Prevention of Elderly Pedestrian Injury - A Comprehensive Approach and Analysis

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PREVENTION OF ELDERLY PEDESTRIAN INJURY – A COMPREHENSIVE APPROACH AND ANALYSIS

By

Carl I. Schulman

A DISSERTATION

Submitted to the Faculty of the University of Miami in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Coral Gables, Florida

May 2011
UNIVERSITY OF MIAMI

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

PREVENTION OF ELDERLY PEDESTRIAN INJURY – A COMPREHENSIVE APPROACH AND ANALYSIS

Carl I. Schulman

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The mortality rate for elderly pedestrians struck by vehicles is the highest of any age group, approaching 30% in several large series. Currently, there is a lack of epidemiological studies of the risk factors associated with elderly pedestrian injury; in particular, few prospective studies of elderly pedestrian injuries have been performed. The primary purpose of this project was to identify risk factors that will lead to the development and implementation of effective prevention strategies to reduce the risk of pedestrian injury in this vulnerable population. The project had three phases. In phase 1, pilot studies were performed and identified potential risk factors for elderly pedestrians and confirmed their ability to recall accident details. Risk factors identified included certain walking and street crossing behaviors, as well as the lack of use of assistive devices. In Phase 2, the relatively new case-crossover design was utilized to investigate the association of transient (proximate) triggers or exposures with elderly pedestrian injuries. The relative risk of injury if not obeying the traffic signal is five-fold (odds ratio = 5.2; 95% confidence interval = 1.8 – 15.1). Risk factors such as use of sedating or mood altering medications, or the use of alcohol did not have sufficient discordance for analysis. The behavioral findings suggested that
educational programs and behavioral modification might play an important role in designing future interventions. Therefore, in Phase 3, an elderly pedestrian safety program called Safe Crossings was created and evaluated. Over 700 subjects participated in the programs, with 99% reporting they felt it was an important topic and 93% acknowledging they learned something from the program. Focus groups were also utilized to help refine the content and delivery of the program. Posters and brochures were created and distributed in English, Spanish and Creole. The program is now set for wider dissemination and validation.
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Chapter 1. Introduction

1.1. General overview

As the fastest growing age group of the US population, the elderly will comprise an increasingly important proportion of trauma victims. Among the many mechanisms of injury, elderly pedestrian injuries have one of the highest morbidities and mortalities of any trauma population. The mortality rate for elderly pedestrians struck by vehicles is the highest of any age group (NHTSA 1998), approaching 30% in a large series of pedestrian injuries (Peng and Bongard 1999). It has been postulated that decreased mobility and visual acuity are key risk factors for elderly pedestrian injury (Allen, Hazlett et al. 1969; Aronson, Nakabayashi et al. 1984; Ferrera, Bartfield et al. 2000), but this has not been validated in clinical studies. In fact, few analytic studies of elderly pedestrian injuries have been performed, particularly longitudinal studies. In addition, the roles of pedestrian behavior versus pedestrian environment have not been elucidated. Some studies suggest that focusing on environmental and engineering changes is a more cost effective approach. Currently, there is a lack of epidemiological studies of the risk factors associated with elderly pedestrian injury. Identification of these risk factors will lead to the development and implementation of effective prevention strategies to reduce the risk of pedestrian injury in this vulnerable population.

1.2. Specific aims and hypotheses

Specific Aim 1: Pilot studies will be performed to determine 1) potential risk
factors associated with elderly pedestrian injuries, and 2) the ability of elderly trauma victims to recall information about the incident, and whether they could reliably and accurately recall recent events and previous similar circumstances. Individual and environmental risk factors that could contribute to elderly pedestrian injuries will be identified.

Specific Aim 2: To determine proximate risk factors, including physical, psychological, environmental, and walking behaviors associated with elderly pedestrian injuries. This aim will be met by testing the research hypothesis using a case-crossover study design, which was developed to study the association of transient exposures and acute health outcomes.

H1-1: Controlling for demographic and roadway factors, the lack of compliance with the use of crosswalks will be associated with increased risk of elderly pedestrian injury.

H1-2: Controlling for demographic and roadway factors, the lack of compliance with the use of pedestrian signals will be associated with increased risk of elderly pedestrian injury.

H1-3: Controlling for demographic and roadway factors, proximate (transient) exposure to alcohol use or sedative/hypnotic drug use, depression or significant life stress will be associated with an increased risk of elderly pedestrian injury.

Other proximate exposures may include acute changes in physical and psycho-emotional states occurring in close temporal proximity to the pedestrian injury.
Specific Aim 3: To develop evidence-based recommendations to inform prevention strategies targeted at reducing elderly pedestrian injuries. This aim will be met through the development and implementation of an elderly pedestrian safety program, which will be piloted and evaluated throughout Miami-Dade County.

1.3 Study significance

The proposed research is innovative because it will be a comprehensive effort to investigate and characterize risk factors associated with elderly pedestrian injuries using a cutting-edge epidemiologic study design. First, we will identify patient and environmental risk factors that contribute to elderly pedestrian injuries. It is our expectation that knowledge of the risk factors associated with elderly pedestrian injury will guide the design of an effective prevention program and decrease elderly pedestrian injuries. To this end, we will create, implement and evaluate a pilot intervention program based on study results. These results will be significant by creating evidence-based interventions to decrease the frequency and severity of elderly pedestrian injuries in a cost-effective manner.

The area of injury prevention is under-represented in research related to traumatic injuries, and this study will provide a model of injury prevention for elderly pedestrians.
Chapter 2. Pilot Study of Elderly Pedestrian Walking Behavior

2.1 Overview

This chapter will describe the pilot study that formed the basis for the analytic case-crossover study to follow. Specifically, survey methods were used to assess self-reported characteristics and behaviors from a typical group of elderly pedestrians in Miami-Dade County. These formed the basis for the development of variables to be tested using the more rigorous case-crossover methodology. A review of the literature highlighting the scope of the problem and the scant literature regarding known and potential risk factors is presented. This is followed by a detailed description of the methods and results. Only descriptive statistics are offered, as this was an attempt to identify potential risk factors for study in the more rigorous case-crossover study that followed.

2.2 Background

The Problem of Elderly Pedestrian Injury

In 2003, the National Highway and Transportation Safety Administration (NHTSA) reported 4,749 pedestrian traffic-related deaths and 7,000 non-fatal injuries (NHTSA 2000). In 1998, pedestrian fatalities were the 2nd leading cause of motor vehicle deaths and 13% of all motor vehicle-related deaths (IIHS 1999). In fact, one pedestrian is killed in a traffic crash every 111 minutes and one pedestrian is injured in a traffic crash every 8 minutes (NHTSA 1998). More than half of crashes occur at night (NHTSA 1998) when less than optimal visual acuity may play a role. Substance abuse is also a problem with either the driver or pedestrian having measurable blood alcohol levels in almost half of all crashes.
Pedestrians greater than 65 years old comprise 10% of the population, yet account for 21% of pedestrian fatalities, and their death rate of 2.95 per 100,000 is the highest for any age group (Aronson, Nakabayashi et al. 1984; NHTSA 2000).

Miami-Dade County (Florida) has the 3rd highest number of pedestrian injuries and fatalities in the United States, and is ranked 1st in the state of Florida. With a population of approximately 3 million people and a complex community with a diversity of risk factors, a significant number of pedestrian crashes involve the elderly. The Metropolitan Planning Organization of Miami-Dade County reports 1572 pedestrian crashes involving the elderly from 2000-2004. Of those greater than 60 years old, the highest risk are those greater than 75 years old. The following table demonstrates the pedestrian crash experience from Miami-Dade County from 2000-2004:

Table 2.1 – Pedestrian Crashes in Miami-Dade County, 2000-2004

<table>
<thead>
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<tr>
<td>60-64 years</td>
<td>2/64</td>
<td>3/60</td>
<td>4/71</td>
<td>5/69</td>
<td>4/58</td>
</tr>
<tr>
<td>70-74 years</td>
<td>6/49</td>
<td>4/70</td>
<td>3/58</td>
<td>5/50</td>
<td>5/45</td>
</tr>
<tr>
<td>75+ years</td>
<td>18/113</td>
<td>18/111</td>
<td>12/119</td>
<td>20/111</td>
<td>14/104</td>
</tr>
</tbody>
</table>

Risk Factors in Pedestrian Trauma

Attempts have been made to identify specific risk factors for elderly pedestrian injuries. Hui and colleagues compared demographics, injury severity, injury
patterns, and outcomes of elderly patients with pedestrian injury versus motor vehicle occupant injury (Hui, Avital et al. 2002). Injury severity score, APACHE II (ICU severity score), and mortality were significantly higher in the pedestrian group. Logistic regression identified 3 independent predictors of mortality: Apache score, intra-cranial hemorrhage with mass effect, and cardiac complications.

Lyons and colleagues looked at the socioeconomic variation in injured children and older people (Lyons, Jones et al. 2003). The population was divided into 3 age groups (0-14, 15-75, 75+), and a measure of socioeconomic deprivation was determined. Adult pedestrian injuries showed a significant gradient in socioeconomic status, with the “deprived” group having higher hospitalization rates. This is consistent with the common finding that socioeconomic status is often associated with many different health outcomes.

Among pediatric pedestrians, Roberts and colleagues investigated the risk of injury related to sensory deficits (Roberts and Norton 1995). This case control study identified significantly increased risk of injury was associated with poor vision or hearing. The risk of pedestrian injury for children whose parents reported abnormal vision was over four times that of children with reported normal vision (odds ratio = 4.25, 95% confidence interval 1.68 to 10.8). The risk of injury for children whose parents reported abnormal hearing was close to twice that of children with reported normal hearing (odds ratio = 1.73, 95% confidence interval 0.83 to 3.61). It seems reasonable to hypothesize that the elderly who
have similar functional deficits in hearing and vision could likewise be at increased risk.

Negligence of the driver and/or pedestrian was studied by Baker and colleagues who reviewed medical records, police reports, and written summaries of accidents (Baker, Robertson et al. 1974). They found 46% of drivers and 60% of pedestrians were negligent (in 25%, both were negligent). Twenty-one percent were speeding, and 22% age 65 or older tested positive for alcohol. Attempts to understand and modify the elements of the injury-producing sequence are important because the pedestrians who are most likely to be killed are often those who are the hardest to influence. The authors suggested that possible use of countermeasures to help pedestrians and drivers see each other better, and vehicle modifications to lessen the injury of impact may prove beneficial (Baker, Robertson et al. 1974).

An observational study by Hoxie et al (1994) attempted to determine the percentage of older pedestrians at risk for injury as a result of reduced walking speeds. A questionnaire was administered to pedestrians who were unable to cross the intersection in time, and the actual gait speed of a sample of 100 younger and 100 older pedestrians was measured. Of the 592 older pedestrians observed (mean age 77 years), 27% were unable to reach the opposite curb before the light changed to allow cross traffic to enter the intersection, and one-fourth of this group were stranded by at least a full traffic lane away from safety. The timing of the signal did not allow adequate time for many older pedestrians to cross, and put them at significant risk (Hoxie and Rubenstein 1994).
A study of five intersections in Miami Beach identified problems encountered by elderly pedestrians (Guerrier, 1998). They discovered pedestrians generally found the time available to cross the street was too short. The data demonstrated that for 15% of elderly pedestrians 3 of 4 intersections studied provided insufficient crossing time. Many of the difficulties of the older pedestrians were physical limitations. In the majority of pedestrian-vehicle conflicts studied, the pedestrians were at fault. They concluded that the results underscored the need for countermeasures that include engineering design considerations and educational campaigns for pedestrians (Guerrier, 1998). A more recent study in Spain measured the normal walking speed of a nationally representative sample of people 75 or more years of age (Romero, 2010). Their study compared the median walking speed of this sample against the reference speed of 0.7m/s. They found that 75.2% of women and 66.7% of men had individual walking speeds less than would be required to safely cross the street and that urgent corrective measures are needed to avoid discrimination and protect the safety of this growing sector of the population (Romero, 2010). Several other recent studies have come to a very similar conclusion (Romero-Romero-Ortuno, 2010 & Amosun, 2007).

Recently, Koepsell et al (2002) performed a case control study of crosswalk markings and the risk of pedestrian-motor vehicle collisions in older pedestrians. The units of study were crossing locations. They explored whether crosswalk markings at urban intersections influence the risk of injury to older adults. Control sites were other nearby crossings matched to case sites based
on street classification. Environmental characteristics, vehicular traffic flow and speed, and pedestrian use at each site were recorded. After adjusting for pedestrian flow, vehicle flow, crossing length, and signalization, the risk was found to be 2.1 fold greater at sites with a marked crosswalk. This was due to the excess risk associated with marked crosswalks at sites with no traffic signal or stop sign (Koepsell, McCloskey et al. 2002). In other words, older pedestrians were more likely to be injured using a crosswalk without a signal or stop sign to halt the flow of traffic. This suggests modification of these crosswalks could decrease the incidence of older pedestrian injury.

2.3. Methods

Survey Study of Elderly Pedestrian Behavior

In order to determine the normal walking behaviors and risk factors of elderly pedestrians in the Miami area, a prospective descriptive study was performed. A questionnaire was created and administered to elderly persons felt to be indicative of the typical elderly pedestrian.

Survey Instrument

The anonymous questionnaire consisted of two separate surveys. A previously validated health survey, the SF-8, was used to gather information about the general health and well being of the study population. The SF-8 is a practical tool for directly linking the norms from large population surveys with the results from more focused clinical trials, outcomes research studies, and monitoring efforts in everyday clinical practice (SF-8, Quality Metric Corp). It is made up of
eight questions, which are used to provide a score for the subject’s mental and physical state of being.

Following the SF-8 was a newly created survey to determine possible patterns or routine behaviors of elderly pedestrians while walking (see Appendix 1). Demographic and descriptive variables were measured such as age, gender, race, ethnicity, marital status, and the primary language spoken by the subjects at home. The acute physical state (such as physical injury, illness, alcohol, psychoactive medication use, or any other deviation from the usual physical baseline within the previous 7 days) was measured. Any anxiety, anger, significant life event/stress, or other deviation from the usual psycho-emotional baseline within the previous 7 days was also measured. These questions were not based on any previously validated measures, but were pilot tested with a small group of elderly participants. The subject’s nature of walking (such as use of assistive devices, accompaniment (person or pet), clothing colors, cell phone use, frequency of adhering to the crosswalk signals, and any possible distractions while walking) was measured.

Since all results remained anonymous with no names or unique subject identifiers, informed consent consisted of a cover letter explaining the study and participant’s rights. Potential participants were told that participation is completely voluntary. All questionnaires were provided in the most common primary languages of the Miami area (English and Spanish).
Inclusion/Exclusion Criteria

The inclusion criteria for eligibility in the study were as follows: 55 years or older, walk more than 3 blocks on at least 2 different occasions each week, and willing to provide informed consent. Those meeting the required criteria were accepted as subjects. Fifty-five years was chosen as the age cut-off because they have the highest mortality in pedestrian crashes compared to younger age groups.

Study Sites

Two study sites (sources) were used for obtaining data for the study. The first was a local physician’s office in the Miami, Florida area. Special attention was used to inform the patients that participation in the study was completely voluntary and would not affect their care or treatment in any way. The second site was an elderly activity center in Little Havana, a predominantly Hispanic area, also in Miami. This site was chosen primarily because of its membership of active people over the age of 55. The time period for subject enrollment lasted for one month. The study was approved by the University of Miami Institutional Review Board.

Statistical Analysis

All data were entered into a master study database using Microsoft Excel. Descriptive statistics (including the mean, median, range and standard deviation) were calculated where appropriate for interval variables. The ordinal data were analyzed graphically to determine any patterns or behaviors that might be considered risk factors for injury, and percentages of the scaled responses were
calculated. The primary outcome measures for the study were potential risk factors for elderly pedestrian injury.

The SF-8 data were scored by assigning the appropriate scale score to each SF-8 item in accordance with its scoring guidelines. The summary score for each item was then compared to the norms provided from the 2000 general US population in the appropriate age group. In addition, physical and mental weights were assigned to the SF-8 scales to yield summary scores of the level of physical and mental functioning (abbreviated PCS and MCS), which were also compared to age appropriate US population norms. Differences from US population norms were assessed by student’s t-test with significance set at $p < 0.05$.

2.4 Results

The average age of the 104 subjects in this study was 74 (range 55-90). Females made up 76% of the subject sample. Almost all spoke Spanish as their primary language. Only 7% spoke English. 15% of the subjects that responded walk between 6PM and midnight suggesting that decreased visibility may be a modifiable risk factor. Table 2.2

Table 2.2 Demographics

<table>
<thead>
<tr>
<th>n=104</th>
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<tbody>
<tr>
<td>Age</td>
<td>74 ± 8 (range 55-90)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>76% Female</td>
<td>26% Male</td>
</tr>
<tr>
<td>Primary Language</td>
<td>93% Spanish</td>
<td>7% English</td>
</tr>
<tr>
<td>Marital Status</td>
<td>38% Married</td>
<td>16% Divorced</td>
</tr>
<tr>
<td>Race</td>
<td>98% White</td>
<td>2% Black</td>
</tr>
<tr>
<td>Work Status</td>
<td>15% Fulltime</td>
<td>29% Part-time</td>
</tr>
<tr>
<td>1° Walking Reason</td>
<td>59% Personal</td>
<td>33% Exercise</td>
</tr>
<tr>
<td>Time of Day Walking</td>
<td>85% Daytime</td>
<td>15% Nighttime</td>
</tr>
</tbody>
</table>

The results of the SF-8 questionnaire revealed that the study population was very similar to the general US population with regards to overall health status, physical and mental functioning. No significant differences were noted between the study population and US population norms.

Figure 2-1 – Health Status of Study Population vs U.S. Population

10% of respondents continue their walking activities when it is raining. The most frequent type of clothing elderly pedestrians reported wearing when walking are dark colored clothes. Only 14% wore bright colored clothes, and not one subject reported the use of reflective gear. Of the 12% that used an assistive device for walking, most used a cane, and a few used a walker or a wheelchair. Surprisingly, 64% never used it, whereas only 13% always used their device. About three quarters of the subjects wore some form of corrective lenses, and
23% stated they never wear them to walk. Of the 8% who wear who used a hearing aid, 61% stated they never wear it while walking (Figure 2-2).

Figure 2-2. Use of assistive devices. The percentage of patients that never use their assistive devices when walking (of those that have them normally) and the absolute percentage of all study patients that go walking without their assistive devices are shown.

Regarding traffic behaviors, 20% never crossed the street at a crosswalk, 12% never waited for the traffic signal before crossing the street, and 9% never walked on the sidewalk (Figure 2-3).

Thirty-one percent of subjects considered themselves nervous or anxious, and 87% of subjects had been told by a doctor that they had a mental illness such as anxiety, depression, schizophrenia, or other mental disorder. Eight percent of subjects indicated they had a fight or argument with a loved one or friend that had significantly affected them within the past 30 days of being
surveyed. Eleven percent of subjects stated they had received some bad news, such as a personal loss, financial loss, or other life event that had significantly affected them within the past 30 days of filling out the questionnaire. When asked if a family member or friend had died in the past 30 days, 16% responded yes. Five percent of subjects stated they drink daily and 10% of subjects responded yes to 1 or more of the CAGE type questions for alcohol abuse.

2.5 Conclusions

Although limited by sample size and demographic homogeneity, this study provided important insight into the potential risk factors for elderly pedestrian injuries. The surprising lack of adherence to pedestrian traffic rules, the non-compliance in using assistive devices, and the environmental and traffic

Figure 2-3. Elderly pedestrian walking behavior. Note that 15 to 26 percent of elderly pedestrians rarely or never exhibit safe pedestrian behaviors.
conditions encountered by a significant number of elderly pedestrians suggest that effective intervention strategies could be developed and implemented to decrease the rate of elderly pedestrian injuries. The results of this study have been submitted for peer-reviewed publication.
Chapter 3 - Pilot Study of Elderly Trauma Victim Recall

3.1 Overview

This chapter will describe a very limited pilot study to assess the ability of elderly trauma victims to recall the details surrounding their traumatic event. A review of the challenges of performing research in this population is followed by the detailed methods and results of the pilot study. As the sample size was extremely limited, only descriptive statistics are offered.

3.2 Background

Epidemiologic Research in the Elderly

There are several issues related to carrying out epidemiologic research in the elderly. One is the length of the questionnaire. In the very elderly, fatigue tends to set in after about half an hour, so questionnaire length should be limited and multiple sessions may be required to complete the questionnaire. A significant amount of detail can be frustrating to older people. Closed ended questions with pre-determined response categories generally facilitate answers by the elderly.

In general, there is a short time window for interviewing in the hospital. Admitted patients may experience considerable physical and psychological pain. Discharge may happen quickly due to insurance reasons. This requires close surveillance of the patient so he/she can be interviewed during the short time frame in which an interview is feasible. Telephone interviewing may be the only way to conduct an interview for some study subjects (Kelsey, 1989).

Vision and hearing impairments are common in the elderly, and may present substantial barriers to communication. Reading material must be in very large
print; and hearing problems require clear, direct speech with frequent repetitions
by the interviewer as well as allowing increased time for the interview to take
place. Rambling may present a problem, and a balance must be achieved
between allowing the respondent to talk freely and avoiding irrelevant digressions
in a proper and tactful manner. These differences highlight that interviewer skill
is particularly important in studies of the elderly, and training must take into
account the particular characteristics of the elderly (Kelsey, 1989)

These techniques were used successfully in a case-control study seeking to
identify risk factors for falls as a cause of hip fracture (Grisso, 1991). There were
174 subjects with a median age of 80 years. Trained interviewers used a
standardized questionnaire to ask the subjects about extremity function,
eyesight, medical and surgical history, use of medications before hospitalization,
dietary history, height, weight, symptoms related to balance and gait,
sociodemographic information, and the circumstances of the fall. The interviews
were conducted within 9 days of hospital admission. Agreement between the
results of the interview and the medical records were assessed and they had
good agreement with a kappa statistic of 0.75 (Grisso, 1991). This suggests the
injured elderly patient may be able to provide reliable and accurate recall
information about their history and the injury event.

3.3 Methods

Study Setting

Participants were recruited from the Trauma Center, the Emergency Room, and
from recently admitted inpatients.
Inclusion Criteria

Patients were included if they were: the victim of a fall, motor vehicle, or pedestrian crash incident. All patients were ≥ 60 years old and had a Glasgow Coma Score of 15 at the time of the interview. Patients were approached for inclusion after their initial work-up and/or when their condition had stabilized. The study was IRB approved and all subjects signed informed consent prior to participation.

Participant Screening

The Folstein Mini Mental State examination was used as an initial screening tool (after obtaining informed consent) to determine eligibility to proceed with the study questionnaire. A score of 27 or greater was required. Recruitment was performed with a once a day screening of the Trauma Center and Emergency Room Census for potential study participants.

Study Questionnaire

This was followed by a study questionnaire (see Appendix 2) including basic demographics, details of the injury incident, and recollection of similar occurrences over the preceding 7 days. When possible, a spouse or caretaker was also interviewed to confirm the accuracy of the information provided. Questions (including medication use, alcohol use, physical and emotional state at the time of the incident and the several days prior to the incident) were included. The questionnaire was administered by the Principal Investigator, with the help of a Spanish interpreter when necessary.
3.4 Results

A total of 13 patients were screened for eligibility over a 3-week period. No patient refused to participate, but 2 patients did not meet eligibility due to inability to answer questions and inadequate score on the Folstein Mini-Mental State Exam.

**Demographics**

There were 11 eligible patients. Mean age was 74 ± 9 (range 61-87). All patients had a score > 27 on the Folstein Mini-Mental State Exam.

<table>
<thead>
<tr>
<th>Gender</th>
<th>64% Women</th>
<th>36% Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td>64% Hispanic</td>
<td>36% Non-hispanic</td>
</tr>
<tr>
<td>Race</td>
<td>91% White</td>
<td>9% Black</td>
</tr>
<tr>
<td>Education</td>
<td>55% &lt; 8yrs</td>
<td>18% 12-16yrs</td>
</tr>
<tr>
<td>Employment Status</td>
<td>46% Retired</td>
<td>27% Employed</td>
</tr>
<tr>
<td>Marital Status</td>
<td>36% Married</td>
<td>64% Widow/Divorced</td>
</tr>
<tr>
<td>Mechanism of Injury</td>
<td>46% PHBC</td>
<td>36% MVC</td>
</tr>
</tbody>
</table>

PHBC=Pedestrian Hit By Car, MVC=Motor Vehicle Crash

There were 7 (64%) women and 4 (36%) men; 64% were Hispanic and 91% were white. Among the 11 participants, 6 (55%) completed < 8 years of school, 2 (18%) had between 12-16 years of school, and 3 (27%) had > 16 years of school. Five (46%) were retired, 3 (27%) were employed and 3 (27%) were unemployed. Only 4 (36%) were married and the remainder were widowed or divorced. Five (46%) were pedestrians hit by car, 4 (36%) were motor vehicle crashes and 2 (18%) were falls (Table 3-1).
The ability to recall information specific to the circumstances of the injury was also evaluated. Subjects were asked to recall the time of the incident, a description of the incident and for pedestrian crashes the details of the intersection such as signalization, crosswalk, and type of vehicle (Table 3-2). Police accident reports or rescue reports were used to confirm the time and description of incident.

Table 3-2 - Ability to recall incident information:

<table>
<thead>
<tr>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of Incident (within 2 hours)</td>
<td>9/11 (82%)</td>
</tr>
<tr>
<td>Time of Incident (within 4 hours)</td>
<td>11/11 (100%)</td>
</tr>
<tr>
<td>Description of Event</td>
<td>10/11 (91%)</td>
</tr>
<tr>
<td>Details of Intersection</td>
<td>4/6 (67%)</td>
</tr>
</tbody>
</table>

In addition, subjects were asked specifically to recall the use or presence of a condition on the day of the event and then separately for each of the 3 days preceding the event, followed by anytime in the past week. Discordancy was noted as any difference in the use or presence in any subject for any of the time periods reported (day of accident, preceding 3 days or past week) Table 3-3. None of this small sample reported the use of hearing aids or assistive devices for walking.

**Validity of Information:**

In 2 of the subjects, there was a family member who lived with the subject who was able to corroborate the subjects’ information as valid. This was done by a separate interview of the family member. For all questions for which the family member had knowledge (daily activities and behaviors), there was excellent concordance (>90%) between the subject and the family member.
Table 3-3. Ability to recall recent events:

<table>
<thead>
<tr>
<th></th>
<th>Able to Recall</th>
<th>Use/Presence</th>
<th>Discordancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medication Use (6/11)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day of Accident</td>
<td>6/6 (100%)</td>
<td>6/6 (100%)</td>
<td></td>
</tr>
<tr>
<td>3 Days Preceding Accident</td>
<td>6/6 (100%)</td>
<td>4/6 (80%)</td>
<td>2/6 (33%)</td>
</tr>
<tr>
<td>Missed any day in last week</td>
<td>6/6 (100%)</td>
<td>4/6 (80%)</td>
<td></td>
</tr>
<tr>
<td><strong>Alcohol Use (5/11)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day of Accident</td>
<td>5/5 (100%)</td>
<td>0/5 (0%)</td>
<td>2/5 (40%)</td>
</tr>
<tr>
<td>3 Days Preceding Accident</td>
<td>5/5 (100%)</td>
<td>2/5 (40%)</td>
<td></td>
</tr>
<tr>
<td>Past Week</td>
<td>5/5 (100%)</td>
<td>2/5 (40%)</td>
<td></td>
</tr>
<tr>
<td><strong>Sad or Depressed (3/11)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day of Accident</td>
<td>3/3 (100%)</td>
<td>2/3 (67%)</td>
<td>1/3 (33%)</td>
</tr>
<tr>
<td>3 Days Preceding Accident</td>
<td>3/3 (100%)</td>
<td>3/3 (100%)</td>
<td></td>
</tr>
<tr>
<td>Past Week</td>
<td>3/3 (100%)</td>
<td>3/3 (100%)</td>
<td></td>
</tr>
<tr>
<td><strong>Wear Glasses (5/11)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day of Accident</td>
<td>5/5 (100%)</td>
<td>4/5 (80%)</td>
<td>3/5 (60%)</td>
</tr>
<tr>
<td>Last time went out</td>
<td>5/5 (100%)</td>
<td>4/5 (80%)</td>
<td></td>
</tr>
<tr>
<td>Any Day/Week before Accident</td>
<td>5/5 (100%)</td>
<td>1/5 (20%)</td>
<td></td>
</tr>
<tr>
<td><strong>Raining (9/11 occurred outside)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At time of Accident</td>
<td>9/9 (100%)</td>
<td>0/9 (0%)</td>
<td>1/9 (11%)</td>
</tr>
<tr>
<td>Last time went out</td>
<td>9/9 (100%)</td>
<td>0/9 (0%)</td>
<td></td>
</tr>
<tr>
<td>Out in last week while raining</td>
<td>9/9 (100%)</td>
<td>1/9 (11%)</td>
<td></td>
</tr>
<tr>
<td><strong>Bright Clothing (Pedestrians Only)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During Crash</td>
<td>5/5 (100%)</td>
<td>2/5 (40%)</td>
<td></td>
</tr>
<tr>
<td>Last time went out</td>
<td>5/5 (100%)</td>
<td>2/5 (40%)</td>
<td></td>
</tr>
<tr>
<td>Anytime in last week</td>
<td>5/5 (100%)</td>
<td>3/5 (60%)</td>
<td></td>
</tr>
<tr>
<td><strong>Remember Breakfast items</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day of Accident</td>
<td>11/11 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Days Preceding Accident</td>
<td>10/11 (91%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.5 Conclusions

Although limited by sample size, this pilot study confirmed the ability of elderly trauma victims to accurately recall the details surrounding the event. The data also suggest there is moderate discordancy for certain items, which should allow the performance of the case-crossover study that follows.
Chapter 4. Case-Crossover Study of Elderly Pedestrian Injury

4.1 Overview

This chapter will begin with a review of the current state of the literature regarding injury risk and outcomes of elderly pedestrian crashes. Following this, an explanation of the unique case-crossover design will highlight its usefulness. A detailed description of the exact methods used to perform the study along with the study results will highlight the significant findings from this rare analytical study of elderly pedestrian crashes.

4.2 Background

Mechanisms and Outcomes of Elderly Pedestrian Injury

The landmark study of pedestrian injury was performed by Haddon and colleagues in 1961. They noticed an increased risk of accident involvement and fatality with increasing age, and that those killed were 17 years older than those similarly exposed but not killed (mean age killed 58.8 years versus controls 41.6 years) (Haddon, Valien et al. 1961). Since Haddon’s landmark study, numerous other researchers have corroborated and added to our knowledge of pedestrian injury. Brainard and colleagues performed a retrospective review of 115 patients in Arizona in 1987, and found not only that mortality increased with age, but that the incidence of fractures, the need for intensive care unit (ICU) and ventilator support, and hospital stay also increased with age (Brainard, Slauterbeck et al. 1989). Lane and colleagues with the Western Ontario Accident Research Team studied 198 pedestrian collisions (Lane, McClafferty et al. 1994). The elderly were found to be over-represented in the fatal cases with 37% of pedestrian
fatalities in those greater than 65 years old. They suggested the risk was greater for elderly pedestrians who move slower, spend a longer time on the street and in traffic. One might expect the elderly would adjust their behavior to compensate for these disabilities, but they may not be doing so. Older pedestrians often fail to recognize dangerous situations while walking (Jonah and Engel 1983). This may be due to mental confusion or sensory changes (hearing and vision) associated with aging (Aronson, Nakabayashi et al. 1984; Ferrera, Bartfield et al. 2000). Pedestrians commonly overestimate their actual visibility (Allen, Hazlett et al. 1969).

Hill and colleagues performed a prospective population based study, including all adult car occupants and pedestrians with an injury severity score greater than 15 (Hill, Delaney et al. 1996). Injured pedestrians were older (mean age 56 years old) than injured car occupants (mean age 26 years old). The median Injury Severity Score (ISS) for pedestrians was an astonishing 34 (an ISS > 15 is considered a severe life threatening injury). Even once they arrived at the trauma center, car occupant mortality was only 13% compared to 30% for pedestrians (Hill, Delaney et al. 1996).

Kong and colleagues looked retrospectively at 273 pedestrian motor vehicle injuries in Los Angeles county between 1991 and 1994 (Kong, Lekawa et al. 1996). Higher injury severity scores and higher mortality were found in the elderly. They associated increased risk with slower walking speeds and decreased visual acuity. It was suggested that educational programs and analyses of traffic patterns in endemic areas at specific locations and times may
be of benefit in preventing pedestrian motor vehicle injuries (Kong, Lekawa et al. 1996).

The Lack of Evidence Based Guidelines for Elderly Trauma

The Academy of Emergency Medicine published a research agenda for geriatric emergency medicine (Wilber and Gerson 2003). They pointed out that the limitations of current research are that many studies are single center retrospective analyses of trauma registries, and that the majority of the research is descriptive, with very little analytic research and no interventional trials. Larger data sets and quality prospective data are needed to improve models.

Similarly, the Eastern Association for the Surgery of Trauma published practice management guidelines for geriatric trauma (Jacobs, Plaisier et al. 2003). They asked several questions relevant to the current proposal, but found it is not possible to answer these questions because few, if any, prospective or randomized controlled trials definitively address these issues.

Case Crossover Studies

While relatively new, case-crossover studies have been successfully utilized to investigate the association of transient (proximate) triggers or exposures with acute, relatively rare, outcomes (Maclure and Mittleman 2000). Originally designed to study the effect of acute exposures on the risk of myocardial infarction, it is also suited to the study of such exposures in acute injuries, such as occupational injuries and motor vehicle accidents including pedestrian injuries (Roberts, Marshall et al. 1995; Redelmeier and Tibshirani 1997; Barbone, McMahon et al. 1998; Petridou, Mittleman et al. 1998; Lee and Schwartz 1999;
Sorock, Lombardi et al. 1999). The case-crossover design is closely analogous to a traditional matched-pair case control design (Figure 4-1).

In both designs, each case has one or more matched controls. The key feature of the case-crossover design is that each subject contributes as both a case and as a control. Specifically, in the case-crossover design, instead of the control being a different person at a similar time, the control is the same person at a different time (such as the same time on the day before the acute outcome). The most important feature of this design is that cases and controls are perfectly matched (within the subject) for all patient-centered characteristics, eliminating
confounding effects between individuals, which are a problem for classic case-control studies. This is particularly important for confounders, which are difficult to measure, such as risk-taking and other personality characteristics. Confounding may still be possible among subjects due to fixed factors (e.g. gender, age, roadway conditions). This issue may be addressed through the use of appropriate stratification techniques and the associated statistical analytic methods.

All traditional case-control studies take place within a theoretical cohort termed the “study base,” which is the person-time of exposure in which the subjects can become cases. Identifying controls which are representative of the same study base is challenging for acute injuries. This problem is solved by the use of the newer case-crossover design in which subjects serve as both cases and controls and are likely representative of the same study base. Within the study base, three other periods are defined: the “hazard period” is the time period between the onset of a proximate exposure and increased risk of the outcome (usually measured in minutes to days); the “effect period” is the induction period associated with the proximate exposure and usually very brief; and the “exposure window” is the arbitrary unit of observation, and is determined based on the length of hazard periods. The hypothesized unit of analysis is the “pedestrian event,” which either results in injury (cases) or does not (controls).

Recent work by Sorock and colleagues has expanded the use of the case-crossover design to the study of occupational injuries. This has allowed the identification of several methodological issues that have subsequently been
addressed. The proper determination of person-time at risk of injury and exposure must be carefully determined so that only person-time during which an individual is at risk is considered. Proper definitions of exposures and hazard periods must be carefully specified to capture the etiologically relevant exposures. The hazard period can vary depending on the nature and duration of the exposure under study. Lastly, the expected frequency of exposure and selection of control time periods will be influenced by the exposure experience of the subjects. The control time period may be investigated by means of the usual frequency analysis (UFA) or the pair matched interval approach (Sorock, 2001).

Another advantage of the case-crossover study design is that it is very efficient in terms of subjects, since each serves as both case and one or more controls. For relatively rare events such as elderly pedestrian injuries (25 per 100,000 person-years (NHTSA 2000), this design maximizes statistical power for an economical number of subjects. This also diminishes the problem of sparse distribution of cases and controls within study strata often seen in more traditional case-control studies.

4.3 Methods

Main Study Sites
The Ryder Trauma Center is a Level 1 Trauma Center within Jackson Memorial Medical Center (Miami, FL). Ryder sees approximately 4500 trauma patients and admits an average of 400 pedestrian injuries annually, with approximately 100 of these patients being greater than 60 years old. In addition, Broward General Hospital (Fort Lauderdale, FL) and their Level 1 Trauma Center were added as
an additional site to increase subject recruitment. Broward General sees approximately 2200 trauma patients each year.

**Subjects and Eligibility**

Each subject will contribute 1 case time period (window) and multiple control time periods (windows).

**Inclusion Criteria:**

- Alive
- Age ≥ 60 years old
- Involved in pedestrian versus motor vehicle accident
- Able to communicate with study team
  - Intact mental status (Folstein Mini Mental State Exam Score > 27)
  - Able to recall recent past events around the time of the injury
- Willingness to sign informed consent to participate

**Exclusion Criteria:**

- Intubated patients, or patients otherwise unable to communicate
- Patients with known cognitive dysfunction
- Presence of sensorium-altering medications (at the time of the interview)
- > 72 hours from time of injury to enrollment
- Absence of pedestrian events in the period up to 28 days prior to pedestrian injury.
- Refusal of participation

**Screening and Enrollment**

Daily examination of the census at Ryder Trauma and Broward General allowed
rapid identification of potential subjects (usually < 24 hours of admission). A member of the study team met with all potential study patients (based on inclusion/exclusion criteria) and explained the study. Patients who were ineligible based on study criteria or who refused participation were thanked for their time. Eligible patients who were willing to participate were asked to sign the informed consent form after thorough explanation of study procedures. The Folstein Mini-Mental State Examination was administered by a member of the study team who had undergone specific training in the administration of the examination. The study interview was conducted either by a trained member of the study team or by the Principal Investigator. All patient interactions, verbal and written, were conducted in English or Spanish by a member of the study team.

If at any time during the enrollment or study interview the investigator noticed any increased anxiety or stress exhibited by the subject due to attempts to recall the crash or past events, the interviewer offered to terminate the interview and appropriate support was offered.

Incentives
As an incentive to enrollment and compensation for their time, subjects were offered $25 for their participation in the study. In addition, if any healthcare related deficiencies were noted in the course of the study interview (lack of assistive devices, need for additional testing, etc.), appropriate referrals were given and the clinical team was notified, after appropriate consultation with the attending physician of record.
Assessment

Demographic and descriptive variables were measured (such as age, gender, race, ethnicity, marital status, educational level, primary language spoken in the home, and usual health state). Proximate exposures were identified based on our pilot data results as well as continued review of the literature. Proximate exposures were measured and categorized into one of at least four domains:

**Acute Physical State:** included acute injury, illness, alcohol or new sedative/hypnotic medication use or any other deviation from usual physical baseline within the exposure window.

**Acute Psycho-emotional State:** included acute depression, anxiety, anger, other strong emotion, significant life event/stress (positive or negative) or other deviation from usual psycho-emotional baseline within the exposure window.

**Pedestrian Walking Behavior:** included behaviors such as using the crosswalk, waiting for the signal, using the sidewalk, use of assistive devices (cane/walker, hearing aid, glasses), walking in bad weather or in low visibility (dusk to dawn).

**Traffic Environment:** included factors such as type of roadway and intersection, pedestrian signalization, crosswalk (surface, condition, width), width of street, number of lanes crossed, traffic volume and traffic speed.

Measurement tools were generated and developed based on the experiences and results obtained from the pilot study and previous studies in the literature.

**Study Outcome:** Incidence of Pedestrian Injury
Case Window: The maximum case window consisted of the pedestrian event culminating in the pedestrian injury. Data collection was sufficient to test these case windows in terms of potential person-times of exposure.

Control Window: Depending on the type of exposure, the control period consisted of a pedestrian event (or sub-period as noted above) occurring on a day prior to, but within 28 days of the pedestrian injury, which did not result in a pedestrian injury. This is known as the pair matched interval approach, and would be applicable for exposures such as use of the crosswalk. Control windows were examined beginning with the day prior to the case window and then retrospectively for multiple control windows per case in the pair matched approach. The unit of exposure was each time they reported a particular behavior or event during a previous pedestrian experience. This data was gathered by asking how frequently in the previous week or month they had a particular exposure, and each of these episodes was separated to generate a unique matched pair.

Hazard Periods: The hazard period consisted of the time interval after the proximate cause begins (when the subject experiences an increased risk of the outcome due to the proximate cause) until the end of the episode of exposure. This can vary depending on the specific proximate cause and its duration. Hazard periods can range from brief periods just prior to the injury to the entire case window for proximate exposures present at the onset of the case window. For example, an exposure may be transient in nature and have a short effect period (such as not waiting for the pedestrian signal) or can be transient but have
longer effects (such as a disturbing event that distracts the pedestrian for hours afterwards). The hazard period is, therefore, the time segment during which the exposure is likely to have its etiological effect on the injury, and will vary depending on the nature and duration of the exposure (Sorock 2001).

**Study Instruments**

**Health Status Survey Protocol:** A previously validated health survey, the SF-36 was used to gather information about the general health and well being of the study population. The SF-36 is felt to be the most widely evaluated generic patient assessed health outcome measure (Garratt, Schmidt, Mackintosh, & Fitzpatrick, 2002). The usefulness of the SF-36 in estimating disease burden and comparing disease-specific benchmarks with general population norms is illustrated in articles describing more than 200 diseases and conditions.

**Case-Crossover Survey Protocol:** A standard survey instrument and administration protocol was developed (see Appendix 3). Wherever possible, questions regarding exposures and the events in the case window were organized in a fashion designed to obscure the principle study question to the interviewees. Standard scripts and probes were developed to minimize observer bias in the collection of recall data. A Spanish version of the instrument was developed using back-translation methodology appropriate to the local population’s Spanish usages and was administered by a Spanish-speaking member of the study team for Spanish speaking participants. The study instrument took approximately 1 hour to complete.
Sample Size and Power

Based on the size of the clinical population available for sampling and the proposed study period, it was estimated that at least 250 matched pairs would be required for sufficient study power. This could be reached with 25 subjects and 10 matched pairs per subject or as few as 10 subjects with 25 matched pairs per subject. Study power was estimated based on the following assumptions:

1. Power was estimated using the McNemar test statistic (2-sided) for paired case-control data. (Greenland 1998)
2. The proportion of discordant pairs was estimated conservatively to be at least 0.3 for any single proximate exposure.
3. Estimated effect size was at least O.R. = 2.0 consistent with other published studies.
4. Level of significance was set at alpha = 0.05
5. Using these assumptions, study power to determine a significant difference between cases and controls for a given proximate exposure was estimated to be greater than 90% (beta less than 0.10)
6. A modest decrease in either number of subjects, number of pairs per subject, or discordancy proportion should still have provided power \( \geq 0.8 \).

Estimation of study power was performed using the NCSS 2004/PASS2005 statistical software package (NCSS Statistical Software, Kaysville, Utah).
McNemar Test Power Analysis-Numeric Results for Two-Sided Test

<table>
<thead>
<tr>
<th>Power</th>
<th>N</th>
<th>P10</th>
<th>P01</th>
<th>P10-P01</th>
<th>Discordant</th>
<th>Ratio</th>
<th>Alpha</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5646</td>
<td>150</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
<td>0.30</td>
<td>2.0</td>
<td>0.05</td>
<td>0.4354</td>
</tr>
<tr>
<td>0.7034</td>
<td>200</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
<td>0.30</td>
<td>2.0</td>
<td>0.05</td>
<td>0.2966</td>
</tr>
<tr>
<td>0.8031</td>
<td>250</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
<td>0.30</td>
<td>2.0</td>
<td>0.05</td>
<td>0.1969</td>
</tr>
<tr>
<td>0.8736</td>
<td>300</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
<td>0.30</td>
<td>2.0</td>
<td>0.05</td>
<td>0.1264</td>
</tr>
<tr>
<td>0.9209</td>
<td>350</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
<td>0.30</td>
<td>2.0</td>
<td>0.05</td>
<td>0.0791</td>
</tr>
</tbody>
</table>

N= number of matched case-control pairs

Statistical Analysis Plan

Figure 4-2 is a schematic representation of the study design and analysis plan.

Day 0 : Case window  Day 0-1: Control window 1  Day 0-2: Control window 2

Figure 4-2. Schematic representation of the study design using the pair matched approach. Day 0 (left) contains the case window for the pedestrian event resulting in injury. Day 0-1 is the most recent day which contains a control window (center) in which the subject was a pedestrian without incident. Similarly, Day 0-2 (right) is the second most recent day containing a pedestrian event without incident. For this subject, the case window is paired with each control window, resulting in 2 case-control pairs for this subject. Each pair will be analyzed for discordancy for exposure ($E_i$) between the case and control within the pair. Up to 4 such pairs will be analyzed per subject, and the process will then be repeated for each additional study subject.

After final database cleaning, the working study database (stripped of all identifiers but unique study number) was exported to a statistical software package (e.g. SAS Institute Inc., Cary, NC). Data element (demographic/descriptive, modifying and proximate exposure variables) frequency distributions were calculated and plotted. Quantitative data were presented with appropriate measures of central tendency and dispersion, as indicated.
Pair Matched Approach Data Analysis

For individual proximate exposures, the exposure within the hazard period was compared to the exposure within a variable number of control periods of comparable magnitude in the days (< 28) preceding the injury outcome. This has been referred to as the parsimonious multiple intervals approach (Mittleman, Maclure et al. 1995). The exposure status was measured as a binomial. As recommended by Maclure and others, odds ratios (as an estimate of relative risk) were calculated using the stratified Mantel-Hantzel estimator for sparse data, which is identical to the matched-pairs odds-ratio estimator (the ratio of two exposure discordant pairs)(Maclure 2000, Greenland 1998). Odds ratio point estimates were reported with 95% confidence intervals (CI). Significance was determined by the application of the McNemar statistic for matched pair data. All tests will be two-sided with significance level set at alpha = 0.05.

Results

A total of 36 subjects met inclusion criteria and consented to be in the study. Twenty subjects were enrolled in Miami at the Ryder Trauma Center and 16 in Broward at their Level 1 Trauma Center. While most of the Miami sample consisted of white Hispanics, the addition of Broward as a recruitment site helped to balance this effect, leading to a more diverse sample. Still, compared to the U.S. census statistics for 2009, where there were 15.8% Hispanics, this sample is still heavily influenced by the Miami location. The median age of the subjects was 70 years old, a particularly high-risk group. The remainder of the demographics is shown in Table 4-2. Of particular note is that although scoring
well on the Folstein Mini-Mental state examination, 63% of respondents reported some type of memory problems. This was not investigated further as part of this study.

<table>
<thead>
<tr>
<th>Table 4-2 – Demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Living Status</td>
</tr>
<tr>
<td>Ethnicity</td>
</tr>
<tr>
<td>Race</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Employment</td>
</tr>
<tr>
<td>Memory Problems</td>
</tr>
</tbody>
</table>

The frequency of specific incident details was ascertained as part of the study questionnaire. There was a preponderance of daylight events, with a majority happening with a stoplight and/or a crosswalk present. In addition, heavy traffic was noted in 54% of the cases. Unfortunately, there was little reported use of assistive devices and almost no use of sedative/hypnotic medications or alcohol (Table 4-3 and Figure 4-3).

<table>
<thead>
<tr>
<th>TABLE 4-3 – Incident Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detail</td>
</tr>
<tr>
<td>Time (Daylight)</td>
</tr>
<tr>
<td>Unknown Route</td>
</tr>
<tr>
<td>Stoplight Present</td>
</tr>
<tr>
<td>Crosswalk Present</td>
</tr>
<tr>
<td>Heavy Traffic</td>
</tr>
<tr>
<td>Assistive Devices (glasses, hearing aid, cane/walker)</td>
</tr>
<tr>
<td>Medications (sedative/hypnotics)</td>
</tr>
<tr>
<td>Alcohol Use</td>
</tr>
</tbody>
</table>
One of the specific aims of the study was to determine if walking behaviors, specifically use of the crosswalk or pedestrian signal, were associated with elderly pedestrian injuries. Analysis of the pair-matched data showed statistically significant increased odds for injury if the subject crossed against the light or pedestrian signal (OR 5.2, 95% CI 1.8-15.1). Similarly, there were increased odds for injury if the pedestrian did not use the crosswalk (OR 1.3, 95% CI 0.6-2.8), although this did not reach statistical significance. Table 4-4 and Figure 4-4

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Odds Ratio for Injury</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Against Light</td>
<td>5.2</td>
<td>1.8 - 15.1</td>
</tr>
<tr>
<td>Use Crosswalk</td>
<td>1.3</td>
<td>0.6 – 2.8</td>
</tr>
</tbody>
</table>
4.5 Conclusions

It is clear from these data that elderly pedestrian crossing behaviors are significantly associated with injury. This is the first demonstration of a behavioral risk factor for elderly pedestrian injury. It remains to be seen if successful prevention programs can lead to the behavioral change required to decrease the rate of elderly pedestrian injuries. Unfortunately, the self-reported behaviors for other potential risk factors were too low to draw any conclusions regarding the influence of alcohol, sedative hypnotic drug use, depression or other significant life stressors. It is unclear if the prevalence of these conditions is truly low in this population or there were other confounding factors to account for this.
Chapter 5. Safe Crossings Elderly Pedestrian Safety Program

5.1 Overview
This chapter presents the creation, evaluation and implementation of an elderly pedestrian safety educational program, Safe Crossings. Review of the literature confirms that until now educational efforts have focused mainly on children. A grant from the Florida Department of Transportation funded the creation and implementation of this safety program. Both process evaluations and focus groups were used to improve and revise the content and delivery of the educational program. Unfortunately, the scale of the intervention was not sufficient to expect to see a decline in the rates of elderly pedestrian injuries. Further funding and wide-scale implementation would be required to reach enough of the target population.

5.2 Background
Previous work in injury prevention for pedestrians has focused mainly on educational interventions in the pediatric age group. Even still, a recent review of randomized controlled trials by Duperrex and colleagues identified only 15 high quality trials (Duperrex, Bunn et al. 2002). Fourteen of these targeted children, and only 1 targeted adults (institutionalized adults ages 21-55). No trial was identified that focused on the elderly. None of the trials assessed effects on the occurrence of injury and only 6 assessed effects on behavior. The authors concluded “There is a lack of good evidence of effectiveness of safety education for adult pedestrians, especially elderly people” (Duperrex, Bunn et al. 2002).
Roberts and colleagues noted that the traditional approach to the prevention of child pedestrian injuries is pedestrian education, yet none of the programs have ever been shown to reduce injury rates (Roberts, Ashton et al. 1994). Again, the concept that environmental modification and enforcement of speed limits may be a more effective prevention strategy in the elderly was proposed. This is further supported by prior research showing pedestrian fatality rate increases 18 fold when the outcome at an impact speed of 20 mph is compared to 60 mph (Hall and Fisher 1972).

**Increased Morbidity and Mortality in Elderly Pedestrians**

There is a large body of evidence to suggest that elderly trauma patients, including pedestrians, have worse clinical outcomes than similarly injured younger patients.

In 1989, Sklar and colleagues (Sklar, Demarest et al. 1989) performed a retrospective review of 1082 pedestrian accidents over 5 year period. The mortality rate was higher for those > 60 yrs old vs < 60 yrs old, with elderly patients much more likely to die (44.6% vs 10.4%). Elderly pedestrians have higher hospital mortality (52.5% vs 21.5%), thereby consuming extensive resources at the end of their lives. Pedestrians > 65 years old have a mortality rate 2.6 to 5.7 times higher than younger pedestrians. It was suggested that improved in-hospital care would decrease elderly mortality rates, and that the elderly were dying of complications that younger pedestrians survive (Sklar, Demarest et al. 1989).
Demetriades and colleagues performed a retrospective study in 1996 in Los Angeles County (Demetriades, Murray et al. 1998). Pedestrian deaths were more common in African-Americans and Hispanics than Caucasians or Asians. People greater than 60 years old had a significantly higher risk of traffic-accident death than younger people, for both passenger and pedestrian groups. The death rate per 100,000 in various age groups is shown here in Figure 5-1.

![Pedestrian Death Rates per 100,000](image)

Figure 5-1 –Pedestrian Death Rates per 100,000 (Demetriades, Murray et al. 1998).

Perhaps the largest study to date was by Peng and colleagues (Peng and Bongard 1999). They retrospectively examined 5000 pedestrian injuries over 3 years (1994-1996) in a trauma database. While those age 65 or greater comprised only 8% (400 patients), they had a mortality of 27.8%. In addition, 78% of pedestrians injured had at least temporary disability on discharge.

5.3 Methods

This study was designed to collect data about the issues and concerns of elderly pedestrians related to their safety, and their perceptions of a novel elderly
pedestrian safety program. To answer these questions, focus groups of elderly pedestrians were performed, and then a new elderly pedestrian safety program was administered and evaluated.

The research questions that guided the focus groups were:

1. What are the safety concerns of elderly pedestrians in Miami-Dade County?
2. What are the barriers to safe pedestrian activity?
3. How do elderly pedestrians perceive their own safety and their pedestrian behavior?
4. What are the perceptions about the usefulness of an elderly pedestrian safety program?

Subject Recruitment

The study population was elderly pedestrians from Miami-Dade County. A total of 729 elderly pedestrians recruited from senior centers and activity centers participated in the pedestrian safety programs.

Survey and Focus Group Administration

Immediately following the presentation and prior to group discussion, participants completed a questionnaire/rating form. Items asked respondents to rate the appeal, relevance, clarity, feasibility, and other appropriate dimensions of proposed program features (see Appendix 4). These questions were modeled after similar questions used in a number of other elderly outreach programs and those found in the literature.

The remaining time was spent in facilitated discussion, focusing on acceptance of the concept, identifying barriers to adoption, and key features. During this time,
the participants were asked questions regarding feasibility for implementation, suggestions for changes, usage issues, etc. The focus group sessions lasted approximately 30 minutes. All discussions were audio recorded and transcribed.

**Data Analysis**

Two types of data were generated by the focus groups. Quantitative ratings of each program element were obtained from the program survey and transcriptions of the focus group discussions were created. Descriptive statistics were calculated for each of each of the questionnaire items. The chief purpose of these analyses was to identify which program features were viewed favorably and which were not.

The focus group transcripts were examined to produce qualitative summaries for each proposed feature. Initially, key words and phrases were identified that shed light on dimensions such as clarity, appeal, appropriateness, strengths, and weaknesses. The key words and phrases were coded and content analysis conducted to identify important themes. The results of the quantitative and qualitative analyses were used to inform further program development. Proposed features with favorable responses were reviewed for program inclusion.

**5.4 Results**

A total of 729 elderly pedestrians participated in 26 presentations of the program. Six of these (23%) were in English, 15 (58%) were in Spanish, and 5 (19%) were conducted bilingually in both languages. Of the 729 seniors who attended the presentations, 176 (24%) were in English, 421 (58%) were in Spanish, and 132 (18%) attended the bilingual presentations (Table 5-1).
Table 5-1 – Distribution of Attendees at Safe Crossings Programs

<table>
<thead>
<tr>
<th></th>
<th>Spanish only</th>
<th>English only</th>
<th>Bilingual</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td># Presentations</td>
<td>15</td>
<td>6</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>% Presentations</td>
<td>58%</td>
<td>23%</td>
<td>19%</td>
<td>100%</td>
</tr>
<tr>
<td># Attendees</td>
<td>421</td>
<td>176</td>
<td>132</td>
<td>729</td>
</tr>
<tr>
<td>% Attendees</td>
<td>58%</td>
<td>24%</td>
<td>18%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Distribution of Educational Materials

The Safe Crossings program met and exceeded the goal of creating and distributing educational materials. The program created new, updated brochures, posters, and a program guide to be more in line with the current needs of South Florida seniors (see Appendix 5). The Safe Crossings program met the goal of delivering the presentations in English and Spanish and translating all materials into English, Spanish, and Haitian Creole (Table 5-2).

Table 5-2. Distribution of Safe Crossings materials in Spanish, English and Creole

<table>
<thead>
<tr>
<th></th>
<th>Spanish</th>
<th>English</th>
<th>Creole</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brochure</td>
<td>2000</td>
<td>1000</td>
<td>250</td>
<td>3250</td>
</tr>
<tr>
<td>Poster</td>
<td>100</td>
<td>63</td>
<td>20</td>
<td>183</td>
</tr>
</tbody>
</table>

Program Evaluation

Evaluation forms were distributed in English and Spanish at presentations, and were updated throughout the program to make them easier to read and understand. The results of the evaluations are below (Table 5-3)
Table 5-3 Results of Safe Crossings Evaluations

<table>
<thead>
<tr>
<th>Question</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could participant hear the presentation?</td>
<td>98.2%</td>
</tr>
<tr>
<td>Could participant see the presentation?</td>
<td>98.5%</td>
</tr>
<tr>
<td>Was the speed appropriate?</td>
<td>97.9%</td>
</tr>
<tr>
<td>Was the speaker prepared?</td>
<td>99.7%</td>
</tr>
<tr>
<td>Was the speaker enthusiastic?</td>
<td>100%</td>
</tr>
<tr>
<td>Is the topic important to the participant?</td>
<td>99%</td>
</tr>
<tr>
<td>Did the participant learn anything?</td>
<td>92.8%</td>
</tr>
</tbody>
</table>

**Focus Group Summary Info**

Focus group transcripts were reviewed and recurrent themes and key points were recorded. With regards to the Safe Crossings program, participants noted that pedestrian safety was important to them, particularly pedestrian signal education. Interestingly, many thought that elderly pedestrians should be required to take a mandatory safety course.

When asked about pedestrian and crossing behavior, participants noted the risk of cars when standing at the corner, risks of crossing at the wrong location, signal timing and adherence, and avoiding night and bad weather. When asked about traffic signals & regulations, they reported vague awareness of traffic signs and signals. They also felt in some cases there was a lack of traffic and pedestrian signals and they allowed insufficient time for an elderly pedestrian to cross the street.

They also noted several characteristics of the drivers including the problem of distracted drivers, not to assume the car will stop, and impaired drivers. They
noted that making visual contact with drivers to ensure that drivers were aware of their presence is not a practiced behavior. They reported they don’t purposely wear fluorescent clothing or reflectors, however, they are willing to adapt to wear clothing that makes them stand out more to drivers.

Perhaps the most interesting comments were those related to the fact that they try to be aware of things but everything is moving so fast that they just hope that if they try their “best” they will make it around. In addition, the prevalence of the problem is not lost on them, as many knew someone personally that got injured while crossing and they have seen it often in the news.

They are also somewhat aware of their own limitations including that they move slowly, don’t know all the traffic rules, and walk in dangerous areas for pedestrians. When asked where they learned about safe pedestrian behaviors and rules, they felt they were never directly educated. They stated they primarily get information from news, radio, sports events commercials, buses, word of mouth or friends and family. In addition they felt there was no known resource site that was available to answer their questions or help them. They suggested traffic laws need to be more strictly enforced, more media campaigns, and more respect and education for both pedestrians and drivers.

5.6 Conclusions
The implementation and evaluation of the Safe Crossings elderly pedestrian safety program has highlighted some very critical needs. First there are large numbers of elderly pedestrians in need of pedestrian education. Second, educational programs can be developed and delivered that are well received and
fill a perceived need by the participants. Lastly, the community of elderly pedestrians is self-aware of the problem but lack the guidance or resources to effect meaningful change to their behaviors or environment.
Chapter 6. Conclusions

6.1 Overview

The evidence clearly demonstrates that elderly pedestrians are more susceptible to injury, and experience significantly higher related morbidity and mortality than other age groups (Kim 2010, Loo 2009, Nicaj 2006, Henari 2006). They sustain more serious injury in less severe collisions. Little quality research has been done to elucidate the risk factors or document the success of prevention programs. Research and intervention in the elderly in general can be difficult and sometimes even impractical. Improvements in medical care are unlikely to change the outcome from this devastating injury, leaving proper risk assessment, epidemiologic analyses and targeted prevention programs as the only viable option. A truly comprehensive program of injury prevention does not consist of just engineering modifications, but the hypothesis-driven collection and analysis of pertinent information, evaluation of countermeasures, and leadership for public programs and legislative needs.

This chapter will summarize the key findings of the studies performed as part of this project. This will be followed by a discussion of the current project and how it compares to prior similar studies. The strengths and limitations of the current studies, in particular the case-crossover study, will then be addressed. Finally, recommendations and suggestions for future research will be made.

6.2 Key Findings

The present series of studies addresses a number of important issues. The first of these was the lack of knowledge of high-risk behaviors in elderly
pedestrians in Miami-Dade County. The survey study conducted as part of Specific Aim 1 demonstrated numerous high-risk behaviors exhibited by elderly pedestrians. These included not obeying traffic signals, not using the crosswalk, and not using their assistive devices such as glasses and hearing aids. Still no association of these high-risk behaviors with actual crashes could be made. In addition, the validity of self-report data from these elderly crash victims was unknown. The second pilot study performed as part of Specific Aim 1 suggested that recall of events in this patient population were reasonably valid.

In the first study of its kind, a case-crossover methodology was used to test several hypotheses relating to elderly pedestrian crashes. The unique features of the case-crossover design allowed for the testing of these hypotheses for the first time. Results demonstrated that specific crossing behaviors, such as crossing against the light, correlated with increased odds of injury. Unfortunately, other hypothesized risk factors (such as use of sedative/hypnotic medications or alcohol use) were not reported with sufficient frequency in this small sample for meaningful analyses. The difficulty in recruiting enough subjects for analysis was formidable, but will not be expanded upon further other than to say both cognitive factors and medico-legal barriers were present in a large majority of potential cases.

While defining the association between certain behaviors and risk of pedestrian injury is a major step forward, the design and implementation of a successful elderly pedestrian prevention program remained. Specific Aim 3 began this process by using the knowledge gained in Aims 1 and 2 to create and
evaluate an elderly pedestrian safety program called Safe Crossings. The program was evaluated for process outcomes as well as self-report data on knowledge gained from the program. It demonstrated the effectiveness of the program at communicating with the elderly population and the ability to reach a large number of elderly with minimal resources. Unfortunately, due to the difficulties in reaching enough of the target population, it was unlikely to show any reduction in local elderly pedestrian crash rates.

Specific Aim 3 also did not include any follow-up with participants to assess their self-reported behavior change as a result of the intervention. The actual efficacy of educational interventions to promote behavior change related to injury prevention in the elderly is poorly studied. A recent study of short educational interventions for motor vehicle safety, fall prevention, pedestrian safety and home safety did not show improvements in test scores for those in the pedestrian safety program, but did show improvements for those in the fall prevention program (Koestner, 2009). It is unknown if our longer and more thorough program has led to any significant changes in either perception of risk or behavior change.

6.3 Discussion

There is one confounding factor in all of the studies done as part of this proposal. That is, of course, the preponderance of Hispanic ethnicity in the subjects. The Hispanic Paradox suggests that they have a decreased rate of injury mortality overall. This was recently studied, however, in relation to pedestrian injury. It was found that independent of gender and age group,
elderly Hispanics were at decreased risk of death from accidental fall or as an occupant in a motor vehicle accident, but increased risk of pedestrian fatality compared with white non-Hispanics (Landy, 2010). This is consistent with and likely reflects differences in culture, socioeconomic status, and geographic distribution for the U.S. Hispanic population. The conclusions of the study were that effective targeting of injury prevention programs, especially community based, should consider the role of Hispanic ethnicity and its impact on lifestyle.

Lending more credence to this need for cultural tailoring, a study of the National Trauma Data Bank looked at whether insurance status and differential survival contribute to the Hispanic disparity in pedestrian injuries. On logistic regression, Hispanics had 33% greater odds of mortality (OR, 1.33; 95% CI, 1.14-1.54) compared with whites, and uninsured patients had 77% greater odds of mortality (OR, 1.77; 95% CI, 1.52-2.06) compared with privately insured patients. They concluded that given the greater incidence of pedestrian crashes in minorities, this compounded burden of injury mandates pedestrian trauma prevention efforts in inner cities to decrease health disparities (Maybury, 2010).

Data from an observational study in Australia suggest that pedestrians exhibit high levels of illegal crossings, leading to an 8-fold increase in crash risk (King, 2009). Data also continue to show that in a majority of crashes, pedestrians are at fault. An analysis based on police reported crash data for 1997 through 2000 in North Carolina showed that pedestrians are found at fault in 59% of the crashes, drivers in 32%, and both are found at fault in 9%. They suggested that pedestrians apply greater caution when crossing streets, waiting to cross, and
when walking along roads, as well as the need for campaigns focused on positively affecting pedestrian street-crossing behavior (Ulfarsson, 2010). The educational intervention created as part of this proposal attempts to do just that. Unfortunately, data linking the intervention with demonstration of behavioral change was beyond the scope of this proposal, and clearly still needs to be undertaken. It has also been shown that pedestrians’ intentions to cross the road in risky situations differ among different age groups, suggesting that road safety interventions need to be designed differently for different groups (Holland, 2007).

Due to the case-crossover study design, certain fixed factors were not amenable to study, including such things as time of accident and weather conditions. Our study population reported that 86% of crashes occurred during daylight hours. This is consistent with recent data from NHTSA and others (Martin 2010, NHTSA 2008, and Nicaj 2006). Also due to the self-report data collection, there was only a 14% reported rate of alcohol use among study subjects. This is less than nationally reported rates for pedestrians, although it is known that older pedestrians have the lowest proportion of total pedestrians with an elevated blood alcohol level (NHTSA, 2008). As previously mentioned, it is likely that this rate is underestimated due to negative factors influencing the likelihood of accurate self-reporting for alcohol use. In addition, it is possible that those who were intoxicated may have been less likely to meet eligibility requirements for the current study.

Another variable not amenable to study is the cognitive decline associated with aging and its influence on pedestrian crashes. Since all of the subjects had
to be able to answer questions after their crash, this excludes the more seriously injured pedestrians. A study of older pedestrian fatalities showed an association between the extent of neurofibrillary tangles in the brain, a hallmark of Alzheimer’s disease, and pedestrian fault in the crash (Gorrie, 2008). While this is a valid criticism, crash research does not support the differentiation between a mild or severe crash in relation to causality.

While environmental factors were not the focus of this study, it is worth noting that recent literature has documented an increased risk of pedestrian injury in the presence of a marked crosswalk (Koepsall 2004, Leden 2006). One explanation for this is the risk compensation theory, which states that people may engage in riskier behaviors if they feel protected in some way. Applied to the pedestrian crash, pedestrians may feel safer and engage in riskier crossing behavior when in a marked crosswalk. If so this highlights another important target for educational interventions.

6.3 Strengths and Limitations

There are several potential study limitations. The case-crossover study used a sample of convenience and there was a possibility that the patients seen at the Ryder Trauma Center and Broward General Medical Center emergency room were not representative of the population of elderly pedestrian injuries in Miami-Dade or beyond. Problems did arise with subject enrollment that interfered with achieving the estimated sample size, although results were still significant. Even using relatively recent events for study, all retrospective studies are subject to recall bias and there could be differential recall within subjects for case versus
control windows. The reliability and validity of self reported transient exposures has been a criticism of case-crossover studies (Redelmeier, 1997). Some authors have performed test-retest reliability studies, which suggest that injured subjects can reliably report the frequency and duration of transient exposures (of occupational hand injuries) in the month before the injury up to 4 days after the initial interview (Lombardi, 2001). The accuracy of the exposure timing was another potential source of information bias. Memory recall of the timing of an exposure after an injury may be “telescoped” closer to the injury time than it actually occurred. This has been found for recall of personal events more than 2 months old (Thompson, 1988). Fortunately, this likely did not affect this study where the time interval between exposure and injury was only a few seconds to hours, and the interview occurred within a few hours to days after the injury. The degree to which this recall bias affects case-crossover studies of injury is currently unknown. Finally, the limited knowledge of proximate exposures in this population may have resulted in misidentification of potentially important exposures.

It could be argued that the case-crossover study exclusion criteria excluded the most severely injured patients and may not have been a representative sample of the entire cohort of elderly pedestrians. This is certainly not the case when dealing with accidents. A human factors model proposed by Drury and Brill (Drury, 1980) poses the view that accidents occur when the momentary demands of the task to be performed exceed the momentary abilities of the individual in question (Sanders, 1987). Generally, “accidents” imply injury to persons,
whereas “near-misses” usually involve the creation of hazardous conditions that, if not recovered, could lead to an accident. The difference between a severe pedestrian accident versus a less severe near miss is most certainly due to random chance or the difference between a split second decision not under volitional control, but the hazardous conditions leading up to the accident or near miss are the same.

Capturing information on near misses is particularly advantageous. Depending on the circumstances, near misses may occur more frequently than severe accidents. If near misses are regarded as events that did not result in accidents by virtue of chance factors alone, then the contexts surrounding near misses should be highly predictive of accidents. The most famous and well studied of near miss incident reporting systems (IRS) is the Aviation Safety Reporting System. Many significant improvements have been made as a result of this system, and this has led to the development of IRSs in other areas.

The case-crossover study performed here clearly focused on these less severe incidents, or near misses, yet this should have provided a representative sample of the hazardous conditions leading up to the incident in order to identify risk factors for injury.

One difficulty in studying pedestrian injuries is the lack of quality data surrounding the event itself. Even if witnessed, the data collected by police and other first responders are rarely detailed or complete enough to accurately reconstruct the events leading up to the crash. The reliance, therefore, on self-report data introduces numerous sources of bias, which are compounded by the
natural cognitive decline in our elderly population at risk. The final difficulty is the lack of any proven intervention on a population scale. No study has demonstrated a decline in the elderly pedestrian crash rate after implementation of a prevention program. This likely stems from the difficulty in reaching enough of the at-risk population. Those at-risk are not easily cohorted and targeted for intervention programs.

Alternatives to the case-crossover study design include a classic case-control study. However, the decreased economies as well as the inferior matching of case-control pairs would indicate the selected study design. Because of the low incidence of the study outcome, a prospective cohort study, although methodologically more rigorous, would have been extremely time and resource intensive, and would have posed challenges to the simultaneous measurement of multiple potential risk exposures.

6.3 Recommendations and future research

In summary, the data show that certain crossing behaviors of elderly pedestrians do increase the odds of injury. While not a surprising finding, this is the first study to show an association between elderly pedestrian behavior and risk of injury. This is important in that it suggests effective educational programs targeting behavior change for these risk factors could be a viable option for prevention programs. Although an educational program was created as part of this proposal, it has not been fully evaluated to determine if changes in behaviors occur. Larger studies will be necessary to implement such programs and track injury rates across a large population sample. Unfortunately, data linking the
intervention with demonstration of behavioral change was beyond the scope of this proposal, and clearly still needs to be undertaken. The area of injury prevention remains underrepresented in research related to traumatic injuries and this study provides a model of injury prevention for elderly pedestrians.
Bibliography


Appendix 1 – Elderly Pedestrian Survey

Screening Questions
1. Do you walk more than 3 blocks on at least 2 different occasions each week?
   - [ ] No (If no, thank you very much, do not complete this survey)
   - [ ] Yes (If yes, continue the survey)

Pedestrian Survey

Please be aware that you are under no obligation to complete this survey and all responses will be kept completely anonymous. Please check the appropriate response or fill in the blank when appropriate.

1. Date of Birth: ________
2. Zip Code: __________
3. Gender:
   - [ ] Male
   - [ ] Female
4. What is your primary language spoken at home? (please check only one)
   - [ ] English
   - [ ] Spanish
   - [ ] Creole
   - [ ] Other (specify) __________
5. What is your marital status? (please check only one)
   - [ ] Married
   - [ ] Divorced
   - [ ] Single
   - [ ] Widow or Widower
6. In what country were you born? _____________
7. Do you consider yourself hispanic? ____________
8. What race do you consider yourself to be?
   - [ ] White
   - [ ] Black
   - [ ] American Indian/Alaska Native
   - [ ] Asian
9. In a typical week, how many hours do you work or volunteer your time? (please check only one)
   - [ ] 40 or more hours per week
   - [ ] 30 to 40 hours per week
10. Do you consider yourself retired?
   - Yes
   - No

11. Thinking back over the last 7 days, approximately how many times have you walked more than 3 blocks? _______

12. What is the primary reason you walk? (please check only one)
   - Business (delivery, sales calls, etc.)
   - Personal (groceries, hair salon, shopping, etc.)
   - Exercise (walking, jogging or running as part of an exercise program, etc.)
   - Other (please specify) __________________________

For the remainder of the questions, please base your answers on the primary reason you walk, based on your typical walking experiences.

13. Approximately what time of day do you normally do your walking? (please check only one)
   - 6AM-Noon
   - Noon-6PM
   - 6PM-midnight
   - midnight-6AM

14. How often do you continue your typical walking activities even when it is raining? (please check only one)
   - Never
   - Rarely
   - Sometimes
   - Almost always
   - Always

15. What type of clothing do you normally wear to go walking? (please check only one)
   - Bright colored clothes (red, yellow, orange, etc.)
   - Dark colored clothes (brown, black, beige, etc)
   - Reflective gear
   - Other ___________________

16a. Which of the following, if any, do you use to assist you in walking? (Choose all that apply).
   - Cane
   - Wheelchair
   - Walker
16b. Approximately how often do you use your assistive device when you go walking? (please check only one)
- Never
- Rarely
- Sometimes
- Almost always
- Always

16c. Approximately how many times in the past 7 days have you gone walking without your assistive device? _____

17a. Do you wear glasses or contact lenses?
- Yes
- No, skip to question 18.

17b. Do you normally wear your glasses or contact lenses when you walk? (please check only one)
- Never
- Rarely
- Sometimes
- Almost always
- Always

17c. Approximately how many times in the past 7 days have you gone walking without your glasses or contact lenses? _____

18a. Do you wear a hearing aid?
- Yes
- No, skip to question 19.

18b. Do you normally wear your hearing aid when you walk? (please check only one)
- Never
- Rarely
- Sometimes
- Almost always
- Always

18c. Approximately how many times in the past 7 days have you gone walking without your hearing aid? _____

19. When you walk for your **primary reason**, how often do you typically use the same route? (please check only one)
Never
Never, go to question 22

20a. When walking for your primary reason, how often do you go walking with a pet? (please check only one)
Never
Rarely
Sometimes
Almost always
Always
Always, skip to question 20

20b. Approximately how many times in the past 7 days have you taken a different route? ______

21. When walking for your primary reason, how often do you go walking with someone? (please check only one)
Never
Never, go to question 22
Rarely
Sometimes
Almost always
Always
Always, skip to question 20

21a. What is your relationship with the person you go walking with?
Friend
Relative
Spouse
Other (please specify) ______________

21b. What is your relationship with the person you go walking with?
Friend
Relative
Spouse
Other (please specify) ______________

21c. Approximately how many times in the past 7 days have you gone walking without your normal walking partner? ______

22. In a typical week, when walking for your primary reason, approximately how often do you cross the street at a crosswalk? (please check only one)
Never
Rarely
Sometimes
Almost always
Always, go to question 23.
22b. Approximately how many times in the past 7 days have you not crossed at a crosswalk? ______

23. How often do you wait for the traffic signal before you cross the street? (please check only one)
   - Never
   - Rarely
   - Sometimes
   - Almost always
   - Always, skip to question 24

23b. Approximately how many times in the past 7 days have you not waited for the traffic signal before crossing the street? ______

24. How often do you encounter obstacles (construction, barriers, etc) when you are walking? (please check only one)
   - Never, skip to question 25
   - Rarely
   - Sometimes
   - Almost always
   - Always

24b. Approximately how many times in the past 7 days have you encountered an obstacle while walking? ______

25. When walking for your primary reason, how often do you stay on the sidewalk when you are walking? (please check only one)
   - Never
   - Rarely
   - Sometimes
   - Almost always
   - Always, skip to question 26

25b. Approximately how many times in the past 7 days have you not stayed on the sidewalk even when it was present? ______

26. When walking for your primary reason, how many lanes do most of the streets have along your route? (please check only one)
   - 2 or less
   - Between 2 and 4
   - Greater than 4

27. When walking for your primary reason, how would you classify the amount of vehicle traffic on the streets along your route? (please check only one)
   - Light
28. When walking for your primary reason, how would you classify the amount of pedestrian traffic along your route? (please check only one)
   □ Light
   □ Moderate
   □ Heavy

29. Do you consider yourself a nervous or anxious person?
   □ Yes
   □ No

30. Has a doctor ever told you that you have any mental illness such as anxiety, depression, schizophrenia or other mental disorder?
   □ Yes
   □ No

31. Have you received any bad news (personal loss, financial loss, or other life events) that have significantly affected you in the past 30 days?
   □ Yes
   □ No

32. Have you had a fight or argument with a loved one or friend that has significantly affected you in the past 30 days?
   □ Yes
   □ No

33. Did a family member or friend die in the past 30 days?
   □ Yes
   □ No

34. How frequently do you use a cellular phone while walking? (please check only one)
   □ Never
   □ Rarely
   □ Sometimes
   □ Almost always
   □ Always

35. How would you classify your use of alcoholic beverages? (please check only one)
   □ I do not drink
   □ I drink socially (2 - 4 drinks per week or less)
   □ I drink daily: (At least 1 drink per day)

36. Have you ever felt you should cut down on your drinking?
   □ Yes
37. Have people annoyed you by criticizing your drinking?
   ☐ Yes
   ☐ No

38. Have you ever felt bad or guilty about your drinking?
   ☐ Yes
   ☐ No

39. Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (eye-opener)?
   ☐ Yes
   ☐ No

Please list your current medications as accurately as you can:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Appendix 2 - Pilot Study of Elderly Trauma Patients

Study Instrument 1 (To be administered to the trauma victim)

Demographics: Age_____ Gender ____

Living arrangement (alone, with relatives, with non-relatives) ______

What ethnic group do you consider yourself a part of?
 Hispanic or Latino
 Non-Hispanic or Non-Latino

What race do you consider yourself to be?
 White
 American Indian/Alaskan Native
 Native Hawaiian or Other Pacific Islander
 Asian
 Black or African American

How many years of school did you complete?
 <= 8 yrs
 9-12 yrs
 12-16 yrs
 > 16 yrs

Current employment status
 Employed
 Unemployed
 Retired
 Disabled

Marital status
 Single (never-married)
 Married
 Divorced
 Widowed

Do you have any problems with your memory? Yes    No  
If yes, what kind of problems do you have? _______________________

What time of day did the accident occur? _____________

Do you remember what happened? Yes    No  
If yes, please briefly describe what happened? _______________________

Where were you going when the accident occurred? _____________________

How often do you travel to this location? ___________________

Was the route familiar to you? Yes    No  

Do you always take the same route? Yes    No  

Did the accident occur at an intersection?
 If yes:
   Was there a traffic light at the intersection? Yes    No  
Where in the intersection did it occur? __________________
What kind of vehicles were involved? __________________
Was there a crosswalk in the intersection? Yes ☐ No ☐
Was there a lot of traffic in the vicinity at the time of the event? Yes ☐ No ☐
Were you alone at the time of the accident? Yes ☐ No ☐
If no, who were you with? __________________
Do you take any medications every day? Yes ☐ No ☐
If yes, did you take them the day of the accident? Yes ☐ No ☐
Did you take your medicine the day before the accident? Yes ☐ No ☐
Did you take your medicine 2 days before the accident? Yes ☐ No ☐
Did you take your medicine 3 days before the accident? Yes ☐ No ☐
Did you not take your medicine any day in the past week? Yes ☐ No ☐
Do you ever drink alcohol? Yes ☐ No ☐
If yes, did you drink any alcohol the day of the accident? Yes ☐ No ☐
How long before the accident did you drink alcohol? ______
How much alcohol did you drink? ______
Did you drink any alcohol the day before the accident? Yes ☐ No ☐
Did you drink any alcohol 2 days before the accident? Yes ☐ No ☐
Did you drink any alcohol 3 days before the accident? Yes ☐ No ☐
Did you drink alcohol any day in the past week? Yes ☐ No ☐
Were you anxious or distracted the day of the accident? Yes ☐ No ☐
Were you anxious or distracted the day before the accident? Yes ☐ No ☐
Were you anxious or distracted 2 days before the accident? Yes ☐ No ☐
Were you anxious or distracted 3 days before the accident? Yes ☐ No ☐
Were you anxious or distracted anytime in the week before the accident? Yes ☐ No ☐
Were you feeling sad or depressed the day of the accident? Yes ☐ No ☐
Were you feeling sad or depressed the day before the accident? Yes ☐ No ☐
Were you feeling sad or depressed 2 days before the accident? Yes ☐ No ☐
Were you feeling sad or depressed 3 days before the accident? Yes ☐ No ☐
Were you feeling sad or depressed anytime in the week before the accident? Yes ☐ No ☐
Do you wear glasses? Yes ☐ No ☐
If yes, were you using them the day of the accident? Yes ☐ No ☐
Did you use them the last time you went out of the house? Yes ☐ No ☐
Did you go out anytime in the past week without them? Yes ☐ No ☐
Do you wear a hearing aide? Yes ☐ No ☐
If yes, were you using it the day of the accident? Yes ☐ No ☐
Did you use it the last time you went out of the house? Yes ☐ No ☐
Did you go out anytime in the past week without it? Yes ☐ No ☐
Do you have any problems with walking or balance? Yes ☐ No ☐
Do you use a cane or walker? Yes ☐ No ☐
If yes, were you using them the day of the accident? Yes ☐ No ☐
Did you use them the last time you went out of the house? Yes ☐ No ☐
Did you go out anytime in the past week without them? Yes ☐ No ☐
Was it raining at the time of the accident? Yes ☐ No ☐
Was it raining the last time you went out of the house? Yes ☐ No ☐
Was it raining any day in the past week when you went out of the house? Yes ☐ No ☐
Were you wearing bright colored clothes at the time of the accident? Yes ☐ No ☐
Were you wearing bright colored clothes the last time you went out? Yes ☐ No ☐
Did you wear bright colored clothes any day in the past week when you went out of the house? Yes ☐ No ☐

What did you have for breakfast the day of the accident?____________________
What did you have for breakfast the day before the accident?________________
What did you have for breakfast 2 days before the accident?________________
What did you have for breakfast 3 days before the accident?________________

A second questionnaire asking the same questions about the actions and behaviors of the study subject was administered to the spouse/caretaker when available.
# Appendix 3 – Case-Crossover Study of Elderly Trauma Patients

## Study Instrument 1 (To be administered to the trauma victim)

1. Demographics: Age _____ Gender _____

2. Living arrangement (alone, with relatives, with non-relatives) ________

3. What ethnic group do you consider yourself a part of?
   - [ ] Hispanic or Latino
   - [ ] Non-Hispanic or Non-Latino

4. What race do you consider yourself to be?
   - [ ] White
   - [ ] American Indian/Alaskan Native
   - [ ] Native Hawaiian or Other Pacific Islander
   - [ ] Asian
   - [ ] Black or African American

5. How many years of school did you complete?
   - [ ] <= 8 yrs
   - [ ] 9-12 yrs
   - [ ] 12-16 yrs
   - [ ] > 16 yrs

6. Current employment status
   - [ ] Employed
   - [ ] Unemployed
   - [ ] Retired
   - [ ] Disabled

7. Marital status
   - [ ] Single (never-married)
   - [ ] Married
   - [ ] Divorced
   - [ ] Widowed

8. Do you have any problems with your memory? Yes [ ] No [ ]
   If yes, what kind of problems do you have? _______________________

9. Do you remember what happened? Yes [ ] No [ ]

   9a. What time of day did the accident occur? __________
   
   9b. If yes, please briefly describe what happened? ______________________
   
   9c. Where were you going when the accident occurred? _________________

10. Was the route familiar to you? Yes [ ] No [ ]

   10a. How many times per week or month do you travel to this location?
       _____ times/week _____ times/ month

   10b. Do you always take the same route? Yes [ ] No [ ]

   10c. (Always ask) How many times per week or month on average do you take a
different route from usual?”
       _____ times/week _____ times/ month
11. Did the accident occur at an intersection? If not, skip to Question 12)
   If yes:
   11a. Was there a traffic light at the intersection? Yes ☐ No ☐
   11b. Were you crossing with the light at the time of the accident? Yes ☐ No ☐
   11c. Where in the intersection did it occur? __________
   11d. What kind of vehicles were involved? __________
   11e. Was there a crosswalk in the intersection? Yes ☐ No ☐
   11f. Were you using the crosswalk at the time of the accident? Yes ☐ No ☐
   11g. Was there a lot of traffic in the vicinity at the time of the event? Yes ☐ No ☐

   11h. (Always ask) How many times per week or month on average do you cross against the light? ___ times/week ___ times/month

   11i. (Always ask) How many times per week or month on average do you cross using the crosswalk? ___ times/week ___ times/month

12. Were you alone at the time of the accident? Yes ☐ No ☐
   12a. If no, who were you with? Name____________________
       Phone No:____________________

13. How often do you go for a walk outside?
    ___ times/week ___ times/month

14. Where do you usually go when you are walking?
    1. ____________
    2. ____________
    3. ____________

15. What is the average number of times you go walking outdoors?
    ___ times/week ___ times/month

16. What is the average length of time you spend outdoors walking?
    ___ time/week ___ time/month

17. On a typical walk, how many times do you typically cross the street? ______

18. How long does it usually take you to cross the average street? ______
    ___ minutes ___ seconds

19. On a typical walk, do you spend any time in the street other than while crossing it?
    Yes ☐ No ☐
   19a. If yes, how much time do you spend in the street? ______

20. How often in the past week and month have you crossed a street?
    ___ times/week ___ times/month

So, let me summarize this for you and you can tell me if I’m correct. On your typical walk you cross the street ___ times, which takes ___ minute each time. That means you spend about ___ minutes crossing the street on each walk. Then since you walked about ___ times in the past month you spent about ___
minutes of total time crossing the street. Does this seem correct to you? Do you think this is too much or too little or would you change this amount?

21. Do you ever take any sedating or mood altering medications (for example, medications that make you sleepy)?  Yes □  No □ (If no, skip to Question 14)

21a. If yes, did you take them the day of the accident? Yes □  No □

21b. When in the last week did you take any of this medication? 
_________ or mark on calendar

21b. What are the names of the medicine(s)? _______________________

21c. How often in the past week or month did you take your medication before going for a walk (where you had to cross the street)?

____ times/week  _____ times/ month

Now I’d like to ask you a few personal, confidential questions about alcohol use.

22. Did you drink any beer, wine or liquor during or within 24 hrs. before the accident?

22a. How long before the accident did you drink alcohol?  ______

22b. How much alcohol did you drink?  ______

23. In the past year, did you drink any beer, wine or liquor? (If no skip to Q. 16)

yes □  no □  refused □

23a. If yes, in the past year, did you drink any beer, wine or liquor during or within 24 hrs. before going for a walk (where you had to cross the street)?

yes □  no □  refused □

23b. If yes, how often? (write in frequency per time period and usual amount)

_________________ /day  ________________ usual amount

_________________ /week  ________________ usual amount

_________________ /month  ________________ usual amount

_________________ /year  ________________ usual amount

24c. If yes to question 15a, when did you last drink any beer, wine or liquor within 24 hrs. of starting walking?

date  ______  time  ______  # of drinks  ______  didn't drink that week ______
25. “Were you anxious or distracted for any reason at the time of the accident back to 90 minutes before the accident? For example, did you have an argument with someone or did you receive bad news?”

25a. If yes to question #16, “when were you distracted during the 90 minute period?”

25b. If yes, “what distracted you?”

25c. (Always ask): “How many times per week or month on average are you anxious or distracted before going for a walk (where you have to cross the street)?

26. Were you feeling ill in any way at the time of the accident back to 90 minutes before the accident?”

26a. If yes to question #16, “when were you feeling ill in the 90 minute period?”

26b. (Always ask): “How many times per week or month on average do you feel ill before going for a walk (where you have to cross the street)?

27. Were you feeling depressed at any time the week before the accident? (If no, skip to question 19)

27a. Were you feeling depressed the day of the accident? Yes ☐ No ☐

27b. (Always ask): “How many times per week or month on average do you feel depressed before going for a walk (where you have to cross the street)?

28. Do you wear glasses to see when you go for a walk (where you have to cross the street)? Yes ☐ No ☐ (If no, skip to Question 20)

28a. If yes, were you using them the day of the accident? Yes ☐ No ☐

28b. How often in the past week or month did you use your glasses before going for a walk (where you have to cross the street)?

29. Do you wear a hearing aide? Yes ☐ No ☐ (If no, skip to Question XX)

29a. If yes, were you using it the day of the accident? Yes ☐ No ☐

29b. How often in the past week or month did you wear a hearing aid while going for a walk (where you had to cross the street)?

30. Do you have any problems with walking or balance? Yes ☐ No ☐

31. Do you use a cane or walker? Yes ☐ No ☐ (If no, skip to Question XX)

31a. If yes, were you using it the day of the accident? Yes ☐ No ☐
31b. How often in the past week or month did you use it while going for a walk (where you had to cross the street)?

____ times/week  ____ times/ month

32. Was it raining at the time of the accident? Yes ☐  No ☐

32a. How often in the past week or month was it raining when you went for a walk (where you had to cross the street)?

____ times/week  ____ times/ month

33. Were you wearing bright colored clothes at the time of the accident? Yes ☐  No ☐

33a. How often in the past week or month did you wear bright colored clothes when you went for a walk (where you had to cross the street)?

____ times/week  ____ times/ month
Appendix 4 - Focus Group Questions

1. What did you like best about the presentation?

2. What did you like least about the presentation?

3. What suggestions do you have for improving the presentation?

4. What did you like best about the speaker?

5. Do you walk (includes walking assistance) around your community?
   - Yes
   - No

6. How many walking trips a week do you make?
   - 1-2
   - 3-4
   - 5-6
   - 7-8
   - 9-10
   - Other

7. What is the purpose of your trips?
   - Exercise/Health
   - Grocery Store
   - Church
   - Recreation
   - To go to work
   - Visit a friend or relative
   - Walk Pet
   - Other

8. Do you cross at crosswalks?
   - Yes
   - No

9. Why or why not?

10. Do you understand cross signals?
    - Yes
    - No

11. Do you cross in the middle of the road?
    - Yes
    - NO
12. Why or why not?

13. Is pedestrian safety important to you?
   - Yes
   - No

14. Why or why not?

15. Identify difficulties that you encounter while crossing the street.

16. What should be done to improve pedestrian safety?

17. What did you like best about the presentation?

18. What did you like least about the presentation?

19. What suggestions do you have for improving the presentation?

20. What did you like best/least about the speaker?

21. Do you cross at crosswalks?
   - Why or why not?

22. Do you understand cross signals?

23. Do you cross in the middle of the road?
   - Why or why not?

24. Is pedestrian safety important to you?
   - Why or why not?
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<th>Appendix 5 – Safe Crossings Program and Materials</th>
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[Pick the date]
Safety Through Education (45- minutes)
This lesson is divided into five sections.

**Section 1: Introduction to Pedestrian Safety**

Introduce yourself to the class.

Hello my name is _________ and I visit seniors all over Miami-Dade County to teach seniors about walking safely around their community.

Raise your hand if you walk around your community.

Great!

Today, we are going to do a lot of fun activities to help us all learn safe ways to walk around your community especially focusing on how to cross the street.

**What is a Pedestrian?**

Ask the class: “Who can tell me what a pedestrian is?”

Answer: A person who is walking. When we are walking anywhere we are all pedestrians. When we are pedestrians we need special tools to help us cross the street safely. I have a toolbox here full of all the tools and you have the same one. We all have a pedestrian toolbox with us at all times. Our tools are our head, our eyes, our ears, and our feet.
Section 2: Safely Crossing the Street

Learning Outcome: Seniors will be educated on how to cross a street safely.

Time: 10 minutes
Materials: Use Your Head Before Your Feet Skit
Give each senior a copy of this skit at the end of the class.

Activity: Use Your Head Before Your Feet

Demonstrate the whole skit as you stand at the edge of the street.
Use the street as your prop.

1. **Stop every time at the edge of the street.**
   (Hold your hand up to signal stop)
2. **Use your head before your feet.**
   (Point to your head and feet)
3. **Make sure you hear every sound.**
   (Cup your hands behind your ears and turn from side to side.)
4. **Look left and right and all around.**
   (Cup your hands above your eyes and turn your head slowly left to right, right to left, and look over your shoulders.)

- Now that we know this skit and have our tools for HOW we are going to cross the street we are going to talk about WHERE we should cross the street.

- Walk along the side of the street on the sidewalk. Talk about walking on the sidewalk a safe distance from the curb.

- Demonstrate where to walk if there is no sidewalk. In the street close to the curb, facing the oncoming traffic. (Use the street as a demo.)

Crossing the street...

- Stop at the curb.
- Look up and down the street for a crosswalk. This is the safest place to cross.
- If there is no crosswalk, go to a corner to cross because cars expect pedestrians to cross at corners more than in the middle of the street.
Section 3: Crosswalks and Sign Identification

Learning Outcome: Seniors will learn to identify crosswalk signals and use a crosswalk correctly.

Time: 10 minutes

Materials: Pedestrian Signs

Activity: Hold Up the Walk/ Don’t Walk Signs

- Hold up the walk signal.
  What does this one mean?

- Hold up the flashing signal.
  What does this one mean?

- Hold up the Don’t Walk sign.
  What does this one mean?

Demonstrate these steps on the “street” in front of the class. Tell them that they are going to practice these steps so they need to pay close attention.

Steps to crossing at a crosswalk

1. Look for a pedestrian cross-walk.
2. Stop at the curb.
3. Wait for the walk signal.
4. Look to the left.
5. Look to the right.
7. Look for cars while you are crossing.
8. If the signal starts to flash while you are crossing, continue crossing.
9. If the signal starts flashing while you are on the curb DO NOT start crossing.
Section 4: Practice crossing the street at non-crosswalk locations

Learning Outcome: Seniors will learn other safe ways to cross the street if there is not a controlled crosswalk.

Time: 15 minutes

Steps to Crossing at the Corner
What should you do if there is not a pedestrian crosswalk?
Cross at the corner because cars expect people to cross at corners more than in the middle of the block.

1. Go to the corner.
2. Stop at the curb
3. Look to the left
4. Look to the right
5. Look behind you.
7. When you do not see or hear any cars cross.
8. Keep looking the whole time you are crossing for cars.

Steps for Crossing Between Parked Cars
If you are trying to cross the street and there are cars parked that are blocking your view these are the steps you take to cross.

1. Stop at the curb.
2. Look to see if anyone is in the cars.
3. Cross to the edge of the cars and use the cars as a barrier.
4. Look to the left.
5. Look to the right.
6. Look to the left again.
7. Listen for cars.
8. Cross when you do not see or hear any cars.

**Driveways and Alleyways:** Walk along the edge of the road and demonstrate stopping and looking at driveways and alleyways for cars that might be backing out. Cars do not always look behind them so it is up to you to always be looking.

**What to do when a car stops for a pedestrian:** If you are waiting to cross the street and a car stop for you it is very important to make eye contact with the person who is driving the car, before you cross. They might have stopped for some other reason and not even see you.
Section 5: CLOSING

Objective: Make sure seniors understand the seriousness of being safe pedestrians.

Time: 2 minutes

Activity:

- Discuss the seriously deadly nature of pedestrian safety and why you are teaching this to them. Stress that they have the power to keep themselves safe by always following the pedestrian safety rules.

- You have homework! It is to go home and tell your friends and family what you learned today and help them be safe pedestrians also.

Walk to the closest sidewalk. (If you are on street with no sidewalks remember you will have to walk in the street facing oncoming traffic.) Stop and tell the seniors that the goal is to all cross the street safely.

   Ask them where they think you all should cross.

- If there is a crosswalk, walk to it and practice crossing one at a time.
- Have the teacher go to the other side of the street to meet the kids when they cross.
- Remind all of the kids that if you yell stop they need to stop right where they are.
- Go through the steps for crossing at a crosswalk.
• Give the first pair very clear instructions on where to go after they have crossed the crosswalk.
• Have every pair come up to the curb, look at the walk/don’t walk sign and decide for themselves when to cross. Kids have a tendency to follow each other through in these situations. Make sure they are aware that they are in charge of their own crossing.
• Make sure they look to the left, right and over their shoulders. If the light is flashing make sure they do not start crossing.
• When everyone is safely across, talk about anything that may have occurred that was dangerous and reiterate the steps to crossing at a cross walk.

While walking to the crosswalk or corner practice other pedestrian safety tips that were taught in the classroom:

- Crossing driveways and alleyways
- Keeping a safe distance from the curb (this is called your safety zone)
- Point out other pedestrian safety hazards and what to do about them.
- (unsafe places to cross, cars not stopping, etc…).
Even if you watch out for cars

...it doesn’t mean that drivers can see you

Be responsible for your own safety

Don’t count on drivers or signals to keep you safe.

· Help let drivers know where you are—wear bright colors, make eye contact, and wave your arms
· Look left-right-left before crossing a street
· Use crosswalks! Never cross in the middle of the street.

safe crossings

For more information:
305-243-8989
traumatalk.org
Even if you watch out for cars

...it doesn’t mean that drivers can see you

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safe crossings

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