

Fall prevention among older adults within the City of Hendersonville

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Certification Statement

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____
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Abstract

The problem was that the City of Hendersonville Fire Department (HFD) did not have a fall prevention program. The purpose of this applied research project was to develop a fall prevention program to reduce the number of preventable falls among older adults aged 65 and older within the City of Hendersonville. Action research was utilized to meet the purpose of this applied research project and to create the framework for a fall prevention program for the HFD. The following research questions were answered by this applied research project: (a) What is the current fall problem among older adults within the City of Hendersonville? (b) What impact does preventable falls have on the department's resources? (c) What are the impacts that preventable falls have on the victims? (d) What mitigation strategies are utilized by other fire departments to reduce the risk of falls among the older adults they serve? (e) How do other departments evaluate the effectiveness of their fall prevention?

The procedures included in this applied research project are a literature review, analysis of CAD system data and data from the fire department records management system. Action research was conducted to create a fall prevention program outline utilizing readily existing programs including the Remembering When Program by the NFPA and the Workout to GO program by the National Institute on Aging at the NIH. In addition to the outline, a fall prevention checklist and a fall risk questionnaire were created and are designed to be used during scheduled voluntary home visits by fire department personnel.

Final recommendations included delivery at local assisted living facilities where high incidents of falls occurred and at fire station two for older adults living within the community. The program should last no longer than two and half hours and should be offered multiple times per year during the morning and early evenings to appeal to the older adult population.

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Introduction

According to the National Council on Aging, falls are the leading cause of deaths attributed to injuries among older adults in the United States. More than a third of older adults aged 65 and older will experience a fall within a given year. Accounting for more than 2.4 million emergency room visits each year and greater than 750,000 hospitalizations and over 21,000 deaths each year, the costs associated with falls in 2012 exceeded \$36 billion dollars. This cost is expected to rise to more than \$59 billion by 2020. In addition to the direct economic costs associated with falls, there are additional human costs. Due to an increasing level of fear from falling among older adults, this population tends to limit their social interactions and limit their activities. The result of this self-imposed limitation is further physical decline, depression, a feeling of helplessness, and isolation (National Council on Aging [NCOA], 2014).

The problem is that the City of Hendersonville Fire Department (HFD) does not have a fall prevention program. The purpose of this applied research project is to develop a fall prevention program to reduce the number of preventable falls among older adults within the City of Hendersonville. Action research was utilized to meet the purpose of this applied research project and to create the framework for a fall prevention program for the HFD. The following research questions will be answered by this applied research project: (a) What is the current fall problem among older adults within the City of Hendersonville? (b) What impact does preventable falls have on the department's resources? (c) What are the impacts that preventable falls have on the victims? (d) What mitigation strategies are utilized by other fire departments to reduce the risk of falls among the older adults they serve? (e) How do other departments evaluate the effectiveness of their fall prevention programs?

Background and Significance

The City of Hendersonville (City) is located in western North Carolina southeast of Asheville, NC. Based on the 2013 Census estimate, the population is approximately 13,466. The City is 6.94 square miles in size. This works out to an approximate population density of 1,940 people per square mile. The population consists of a large proportion of older adults aged 65 or older. Based on the 2010 Census, the older adult demographic made up 30.2 percent of the total population. This is 2.34 times the North Carolina demographic for this group and 2.14 times the National demographic ("USA QuickFacts," 2014).

The City is desirable location for those wishing to escape the extreme cold of the North and the extreme heat of the South. In fact, another name for the City of Hendersonville is the City of Four Seasons. The average annual high temperature is 66.8°F and the annual low temperature is 46°F. Precipitation is mainly in the form of rain and averages 54.7" annually. On average, there is 8" of snowfall each year ("U.S. Climate Data," 2015).

In addition to the reasonable climate, the City offers a vibrant downtown area with a newly redesigned Main Street as well as many recreational opportunities. The City finished the third and final phase of Main Street upgrades in spring of 2014. This final phase wrapped up a multi-million dollar project to create a Main Street which serpentine more than nine blocks and includes wide inviting sidewalks with multiple sidewalk dining options. The City has been designated as a "Tree City" for more than 23 years ("Arbor Day Foundation," 2014).

The area also boasts excellent healthcare and assisted living resources. There are two community hospitals and one Level II trauma center with more than 700 beds all within less than a thirty minute drive. The local community hospital, Pardee Hospital has 222 beds and is part of the UNC Healthcare System ("Mission Hospital," 2014), ("Pardee Hospital," 2014).

There are thirteen assisted living/care facilities within the City. These facilities vary in their level of care and assistance, but demonstrate the resources available to the older adult populations within the City. In addition to the facilities within the City, there are also additional assisted living/care facilities scattered in close proximity to the City. Many of these facilities provide transportation services to their residents so they may shop and play within the City limits (City of Hendersonville Fire Department Emergency Reporting System [HFD RMS System], 2014).

HFD serves the City from two fire stations with two staffed engine companies and one staffed ladder. Currently, the HFD has 27 full-time positions and utilizes a pool of approximately 15 part-time staff members to fill in on an as needed basis. The properties within the City are a mix of commercial and residential. The City is bifurcated East and West by I-26 and North and South by Highway 64. The HFD is an all hazards department and responds to medical incidents at the Emergency Medical Technician – Basic (EMT-B) level. The department only responds as a first responder service and does not transport patients. Emergency medical transport services are provided by Henderson County Emergency Medical Services (HCEMS) and convalescent transport services are provided by the Henderson County Rescue Squad (HCRS).

This applied research project is directly related to the Executive Fire Officer Program 2nd year course, titled Executive Analysis of Community Risk Reduction. Specifically, this project will include assessing the community risk, develop a program to intervene in the identified risk, and evaluate the effectiveness of the program (FEMA, 2013).

This applied research project will also address one of the United States Fire Administration goals, “reducing risk at the local level through prevention and mitigation”

(United States Fire Administration [USFA], n.d., p. 13). By creating a fall prevention program for the HFD, the risk of falling and the resulting injuries will be reduced through prevention and mitigation.

Literature Review

In developing a comprehensive fall program, the problem must be defined on the national, state, and local levels. Nationally, according to the National Council on Aging, falls are the leading cause of deaths associated to injury within the United States among older adults aged 65 or older. In addition to deaths associated to falls, falls also have a major impact on independence for older adults. There are also major economic costs associated with falls within this age group. Each year, at least 33 percent of older adults will experience a fall. In fact, an older adult is seen in an emergency room every 14 seconds while a member of this age group dies every 29 minutes from a fall. Each year, more than 2.4 million injuries from falls are treated in the emergency room and ultimately results in more than 772,000 hospital admissions and almost 22,000 deaths. In 2012, the costs associated with injury resulting from falls was greater than \$36 billion and this cost is projected to exceed \$59 billion by 2020 (NCOA, 2014).

In North Carolina, more than 3,000 older adults have died as a result of falls over the past ten years. More than 182,000 have been injured severely enough to require hospitalization and more than 600,000 have required visits to the emergency room. Greater than 50 percent of hospitalizations required time spent in a nursing facility once discharged. Women aged 65 and older accounted for greater than 2.5 times more emergency room visits for unintentional falls than men. During 2012, 756 older adults died as a result of unintentional falls in North Carolina. (NC Department of Health and Human Services [NC DHHS], 2011).

Locally, from 2007 to 2009, 56 older adults died from unintentional falls in Henderson County where the City of Hendersonville is located. There were more than 920 hospitalizations and greater than 1,700 emergency room visits during this same time period (North Carolina Department of Health and Human Resources [NC DHHS], 2014) (North Carolina Department of Health and Human Services [NC DHHS], 2009).

According to the National Center for Injury Prevention and Control, there are nine steps to creating a community based fall prevention program. First, an assessment of the community needs is conducted. This initial assessment includes identifying the fall prevention program needs for the selected community, determining what services and programs are currently available, determine the current and future goals for providing services to older adults within the community, determining levels of support within the organization, and identify potential partners within the community. Next, the organization must establish the purpose, goals, and objectives for the program by asking “Why are we developing this program?” and “What short term and long term accomplishments are desired for this program?” Goals and purpose must be clear, realistic, and specific. The next step is to determine if the program will be a single intervention program or a multifaceted program. A single intervention program may simply be an exercise program, while a multifaceted intervention program may include exercise, fall prevention education, eye exams, home fall prevention inspections, and installation of fall prevention devices such as grab bars in showers. Effective fall prevention programs are multifaceted and includes exercise and at a minimum one addition method of intervention such as fall prevention education. The next step is to identify way to collaborate with community partners. Next, decide who will implement each component of the fall prevention program. The next step is to determine the location or locations where the program will be conducted. This may be in fire

station training rooms, in the home, local gyms, senior recreation centers, and assisted living facilities to name a few. After conducting the program, the program must be evaluated to determine if the program is effective, as part of the evaluation process, the program may need to be modified to ensure the appropriateness of the individual components. An additional function of the evaluation process is to document the program's effectiveness. This effectiveness documentation can then be utilized in the next step in the process, promoting the program. Promoting the program ensures awareness of the program among the community and helps to create a successful program. Finally, the program must be sustained. To help sustain the program, it must be reviewed and updated periodically. Collaboration with community partners must be ongoing, and funding resources must be maintained or new ones identified (National Center for Injury Prevention and Control, 2008).

A review of other fire department fall prevention programs found many similarities and some differences in how the programs were created, implemented, evaluated, and funded. For example, in Londonderry, New Hampshire, a process of creating a fall prevention taskforce to develop a deployment strategy using readily available off the shelf programs such as the "Remembering When" program by the National Fire Protection Association was utilized. The taskforce would consist of volunteers, fire department staff, and the local senior affairs agency (Waldron, n.d.).

In "A Fall Injury Reduction Initiative for Older Adults" by Tim M. Gemind, he recommended using the Department of Homeland Security Community-Risk Reduction Model to create a fall prevention initiative that focused primarily on community awareness and creating a fall reduction steering committee. The committee would identify stakeholders and create partnerships to implement the initiatives identified. While this research paper identified the fall

problems for Bath Fire Department, it seemed the product produced was merely a plan to create a program (Gemind, 2010).

Kenneth Barnes of the San Diego Fire Department recommended relying heavily on existing community organizations as the primary workforce to deliver the slip and fall reduction program while utilizing company level fire department personnel to coordinate the activities of community volunteers. This program would be part of the department's overall community outreach programs. One recommendation of this report was to identify liability issues associated with slip and fall programs, specifically liability for the City of San Diego, California (Barnes, 2011).

Fall survey and inspection forms were a popular tool among the various fall prevention programs reviewed for this applied research project. These tools were designed to be used by fire department staff to conduct in home inspections to identify common causes of falls among older adults. The common theme among most of these forms included inspections of walking surfaces such as floors and walkways, bathrooms, and stairwells. In addition, many also included adequate lighting, footwear, telephone locations and types, reducing the need for step ladders, and locations of furniture (Putnam, 2012).

Many fall prevention programs include home inspections, education, and components to address physical risk factors. One such program is produced by The American Occupational Therapy Association, Inc. This program takes a three point approach to addressing falls among older adults. It lists the three factors that interact to cause most falls as physical risk factors, behavioral risk factors, and environmental risk factors. Physical risk factors are those risks associated with changes in the body as we age which increase the likelihood of falling. Behavioral risk factors are what we do or don't do that may cause us to fall. Finally,

environmental risk factors are things in our environment where we live, work, and play that create fall hazards (The American Occupational Therapy Association, Inc. [AOTA], 2015).

The Remembering When Program through the National Fire Protection Association is a program for older adults that addresses both fire safety and fall prevention. There are sixteen key messages in this program with half addressing fire safety and the other half addressing fall prevention. Since this applied research project is focusing only on fall prevention, only the eight key fall prevention messages will be discussed. Those key messages are: Exercise regularly, take your time, clear the way, look out for yourself, slippery when wet, throw rugs can throw you, tread carefully, and best foot forward. Each of these key messages has sub-messages and offer more detail on how to apply the key messages. For example, the key message, take your time includes the following sub-messages: get out of chairs slowly, sit a moment before you get out of your bed, stand and get your balance before you walk, and be aware of your surroundings. This program is designed to be a turnkey fire safety and fall prevention program that can be adopted by a fire department. It discusses many areas that have been identified as preventable within their respective categories. One of the key messages for preventing falls, exercise regularly, does not give good examples of exercises appropriate for the reduction of falls among older adults (National Fire Protection Association [NFPA], 2013).

Procedure

This applied research project was conducted to develop a comprehensive fall prevention program for the HFD. The action research method was the primary method used to create the final product. In order to develop the final product, local incident data was reviewed and analyzed to get a clear picture of the fall problem among older adults within the response area of the HFD. A comprehensive review of available literature was conducted to determine the

possible components of a fall prevention program. During the review of available literature, an emphasis was placed on identifying currently available programs, such as those created by the National Fire Protection Association (NFPA) and the National Council on Aging (NCOA) in order to prevent trying to recreate resources already available.

What is the current fall problem among older adults within the City of Hendersonville?

To determine the current problem associated with falls among the older adult populations within the City, a review of the fire department’s records management system (RMS) was conducted.

Very early in the review process, it was determined that there was no way to extract data specifically related to falls. Based on this finding, the author contacted the director of the Henderson County Public Safety Answering Point (PSAP) to determine if fall data could be extracted from the computer aided dispatch (CAD) system. In March of 2014, the ‘falls’ call type was created within the CAD system to begin tracking fall responses. A request was made to have all incident data for ‘falls’ as the call type to be exported into an Excel® file. Upon inspection, this file contained approximately six months of data (see *Figure 1*).

CAD #	Date	Dispatch	Enroute	Arrival	Clear	Commit	Complaint	Address
14026479	3/13/14	12:45:40 PM	12:46:22 PM	12:59:51 PM	1:10:34 PM	24:12	FALLS	57 ASHLEY HILL LN
14026979	3/14/14	3:43:47 PM	3:43:48 PM	3:48:04 PM	3:57:39 PM	13:51	FALLS	1815 FOUR SEASONS BLVD
14027050	3/14/14	6:21:09 PM	6:21:52 PM	6:23:09 PM	6:39:28 PM	17:36	FALLS	1411 RIDGECREST DR
14027698	3/16/14	5:25:09 PM	5:25:43 PM	5:27:36 PM	5:42:50 PM	17:07	FALLS	312 5TH AVE W
14027744	3/16/14	9:16:01 PM	9:16:58 PM	9:20:38 PM	9:36:17 PM	19:19	FALLS	1000 W ALLEN ST
14028454	3/18/14	7:09:10 PM	7:10:37 PM	7:15:42 PM	7:25:46 PM	15:09	FALLS	1000 W ALLEN ST
14028825	3/19/14	5:38:14 PM	5:38:58 PM	5:44:11 PM	5:56:20 PM	17:22	FALLS	334 THOMPSON ST

Figure 1. Example of CAD data contained in Excel file

Once this data was reviewed and determined to be useful, it was analyzed to determine possible patterns in the data that may be relevant to creating a fall prevention program to specifically meet the needs of the City. In order to maintain perspective, a report was run in the HFD RMS system to determine the total incidents for the associated time frame.

What impact does preventable falls have on the department's resources?

To answer this research question, the author requested and received fall specific data from the Henderson County 911 Dispatch because the HFD did not specifically record fall related data. This data was received in a generic CSV file and contained only basic information such as dispatch, responding, arrival, and clear times in addition to incident address. This data was used to determine trends in the data related to falls such as, hour of day, day of week, and average commit times for fall incidents.

Additionally, the HFD records management system was queried to obtain comparable data for the same time period. This was done to determine the impact of falls on the fire department resources as compared to other call types. Specifically, the author wanted to determine what percentage of the overall call volume and what percentage of medical calls were attributable to falls. Since prior to this applied research project, the HFD recorded all fall responses in the medical response grouping.

Finally, the addresses associated with all of the incidents from the study period were geocoded in ArcGIS to determine the call density within specific geographic areas. From this information, a fall response heat map was created. Areas determined to hold high concentrations of falls were reviewed to determine possible reasons for the repeated responses.

What are the impacts that preventable falls have on the victims?

This question was answered by reviewing available literature. Falls within the older adult population aged 65 and older are a significant risk factor to their health and safety. Due to this, there is an abundance of resources and literature available on the topic. The procedure utilized to determine the literature that would be reviewed for this project was to identify national/regional level literature, state level literature, and finally local/county level literature. This procedure was used in an attempt to correlate the impacts to the local population.

What mitigation strategies are utilized by other fire departments to reduce the risk of falls among the older adults they serve?

A literature review was conducted to identify the various mitigation strategies utilized by other fire departments. Many mitigation strategies were identified, but surprisingly there were not many fire departments that provided fall prevention programs based on internet searches. Of the fire departments that had fall prevention programs and included this information on their websites, most provided a multi component approach to their programs.

How do other departments evaluate the effectiveness of their fall prevention programs?

A literature review was again used to determine if fire departments which had established fall prevention programs also had a method to determine the effectiveness of their programs. Because there was almost no information on fall prevention program evaluation included on the fire department websites, the author contacted individual departments and attempted to conduct an informal interview. Unfortunately, this was not very successful as will be explained in the results section.

The following limitations are to be noted in this applied research project. First, as stated above, very little information was found to describe how fire departments evaluated the effectiveness of their fall prevention programs. There is one study that was conducted by the Centers for Disease Control (CDC) that evaluated the Remembering When Program by the NFPA. This study used pre, post, and follow-up questionnaires to measure the effectiveness of that single program. This limitation was a little discouraging as it is very difficult to gain support from elected officials when a program's effectiveness cannot be quantified.

An additional limitation of this applied research project is the fact that the fall data provided from the CAD system does not break down the incidents in a way that the author could

determine which incidents included injuries and which included older adults simply needing assistance getting off the floor. This limitation will be specifically addressed in the recommendations section of this applied research project.

Results

Fall prevention among older adults within the City of Hendersonville is a significant issue. Falls impact victims, the fire department, and affects the department's ability to effectively respond to other incidents which might occur concurrently with responses to fall incidents. Falls account for a significant number of the calls that the HFD responds to each year. Due to the fact that the population of the City of Hendersonville currently includes 30.1 percent as older adults aged 65 or older, falls will continue to account for a large number of responses annually.

What is the current fall problem among older adults within the City of Hendersonville?

In 2014 HFD responded to more than 3,800 incidents, of which, more than 2,800 were medical calls. Prior to March of 2014, falls with injuries and assist invalid calls were dispatched as medical incidents. The HFD responded to many incidents which included falls among the age 65+ demographic, but was not tracking this information. At the request of HFD, the Henderson County 911 Center began tracking falls with injuries as 'falls.' During a six month period, HFD responded to 1,547 total incidents. Of those incidents, 1,136 or 73.43 percent were medical first responder incidents (see *Figure 2*).

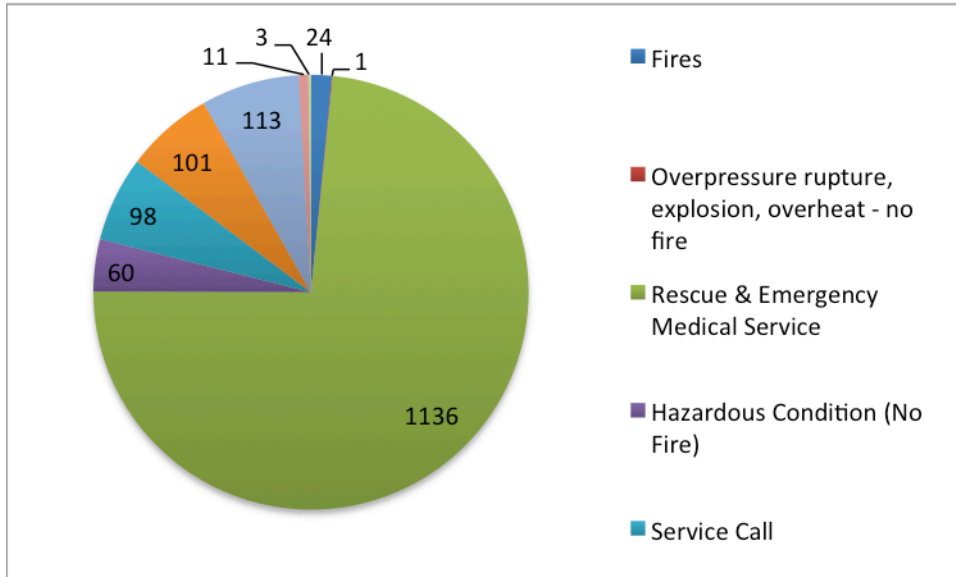


Figure 2. Total calls by incident type

Of the 1,136 medical first responder incidents, 228 or 20.07 percent were falls (see Figure 3).

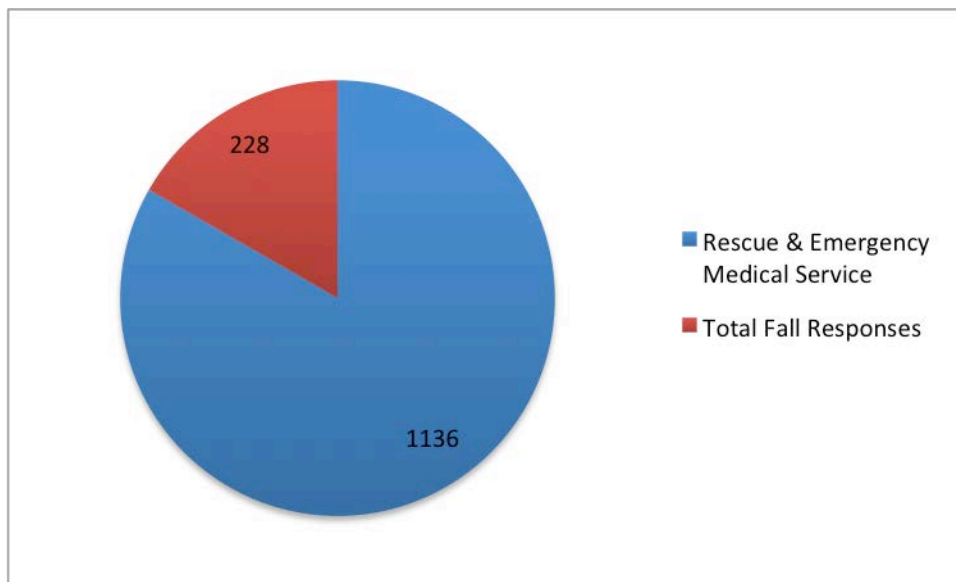


Figure 3. EMS incidents vs. Fall incidents

When comparing the total number of falls to the total number of incidents, falls accounted for 14.74 percent of all call types during the study period. Because of the current demographic

makeup of the City, the number of incidents related to falls is expected to increase in future years if not addressed through a fall prevention program (HFD RMS System, 2014).

What impact does preventable falls have on the department's resources?

Preventable falls among older adults has a direct impact on the resources of the HFD. By analyzing the data obtained from the CAD system, the author was able to determine several interesting facts. The data was analyzed to determine the peak days of the week, the peak hour of the day, and the total commit time associated with responses to falls. Additionally, the data was geo referenced to create a fall response heat map so location trends could be identified. Falls incidents were analyzed to determine if specific days had higher demands for service than other days. It was determined that by day of week, fall incidents ranged from 28 to 38 incidents (see *Figure 4*).

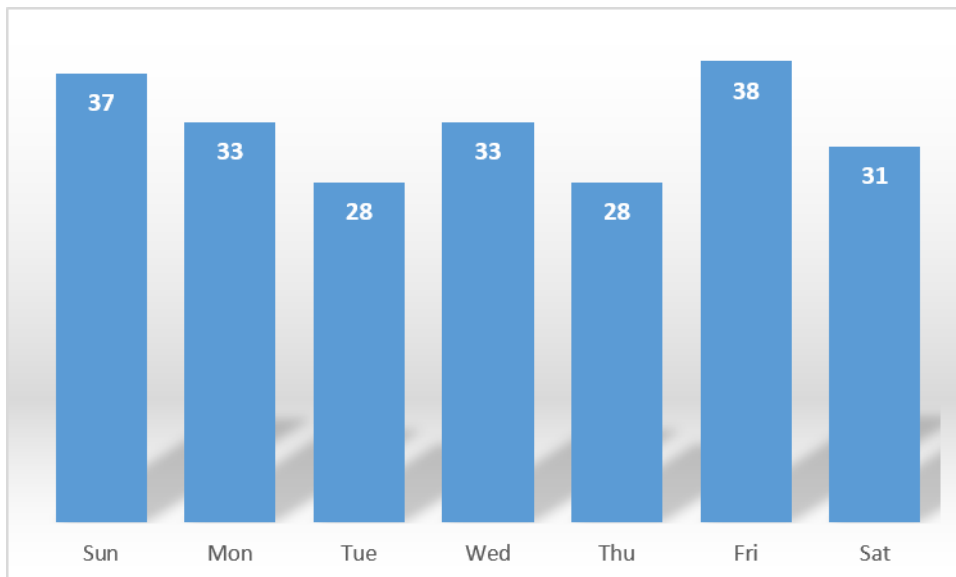


Figure 4. Falls by day of week

The peak days of the week for falls within the HFD response area are Sundays and Fridays. The number of fall incidents for each of these days was determined to be 37 and 38 respectively. The

remaining five days ranged from 28 – 33. While the peak days did were not extremely higher than any other day of the week, there is a possible correlation that will be discussed later in the results section

The data was also reviewed to determine when the majority of fall incidents occurred during the day. It was determined that most fall incidents occurred between the hours of 8:00 AM and 7:00 PM. In addition to this higher concentration of fall incidents, there were three peaks during this time frame that seemed to occur during typical meal times (see *Figure 5*).

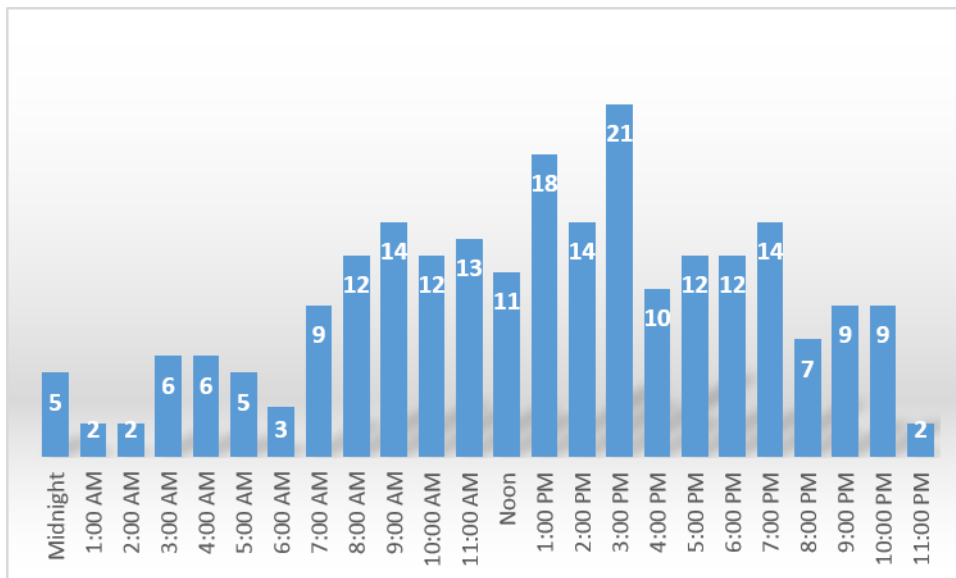


Figure 5. Falls by hour of day

The impact to the HFD includes safety due to the frequent number of responses to fall incidents. Each response puts both personnel and apparatus at risk while attempting to negotiate traffic, sometimes at heavy traffic time periods. In addition to the impact on safety, there is wear and tear on the apparatus resulting in additional maintenance costs. In addition to these impacts, responding to these incidents represents a significant amount of time. While apparatus and personnel are committed to these incidents, they are not available to respond to other incidents.

Because of this, the average commit time was calculated for all of the fall incident responses during the study period. It was determined that the average commit time was 30 minutes and 20 seconds. This average commit time calculates to approximately 115 hours spent responding to and mitigating 228 fall incidents.

Finally, all incidents during the study period were geo-coded into ArcGIS® to create a heat map and spatially represent fall incidents. The purpose of this analysis was to determine if there were higher than average concentrations of falls in specific areas of the HFD response area. In order to create this map, ArcGIS® was utilized to geo-code the incident addresses. Once all incident addresses were geo-coded, the Spatial Analyst Extension was used to create a heat map (see Figure 6).

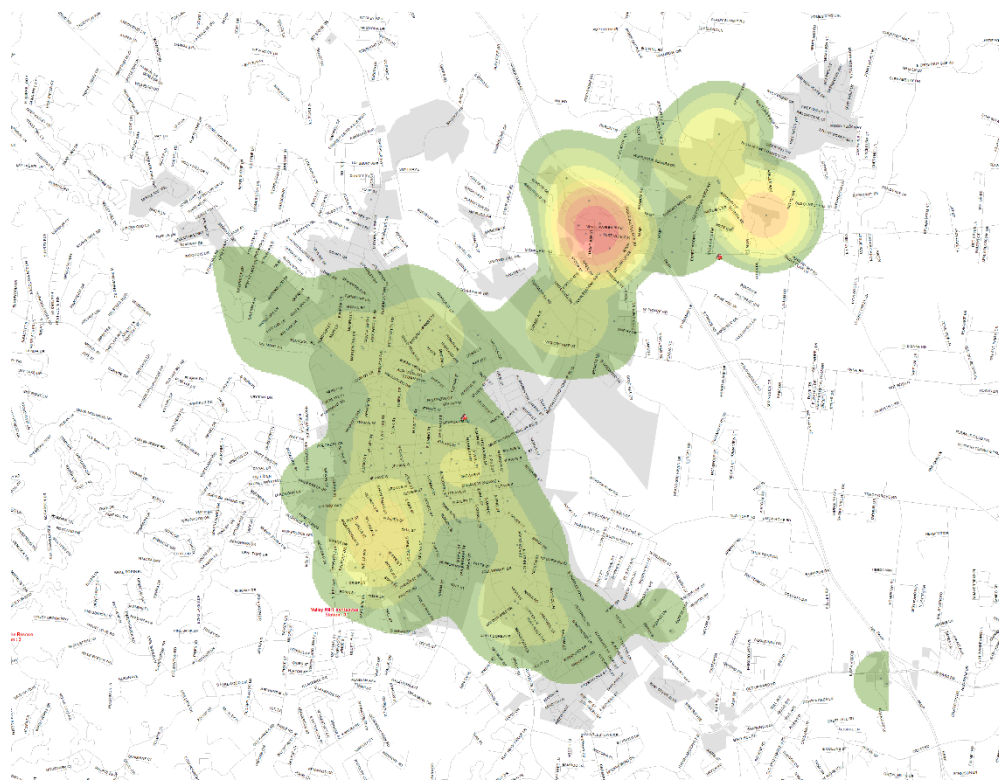


Figure 6. Fall incidents heat map

Once the fall incidents were mapped, it became readily apparent there were areas within the HFD response district that had higher than average fall incidents. Once this was determined, the author conducted an analysis by address within the CAD system data to identify those addresses where multiple fall incident responses occurred. Based on the results of this additional analysis, it was determined that 45.18 percent (103) of the 228 fall incidents during the study period occurred in or at assisted living facilities. It was further determined that those 103 incidents occurred at seven specific facilities (see Table 1).

Table 1

Fall Incidents by Assisted Living Facility

Facility	Number of Incidents
Lake Pointe Landing	34
Carillon Assisted Living	24
Cardinal Care Center	13
Emeritus at Pine Park	11
Carolina Village	11
Life Care Center of Hendersonville	6
Golden Living Center	4

If we calculate the time spent responding to fall incidents in assisted living facilities based on the average commit time, the HFD spent more than 54 hours in assisted living facilities. Based on this, responding to falls in assisted living facilities is a major impact on Hendersonville Fire Departments ability to respond to other incidents.

What are the impacts that preventable falls have on the victims?

Preventable falls have many direct and indirect impacts. Direct impacts include pain, emotional distress, expense, reduced quality of life, and death. Indirect impacts include less interaction with loved ones, associated health problems, and depression. Preventable falls can create severe pain for victims. Older adults often have weaker bones that are more susceptible to breaks. A frequent injury in older adults is a broken hip. Broken hips can be both painful and expensive. Considering that a large number of fall victims with broken hips are eventually discharged to assisted living facilities for extend or long term care, expenses associated with falls can in the tens of thousands of dollars. Most victims who experience broken hips also experience a reduction in the quality of life. This is due to reduce mobility, fear of additional falls, and self-limiting of activities resulting in less social interaction. Many fall victims who experience significant injuries live less than one year following their injury.

Indirect impacts can be just as devastating to the victims of falls. As previously stated, many older adults will self-limit their activities to reduce the risk of additional falls. Along with this comes less interaction with loved ones. Also, with less activity, older adults become more susceptible to other health problems associated with less mobility. Examples would be pressure wounds such as bed sores, pneumonia due to lying down, and lack of exercise. All of these things can lead to severe depression in an older adult due to a general feeling that they have reached their end of life.

What mitigation strategies are utilized by other fire departments to reduce the risk of falls among the older adults they serve?

Through literature review, it was determined that many fire departments relied on canned programs such as NFPA's Remembering When Program for their fall prevention efforts. Many offered some sort of home inspection program to assist older adults in identifying fall risk factors

in the home. A few offered programs to assist with in home modifications such as grab handles in showers and around toilets. Even less offered exercise programs aimed at helping older adults gain better balance and strength, both of which were identified as important mitigation tools by the National Council on Aging. Most fall prevention programs offered were voluntary and required that the older adults request assistance under the program.

How do other departments evaluate the effectiveness of their fall prevention programs?

As was previously mentioned in the procedures section of this applied research project, very little information was found during the research for this project. In fact, the only information found included comparing the number of falls from one year to the next. The author did attempt to conduct informal interviews with a few fire departments which were identified as having fall prevention programs, but this was found to be very unproductive and was ultimately abandoned. In the author's opinion, simply comparing the number of falls from one year to the next as a means to evaluate the effectiveness of the fall program is adequate in and of itself. There are many other factors that may affect the number a fall incident responses from one year compared to another and could falsely influence the outcome of the evaluation program. This research question was not adequately answered in the author's opinion.

Based on the results of this applied research project, it was determined that a multi-component fall prevention program should be created for the HFD. The HFD should create an fall prevention program outline (see Appendix A) and include the Remembering When Program by the NFPA and the Workout to GO program by the National Institute on Aging by the NIH, an exercise program that requires little to no equipment, a home fall prevention checklist (see Appendix B), and a home fall risk assessment questionnaire (see Appendix C).

The results also demonstrated the need to limit the overall length of the program to two and a half hours or less. This was recommended to keep the length short enough that older adults would be more willing to attend, but also fit in the early morning or early evening hours. Older adults are reluctant to attend functions that will require travel once the sun has set.

Discussion

The results of this applied research project confirmed both the need for a comprehensive fall prevention program for older adults within the City of Hendersonville and identified several possible components of fall prevention program. According to the National Center for Injury Prevention, an effective community-based fall prevention program consists of five building blocks. The five building blocks are: education programs for older adults and their caregivers, progressive exercise programs to improve mobility, strength, and balance, medication review and management, vision exams and vision improvement, and home safety assessment and home modification (National Center for Injury Prevention and Control, 2008, Chapter 5).

For the education component, several resources were reviewed. Many fire departments with existing fall prevention programs utilize the Remembering When Program by the NFPA. This program includes both fall prevention and fire prevention messages and training for older adults. The fall prevention component focuses on eight key messages. Those key messages are exercise regularly, take your time, keep stair and walking areas free, improve the lighting, use non-slip mats, be aware of uneven surfaces, stairways should be well lit, and wear sturdy, well-fitting, low-heeled shoes with non-slip soles. This program goes on to touch on many of the five building blocks of a successful community-based fall prevention program listed previously (NFPA, 2013).

Exercise to improve strength and balance was a major component of larger programs and was identified as a vital part of a successful program. In researching various exercise programs aimed at addressing fall prevention among older adults, the GO4LIFE program from the National Institute on Aging at the NIH was identified as readily available and easily included as a component of the fall prevention program. This program offers many free resources such as a full manual that covers multiple aspects of wellness and fitness among older adults, a “Workout to GO” pamphlet that includes sample exercise routines aimed at addressing fall prevention with very little tools, and finally, a DVD that contains exercises that can be done at home, at work, or in a gym. The pamphlet only requires two tennis balls, a rolled towel, a sturdy chair, and two equally weighted objects (National Institute on Aging at NIH, 2009).

A review of medications is another component of the CDC recommendations. Only one fire department was identified as providing this component. Because many older adults are on a wide range of medications that may have an effect on their balance and mobility, this component could easily play a vital role in any comprehensive fall prevention program. The fire department that provided this service used department paramedics to review medications during a home visit. During the review process, the medications should be reviewed by a pharmacist or healthcare provider to identify side effects or drug interactions that might increase the likelihood of falls. If any risks are identified, the medications should be adjusted or changed by a physician to reduce the risk of falls (National Center for Injury Prevention and Control, 2008).

Vision in older adults is also identified as a major contributing factor in falls. As we age, our vision can begin to fail. Lack of visual clarity and depth perception can cause instability among older adults as they ambulate through their homes and across uneven surfaces. Another recommendation of the National Center for Injury Prevention and Control guide to building an

effective community-based fall prevention program is to have regularly scheduled vision exams by healthcare professionals and having vision corrected by an optometrist or ophthalmologist (National Center for Injury Prevention and Control, 2008, p. 21).

The final building block based on the CDC guide is the home safety assessment and home medication component. Home safety assessments were a very popular component of most of the programs and guides reviewed. These assessments varied in their depth and scope. Some included a simple checklist type inspection conducted by fire department personnel while others included visits by occupational therapists. Another component of the home safety assessment included in some programs was home modifications. These modifications might include grab bars, wheel chair ramps, and access modifications to reduce risks associated with lack of reach. The home safety assessments reviewed seemed to be popular due the perceived ease of implementation. The home modification programs were much more involved and most required a vetting process to identify local contractors to install the recommended safety components or make the appropriate modifications (National Center for Injury Prevention and Control, 2008).

The author's interpretation of the results from this applied research project is based on the research conducted and a review of the data collected locally to review the fall problem within the City of Hendersonville. It was determined that falls among older adults are a major concern on the national, state, and local level. Falls is the number one cause of unintentional injury death for individuals aged 65 and older every year from 2003 to 2012 (NC DHHS, 2014). Locally, falls among those aged 65 and older accounted for 56 deaths, 920 hospitalizations, and 1,703 emergency department visits from 2007 to 2009 (NC DHHS, 2009, p. 19). During the six month study period, the HFD responded to 228 falls with injury, 103 occurring in assisted living facilities and 125 in other occupancy types including residential and commercial occupancies.

These responses accounted for almost 15 percent (14.75%) of the total 1,547 calls the HFD responded to during this study period (HFD RMS System, 2014). Based on these results, falls are a significant problem among older adults within the City of Hendersonville and have a direct impact on the resources of HFD.

The implications of the results gained from this applied research project are significant to the HFD. The impact to the resources of the HFD includes personnel fatigue and apparatus wear and tear. Additionally, there are safety risks to both personnel and the public while responding to fall incidents. With the high number of falls with injury, the HFD may be delayed in responding to other types of emergencies such as structure fires.

Recommendations

Based on the literature review and a review of response data, the HFD should create a comprehensive fall prevention program. The program should include The Remembering When Program by the NFPA, the Workout on the GO program by National Institute on Aging at NIH and should include the following optional in home fall prevention tools:

1. Fall Prevention Program Outline (Appendix A)
2. Home Fall Prevention Checklist (Appendix B)
3. Home Fall Risk Questionnaire (Appendix C)

The fall prevention program should run for less than two and a half hours. Home fall assessment tools should be optional and offered during the delivery of the fall prevention program. The HFD will offer the fall prevention program to the community once per quarter at fire station two. In addition to the quarterly delivery to the public, the HFD will schedule fall prevention programs with the seven assisted living facilities identified in Table 1 twice per year.

Evaluating the fall prevention program will be accomplished by utilizing the evaluation tool provided in the Remembering When Program by the NFPA. In addition to this evaluation tool, the HFD will analyze fall response data on a quarterly basis and compare this to the previous quarter and the same quarter from the previous year. This comparison will serve to determine if the program is reducing the overall fall related call volume.

The HFD should work with the Henderson County 911 Center to create an additional call type to better determine the number of fall responses that result in injury versus those that only require assistance. Currently, all falls are dispatched as the “fall” call type. Creating an assist invalid call type for falls that do not involve injuries will allow the department to monitor falls with and without injuries.

Finally, the HFD should seek community partnerships to help deliver and fund the fall prevention program in the future. Working with community partners, the HFD could reduce the costs to the fire department while increasing the number of program offerings. Ultimately, the department should provide assistance to the various assisted living facilities listed in Table 1 with the materials and training so that their staff can deliver the program to their residents.

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Appendix A



Hendersonville Fire Department



Fall Prevention Program

Remembering When Program by NFPA	80 Mins
Introductions	5 Mins
Pre-Test/Ice Breaker	10 Mins
Group PowerPoint Presentation	25 Mins
At our Age with Tom Bosely Video	20 Mins
Trivia Game	10 Mins
Wrap up/Questions	10 Mins
Workout to GO by National Institute on Aging at NIH	60 Mins
Introductions	5 Mins
Strength Exercises Demonstrations	15 Mins
Balance Exercises Demonstrations	15 Mins
Flexibility Exercises Demonstrations	15 Mins
Handouts/Take home Items	5 Mins
Wrap up/Questions	5 Mins
HFD Home Fall Risk Questionnaire (Requires optional home visit)	5 Mins
Signup/Scheduling	5 Mins
HFD Fall Prevention Checklist (Requires optional home visit)	5 Mins
Signup/Scheduling	5 Mins
Total Program Time: 2 Hours 30 Mins	

Required supplies: Pre-test/ice breaker handouts, audio visual devices and PowerPoint presentation, At our Age DVD, Trivia Game handouts, tennis balls (two for each participant), rolled towels (one for each participant), canned goods (two for each participant), Workout to GO handouts, HFD Home Fall Risk Questionnaire signup sheet, HFD Fall Prevention Checklist signup sheet, fruits, healthy snacks, and bottled waters.

Appendix B



Hendersonville Fire Department



Home Fall Prevention Checklist

Page 1

Bathrooms	Yes	No	N/A
Path from bedroom to bathroom well lit			
Pathway clear of clutter, wires, cords, and other trip hazards			
Grab bars installed next to bathtubs, showers, and toilets			
Are you able to stand while taking a shower without difficulty			
Non-slip runner mats in shower and/or tub floors			
Raised toilet seat			
Tub or shower seat			
No bathroom area rugs			
Bathroom floors dry after bath/shower			
Shower items within safe reach (soap, shampoo, towels, etc)			
Bedroom	Yes	No	N/A
Adequate lighting within reach of bed			
Telephone within reach of bed			
Eyewear within reach of bed			
Floor clear of clutter, wires, cords, and other trip hazards			
Night lights to illuminate paths around bed			
No floor area rugs			
Television remote near bed			
Sturdy furniture or handrail near bed			
Living Areas	Yes	No	N/A
No area rugs within walkways			
No low furniture			
Phone within reach of floor			
Floor clear of clutter, wires, cords, and other trip hazards			
No reach required for fans, lights, etc. (Pull cords, etc)			
Kitchen	Yes	No	N/A
Commonly needed items within reach without the use of ladders, step stools, etc.			
Floor clear of clutter, wires, cords, liquids, grease, etc.			
No area rugs within kitchen			
List of important healthcare information on refrigerator (Names of Physicians, current list of medications, emergency contacts)			
Appliances accessible			

Answering "No" to any item should be considered for intervention



Hendersonville Fire Department



Home Fall Prevention Checklist

Page 2

Floors, Hallways, & Stairs	Yes	No	N/A
Floors, Hallways, & Stairs clear of clutter, wires, cords, and other trip hazards			
Areas well lit			
Handrails securely fastened to the wall			
No area rugs, frayed carpeting			
Stair treads secure			
Top and bottom steps clearly marked			
Porch, Yard, Outside Areas	Yes	No	N/A
Paths from driveway/garage to house well lit			
Walking paths and sidewalks clear of cracks and buckles, hoses, weeds, other obstacles			
Walking paths and sidewalks clear of standing water/ice			
Parking space close to house			
Doors easy to open			
Steps and uneven walking surfaces clearly marked			
General	Yes	No	N/A
Exercise regularly			
Take all medications to doctor visits			
Vision is checked annually			
Hearing checked annually			
Wear skid-free shoes (non-slip soles)			
Use walkers or canes if necessary			
Before getting up, dangle with feet on floor, then stand up slowly, if dizzy sit back down			
Avoid drinking alcohol			
Wearable alert device			
Phone can be reached from floor and bed			
Wireless or cellular phone in your pocket			
Emergency contact numbers next to each phone/stored in phone			

Answering "No" to any item should be considered for intervention

Appendix C



Hendersonville Fire Department



Home Fall Risk Questionnaire

Fall History	Yes	No	N/A
Have you ever fallen before?			
When was the last time you fell?			
Have you fallen more than once in the past three months?			
Have you been injured in a previous fall?			
Physical Ability (To be assessed by Fire Department Personnel)	Yes	No	N/A
Has your hand strength decreased?			
Do you shuffle when you walk?			
Do you feel unsteady on your feet?			
Do you feel weaker than you used to?			
Do you have weakness in your arms and legs?			
Medical Conditions	Yes	No	N/A
Do you experience incontinence?			
Have you experienced hearing loss?			
Do you feel dizzy when you stand up?			
Has your eye sight diminished?			
Do you have trouble seeing at night?			
Do you have trouble with depth perception?			
Do you have any foot conditions which cause you to adjust your gait?			
Medications	Yes	No	N/A
Do you take four or more medications?			
Do you take medications to control your blood pressure?			
Do you take medications to help you sleep?			
Do you take medications that you are unaware of their side effects?			
Have been prescribed new medications in the past six months?			
Quality of Life	Yes	No	N/A
Have you stopped doing daily activities due to a fear of falling?			
Do you avoid exercising regularly?			
Do you avoid social gatherings due to a fear of falling?			
Clothing and Footwear	Yes	No	N/A
Do you wear high heels?			
Does any of your clothing include long cords or ties such as bathrobes?			
Do you ever wear only socks or slippers without rubber soles?			
Do you wear shoes without non-slip soles?			

Answering "Yes" to any item should be considered for intervention