willing to participate in the research and to give their consent to be included.

A power analysis was conducted to determine the appropriate study sample size. By selecting a power of 80% with a medium effect size of 0.15 and an alpha of 0.01, with 15 independent variables, it was determined to require 193 caregivers (Cohen, 1988). A sample size of 200 was targeted to allow for potential disqualification of completed questionnaires. Caregivers were recruited from a variety of settings. The majority of the caregivers were recruited from five child-oriented local restaurants that were part of a chain of restaurants that had inside children's playgrounds and coin-operated play machines.

Data Collection Procedure

Prior to conducting this study, the researcher received permission from the Hampton University Institutional Review Board (see Appendix A). Permission was received from the developers of the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire (see Appendix B) to use and modify the instrument.

Caregivers received an incentive in the form of a gift certificate card redeemable at a local store as compensation for participation in the study. This incentive was valued at $5.00. Funding for these gift cards was provided by HU Power Project by the Bureau of Primary Health Care – Healthy Communities Access Program (HCAP) Demonstration Project Award, Department of Health and Human Services Health Resources Administration # 1D72CS04180-01-00.

The prospective caregivers were approached and asked if they were willing to participate in a research study that was being conducted by a Hampton University School of Nursing doctoral student. After the researcher determined that the inclusion criteria were met, all aspects of the study were explained to the caregiver. A packet was given to each caregiver who wished to participate in the study. An informed consent form (see Appendix C) and the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire (see Appendix D) were included in each packet. The signed informed consent and the questionnaire were kept separate in order to provide confidentiality to the caregivers. The caregivers were informed that all data collected during the study would be reported in the aggregate form, thereby eliminating the potential for individual

identifying information being shared. The researcher provided both verbal and written instructions prior to administering the questionnaire. The questionnaire was completed by the caregiver and returned to the researcher.

The caregiver was then given the $5.00 gift card. The reference number on the back of the gift card was recorded on a log sheet. The caregiver was then asked to sign the log sheet next to the reference number to indicate that the caregiver had received the gift card. The instruments, consent forms, and log sheets were maintained in a locked filing cabinet to ensure caregiver confidentiality. This process also allowed the caregiver to contact the researcher if removal from the study was desired.

No risks to the caregivers were anticipated. However, it was possible that questions about the appropriate installation of a child restraint system may have been emotionally traumatic to a parent or caregiver who had had a child injured in an inappropriately installed child restraint system. If a caregiver had developed a crisis, the researcher would have referred the caregiver to the emergency department of the nearest hospital or their own counselor, if available.

Instrumentation

Vaca et al. (2002) developed an instrument to measure the level of child restraint system and airbag safety knowledge in parents who utilized emergency care services for their children as well as to determine factors that influenced knowledge of safe transportation of children. The Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire was used for this study. Permission to use and modify the instrument was obtained. It was modified with permission to bring the instrument up-to-date in regard to current recommendations for child restraint system installation. In

particular, recent recommendations for infants to remain rear-facing as long as possible were incorporated into the instrument to replace the references to 1 year and 20 pounds. This questionnaire was also modified for use in the Commonwealth of Virginia instead of the State of California to allow for differences in state laws governing child passenger safety. The instrument was modified to remove irrelevant descriptive questions not appropriate for this study. The questions removed included the child's weight, insurance information, child's name, and date of birth. Questions about the child's primary healthcare provider, visits to the emergency department, transportation to the emergency department for the visit in which the survey was administered, and questions about a single child's transportation habits were also removed. Questions seeking information about the safety equipment and normal occupants of each vehicle in the home were also removed. A descriptive question asking about previous motor vehicle trauma was also excluded. These descriptive questions were found to either be inappropriate for the settings in which the survey would be conducted or were not germane to the study. One knowledge question was removed from analysis after expert review determined that it was ambiguous and could have multiple answers depending upon individual interpretation. In addition, five open-ended questions were added to the end of the questionnaire to generate additional information about the caregiver's sources of information that were used or would be used when seeking information and making decisions regarding child passenger safety.

The terminology on the instrument was kept the same as the original use of the instrument. The term child safety seat was used as a generic and familiar term for the lay public. For the purpose of the instrument, a child safety seat included infant, convertible, toddler, and booster seats.

Socio-demographic information was collected for comparison within and between groups for child passenger safety knowledge level and sources for child passenger safety information. This data was non-identifiable. Caregiver privacy and confidentiality were preserved throughout the study.

Data Analysis

Inferential statistics were used to evaluate the relationships between the variables. Analysis using the *t* test was used for all variables with two categories against the total score. Pearson correlations were used for all continuous variables. General linear model was further used to fit both categorical and continuous variables and was used post hoc to examine categorical variables adjusting for other variables.

Five open-ended questions were used to generate middle-range theory about the caregiver's sources of information that were used or would be used when seeking information and making decisions regarding child passenger safety. The data were analyzed using qualitative research techniques to determine trends for later testing by quantitative techniques.

CHAPTER IV

RESULTS

Data Procedures

The Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire was used to investigate the knowledge level of selected caregivers regarding their knowledge of child passenger safety. Descriptive statistics were used to analyze sociodemographic data of the sample population. Data were entered and analyzed using a statistical analysis package, SAS® 9.1. The descriptive analysis of the sample population and answers to the child passenger safety knowledge questions included frequencies, percentages for categorical variables, means, standard deviations, and a range of continuous variables. Univariate and multivariate statistical procedures were used to compare sociodemographic and descriptive variables with scores on the child passenger safety knowledge questions. The reliability of the scores on the child passenger safety knowledge questions was also calculated.

The variables from the sample population were compared with the score on child passenger safety knowledge questions using descriptive statistics and inferential analysis techniques appropriate for the type of data obtained. Inferential statistics were used to evaluate the relationships between the variables. Inferential statistics included bivariate analysis, *t* tests, correlations, and general linear model regression. The difference between the outcomes, average scores for knowledge, and two category variables were calculated using the *t* tests. Pearson correlations were used to examine the bivariate relationship between two continuous variables. An analysis of variance (ANOVA) was

performed for categorical variables which had more than two categories. General linear model was further used to examine categorical with continuous variables and was used post hoc to examine categorical variables adjusting for other variables. Cronbach alphas were used to assess the reliability of the child passenger safety knowledge questions. An alpha level of 0.05 was used for all statistical tests.

In addition, five open-ended questions were used to generate knowledge regarding caregivers' sources of information that were used or would be used when seeking information and making decisions regarding child safety seats. These five questions were analyzed using a descriptive qualitative technique to determine exclusive or non-overlapping categories for the answers provided by the caregivers. The resultant categories were then related to the basic conditioning factors in Orem's framework.

Presentation of Results

The sample consisted of 209 caregivers whose ages ranged from 18 to 55 years. Of the 209 caregivers, 76.56% (n = 160) were female and 23.44% (n = 49) were male. The majority of the sample, 49.52% (n = 103) was African American and 36.06% (n = 75) were non-Hispanic Whites. The majority of the caregivers, 27.18% (n = 53), had a household income of $50,000 to $74,999 a year. Of the 209 caregivers, 64.42% (n = 134) were married, 31.37% (n = 64) had 12 years of education, and 7.84% (n = 16) had less than 12 years of education (see Table 5).

Table 5. Characteristics of the sample population.

Variable	*n*	%
Age		
18 – 19	6	1.91
20 – 29	73	34.92
30 – 39	84	40.19
40 – 49	26	12.44
50 – 59	2	0.95
Missing Data (Not included in above percentages)	18	
Gender		
Male	49	23.44
Female	160	76.56
Ethnicity		
Hispanic or Latino	13	6.25
Non-Hispanic White	76	36.06
Black or African American	103	49.52
Asian	11	5.29
American Indian or Alaskan Native	1	0.48
Other	5	2.40
Household Income		
Less than $ 9,999	9	4.62
$10,000 - $14,999	17	8.72
$15,000 - $19,999	8	4.10
$20,000 - $29,999	18	9.23
$30,000 - $39,999	25	12.82
$40,000 - $49,999	28	14.36
$50,000 - $74,999	53	27.18
$75,000 - $100,000	14	7.18
More than $100,000	23	11.79
Missing Data (Not included in above percentages)	14	
Marital Status		
Married	134	64.42
Living Together, Not Married	12	5.77
Single	35	16.83
In a Relationship, Not Living Together	8	3.85
Divorced	6	2.88
Widowed	2	0.96
Separated	11	5.29
Missing Data (Not included in above percentages)	1	
Education		
Less than 12 Years	16	7.84
12 Years	64	31.37
13 – 15 Years	60	29.41
16 Years	33	16.18
More than 16 Years	31	15.20
Missing Data (Not included in above percentages)	5	

Note. ($N = 209$)

Research question 1: What is the child passenger safety knowledge of selected caregivers? A child passenger safety knowledge score was calculated for all of the caregivers (M = 12.83, Mdn = 13.00, SD = 3.044, Mode = 15, Range 3 to 19). This score consisted of 21 knowledge questions on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire (see Table 6).

Table 6. Frequency of scores on the child passenger safety knowledge questions.

Score	*n*	%
19	1	0.48
18	4	1.91
17	11	5.26
16	20	9.57
15	39	18.66
14	28	13.40
13	22	10.53
12	20	9.57
11	21	10.05
10	12	5.74
9	10	4.78
8	9	4.30
7	2	0.96
6	7	3.35
5	1	0.48
4	1	0.48
3	1	0.48

Note. (N = 209)

The score consisted of 8 questions on child safety seats and 13 questions on airbag safety. All of the questions were multiple choice types except one airbag safety question which was fill in the blank. The individual questions were correctly answered in a range of 6.70% to 95.69% (see Table 7).

Table 7. Percent of caregivers answering individual questions correctly on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire.

Question	%
Child Safety Seat Knowledge Questions – 8 Questions	
For a child weighing less than 20 pounds and less than 1 year of age, how should the child ride in the car?	93.30
For a child weighing less than 20 pounds and less than 1 year of age, the infant car seat should face which direction when placed in a car?	93.30
For a child weighing between 20 to 40 pounds and older than 1 year of age, how may the child ride in the car?	77.99
For a child weighing between 40 to 60 pounds, how should the child ride in the car?	68.42
For a child weighing 25 pounds and 1 year 2 months old, how should the child ride in the car?	27.75
The safest place for a child less than the age 13 years old to ride in a car is:	41.15
Infants properly restrained in an infant car seat should not be turned from a rear facing position to a forward facing position until the infant:	20.57
Virginia law states that children should be restrained in a child car seat until:	19.62
Occupant Air Bag Safety Knowledge Questions – 13 Questions	
If the car has "SRS" imprinted on the dash board, what does this means?	
An air bag is present.	71.29
How can you tell if a car is equipped with an air bag on the front driver's side? Please circle the given response at the end of the statement:	
The steering wheel has the word "SRS" or "Air Bag" printed on it.	79.43
The owner's manual includes a section on air bags.	72.25
An "Air Bag" sticker or decal is present on the driver side sun visor.	66.51
How can you tell if a car is equipped with an air bag on the front passenger side?	
The dash board has the word "SRS" or "Air Bag" printed on it.	76.56
The owner's manual includes a section on air bags.	66.51
An "Air Bag" sticker or decal is present on the passenger side sun visor.	61.24
Please tell me whether you agree or disagree with the following statement: "If my car has a driver side air bag, I don't need to wear my seat belt when driving."	95.69
Please tell me whether you agree or disagree with the following statement: "If my car has a passenger side air bag, I don't need to wear my seat belt when riding in the front seat."	95.69
Which one group of children should NEVER be placed in front of an air bag in a car?	64.11
If you owned a new model (2006) pick-up truck with no rear seats and wanted to carry an infant in the front passenger side of the truck, what should you do to protect the child from an air bag related injury once the child is properly restrained?	37.25
On a trip to the store, a 5-year-old child must ride in the front seat of a 5 passenger car with a passenger side air bag. After properly restraining the child, what precautions could you take to reduce the possibility of the child being injured by an air bag?	44.98
Would you say that air bags in new model cars and trucks (1999 and later Models) are: Less powerful than 5 years ago; The same as 5 years ago; More powerful than 5 years ago	6.70

A coefficient of reliability using Cronbach's alpha was determined for the knowledge questions. The result for the Cronbach's alpha on the raw scores was 0.648 and 0.681 on the standardized scores. These scores indicated an acceptable level of internal consistency or reliability for the knowledge questions.

Research questions 2 through 6 were analyzed using statistical analysis to determine relationships between variables representing Orem's basic conditioning factors and the child passenger safety knowledge score determined from question 1. Descriptive statistics were calculated on the variables (see Table 8) and Pearson product moment

Table 8. Descriptive statistics for Pearson's product moment coefficients.

Variable	***n***	***M***	***SD***	**Min**	**Max**
Score	209	12.83	3.04	3	19
Number of children in the household	209	2.07	1.14	1	8
Age of the oldest child	209	7.23	4.59	0.08	20.8
Age of the youngest child	209	3.66	2.48	0.08	9.2
Average age of children	209	5.46	2.96	0.08	13
Seat belt use while driving	209	4.45	0.46	2	5
Seat belt use while front seat passenger	209	4.80	0.54	1	5
Seat belt use while back seat passenger	208	4.13	1.17	1	5
Number of vehicles in the household	202	2.12	1.08	0	7
Age of the caregiver	191	31.49	7.15	18	55
Ability to speak English	208	1.07	0.30	1	3
Years of education	204	13.90	2.71	4	22
Household income	195	5.75	2.24	1	9
Number of people household income supports	195	3.84	1.55	1	10
Vehicle year	176	2001	4.21	1984	2007

coefficients were calculated among selected variables (see Table 9). There were very low positive correlations between the ages of the caregivers and the child passenger safety knowledge scores. Also, the results indicated there were low positive correlations between using a seat belt while a back seat passenger, number of people the household

Table 9. Pearson correlations for selected variables vs. scores on child passenger safety knowledge questions.

Variable	***n***	***r***	***p***
Number of children in the Household	209	0.11	0.10
Age of the oldest child	209	0.11	0.11
Age of the youngest child	209	0.02	0.81
Average age of children	209	0.12	0.10
Seat belt use while driving	209	0.02	0.74
Seat belt use while front seat passenger	209	0.12	0.09
Seat belt use while back seat passenger	208	0.13	0.05
Number of vehicles in the household	202	0.16	0.02
Age of the caregiver	191	0.17	0.02
Ability to speak English	208	-0.29	<0.0001
Years of education	204	0.19	0.01
Household income	195	0.30	<0.0001
Number of people household income supports	195	0.20	0.01
Vehicle year	176	0.0034	0.96

income supports, number of vehicles in the household, years of education, and household income with the child passenger safety knowledge scores. The results indicated that there was a negative correlation between ability to speak English and the child passenger safety knowledge scores. However, the results did not reveal a linear relationship between using seat belts while driving, use of seat belts while a front seat passenger, number of children,

age of the youngest child, age of the oldest child, average age of children, and age of the caregiver's primary vehicle with the child passenger safety knowledge scores.

A *t* test did not reveal any significant differences for the average child passenger safety knowledge scores by gender, employment status, spouse or partner's employment status, or place of birth (see Table 10). A general linear model analysis was

Table 10. Statistics for *t* test procedures.

Variable	Groups	*n*	*M*	*SD*	*SE*	Min.	Max.	*p*	*df*	*t*
Score	Gender							0.36	207	0.98
	Male	49	13.20	3.33	0.48	4	18			
	Female	160	13.18	2.95	0.23	3	19			
Score	Employment Status							0.98	205	0.02
	Yes/Full/Part-Time	162	12.83	3.04	0.24	3	19			
	No/Other	45	12.82	3.11	0.46	4	18			
Score	Spouse/Partner's Employment Status							0.41	189	0.82
	Yes/Full/Part-Time	146	13.10	2.80	0.23	4	19			
	No/Other	45	12.69	3.42	0.51	5	18			
Score	Place of Birth							0.31	207	1.01
	USA	178	12.92	2.95	0.22	3	18			
	Elsewhere	31	12.32	3.53	0.63	5	19			

Note. ($N = 209$)

performed for the consolidated categories of marital status and ethnicity. The means and confidence intervals were tabulated and are presented in Table 11 for both variables. A least square of the means was also tabulated and presented in Table 12 for marital status.

Table 11. Means of child passenger safety knowledge scores for marital and ethnicity status groups.

Category	*M*	95% Confidence Limits	
Marital			
In a relationship	11.88	9.82	13.93
Married/Living together	13.40	12.92	13.88
Other	11.63	10.30	12.96
Single	11.40	10.41	12.38
Ethnicity			
African American	11.82	11.26	12.37
Other	12.83	11.81	13.86
Non-Hispanic White	14.20	13.55	14.86

The marital status category of being single was found to correspond significantly to a lower child passenger safety knowledge score on the questionnaire ($p = 0.002$) compared to those married or living together. There were no other significant differences among marital status comparison categories.

Table 12. Least square means for marital status groups.

	In a relationship	Married/ Living together	Other	Single
In a relationship				
Married/Living together	0.481			
Other	0.997	0.068		
Single	0.976	0.002	0.993	

Least square of the means was also tabulated for ethnicity status (see Table 13). The ethnicity category of African American was found to correspond significantly ($p < 0.0001$) to a lower child passenger safety knowledge score on the questionnaire. However, there were no other significant differences among ethnicity groups.

Table 13. Least square means for ethnicity groups.

	African American	Other	Non-Hispanic White
African American			
Other	0.202		
Non-Hispanic White	< 0.0001	0.071	

Research question 2: Is there a relationship between child passenger safety knowledge and the caregiver's individual basic conditioning factors of age, gender, or developmental state (years of education)?

H_0: There is no relationship between child passenger safety knowledge and the selected variable representing a basic conditioning factor.

H_A: There is a relationship between child passenger safety knowledge and the selected variable representing a basic conditioning factor.

For the age variable, a Pearson correlation coefficient was calculated to be 0.17 ($p = 0.02$) which showed that the observed relationship did not happen by chance in 191 observations (see Table 9). This was a very low positive relationship; therefore, the null hypothesis was rejected. Age was a very low positive predictor of child passenger safety knowledge. For the gender variable, a *t* test was performed and a *t* value of 0.92 ($p = 0.36$, $df = 207$) was calculated. No relationship was found; therefore, the null hypothesis was accepted. Gender was not a predictor of child passenger safety knowledge.

For the developmental state variable, measured by years of education, a Pearson correlation coefficient was calculated to be 0.19 ($p = 0.007$) which showed that the observed relationship did not happen by chance in 204 observations (see Table 9). This

was a low positive relationship; therefore, the null hypothesis was rejected. The developmental state, measured by years of education, was a low positive predictor of child passenger safety knowledge.

Research question 3: Is there a relationship between child passenger safety knowledge and the caregiver's pattern of living factors (use of a seat belt while driving, use of a seat belt while a front seat passenger, use of a seat belt while a back seat passenger, or marital status)?

H_0: There is no relationship between child passenger safety knowledge and the selected variable representing the caregiver's pattern of living factors.

H_A: There is a relationship between child passenger safety knowledge and the selected variable representing the caregiver's pattern of living factors.

For the use of a seat belt while driving variable, the Pearson correlation coefficient was 0.023 ($p = 0.74$), which showed that the observed relationship could have happened by chance in 209 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For the use of a seat belt while a front seat passenger variable, a Pearson correlation coefficient was 0.119 ($p = 0.08$) which showed that the observed relationship could have happened by chance in 209 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For use of a seat belt while a back seat passenger a Pearson correlation coefficient of 0.135 ($p = 0.05$) showed that the observed relationship did not happen by chance in 208 observations (see Table 9). This was a low positive relationship; therefore, the null hypothesis was rejected. For marital status, a general linear model analysis was performed for the consolidated categories of marital

status in comparison with the score on the child passenger safety knowledge questions (see Table 11). For the marital status category, being single was found to correspond significantly to a lower child passenger safety knowledge score on child passenger safety knowledge (see Table 12). There was a low probability ($p = 0.0021$) that the observed relationship could have happened by chance in 205 observations. A post-hoc comparison indicated that the average score on child passenger safety knowledge for married caregivers ($M = 13.4$) was different from single caregivers ($M = 11.4$). There were no other significant differences among marital status comparison categories.

Research question 4: Is there a relationship between child passenger safety knowledge and the caregiver's family system factors (number of children in the immediate household, the age of the youngest child in the immediate household, the age of the oldest child in the immediate household, the average age of the children in the immediate household, employment status, spouse's or partner's employment status, or household size)?

H_0: There is no relationship between child passenger safety knowledge and the selected variable representing the caregiver's family system factors.

H_A: There is a relationship between child passenger safety knowledge and the selected variable representing the caregiver's family system factors.

For the number of children variable, a Pearson correlation coefficient of 0.114 ($p = 0.10$) showed that the observed relationship could have happened by chance in 209 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For the age of the youngest child variable, a Pearson correlation coefficient of 0.017 ($p = 0.81$) showed that the observed relationship could

have happened by chance in 209 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For the age of oldest child variable, a Pearson correlation coefficient of 0.11 *(p* = 0.11) showed that the observed relationship could have happened by chance in 209 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For the average age of children variable, a Pearson correlation coefficient of 0.116 (*p* = 0.10) showed that the observed relationship could have happened by chance in 209 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For employment status, a *t* test was performed (see Table 10), and a *t* value of 0.02 (*p* = 0.98, *df* = 205) was calculated. No relationship was found therefore the null hypothesis was accepted. For spouse's or partner's employment status, a *t* test was performed (see Table 10) and a *t* value of 0.82 (*p* = 0.41, *df* = 189) was calculated. No relationship was found therefore the null hypothesis was accepted. For the household size variable, a Pearson correlation coefficient of 0.20 *(p* = 0.0062) showed that the observed relationship did not happen by chance in 195 observations (see Table 9). This was a low positive relationship; therefore, the null hypothesis was rejected.

Research question 5: Is there a relationship between child passenger safety knowledge and the caregiver's sociocultural factors (ethnicity, place of birth, or ability to speak English)?

H_0: There is no relationship between child passenger safety knowledge and the selected variables representing the caregiver's sociocultural factors.

H_A: There is a relationship between child passenger safety knowledge and the selected variables representing the caregiver's sociocultural factors.

For ethnicity, a general linear model analysis was performed for the consolidated categories in ethnicity in comparison with the score on the child passenger safety knowledge questions. The ethnicity category of African American was found to correspond significantly to lower child passenger safety knowledge scores (see Table 13). A low probability ($p < 0.0001$) showed that the observed relationship did not happen by chance in 208 observations. Post-hoc comparison indicated that the average scores on child passenger safety knowledge for non-Hispanic Whites *(*M = 14.2) were different from African Americans *(*M = 11.8). However, there were no other significant differences among ethnicity comparison categories (see Table 13). For place of birth, a *t* test was performed (see Table 10). A *t* value of 1.01 ($p = 0.31$, $df = 207$) was calculated. No relationship was found therefore the null hypothesis was accepted. For the ability to speak English variable, a Pearson correlation coefficient of -0.292 ($p < 0.0001$) demonstrated that the observed relationship did not happen by chance in 208 observations (see Table 9). This was a low negative relationship; therefore, the null

hypothesis was rejected. The instrument was coded so that those who reported that they spoke English well received a score of 1 while those that spoke English with less proficiency received a higher score.

Research question 6: Is there a relationship between child passenger safety knowledge and the availability of resources (age of the primary vehicle, number of vehicles in the household, or household income)?

H_0: There is no relationship between child passenger safety knowledge and the selected variables representing availability of resources.

H_A: There is a relationship between child passenger safety knowledge and the selected variables representing availability of resources.

For the age of the primary vehicle variable, a Pearson correlation coefficient of -0.003 ($p = 0.965$) was calculated and showed that the observed relationship could have happened by chance in 176 observations (see Table 9). There was no significant relationship determined; therefore, the null hypothesis was accepted. For the number of vehicles in the household variable, a Pearson correlation coefficient of 0.163 ($p = 0.02$) was calculated and showed that the observed relationship did not happen by chance in 202 observations (see Table 9). This was a low positive relationship; therefore, the null hypothesis was rejected. For the household income variable, a Pearson correlation coefficient of 0.30 ($p < 0.0001$) was calculated and showed that the observed relationship did not happen by chance in 195 observations (see Table 9). This was a moderate positive relationship; therefore, the null hypothesis was rejected.

For research questions 7 through 11, the answers provided were subjected to a qualitative procedure to determine exclusive or non-overlapping categories for the

answers provided by the caregivers. For questions 7 through 10, the summary answers were coded into like words and answers (see Table 14). These responses were further combined and selectively coded into the categories (see Table 15).

Research question 7: When you last purchased a child safety seat, who did you ask for assistance? The most frequent answer to this question was no one (n = 98), followed by store personnel (n = 36). Fire and rescue was the third most frequent answer (n = 17). A total of 30 individual and non-related answers were consolidated into the category of other (see Tables 14 and 15).

Research question 8: When you last installed a child safety seat, who did you ask for assistance? The most common answer for the question was no one (n = 91). The second most frequent answer was fire and rescue (n = 35). Third was the caregiver's spouse or significant other (n = 22) followed by the manufacturer's instructions (n = 19). A total of 23 individual and non-related answers were consolidated into the category of other (see Tables 14 and 15).

Research question 9: If you had a question about child safety seats, where would you get your answer? The most common answer for the question was fire and rescue (n = 77). The Internet (n = 45), police (n = 29), public assistance or governmental agency (n = 24), pediatrician or healthcare provider (n = 22), and the manufacturer's customer service (n = 21) followed. A total of 21 individual and non-related answers were consolidated into the category of other. In contrast to research questions 7 and 8, only two responses were no one (see Tables 14 and 15).

Table 14. Summary of answers to descriptive qualitative questions about caregivers' sources of information.

	When you last purchased a child safety seat, who did you ask for assistance?		When you last installed a child safety seat, who did you ask for assistance?		If you had a question about child safety seats, where would you get your answer?		If you had to ask any one person for help with your child safety seat, who would it be?	
Answer	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
No one	98	44.14	91	40.99	2	0.72	3	1.27
Manufacturer's Instructions	6	2.70	19	8.76	11	3.97	1	0.42
Library/Books	0	0	0	0	3	1.08	0	0
Internet	4	1.80	0	0	45	16.25	0	0
Store Personnel	36	16.22	4	1.84	6	2.17	5	2.12
Manufacturer/ Phone Support	0	0	0	0	21	7.58	12	5.08
Public Assistance (WIC, Health Dept., Social Services)	8	3.60	2	0.92	13	4.69	4	1.69
Fire/Rescue	16	7.21	34	15.67	74	26.71	76	32.20
EMS Specific	1	0.45	1	0.46	3	1.08	1	0.42
Police	3	1.35	5	2.30	23	8.30	28	11.86
State Police Specific	2	0.90	3	1.38	6	2.17	2	0.85
Hospital Personnel	3	1.35	1	0.46	3	1.08	1	0.42
Certified Technician	0	0	0	0	0	0	1	0.42
Traditional News Media	1	0.45	0	0	0	0	0	0
Spouse/ Significant Other	6	2.70	22	10.14	1	0.36	21	8.90
Family (Parent)	5	2.25	6	2.76	6	2.17	27	11.44
Friend/Neighbor	2	0.90	1	0.46	4	1.44	3	1.27
Another Parent	1	0.45	0	0	5	1.81	2	0.85
DMV/ Transportation Office	0	0	0	0	11	3.97	2	0.85
Class in CPS or Childrearing	1	0.45	2	0.92	2	0.72	1	0.42
Dealership	0	0	0	0	1	0.36	1	0.42
Auto Insurance Company	0	0	0	0	2	0.72	0	0
Nurse	0	0	3	1.38	5	1.81	1	0.42
Doctor/ Pediatrician	0	0	0	0	12	4.33	15	6.36
Don't Know	0	0	0	0	3	1.08	7	2.97
Pamphlets	1	0.45	0	0	0	0	0	0
Non Specific Yes or Indication of assistance	12	5.41	9	4.15	5	1.81	11	4.66
Don't Remember	3	1.35	1	0.46	0	0	0	0
N/A	4	1.80	4	1.84	2	0.72	2	0.85
No Answer	9	4.05	9	4.15	8	2.90	9	3.81
Total Comments	222		217		277		236	

Note. Percentages may not add to totals because of rounding.

Table 15. Rank order, percent, and mode of selectively coded answers to descriptive qualitative questions about caregiver's sources of information.

	When you last purchased a child safety seat, who did you ask for assistance?			When you last installed a child safety seat, who did you ask for assistance?			If you had a question about child safety seats, where would you get your answer?			If you had to ask any one person for help with your child safety seat, who would it be?		
Answer	***n***	**Rank**	**%**	***n***	**Rank**	**%**	***n***	**Rank**	**%**	***n***	**Rank**	**%**
Fire/Rescue	17	4	7.7	35	2	16.2	77[a]	1	28.1	77[a]	1	32.6
Police	5	7	2.3	8	6	3.7	29	3	10.6	30	4	12.7
Pediatrician or Healthcare Provider	4	8	1.8	6	8	2.8	22	5	8.0	18	6	7.6
Spouse or Significant Other	6	6	2.7	22	4	10.1	1	11	0.4	21	5	8.9
Family, Friend or Another Parent	8	5	3.6	7	7	3.2	15	7	5.5	32	2	13.6
Internet	4	8	1.8	0	11	0	45	2	16.4	0	12	0
Store Personnel	36	2	16.2	4	9	1.8	6	9	2.2	5	9	2.1
Manufacturer's Instructions	6	6	2.7	19	5	8.8	11	8	4.0	1	11	0.4
Manufacturer's Customer Service	0	9	0	0	11	0	21	6	7.7	12	7	5.1
Public Assistance/ Government Agency	8	5	3.6	2	10	0.9	24	4	8.8	6	8	2.5
No One	98[a]	1	44.1	91[a]	1	41.9	2	10	0.7	3	10	1.3
Other	30	3	13.5	23	3	10.6	21	21	7.6	31	3	13.2
Total	222			217			274			236		

[a] = Mode

Research question 10: If you had to ask any one person for help with your child safety seat, who would it be? This question received several multiple answers even though the instructions asked for only one. The most common answer was fire and rescue (n = 77). Family, friend, or another parent (n = 32); police (n = 30); spouse or significant other (n = 21); and pediatrician or healthcare provider (n = 18) followed. A total of 21 individual and non-related answers were consolidated into the category of other. In contrast to research questions 7 and 8, only three responses were no one (see Tables 14 and 15).

Research question 11: What has your child's pediatric provider told you about child safety seat? The responses are found on Table 16. The most common response was

Table 16. Summary of answers to a question about information obtained from the child's pediatric provider.

	What has your child's pediatric provider told you about child safety seats?	
Response	***n***	**%**
Nothing	67	28.51
Use One	47	20.00
Specific Recommendations	42	17.87
Did Not Answer	17	7.23
Child Seats are Safe	12	5.11
Laws/Regulations	9	3.83
Provided Materials	7	2.98
Non Specific – "Lots of Information", "Everything", "Answered Questions"	7	2.98
N/A, Unrelated Comments	6	2.55
Non Specific Indication that it was Discussed	4	1.70
Follow Seat Instructions	4	1.70
Wear Seat Belts	4	1.70
Can't Remember/Long Time	3	1.28
Wall Posters	2	0.85
Seek Assistance	2	0.85
Did Not See Doctor	2	0.85
Total Responses	235	

Note. Percentages may not add to totals because of rounding.

nothing (n = 67), followed by instructions to use one (n = 47). Specific recommendations such as use an infant carrier for an infant, rear facing as long as possible or use a booster seat until the child was 4-foot 9-inches was the third most common answer (n = 42). The benefits of a child safety seat were mentioned as the next most common category (n = 12). All other answers were fewer than 12 and combined into an other category. The responses were further consolidated into five exclusive or non-overlapping categories (see Table 17).

Table 17. Selectively coded answers to a question about information obtained from the child's pediatric provider.

	What has your child's pediatric provider told you about child safety seats?			
Response	***n***	**%**	**Rank**	**Mode**
Nothing	67	29	1	67
Use One	47	20	2	
Specific Recommendations	42	17	3	
Benefits were Advocated	12	5	4	
Other	67	29	1	67
Total Responses	235			
Missing Data	17			

CHAPTER V

DISCUSSION

Major Findings

The findings from this study can best be described by looking at them from several perspectives: knowledge levels of caregivers, differences of child passenger safety knowledge between groups in the population, sources of information that caregivers use or would use to purchase or install a child restraint system; and healthcare involvement in child passenger safety. The knowledge level of caregivers regarding child passenger safety presents several areas of deficit and concern. Within the population, the knowledge level of child passenger safety was found to differ between several groups. Caregivers did not receive information from the sources they indicated were their recognized authorities; and healthcare providers are failing to discuss child passenger safety with caregivers.

Child passenger safety knowledge as measured by the knowledge questions on the Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire indicated that very few caregivers were knowledgeable of current child passenger safety recommendations. With a mean of 12.83 (61%) correctly answered, an important potential for misuse within this sample is identified. There is no way to determine if this is consistent across the population as there are no standard measurements or studies to determine a general knowledge level.

The scores on child passenger safety knowledge correspond with the scores attained in the Vaca et al. (2002) study with a mean of 13.0 (59%) correctly answered and

it unfortunately also corresponds with the scores that physicians obtained in the Rothenstein (2004) study where it was found that the majority of pediatricians (92%) correctly identified the recommended weight for transition to a forward-facing car seat, fewer (63%) identified the recommended weight for graduation to a booster seat and only one third identified the recommended weight for transition to a seat belt.

The specific questions which caregivers missed in regard to techniques for installing child restraint systems also give some indication of major areas of knowledge deficit. The most missed question in this area was about the current Commonwealth of Virginia law for the transportation of children. Only 19.62% of the caregivers correctly answered the question. In the Vaca et al. (2002) study, only 41% of the participants were aware of that state's laws for child passenger safety. Since many caregivers use this as the benchmark and not the current medical recommendation, it is even more disconcerting that so many would get it wrong. Anecdotally, caregivers frequently ask providers and child passenger safety advocates "what is the law?" Unfortunately, state laws do not reflect best medical practice; instead, they are designed to give police officers a clear cut limit upon which to base traffic offenses. State laws do change over time and they have progressively become more conservative in protecting children, but they always lag behind current science and medical recommendations. A common response to the question "what is the law?" has been to answer "do you want the state law, or the law of physics?"

The next two questions most frequently missed were related in that one asked when a child should be turned from rear facing to forward facing and the other gave a scenario with choices for the best transportation option. The correct answer for both was

rear facing. These were answered correctly 20.57% and 27.75% respectively. This indicates that caregivers are still turning children from rear facing to forward facing based upon outdated knowledge despite 10 years of technology and recommendations to keep children rear facing as long as possible. Part of the reason for this lack of knowledge could be the continued ambiguity that the American Academy of Pediatrics and the National Highway Traffic Safety Administration continue to use to phrase their recommendations. The National Highway Traffic Safety Administration places the words "Birth to at least 1 year and at least 20 pounds" on the very visible and prominent Web site chart General Child Seat Use Information (National Highway Traffic Safety Administration, 2007), but the same chart places children weighing more than 20 pounds and older than 1 year of age forward facing without mentioning the recommendation to keep them rear facing as long as possible. On the Child Passenger Safety, a Parent's Primer flyer available from the same source, it indicates that infants should be rear facing as long as possible with a de-emphasis on 1 year and at least 20 pounds. The American Academy of Pediatrics has similar wording:

> All infants should ride rear-facing until they have reached at least 1 year of age and weigh at least 20 pounds. That means that if your baby reaches 20 pounds before her first birthday, she should remain rear-facing at least until she turns 1-year-old. It is best for children to ride rear-facing to the highest weight or height allowed by the manufacturer (American Academy of Pediatrics, 2007, p. 1).

The placement of the rear facing recommendation at the end of the statement and the National Highway Traffic Safety Administration's exclusion of it in the most visible set of recommendations presents an ambiguous and easily overlooked major

recommendation. With a large number of caregivers indicating that the Internet is their choice for information about child passenger safety, these ambiguous statements present an important source for misinformation.

The next most missed question involved the transportation of a child in a pickup truck and what should be done if a rear-facing infant must be placed in the front passenger seat with an airbag. This information would not be part of the life experience of individuals who did not own a pickup truck. Only four caregivers (2%) indicated that a pickup truck was the primary vehicle in the home. Even though that does not say how much experience the caregivers had with pickup trucks, it would imply a potentially low experience rate. The fact that 37.25% of the caregivers gave the correct answer by filling in the blank is therefore impressive.

Only 41.15% selected the center of the back seat as the answer to "The safest place for a child less than the age 13-years-old to ride in a car is...." However, the majority of the caregivers did give one of the back seat positions as the answer. Since the general recommendations are emphasizing the backseat without specifying the center and many center rear positions are incompatible with a child safety seat it is difficult to determine if this finding is actually significant. It does indicate however an opportunity for additional study on how caregivers are making decisions about transporting children.

Caregivers also scored low on "On a trip to the store, a 5-year-old child must ride in the front seat of a 5 passenger car with a passenger side air bag. After properly restraining the child, what precautions could you take to reduce the possibility of the child being injured by an air bag?" with a correct response rate of 44.98%. The correct answer was to move the seat back, away from the airbag deployment zone. This question

also had a low correct answer rate of 43% on the original use of the instrument (Vaca et al., 2002). Recommendations for moving the seat back are found in the common questions section of the American Academy of Pediatrics' Web site (American Academy of Pediatrics, 2007) and in similar places in other resources. The low visibility of this type of information puts a response of 44.98% into a different light than a similar score on a major recommendation. How the caregivers arrived at the correct answer to this question would be an area for future study. However, the lack of information on this recommendation or its obscurity could reflect a potential need for less ambiguous and clearer instructions for caregivers.

The last question was almost universally missed with a correct response rate of 6.70%. "Would you say that air bags in new model cars and trucks (1999 and later Models) are: Less powerful than 5 years ago; the same as 5 years ago; More powerful than 5 years ago." This question was also answered correctly only 14% of the time in the original use of the instrument (Vaca et al., 2002). While the correct response to this question is low, the information is not critical for the day-to-day transportation of a child in a motor vehicle. For a caregiver to know this type of technical information, it would have required that they follow announcements of changing safety technology in automotive design over the past several years. This is not an activity that would normally be attributed to the general public. Though the score is low, findings or inferences from this question need to be kept in context. Therefore it is difficult to assign any major finding to the responses to this question.

The knowledge level of child passenger safety was found to differ between several groups. These groups included age, developmental state (years of education),

pattern of living (use of a seat belt while a back seat passenger and being single), family system factors (household size), sociocultural factors (ethnicity and ability to speak English), and availability of resources (household income and number of vehicles in the household).

Caregiver age, representative of Orem's basic conditioning factor of age, and the score on child passenger safety knowledge questions were found to have a low positive correlation. This indicated that older caregivers did better on the knowledge questions than younger caregivers. It is interesting to note that Winston et al. (2006) found that older drivers had an increased sub-optimal restraint of children ages 5- to 9-years-old in actual crash experience. Neither Vaca et al. (2002) nor Snowdon et al. (2006) addressed the age of the caregiver.

A low positive correlation between years of education, representative of Orem's basic conditioning factor developmental state, and child passenger safety knowledge was found in the data. This finding corresponded to the findings during the original use of the questionnaire where a positive correlation was also found (Vaca et al., 2002). The more education a caregiver had, the better they did on the child passenger safety knowledge score. Winston et al. (2006) also found that parent drivers with more years of education have a decreased incidence of sub-optimal child restraint use in crashes.

Wearing seat belts while a backseat passenger and marital status are representative of Orem's basic conditioning factor pattern of living. Wearing a seat belt while driving and as a front seat passenger were not predictors of child passenger safety knowledge though use of a seat belt while a back seat passenger had a low positive correlation with child passenger safety knowledge. The National Center for Statistics and

Analysis (Starnes, 2003) found that fatally injured children, birth to age 15 years, were much more likely to be unrestrained if the driver was unrestrained. In light of Starnes' finding, his combination of results is noteworthy as it appears to be new information not addressed in the literature. These three questions, taken together, appear to be contradictory at first glance and should have additional study before arriving at a definitive conclusion.

Single caregivers did not perform as well as caregivers who were married or in a relationship. There were no previous studies that tested this relationship to provide a comparison. While this question was included on the questionnaire, there were no published data on any relationships involving marital status and child passenger safety knowledge. Household size is representative of Orem's basic conditioning factor family system. Household size was also found to be a weak positive predictor of child passenger safety knowledge. Caregivers from larger households tended to have a slightly higher score on the knowledge questions. There were no other factors in family system that had a relationship with child passenger safety knowledge scores.

Sociocultural factors measured by ethnicity and the ability to speak English were found to be predictors of lower scores on child passenger safety knowledge. The majority of the sample, 49.52% (n = 103), was African American and 36.06% (n = 75) were non-Hispanic Whites. In this sample, the average score on child passenger safety knowledge for non-Hispanic Whites (M = 14.2) was different from African Americans (M = 11.8). Vaca et al. (2002) found a similar situation between Hispanic and non-Hispanic Whites in which Hispanic participants scored lower on child passenger safety knowledge than White participants. Despite the higher rate of deaths from motor vehicle

trauma for White children versus African American children (Centers for Disease Control and Prevention, 2003), Winston et al. (2006) found that non-Hispanic Black driver parents of children involved in crashes were at higher risk for sub-optimal restraint use.

English ability was also found to be a predictor of scores on child passenger safety knowledge. This finding corresponds to the factor with the greatest significance in the study by Vaca et al. (2002). Since the caregivers in this study were infrequently found to have English as a second language (n = 11), the impact of language may not be comparable with the Vaca et al. (2002) study with a largely Spanish speaking population. Even though the ability to speak English was a factor in child passenger safety knowledge scores, place of birth was not. This combination of factors may indicate that the receiving, processing, and understanding of the message is more of a factor than sociocultural or pattern of life orientation before arriving in the United States. Additional study is indicated by this combination of factors to determine if it is orientation, message, or some other unknown factor that is most significant.

A positive correlation between representatives of Orem's basic conditioning factor availability of resources and child passenger safety knowledge was found in the data. These factors were measured by household income and number of vehicles in the household. The more resources a caregiver had, the better they did on the child passenger safety knowledge score.

Several exclusive and non-overlapping categories were developed as a result of the open-ended questions. When asked who they received assistance from when they last purchased a child safety seat, 44.1% (n = 98) of the responses were "no one." By itself, this information provides no important information other than a category. The next

largest category was store personnel (*n* = 36, 16.2%). It is important to realize that retail stores do not staff their child safety seat departments with trained personnel. This is a major finding as the caregivers were not asking anyone or they asked an untrained person for information to protect their child in more than 60% of purchase decisions. It is also important to notice that fire and rescue personnel were asked for information about purchases in 7.7% (*n* = 17) of the responses and healthcare providers were asked in only 1.8% (*n* = 4) responses.

When asked who they received help from when they last installed a child safety seat, the responses were similar with no one the major source of assistance (*n* = 91, 41.9%). Fire and rescue personnel increased for installations (*n* = 35, 16.2%). Manufacturer's instructions accounted for 8.8% of responses (*n* = 19) with spouse or significant other representing 10.1% of the responses (*n* = 22).

A major shift in answers occurred when the caregivers were asked where they would receive information. They identified a source in all but 0.7% (*n* = 2) of the cases where no one was answered. The predominant source was fire and rescue at 28.1% (*n* = 77) with the Internet ranking second (*n* = 45, 16.4%). Police (*n* = 29, 10.6%), pediatrician or healthcare provider (*n* = 22, 8.0%), public assistance or government agency (*n* = 24, 8.8%), and manufacturer's customer service (*n* = 21, 7.7%) were extremely close in number of responses. The majority of responses indicated a professional source of information (*n* = 222, 81%) although they may have differed on the exact source.

The last question about sources of information asked for the one person that would be asked for help with a child safety seat. The responses to this were very similar

to the question about where the caregiver would receive information. Fire and rescue ranked first with 32.6% (*n* = 77). The results for police (*n* =30, 12.7%), pediatrician or healthcare provider (*n* =18, 7.6%), and store personnel (*n* =5, 2.1%) were similar to the previous question. Public assistance or government agency (*n* =6, 2.5%), manufacturer's customer service (*n* =12, 5.1%), and manufacturer's instructions (*n* =1, 0.4%) dropped substantially. A very noticeable change occurred in the Internet response. Responses indicating the Internet dropped from 16.4% (*n* = 45) to 0. The two categories that increased were spouse or significant other (*n* = 21, 8.9%) up from 0.4% (*n* = 1) and family, friend, or another parent (*n* = 32, 13.6%) up from 5.5% (*n* = 15). The low number of responses indicating healthcare providers as a source of information corresponds with the findings in Snowdon's study (2006) in which healthcare providers were not common sources of information.

Under Orem's framework, the source of information for healthcare decisions is representative of the basic conditioning factor healthcare systems. In the responses to these questions, it appears that caregivers are not getting information from the sources they recognize as authorities on the topic of child passenger safety. The very low number of responses identifying traditional healthcare providers in each category is a major finding from the study.

The question about the type of information obtained from the child's pediatric provider also represents healthcare systems in Orem's framework. The responses selectively coded into four distinct categories: nothing was said, the caregiver was told to use one, the caregiver was given specific recommendations, and the benefits of using a car seat were advocated. An other category was used to accumulate individual answers

that did not show trends or easily defined categories. The most common response to the question about the information provided by a child's pediatric provider was that nothing had been communicated about child passenger safety by the pediatric provider (n = 67, 29%). Only 17% (n = 42) of the caregivers responded that the pediatric provider had made specific recommendations regarding height, weight, type of seat, or seating position. The most important finding from this question was the number of caregivers that reported that they did not receive any information from their provider. Even though the study identified pediatric providers and other healthcare providers as fifth and sixth ranked providers of information about child passenger safety, healthcare providers are failing to provide essential prevention messages and resources to assist caregivers in making life-saving decisions for the safe transportation of their children. This failure in the basic conditioning factor of healthcare state presents an opportunity for nurses to fill in this gap in healthcare.

Limitations of the Study

This study was developed to determine the child passenger safety knowledge level of caregivers. While disparities between groups were identified, the causes of those disparities were not investigated. The questionnaire also determined self-reported behavior and not actual observed behavior. There could feasibly be significant differences between self-reported behavior and actual behavior. Another aspect of this lack of observation of actual practice relates to the rate of errors in the installation of child restraint systems. The study did not investigate how the caregivers actually transported their children; it only dealt with their knowledge level. Actual performance cannot be inferred from this study. The variables studied were representative of basic

conditioning factors but cannot be inferred to represent all of the possible variables in each of the basic conditioning factors. The sample was a sample of convenience from one geographic region. Even though the locations were throughout the region, the population of the region is also diverse and heterogeneous and this study may not be able to be generalized to the population in the region or at large.

Conclusions

The results of this study provide conclusions in several topics. The first topic is Orem's self-care framework. The second topic is in which areas caregivers demonstrate the most deficits of knowledge of child passenger safety. The third topic is which basic conditioning factors have a relationship with caregivers' knowledge of child passenger safety. The final topic regards the sources of information that caregivers use to make decisions regarding the safe transportation of their children.

Orem's self-care framework is adequate for the study of child passenger safety. The theory of self-care deficit and dependent-care agency apply to the relationships between caregivers and the dependent children in their care. It was further found that Orem's framework was adequate for family-related research within child passenger safety.

It was also found that caregivers do not have the knowledge necessary to correctly use a child restraint system every time their dependent child travels in a motor vehicle which has been indicated as necessary as a prerequisite to the safe transportation of children. Specifically, caregivers do not have adequate knowledge of medical best practice nor state laws regulating the safe transportation of children. It was also evident

that caregivers have not received or understood the message about infants riding rear facing as long as possible. Therefore, caregivers need more anticipatory guidance.

The relationship that basic conditioning factors have with child passenger safety knowledge is demonstrated by the differences that were found between groups of the basic conditioning factors. Within these groups it was found that younger caregivers, caregivers with less education, single caregivers, caregivers from smaller households, African American caregivers, caregivers less fluent in English, caregivers from households with lower incomes, and caregivers with fewer vehicles in the household may require additional anticipatory guidance regarding child passenger safety. These factors affect the ability of a caregiver to provide dependent care in maintaining the health status of a child.

The most important conclusions to be drawn from the questions developing knowledge about sources of information include the appearance that caregivers receive help from sources they do not consider being their primary choice for information. Since these sources of information are providing information to protect the caregiver's child from injury or a change in health status, the sources of information can be considered part of the healthcare system, a basic conditioning factor. A middle-range theory developed from this observed phenomenon is that unidentified barriers to appropriate healthcare systems in child passenger safety exist. Another conclusion that can be made from this information is that healthcare providers are not providing essential information to caregivers regarding the safe transportation of children. There is a significant gap in healthcare for child passenger safety.

Implications for Nursing

This study supported Orem's theory of self-care deficit in the testing of theory associated with the impact of basic conditioning factors on knowledge to prevent injury through dependent-care agency. There is a deficit of knowledge of child passenger safety by caregivers that can be reduced through adequate nursing educational interventions. The study also supported that there is a deficit in the information being provided by caregivers in the healthcare setting which presents an opportunity for nurses to offset the deficit through appropriate patient education.

It is evident from the frequency with which caregivers answered incorrectly about the appropriate time to turn infants from rear facing to forward facing that the information is not getting to the caregivers. Part of this could be the ambiguity of major sources of information available to the public. Nurses and child passenger safety advocates must advocate for clear and concise recommendations from national organizations for the safe transportation of children.

The importance of availability of resources for predicting child passenger safety knowledge also underscores the importance of child restraint system activities within programs targeted to that population. Advocacy for the inclusion of child passenger safety in governmental and private programs targeted to the lower income population is a challenge for nursing. Advocacy for reimbursement for child passenger safety activities in the healthcare home is also a challenge for nursing attempting to implement child passenger safety programs. The Medicaid program is one area in which reimbursement for prevention has been found, but child passenger safety is excluded.

The less than adequate knowledge of state laws presents nurses and advocates for child passenger safety with an opportunity to replace state laws as the common benchmark used by consumers with the best medical practice. There is a need for additional anticipatory guidance for child passenger safety and healthcare providers are failing to provide this needed service. Nurses are in a position to provide appropriate anticipatory guidance, and in doing so, change public perception of state laws as benchmarks for adequate child passenger safety.

Recommendations for Further Research

Additional information is needed to determine how caregivers make their decisions regarding the safe transportation of children. The process by which caregivers without pickup trucks correctly identified turning off the airbag in a pickup truck is unknown. Also, why caregivers failed to consider pushing the vehicle seat as far back as possible from the airbag when faced with a child that must sit in the front seat is unknown. Exploring these processes may assist in designing appropriate education activities. The process of decision making is a different process than the attainment of knowledge upon which the decisions are made.

The patterns of life questions about seat belt use, coupled with the evidence presented that children are less likely to be restrained when drivers are not restrained presents an opportunity to further investigate the discrepancy found in this study that back seat passengers who were less restrained had lower scores on child passenger safety. Additional research is needed to examine what, if any, relationship exists between seat

belt use and child passenger safety knowledge. Further research into sociocultural factors and interrelated variables needs to be conducted to determine if there are any influencing variables.

The additional information identified by the qualitative component of the study indicates several areas of further research. The categories developed for information sources that caregivers used to make decisions about child passenger safety should be tested in another study to validate the findings. Also, the information that was received by caregivers from their child's pediatric healthcare provider should likewise be tested to validate the findings.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL FORM

HAMPTON UNIVERSITY
HAMPTON, VIRGINIA 23668

INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL FORM

Title of Proposed Research:
Project/Thesis/Course: **A Description of Child Passenger Safety Knowledge and Sources of Parents and Care Givers**

Investigator(s): **W. Lawrence Daniels**

Department/Area: **Nursing**

Signature (Investigator) 5/16/06 Date

Signature (Instructor or Advisor) 5/16/06 Date

Signature (Department Chair) Date

Signature (Dean/Area Administrator) 5/16/06 Date

The investigator has certified that the potential risk is outweighed by the expected benefits and adequate steps have been taken to assure the protection of human subjects.

1. _____ Yes ☑ No ☐
Dr. James E. Forbes
Chairperson

Date Approved 5/19/06

A written review on the involvement of human subjects in this research is required at the times given below. No changes can be made in this research activity without prior written approval by IRB. All unanticipated risks to human subjects should be reported immediately to the Chairperson of the IRB.

Frequency of Required Review Annual ✓ Other ___

Comments:

APPENDIX B

PERMISSION FOR INSTRUMENT

-----Original Message-----
From: Craig Anderson [mailto:clanders@uci.edu]
Sent: Friday, May 12, 2006 3:54 PM
To: W. Lawrence Daniels
Cc: Dr. Federico E. Vaca
Subject: Re: Permission to use and modify an instrument

Questionnaire is attached. Sorry this took longer than I said.
You may use it and modify it. As we discussed, please cite this as modified from the Pediatrics article.
Good luck with your IRB.
Craig
At 7:54 PM -0400 5/10/06, W. Lawrence Daniels wrote:

Dear Drs. Vaca, Agran and Anderson;

I am a PhD candidate preparing my dissertation proposal submission. The purpose of my study is to investigate the knowledge level of parents in regard to child passenger safety with the end result to target interventions based upon demonstrated deficits. It is to be a mixed method study, as my dissertation is required to entail both theory generating and theory testing research. The qualitative component will encompass focus groups which will essentially be to develop theories on where parents and care-givers get their information about child passenger safety. The quantitative piece will be an investigation of their knowledge levels. I would like to use the instrument you developed and used in your study which was published in 2002. Pediatrics 2002;110;61-

"Child Safety Seat Knowledge among Parents Utilizing Emergency Services in a Level I Trauma Center in Southern California"

May I have your permission to use the survey? Would it be possible to obtain an electronic copy of the instrument as the article does not have the choices for the multiple choice questions?

Since there have been a few changes in recommendations in the past few years, may I have your permission to slightly modify the questions that pertain to new recommendations and the California law (the survey will be conducted in Virginia).

Thank you kindly for your assistance with this project.

Sincerely,

Larry Daniels

W. Lawrence (Larry) Daniels, MSN, CPNP
Assistant Professor
Department of Graduate Nursing Education Hampton University School of Nursing Hampton University Hampton, VA 23668

Office Voice and Fax (757) 727-5768

APPENDIX C

CONSENT FORM

Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire

Consent for Participation

You have been invited to participate in a study of parent's and care givers knowledge about child passenger safety and sources of information. This research study is strictly voluntary and completely confidential. This research is intended to assist in improving the safety of our children in motor vehicles.

This research is being conducted as part of the studies of W. Lawrence Daniels, a doctoral candidate in nursing at Hampton University. It is funded through a grant from the National Institutes of Health.

You may stop the survey at any point without penalty. You may skip questions that you do not feel comfortable answering. This survey is totally voluntary and no one can force you to complete any answer unless you want to.

If you have any questions about this research at any time, during the survey or after, you can direct them to:

W. Lawrence Daniels, MSN, CPNP
Assistant Professor
School of Nursing
Hampton University
Hampton, Virginia 23668
Office (757) 727-5768
Main Office (757) 727-5251

This survey has been approved through an institutional review board at Hampton University. They can be reached for questions or concerns at:

Toni Edwards, Administrator
Hampton University IRB
Phenix Hall Room 100
Hampton, Virginia 23668
(757) 727-5794

By signing below and providing your contact information, you give consent to participate in the study.

I hereby give my consent to participate in this study: _____

Address: _____

City, State, Zip: _____

Phone: _____

APPROVED
HAMPTON UNIVERSITY
IRB
DATES: 5/11/06 - 5/11/07

APPENDIX D

INSTRUMENT

Knowledge of Child Safety Seat and Occupant Air Bag Safety Questionnaire

The questionnaire will take approximately 15 minutes.

Your help is GREATLY APPRECIATED.

NOTE: In order to participate in this study, you must be a parent or legal guardian of a child UNDER 10 years of age.

Please Circle The Given Response or Fill In The Appropriate Blank Space

1) Gender of parent or guardian being interviewed?
   a) Male
   b) Female

2) How many children are in your immediate household? Total Number _____

3) Please report AGE and GENDER for each

Gender	Age
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

4) What is the year and make of the primary vehicle that you drive, if you drive?
   _____

5) How often do you use a seat belt when you drive a car?
   a) Always
   b) Most of the Time
   c) Seldom
   d) Rarely
   e) Never
   f) N/A (Doesn't Drive)

6) How often do you use a seat belt when you are a front seat passenger in a car?
   a) Always
   b) Most of the Time
   c) Seldom
   d) Rarely
   e) Never

7) How often do you use a seat belt when you are a rear seat passenger in a car?
   a) Always
   b) Most of the Time
   c) Seldom
   d) Rarely
   e) Never

8) What is the number of vehicles in your household? _____

   What is your age? _____

Which of the following categories best describes your marital status?

a) Married
b) Living together (but not married)
c) Single
d) In a relationship but not living together
e) Divorced
f) Widowed
g) Separated
h) Other

9) What is your ethnicity?
   a) Hispanic: Hispanic or Latino
   b) Non-Hispanic White
   c) Black or African American
   d) Asian (specify)_____
   e) Native Hawaiian or other Pacific Islander
   f) American Indian or Alaskan Native
   g) Other (specify)_____

10) Where were you born?

_____

11) How well do you feel that you speak English?
   a) Very well - English is my primary language
   b) Well - I can hold a conversation in English
   c) Not so well - English is my secondary language
   d) Poorly - I always need translation assistance to communicate in English

12) How many total years of school did you complete? _____

13) Are you currently employed?
   a) Yes, full-time
   b) Yes, part-time
      If yes, what type of work
      _____
   c) No
   d) Other _____

14) Is your spouse or partner currently employed?
   a) Yes, full-time
   b) Yes, part-time
      If yes, what type of work
      _____
   c) No
   d) Other_____

15) Can you estimate your total yearly HOUSEHOLD income? (gross or take home - circle one)
   a) Less than $9,999
   b) $10,000 to 14,999
   c) $15,000 to 19,999
   d) $20,000 to 29,999
   e) $30,000 to 39,999
   f) $40,000 to 49,999
   g) $50,000 to 74,999
   h) $75,000 to 100,000
   i) Over $100,000

16) How many people does your yearly HOUSEHOLD income support?

_____

17) For a child weighing less than 20 pounds and less than 1 year of age, how should the child ride in the car?
   a) Seat belt alone
   b) Infant / Child car seat
   c) Booster seat
   d) Unsure
   e) Someone's lap

18) For a child weighing less than 20 pounds and less than 1 year of age, the infant car seat should face which direction when placed in a car?
   a) Forward Facing
   b) Rear Facing
   c) Unsure

19) For a child weighing between 20 to 40 pounds and older than 1 year of age, how may the child ride in the car?
   a) Seat belt alone
   b) Infant / Child car seat
   c) Booster seat
   d) Unsure
   e) Someone's lap

20) For a child weighing between 40 to 60 pounds, how should the child ride in the car?
   a) Seat belt alone
   b) Child car seat
   c) Booster seat
   d) Unsure
   e) Someone's lap

21) For a child weighing 25 pounds and 1 year 2 months old, how should the child ride in the car?
   a) Forward Facing
   b) Rear Facing
   c) Unsure

22) The safest place for a child less than the age 13 years old to ride in a car is:
   a) Front seat passenger
   b) Rear seat in the middle
   c) Rear seat behind the passenger or driver
   d) Unsure

23) If the car has "SRS" imprinted on the dash board, what does this means? Please circle the correct response at the end of the statement:

   An air bag is present.

   Yes / No / Don't Know

24) How can you tell if a car is equipped with an air bag on the front driver's side? Please circle the given response at the end of the statement:

   a) The steering wheel has the word "SRS" or "Air Bag" printed on it.

      Yes / No / Don't Know

   b) The owner's manual includes a section on air bags.

      Yes / No / Don't Know

   c) An "Air Bag" sticker or decal is present on the driver side sun visor.

      Yes / No / Don't Know

25) How can you tell if a car is equipped with an air bag on the front passenger side? Please circle response at the end of the statement:

   a) The dash board has the word "SRS" or "Air Bag" printed on it.

      Yes / No / Don't Know

   b) The owner's manual includes a section on air bags.

      Yes / No / Don't Know

   c) An "Air Bag" sticker or decal is present on the passenger side sun visor.

      Yes / No / Don't Know

26) Please tell me whether you agree or disagree with the following statement: "If my car has a driver side air bag, I don't need to wear my seat belt when driving."
   a) Agree
   b) Disagree
   c) Don't know

27) Please tell me whether you agree or disagree with the following statement: "If my car has a passenger side air bag, I don't need to wear my seat belt when riding in the front seat."
   a) Agree
   b) Disagree
   c) Don't know

28) Which one group of children should NEVER be placed in front of an air bag in a car?
   a) 8 year old child in a seat belt
   b) 3 year old child in a child car seat
   c) Infant in a infant car seat rear facing

29) If you owned a new model (2006) pick-up truck with no rear seats and wanted to carry an infant in the front passenger side of the truck, what should you do to protect the child from an air bag related injury once the child is properly restrained?

   Answer _____

30) On a trip to the store, a 5 year old child must ride in the front seat of a 5 passenger car with a passenger side air bag. After properly restraining the child, what precautions could you take to reduce the possibility of the child being injured by an air bag?
   a) Move the passenger front seat as far back as it is able to go
   b) Have the air bag turned off or disconnected
   c) There are no additional precautions that can be taken
   d) Don't know

31) Would you say that air bags in new model cars and trucks (1999 and later Models) are:
   a) Less powerful than 5 years ago
   b) The same as 5 years ago
   c) More powerful than 5 years ago
   d) Don't know

32) Is there any decal or sticker anywhere in your car that tells you how to place your child safely in your car?
   a) Yes
      Location of the sticker_____

      _____
   b) No
   c) Don't know

33) Infants properly restrained in an infant car seat should not be turned from a rear facing position to a forward facing position until the infant:
   a) Is one year old
   b) Twenty pounds in weight
   c) One year old OR weighs twenty pounds
   d) One year old AND weighs twenty pounds
   e) Reaches the weight limit of the seat, usually 30 pounds in weight

34) Virginia law states that children should be restrained in a child car seat until:
    a) The child is 6 years old
    b) The child weighs eighty pounds
    c) The child is 6 years old OR weighs eighty pounds
    d) The child is 6 years old AND weighs eighty pounds

35) When you last purchased a child safety seat, who did you ask for assistance?

36) When you last installed a child safety seat, who did you ask for assistance?

37) If you had a question about child safety seats, where would you get your answer?

38) If you had to ask any one person for help with your child safety seat, who would it be?

39) What has your child's pediatric provider told you about child safety seats?

Adopted with modification from Vaca, F., Anderson, C. L., Agran, P., Winn, D., & Cheng, G. (2002). Child safety seat knowledge among parents utilizing emergency services in a level I trauma center in southern California. *Pediatrics, 110*(5).

APPENDIX E

CAREGIVER RECRUITMENT LETTER AND FLYERS

HAMPTON UNIVERSITY
HAMPTON, VIRGINIA 23668

DEPARTMENT OF GRADUATE NURSING EDUCATION
SCHOOL OF NURSING
WILLIAM FREEMAN HALL
(757) 727-5672

Dear Caregiver:

You are invited to participate in a research study on care giver child passenger safety knowledge as it relates to demographic information and sources of child passenger safety information used by care givers in making decisions about the transportation of children in their care. You are eligible to participate in the study if you are the parent or legal guardian of a child under the age of 10. Three hundred completed surveys are needed for this study.

Title of Study: An Investigation of Child Passenger Safety Knowledge of Selected Care Givers

I am the principal investigator for this project and a doctoral candidate at Hampton University School of Nursing in Hampton, Virginia. This research study is the basis of my doctoral dissertation and the final step in my pursuit of the PhD degree in nursing with a concentration in family and family-related research.

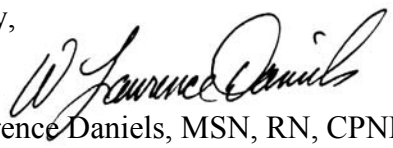
Your assistance in this study may help parents and care givers in the future make decisions about the safe transportation of their children. You are asked to complete a survey which includes information about you such as your marital status, income, race and other demographic information and several questions about transporting children in Virginia. It will take approximately 15 to 30 minutes to complete the survey.

Participation in this study is completely voluntary and the information you provide will be kept in strictest confidence. To protect your privacy, your survey will receive a control number and your name will be removed from the rest of the survey answers. The part of the survey with your name and the control number will be kept by me in a locked file cabinet. The administrator of the survey will turn over all completed surveys to me and no other records will be kept. You will not be identified individually in any publications or reports about this study. Your answers will be grouped with the answers of all the participants in the study.

Upon completion of the survey you will receive a thank you gift as a token of my appreciation for your participation. If you have any questions, please feel free to contact me by email or my office phone. Email is the most reliable means of contacting me.

Thank you very much for your assistance.

Sincerely,



W. Lawrence Daniels, MSN, RN, CPNP
Principal Investigator and Doctoral Candidate
Phone: Office (757) 727-5768 Email: lawrence.daniels@hamptonu.edu

Partially funded through the HU Power Project by a Bureau of Primary Health Care - Healthy Communities Access Program (HCAP) Demonstration Project award. Department of Health and Human Services Health Resources and Services Administration # 1D72CS04180-01-00

Seeking Parents and Care Givers of Children under the Age of 10

An Investigation of the Child Passenger Safety Knowledge of Selected Care Givers

This study will provide new information about the relationships between demographics and child passenger safety knowledge and where parents and care givers get information about the safe transportation of their children.

To participate you must:

- **Read and Write English**
- **Be the parent or legal guardian of a child under the age of 10**

All participants will be asked to complete a survey of demographic information, child passenger safety knowledge and sources of child passenger safety information. Upon completion of the survey, a token of appreciation will be provided.

For more information contact:

W. Lawrence Daniels, MSN, RN, CPNP, Doctoral Candidate
Principal Investigator
School of Nursing **(757) 727-5768**
Hampton University
Hampton, VA 23668 **lawrence.daniels@hamptonu.edu**

Partially funded through the HU Power Project by a Bureau of Primary Health Care - Healthy Communities Access Program (HCAP) Demonstration Project award. Department of Health and Human Services Health Resources and Services Administration # 1D72CS04180-01-00

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To participate you must:

- **Read and Write English**
- **Be the parent or legal guardian of a child under the age of 10**

Upon completing a survey of demographic information, child passenger safety knowledge and sources of child passenger safety information you will receive a

$5 WAL-MART GIFT CARD

W. Lawrence Daniels, MSN, RN, CPNP, Doctoral Candidate
Principal Investigator
School of Nursing **(757) 727-5768**
Hampton University
Hampton, VA 23668 **lawrence.daniels@hamptonu.edu**

Partially funded through the HU Power Project by a Bureau of Primary Health Care - Healthy Communities Access Program (HCAP) Demonstration Project award. Department of Health and Human Services Health Resources and Services Administration # 1D72CS04180-01-00

APPENDIX F

SUPPLEMENTAL FREQUENCY TABLES

Frequency of model years of the caregiver's primary vehicle.

	Total	
Model Year	***n***	**%**
1984	1	0.57
1987	2	1.14
1988	1	0.57
1989	1	0.57
1990	1	0.57
1991	3	1.70
1992	1	0.57
1993	2	1.14
1994	2	1.14
1995	3	1.70
1996	5	2.84
1997	4	2.27
1998	8	4.55
1999	12	6.82
2000	19	10.80
2001	20	11.36
2002	26	14.77
2003	18	10.23
2004	16	9.09
2005	13	7.39
2006	14	7.95
2007	4	2.27
Missing Data	33	

Note. Percentages may not add to totals because of rounding.

Frequency of the number of vehicles in the household.

	Total	
Number of Vehicles	***n***	**%**
0	5	2.48
1	47	23.27
2	99	49.01
3	28	13.86
4	19	9.41
5	2	0.99
7	2	0.99
Missing Data	7	

Note. Percentages may not add to totals because of rounding.

Frequency of responses to "How often do you use a seat belt when you drive a car?"

	Total	
Responses	***n***	**%**
Rarely	2	0.96
Seldom	2	0.96
Most of the Time	22	10.53
Always	183	87.56

Note. Percentages may not add to totals because of rounding.

Frequency of responses to "How often do you use a seat belt when you are a front seat passenger in a car?"

	Total	
Responses	***n***	**%**
Never	1	0.48
Rarely	1	0.48
Seldom	5	2.39
Most of the Time	25	11.96
Always	177	84.69

Frequency of responses to "How often do you use a seat belt when you are a rear seat passenger in a car?"

	Total	
Responses	***n***	**%**
Never	12	5.77
Rarely	13	6.25
Seldom	20	9.62
Most of the Time	53	25.48
Always	110	52.88
Missing Data	1	

Frequency of the caregiver's place of birth by response.

	Total	
Place of Birth	***n***	**%**
1970[a]	1	0.51
AL	1	0.51
Ahoski, NC	2	1.02
Alabama	2	1.02
Alaska	1	0.51
Albany, NY	1	0.51
Anahiem, CA	1	0.51
Baltimore, MD	2	1.02
Boston, MA	1	0.51
Burlington, VT	1	0.51
California	4	2.03
Canada	1	0.51
Cedar Rapids, IA	1	0.51
Charleston, SC	2	1.02
Chesapeake General	1	0.51
Chesapeake, VA	1	0.51
Chicago	1	0.51
Chicago, IL	1	0.51
Cocoa, FL	1	0.51
Columbia, SC	1	0.51
Connecticut	1	0.51
Dallas, TX	1	0.51
Detroit, MI	1	0.51
Durham, NC	2	1.02
East Elmhurst, NYC	1	0.51
Elizabeth City, NC	2	1.02
Elizabeth, NJ	1	0.51
Emporia, VA	1	0.51
FL	1	0.51
Farmville, VA	1	0.51
Fayetteville, NC	1	0.51
Flint, MI	1	0.51
Fontain Valley, CA	1	0.51
Franklin, VA	1	0.51
Georgia	1	0.51
Germany	2	1.02
Greensboro, NC	1	0.51
Greenville, NC	1	0.51
Greenwood, SC	1	0.51
Grenada	1	0.51

[a] = Actual response by caregiver.

Frequency of the caregiver's place of birth by response – Continued.

	Total	
Place of Birth	***n***	**%**
Haiti	2	1.02
Hampton, VA	2	1.02
Harlem, NY	1	0.51
Havelock, NC	1	0.51
Houston, TX	1	0.51
Iceland	1	0.51
Illinois	1	0.51
Indiana	1	0.51
Iowa	1	0.51
Italy	1	0.51
KY	1	0.51
Ketchikan, AK	1	0.51
Kinston, NC	1	0.51
Kuwait	1	0.51
Lima, Peru	1	0.51
Lithuania, Europe	1	0.51
Little Rock, AK	1	0.51
Los Angeles, CA	1	0.51
Louisville, KY	1	0.51
Lubbock, TX	1	0.51
Lynchburg, VA	1	0.51
Memphis, TN	1	0.51
Mexico	2	1.02
Minnesota	1	0.51
Mississippi	1	0.51
Missouri	1	0.51
Mobile, AL	1	0.51
Muncie, IN	1	0.51
NC	4	2.03
NY	1	0.51
NYC	1	0.51
New Haven, CT	1	0.51
New Jersey	3	1.52
New Rochelle, NY	1	0.51
New York	6	3.05
New York, NY	2	1.02
Newport News, VA	3	1.52
Norfolk	1	0.51
Norfolk, VA	25	12.69
North Carolina	2	1.02
Northern, VA	1	0.51

Frequency of the caregiver's place of birth by response – Continued.

	Total	
Place of Birth	***n***	**%**
New Orleans, LA	1	0.51
OH	3	1.52
Ohio	2	1.02
Olongapo, Philippine	1	0.51
Opelika, AL	1	0.51
Oxford, OH	1	0.51
PA	1	0.51
Palm Springs, CA	1	0.51
Panama City, Panama	1	0.51
Pennsylvania	2	1.02
Philadelphia	1	0.51
Philadelphia, PA	1	0.51
Philippines	2	1.02
Pittsburgh, PA	2	1.02
Portsmouth	2	1.02
Portsmouth Naval	2	1.02
Portsmouth, VA	6	3.05
Puerto Rico	1	0.51
Richlands, VA	1	0.51
San Berdo, CA	1	0.51
San Diego, CA	3	1.52
Sante Fe, NM	1	0.51
Saratoga, NY	1	0.51
Singapore	1	0.51
St. Louis, MO	1	0.51
TX	1	0.51
Texas	1	0.51
Tuscon, AZ	1	0.51
USA	3	1.52
VA	3	1.52
Vancouver, WA	1	0.51
Virginia	9	4.57
Washington	1	0.51
Washington, DC	3	1.52
Wilson, NC	1	0.51
Windsor, NC	1	0.51
Missing Data	1	

Note. Percentages may not add to totals because of rounding.

Frequency of the caregiver's response to defining caregiver's other employment status.

Other Employment Status	Total *n*	Total %
Babysitting	1	9.09
Child care provider	1	9.09
Full time student	1	9.09
Full time student jr	1	9.09
Homemaker	1	9.09
Navy officer Program	1	9.09
Self-employed	2	18.18
Stay at home mother	1	9.09
homemaker	1	9.09
stay at home mom	1	9.09
Missing Data	198	

Note. Percentages may not add to totals because of rounding.

Frequency of the caregiver's response to defining spouse or partner's other employment status.

Other Employment Status	Total *n*	Total %
N/A	1	25.00
Stay-at-home Dad	1	25.00
No Spouse	1	25.00
Student	1	25.00
Missing Data	205	

Frequency of the caregiver's type of work.

Type of Work	Total *n*	Total %
A/C contractor	1	2.13
Administration	1	2.13
Administrative	1	2.13
Auto worker	1	2.13
Cardiovascular group	1	2.13
Case manager	1	2.13
Day care	1	2.13
Education	1	2.13
Esthetician	1	2.13
Event planner	1	2.13
Hair dresser	1	2.13
Home business	1	2.13
Housewife	1	2.13
HVAC service tech	1	2.13
Ice carver	1	2.13
Independent agent/contractor	1	2.13
Manufacturing	1	2.13
Massage therapy	1	2.13
Medical assistant	1	2.13
Medical assistant and receptionist	1	2.13
Medical transcriptionist	1	2.13
Military	1	2.13
Military USAF	1	2.13
Minister of music	1	2.13
Navy	2	4.26
Notary signing agent	1	2.13
Nursing	2	4.26
P.C.A..	1	2.13
P3c navigator (Navy)	1	2.13
Pharmacy	1	2.13
Photographer	1	2.13
Picadilly cafeteria	1	2.13
Real estate	1	2.13
Realtor, paralegal	1	2.13
Recreational therapy	1	2.13
Retail	1	2.13
RN	1	2.13
Sales	1	2.13
Sales associate	1	2.13
Sales management	1	2.13

Frequency of the caregiver's type of work – Continued.

Type of Work	Total *n*	Total %
Social worker	1	2.13
Tax professional	1	2.13
Us army	1	2.13
US Govt. Engineering tech/diver	1	2.13
US Navy	1	2.13
Missing Data 18		

Note. Percentages may not add to totals because of rounding.

Frequency of caregiver's household income.

Household Income	Total *n*	Total %
<=9,999	9	4.62
$10,000-14,999	17	8.72
$15,000-19,999	8	4.10
$20,000-29,999	18	9.23
$30,000-39,999	25	12.82
$40,000-49,999	28	14.36
$50,000-74,999	53	27.18
$75,000-100,000	14	7.18
>$100,000	23	11.79
Missing Data	14	

Frequency of the caregiver's spouse's or partner's type of work.

	Total	
Type of Work	***n***	**%**
Account Manager	1	3.13
Biomed	1	3.13
Bookkeeper	1	3.13
College teacher	1	3.13
Construction	1	3.13
Construction Accounting	1	3.13
Electric	1	3.13
Electrical	1	3.13
Engineer	1	3.13
Engineer	1	3.13
GM	1	3.13
Independent salesman	1	3.13
Instrumentations and control tech	1	3.13
Long shoreman	1	3.13
Maintenance	1	3.13
Manager	1	3.13
MD	1	3.13
Military	2	6.25
Mortgage broker	1	3.13
Navy	1	3.13
Notary Public - signing agent	1	3.13
Principal consultant	1	3.13
Retail	1	3.13
Shipyard	1	3.13
Telecommunications	1	3.13
US Army	2	6.25
US Navy	1	3.13
USN	1	3.13
Warehousing	1	3.13
Welder	1	3.13
Missing Data	177	

Note. Percentages may not add to totals because of rounding.

Frequency of the age of the caregiver's first child.

	Total	
Age of Child 1	***n***	**%**
0.08	2	0.96
0.17	1	0.48
0.41	1	0.48
0.42	1	0.48
0.58	1	0.48
0.67	1	0.48
0.82	1	0.48
0.83	1	0.48
0.84	2	0.96
0.92	1	0.48
1.00	8	3.83
1.33	1	0.48
1.34	1	0.48
1.50	3	1.44
1.83	1	0.48
1.90	1	0.48
2.00	10	4.78
2.50	3	1.44
3.00	24	11.48
3.50	2	0.96
4.00	16	7.66
5.00	15	7.18
6.00	16	7.66
7.00	23	11.00
8.00	18	8.61
9.00	10	4.78
9.20	1	0.48
10.0	8	3.83
11.0	6	2.87
12.0	8	3.83
13.0	4	1.91
14.0	2	0.96
15.0	8	3.83
16.0	5	2.39
17.0	1	0.48
18.0	1	0.48
19.0	1	0.48

Note. Percentages may not add to totals because of rounding.

Frequency of the age of the caregiver's second child.

	Total	
Age of Child 2	***n***	**%**
0.17	2	1.60
0.67	1	0.80
0.84	1	0.80
0.95	1	0.80
1.00	7	5.60
1.50	3	2.40
1.60	1	0.80
2.00	7	5.60
2.50	2	1.60
3.00	10	8.00
4.00	11	8.80
5.00	13	10.40
6.00	9	7.20
7.00	11	8.80
8.00	7	5.60
9.00	8	6.40
9.20	1	0.80
10.0	4	3.20
11.0	10	8.00
12.0	5	4.00
13.0	3	2.40
13.5	1	0.80
14.0	4	3.20
15.0	2	1.60
16.0	1	0.80
Missing Data	84	

Frequency of the age of the caregiver's third child.

Age of Child 3	Total *n*	%
0.60	1	1.61
0.67	1	1.61
0.92	1	1.61
1.00	3	4.84
1.17	1	1.61
2.00	6	9.68
3.00	8	12.90
4.00	10	16.13
5.00	4	6.45
6.00	6	9.68
7.00	4	6.45
8.00	4	6.45
9.00	4	6.45
10.0	2	3.23
11.0	1	1.61
12.0	2	3.23
13.0	1	1.61
14.0	1	1.61
16.5	1	1.61
17.0	1	1.61
Missing Data	147	

Note. Percentages may not add to totals because of rounding.

Frequency of the age of the caregiver's fourth child.

Age of Child 4	Total *n*	Total %
0.40	1	4.35
0.42	1	4.35
0.75	2	8.70
0.84	1	4.35
1.00	2	8.70
1.77	1	4.35
2.00	2	8.70
3.00	6	26.09
5.00	1	4.35
6.00	2	8.70
7.00	1	4.35
9.00	1	4.35
13.0	1	4.35
14.0	1	4.35
Missing Data	186	

Note. Percentages may not add to totals because of rounding.

Frequency of the age of the caregiver's fifth child.

Age of Child 5	Total *n*	Total %
1.00	1	25.00
2.00	1	25.00
6.00	1	25.00
16.0	1	25.00
Missing Data	205	

Frequency of the age of the caregiver's sixth child.

Age of Child 6	Total *n*	Total %
5.00	1	50.00
19.0	1	50.00
Missing Data	207	

Frequency of the caregiver's children's gender.

Children's Gender	Total *n*	Total %
Child 1		
Male	104	50
Female	104	50
Child 2		
Male	59	47.97
Female	64	52.03
Child 3		
Male	35	56.45
Female	27	43.55
Child 4		
Male	14	60.87
Female	9	39.13
Child 5		
Male	1	25
Female	3	75
Child 6		
Male	1	50
Female	1	50
Total		
Male	214	50.71
Female	208	49.29

Age of the oldest child in years.

Age	*n*	%
0.08	2	0.96
0.17	1	0.48
0.25	1	0.48
0.42	2	0.96
0.58	1	0.48
0.67	1	0.48
0.83	1	0.48
0.84	1	0.48
1.00	6	2.87
1.33	1	0.48
1.34	1	0.48
1.83	1	0.48
1.90	1	0.48
2.00	9	4.31
2.50	3	1.44
3.00	19	9.09
3.50	2	0.96
4.00	15	7.18
5.00	15	7.18
6.00	17	8.13
7.00	23	11.00
8.00	17	8.13
9.00	13	6.22
10.0	8	3.83
11.0	8	3.83
12.0	9	4.31
13.0	6	2.87
14.0	3	1.44
15.0	9	4.31
16.0	6	2.87
16.5	1	0.48
17.0	2	0.96
18.0	1	0.48
19.0	2	0.96
20.8	1	0.48

Note. Percentages may not add to totals because of rounding.

Age of the youngest child in years.

Age	*n*	%
0.08	2	0.96
0.17	3	1.44
0.25	1	0.48
0.40	1	0.48
0.42	3	1.44
0.50	1	0.48
0.58	1	0.48
0.60	1	0.48
0.67	3	1.44
0.75	2	0.96
0.82	1	0.48
0.83	1	0.48
0.84	3	1.44
0.92	2	0.96
0.95	1	0.48
1.00	20	9.57
1.17	1	0.48
1.33	1	0.48
1.34	1	0.48
1.50	6	2.87
1.60	1	0.48
1.77	1	0.48
1.83	1	0.48
1.90	1	0.48
2.00	20	9.57
2.50	4	1.91
3.00	30	14.35
3.50	2	0.96
4.00	21	10.05
5.00	22	10.53
6.00	15	7.18
7.00	17	8.13
8.00	10	4.78
9.00	8	3.83
9.20	1	0.48

Note. Percentages may not add to totals because of rounding.

APPENDIX G

PEARSON PRODUCT MOMENT CORRELATIONS

Correlation Table Descriptive Statistics

Variable	*n*	*M*	*SD*	Σ	Min.	Max.
Score on Knowledge Questions	209	12.83	3.04	2682	3	19
Number of Children in the Household	209	2.07	1.15	433	1	8
Age of Oldest Child in the Household	209	7.23	4.59	1512	0.08	20.80
Age of Youngest Child in the Household	209	3.66	2.49	765.87	0.08	9.20
Average Age of Children in the Household	209	5.46	2.96	1141	0.08	13
Wears Seatbelt While Driving	209	4.85	0.46	1013	2	5
Wears Seatbelt While Front Seat Passenger	209	4.80	0.54	1003	1	5
Wears Seatbelt While Back Seat Passenger	208	4.13	1.18	860	1	5
Number of Vehicles in the Household	202	2.12	1.08	429	0	7
Caregiver Age	191	31.49	7.15	6015	18	55
Ability to Speak English	208	1.07	0.30	222	1	3
Years of Education	204	13.90	2.71	2836	4	22
Household Income	195	5.75	2.24	1122	1	9
Number of People Household Income Supports	195	3.84	1.55	748	1	10

Pearson product moment correlation for selected variables.

			SCORE	NCH	OCH	YCH	ACH	SBD	SBP	SBR	NVEH	AGE	ENG	EDUC	HIN	NH	VYEAR
SCORE –	Score on child passenger safety knowledge questions	*r*	1.00	0.11	0.11	0.02	0.12	0.02	0.12	0.13	0.16	0.17	-0.29	0.19	0.30	0.20	0.00
		p		0.10	0.11	0.81	0.10	0.74	0.09	0.05	0.02	0.02	<0.0001	0.01	<0.0001	0.01	0.96
		N	209	209	209	209	209	209	209	208	202	191	208	204	195	195	176
*NCH –	Number of children in the household	*r*		1.00	0.67	-0.04	0.48	0.03	0.07	0.10	0.04	0.38	0.08	0.10	0.17	0.83	-0.11
		p			<0.0001	0.55	<0.0001	0.66	0.32	0.17	0.62	<0.0001	0.24	0.14	0.02	<0.0001	0.15
		N		209	209	209	209	209	209	208	202	191	208	204	195	195	176
OCH –	Age of the oldest child	*r*			1.00	0.44	0.91	0.05	0.08	0.11	0.10	0.55	-0.05	0.16	0.24	0.51	-0.17
		p				<0.0001	<0.0001	0.47	0.28	0.12	0.16	<0.0001	0.49	0.02	0.00	<0.0001	0.02
		N			209	209	209	209	209	208	202	191	208	204	195	195	176
YCH –	Age of the youngest child	*r*				1.00	0.71	-0.04	-0.07	0.05	0.09	0.39	-0.08	0.17	0.18	-0.08	-0.03
		p					<0.0001	0.54	0.35	0.52	0.20	<0.0001	0.28	0.02	0.01	0.25	0.64
		N				209	209	209	209	208	202	191	208	204	195	195	176
ACH –	Average age of children	*r*					1.00	0.02	0.02	0.08	0.11	0.54	-0.07	0.20	0.26	0.35	-0.12
		p						0.80	0.81	0.26	0.12	<0.0001	0.29	0.00	0.00	<0.0001	0.12
		N					209	209	209	208	202	191	208	204	195	195	176
SBD –	Seat belt use while driving	*r*						1.00	0.59	0.38	-0.07	-0.09	0.01	0.00	-0.09	-0.09	-0.06
		p							<0.0001	<0.0001	0.31	0.23	0.94	0.99	0.22	0.20	0.40
		N						209	209	208	202	191	208	204	195	195	176
SBP –	Seat belt use while front seat passenger	*r*							1.00	0.56	-0.02	0.10	0.08	-0.02	0.08	0.12	-0.02
		p								<0.0001	0.78	0.16	0.24	0.75	0.26	0.09	0.76
		N							209	208	202	191	208	204	195	195	176
*SBR –	Seat belt use while back seat passenger	*r*								1.00	0.00	0.14	0.04	0.10	0.10	0.09	-0.03
		p									0.97	0.05	0.55	0.14	0.15	0.19	0.70
		N								208	201	190	207	203	194	195	175
NVEH –	Number of vehicles in the household	*r*									1.00	0.00	-0.01	0.14	0.16	0.12	-0.03
		p										0.95	0.90	0.05	0.03	0.09	0.69
		N									202	185	202	199	189	190	171
*AGE –	Age of the caregiver	*r*										1.00	0.00	0.29	0.44	0.32	-0.06
		p											1.00	<0.0001	<0.0001	<0.0001	0.43
		N										191	190	186	180	179	164
ENG –	Ability to speak English	*r*											1.00	-0.06	-0.14	0.10	-0.09
		p												0.38	0.05	0.17	0.23
		N											208	203	194	194	175
EDUC –	Years of education	*r*												1.00	0.46	0.18	0.05
		p													<0.0001	0.01	0.49
		N												204	191	193	173
HIN –	Household income	*r*													1.00	0.38	0.19
		p														<0.0001	0.13
		N													195	188	166
NH –	Number of people household income supports	*r*														1.00	0.01
		p															0.86
		N														195	166
VYEAR –	Year of the caregiver's primary vehicle	*r*															1.00
		p															
		N															176

APPENDIX H

RESPONSES ON THE CHILD PASSENGER SAFETY KNOWLEDGE QUESTIONNAIRE

Frequency of the caregiver's knowledge question responses.

Question Responses	*n*	Total %
For a child weighing less than 20 pounds and less than 1 year of age how should the child ride in the car?		
Seat belt alone	2	0.96
*Infant / Child car seat	203	97.13
Booster seat	3	1.44
Unsure	1	0.48
Someone's lap	0	0
Correct	203	97.13
Wrong	6	2.87
For a child weighing less than 20 pounds and less than 1 year of age, the infant car seat should face which direction when placed in a car?		
Forward Facing	11	5.31
*Rear Facing	195	94.20
Unsure	1	0.48
Missing	2	
Correct	195	93.30
Wrong	14	6.70
For a child weighing between 20 to 40 pounds and older than 1 year of age, how may the child ride in the car?		
Seat belt alone	3	1.44
*Infant / Child car seat	163	77.99
Booster seat	42	20.10
Unsure	1	0.48
Someone's lap	0	0
Correct	163	77.99
Wrong	46	22.01

Frequency of the caregiver's knowledge question responses – Continued.

Question Response	Total *n*	Total %
For a child weighing between 40 to 60 pounds, how should the child ride in the car?		
Seat belt alone	16	7.73
Infant / Child car seat	46	22.22
*Booster seat	143	69.08
Unsure	2	0.97
Someone's lap	0	0
Missing Data	2	
Correct	143	68.42
Wrong	66	31.58
For a child weighing 25 pounds and 1 year 2 months old, how should the child ride in the car?		
Forward Facing	145	70.39
*Rear Facing	58	28.16
Unsure	3	1.46
Missing Data	3	
Correct	58	27.75
Wrong	151	72.25
The safest place for a child less than the age 13 years old to ride in a car is:		
Front seat passenger	3	1.46
*Rear seat in the middle	86	41.95
Rear seat behind the passenger or driver	113	55.12
Unsure	3	1.46
Missing Data	4	
Correct	86	41.15
Wrong	123	58.85

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	*n*	Total %
If the car has "SRS" imprinted on the dash board, what does this means? Please circle the correct response at the end of the statement:		
An air bag is present.		
*Yes	149	74.13
No	6	2.99
Don't Know	46	22.89
Missing Data	8	
Correct	149	71.29
Wrong	60	28.71
How can you tell if a car is equipped with an air bag on the front driver's side? Please circle the given response at the end of the statement:		
The steering wheel has the word "SRS" or "Air Bag" printed on it.		
*Yes	166	88.30
No	5	2.66
Don't Know	17	9.04
Missing Data	21	
Correct	166	79.43
Wrong	43	20.57
The owner's manual includes a section on air bags.		
*Yes	151	92.64
No	7	4.29
Don't Know	5	3.07
Missing Data	46	
Correct	151	72.25
Wrong	58	27.75

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	*n*	Total %
An "Air Bag" sticker or decal is present on the driver side sun visor.		
*Yes	139	80.81
No	12	6.98
Don't Know	21	12.21
Missing Data	37	
Correct	139	66.51
Wrong	70	33.49
How can you tell if a car is equipped with an air bag on the front passenger side? Please circle response at the end of the statement: The dash board has the word "SRS" or "Air Bag" printed on it.		
*Yes	160	87.91
No	5	2.75
Don't Know	17	9.34
Missing Data	27	
Correct	160	76.56
Wrong	49	23.44
The owner's manual includes a section on air bags.		
*Yes	139	89.10
No	8	5.13
Don't Know	9	5.77
Missing Data	53	
Correct	139	66.51
Wrong	70	3.49

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	*n*	Total %
An "Air Bag" sticker or decal is present on the passenger side sun visor.		
*Yes	128	76.19
No	14	8.33
Don't Know	26	15.48
Missing Data	41	
Correct	128	61.24
Wrong	81	38.76
Please tell me whether you agree or disagree with the following statement: "If my car has a driver side air bag, I don't need to wear my seat belt when driving."		
Agree	5	2.42
*Disagree	200	96.62
Don't Know	2	0.97
Missing Data	2	
Correct	200	95.69
Wrong	9	4.31
Please tell me whether you agree or disagree with the following statement: "If my car has a passenger side air bag, I don't need to wear my seat belt when riding in the front seat."		
Agree	4	1.93
*Disagree	200	96.62
Don't Know	3	1.45
Missing Data	2	
Correct	200	95.69
Wrong	9	4.31

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	*n*	Total %
Which one group of children should NEVER be placed in front of an air bag in a car?		
8-year-old child in a seat belt	29	14.29
3-year-old child in a child car seat	40	19.70
*Infant in a infant car seat rear facing	134	66.01
Missing Data	6	
Correct	134	64.11
Wrong	75	35.89
If you owned a new model (2006) pick-up truck with no rear seats and wanted to carry an infant in the front passenger side of the truck, what should you do to protect the child from an air bag related injury once the child is properly restrained?		
Correct	76	37.25
Incorrect	128	62.75
Missing Data	5	
On a trip to the store, a 5-year-old child must ride in the front seat of a 5 passenger car with a passenger side air bag. After properly restraining the child, what precautions could you take to reduce the possibility of the child being injured by an air bag?		
*Move the passenger front seat as far back as it is able to go	94	45.63
Have the air bag turned off or disconnected	70	33.98
There are no additional precautions that can be taken	13	6.31
Don't know	29	14.08
Missing Data	3	
Correct	94	44.98
Wrong	115	55.02

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	*n*	Total %
Would you say that air bags in new model cars and trucks (1999 and later Models) are:		
*Less powerful than 5 years ago	14	6.83
The same as 5 years ago	27	13.17
More powerful than 5 years ago	70	34.15
Don't know	94	45.85
Correct	14	6.70
Wrong	195	93.30
Infants properly restrained in an infant car seat should not be turned from a rear facing position to a forward facing position until the infant:		
Is one-year-old	20	9.76
Twenty pounds in weight	23	11.22
One-year-old OR weighs twenty pounds	33	16.10
One-year-old AND weighs twenty pounds	86	41.95
*Reaches the weight limit of the seat, usually 30 pounds in weight	43	20.98
Missing Data	4	
Correct	43	20.57
Wrong	166	79.43
Virginia law states that children should be restrained in a child car seat until:		
*The child is 6 years old	41	20.40
The child weighs eighty pounds	23	11.44
The child is 6 years old OR weighs eighty pounds	69	34.33
The child is 6 years old AND weighs eighty pound	67	33.33
Missing Data	8	
Correct	41	19.62
Wrong	168	80.38

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	*n*	Total %
If you owned a new model (2006) pick-up truck with no rear seats and wanted to carry an infant in the front passenger side of the truck, what should you do to protect the child from an air bag related injury once the child is properly restrained?		
Car seat face rear	1	0.76
Deactivate the airbag	1	0.76
Disable air bag	1	0.76
Disable air bag passanger side	1	0.76
Disable airbag	3	2.29
Disable the air bag	1	0.76
Disable the passenger air bag	1	0.76
Disarm the airbag	1	0.76
Disengage the airbag	2	1.53
Disengage the airbag or rear facing car	1	0.76
Do not put seat in front of an airbag	1	0.76
Don't carry them	1	0.76
Don't know	5	3.82
Don't put child in truck	1	0.76
Don't put child on the truck	2	1.53
Don't ride the child	1	0.76
Face rear	2	1.53
Face rear and seat in middle	1	0.76
Face the child backwards	1	0.76
Face the infant backwards	1	0.76
Face them to the rear so they can breath if anything happen	1	0.76
Facing rear	1	0.76
Keep pillows and drive carefully.	1	0.76
Make sure it face rear.	1	0.76
Make sure seat	1	0.76
Middle in car seat facing backwards	1	0.76
Middle of car between driver and passenger in seat belt	1	0.76
Middle seat instead or turn off the passenger airbag	1	0.76
Most trucks-at least Ford trucks have an airbag turn of key switch. This needs to be turned off.	1	0.76
Never owned a truck	1	0.76
No	1	0.76
Not sure	1	0.76

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	Total *n*	Total %
Place face rear in the middle	1	0.76
Place in middle seat rear facing	1	0.76
Not place rear facing in the middle	1	0.76
Place the car seat in the middle seat	1	0.76
Place the car seat rear facing and fasten seat belt	1	0.76
Place the child in the center	1	0.76
Place the seat in middle of seat facing rear	1	0.76
Place them rear facing	1	0.76
Push seat all the way back	1	0.76
Push seat all the way back or turn off air bag if possible	1	0.76
Push the seat back further	1	0.76
Put child in car seat facing away from window	1	0.76
Put child in the middle	1	0.76
Put in middle	1	0.76
Put in middle next to driver	1	0.76
Put seat back as far as possible then fasten child car seat properly. If equipped turn off passenger air bag.	1	0.76
Put the back of the car seat to the airbag	1	0.76
Put them in the middle	1	0.76
Rear facing	3	2.29
Rear facing car seat	1	0.76
Rear facing in the middle	1	0.76
Returned the car	1	0.76
Seat belt, Child/Infant seat rear facing	1	0.76
Seat the child in the middle	1	0.76
Sell the truck, get a car or van with safety features to your child's safety	1	0.76
The back of the car seat should be facing the window	1	0.76
The child should be rear faced	1	0.76
They should not be in the front seat of a pickup truck	1	0.76
Turn air bag off	1	0.76
Turn airbag off	2	1.53
Turn airbag off switch	1	0.76
Turn airbag off with key	1	0.76
Turn airbag switch off	1	0.76
Turn car seat facing rear	1	0.76
Turn it off	3	2.29
Turn it off (airbag)	1	0.76
Turn off	1	0.76
Turn off air bag	1	0.76

Frequency of the caregiver's knowledge question responses – Continued.

Question Responses	Total *n*	Total %
Turn off air bag	1	0.76
Turn off airbag	3	2.29
Turn off airbag	7	5.34
Turn off airbag on passenger side	1	0.76
Turn off airbag or drive different vehicle	1	0.76
Turn off airbag with a key or a button	1	0.76
Turn off airbags.	1	0.76
Turn off if possible	1	0.76
Turn off passenger side airbag	1	0.76
Turn off side passenger airbag	1	0.76
Turn off the airbag	8	6.11
Turn off the airbag or get another vehicle	1	0.76
Turn off the airbag/disconnect it	1	0.76
Turn off the passenger side airbag.	2	1.53
Turn the air bag off	1	0.76
Turn the air bag off after facing the car seat rear facing	1	0.76
Turn the airbag off	1	0.76
Turn the airbag off & use the seat belt to properly secure the child/infant	1	0.76
Turn to rear	1	0.76
Unknown	1	0.76
Unsure	3	2.29
Unsure - however, I will guess that a child seat in the front of a car facing the rear will create greater injury than it facing forward.	1	0.76
Use airbag turn off switch	1	0.76
Use the middle seat	1	0.76
What is the best way for child safety?	1	0.76
Wouldn't do it	1	0.76
You should never place and infant in the front seat period.	1	0.76
You should not by a two seater truck if you have an infant	1	0.76
You shouldn't have a child in front (never)	1	0.76

Note. Percentages may not add to totals because of rounding.
* = Correct answer.

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Professional Experience

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South Norfolk Pediatric Center, Chesapeake, Virginia

Emergency Department Staff Nurse (1993-2002, 2005-Present)
Bon Secour Health Systems, Norfolk, Virginia

Consultant for Disaster and Emergency Medical Services (1991-Present)
Republic of the Philippines, Department of Health and Philippine National Red Cross

Child Passenger Safety Technician Instructor (1997-Present)
Emergency Medical Technician (1975-Present), Paramedic (1992-Present)

Honors and Awards

Fellow-National Association of Pediatric Nurse Practitioners: National Treasurer, 2004-2008
Virginia: Hampton Roads Chapter, Treasurer 1996-2002, President-Elect 2002-2003, President 2003-2005

Publications and Presentations

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