PEDIATRIC INJURY PREVENTION STRATEGIES

Leading Community Risk Reduction

Pediatric Injury Prevention Strategies in the Fire Service: Addressing the Need in the Laconia, New Hampshire Community

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June 2004

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 the appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

Injuries continue to be the leading cause of childhood death in the United States. The problem was that the Laconia Fire Department did not have a comprehensive injury prevention program in place to address the problem in this high-risk population.

Children under 14 years of age have been identified as a high-risk group for preventable injuries which can lead to disabilities and even death. The purpose of this research was to look at the injury statistics resulting in emergency medical response for the LFD and determine if there was a need for an injury prevention program and what elements were needed for a program to be effective. Through descriptive research, the following questions were answered:

1. What are the pediatric injury statistics in Laconia and how do they compare with national statistics?
2. What types of programs are other fire departments using to meet the challenge?
3. What elements need to be present in an effective pediatric injury prevention program?
4. What can be done by Laconia Fire Department to effect positive change in the incidence of injuries and death in the pediatric population?

The procedures included a literature review to get an understanding of the injury problem, and a study of local data to compare the incidence of injuries locally to those nationally. Also, a survey was distributed to other fire departments for information on their injury prevention programs.

The results of the literature review and data study confirmed that the injury statistics in Laconia are just as much of a health problem as they are across the country. The results of the survey revealed that many other departments, like Laconia, do not fully address the injury problems of their communities.

Recommendations included a list of steps for the Laconia Fire Department to follow to implement an effective injury prevention program addressing the needs of the children of our community.

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Pediatric Injury Prevention Strategies in the Fire Service:

Addressing the Need in the Laconia, New Hampshire Community

The incidence of unintentional injuries in the pediatric population is considered an epidemic in the United States. In fact, unintentional injuries are the leading cause of death among children in the birth through 14 years age group. This pediatric population has been defined as “high-risk” according to many organizations, including the United States Fire Administration (USFA, 1997). In the United States, unintentional injuries claim more than 5,600 child lives annually, which averages to be 15 children each day, according to the National Safe Kids Campaign “Report to the Nation” (2003). Also, in the year 2000, one in every five children in the identified age group in the United States was among the more than 11.8 million medical visits for unintentional injury. These are staggering statistics considering that these injuries are preventable and can have a devastating impact on the financial and emotional well-being of the children and their families, their community, and society as a whole.

Because emergency medical incidents are such a large portion of the responses of many fire departments, firefighters and Emergency Medical Technicians deal first hand with the young victims of these unfortunate events. The problem is that the Laconia Fire Department does not have a comprehensive injury prevention program in place to address the “accidents” which are the greatest public health epidemic facing children today. Charged with life safety, the Laconia Fire Department recognizes the need for research into prevention strategies for the high risk pediatric population of our community. Therefore, the purpose of this research is twofold. First, it is important to look at injury

statistics resulting in emergency medical response for the Laconia Fire Department (LFD) and determine if there is a need for a pediatric injury prevention program. Second, it is necessary to study types of programs and what elements need to be present for a program to be effective.

Through literature reviews and surveys, the descriptive research method is used to answer the following questions:

1. What are the pediatric injury statistics in Laconia and how do they compare with national statistics?
2. What types of programs are other fire departments using to meet the challenge?
3. What elements need to be present in an effective pediatric injury prevention program?
4. What can be done by the Laconia Fire Department to effect positive change in the incidence of injuries and death in the identified population?

Background and Significance

The Laconia Fire Department has proudly served the community with a firefighting history of nearly 150 years. With extreme staffing shortages, expanding responsibilities and ever-increasing risks, it is becoming more difficult to fulfill our mission to respond to the emergency needs of those we protect. As many departments have over the last 20-30 years, Laconia has taken a more proactive approach to service by providing public education and fire prevention activities. A look over the last 10 years of the department reveals such actions as annual facility safety inspections, annual fire

prevention open houses, fire extinguisher demonstrations, school visits and demonstrations, and fire station tours. With expanded services in such areas as hazardous materials, technical rescue including dive rescue, bomb threats and other domestic events, the firefighters and resources of the LFD are already strained with responding to over 3100 emergency calls annually with a staff of 28 and only 7 on duty per shift. This leaves very little time left over for scheduling public education. Each October during fire prevention week, we host successful open houses and school visits for fire safety education, but we are lacking programs for the other eleven months and for injury prevention education.

The city of Laconia is located in Belknap County which is situated in Central New Hampshire. Laconia is in the heart of the “Lakes Region” of New Hampshire and is the most populated area and the only city in Belknap County. With 19 miles of lakefront shoreline and the White Mountain range to the North, the City of Laconia is a popular tourist destination in all 4 seasons. Hikers, swimmers, skiers, boaters, snowmobilers, campers and “leaf peepers” , among others, find tranquility and serenity or thrills and adventure on Mt. Belknap, Lake Winnipesaukee, Lake Opechee, and Lake Winnisquam, all located in Laconia, New Hampshire. By far, the largest tourist influx happens in June each year when Laconia hosts the oldest and third largest motorcycle rally in the United States. Anywhere from 200,000 to 325,000 fans descend on the Weirs Beach area of Laconia over a nine day period to enjoy the area, socialize, ride, show off their “wheels”, drink beer, listen to an array of bands and possibly add to their tattoo collection.

The city if Laconia is an old mill city. It is a moderately sized, suburban

community with just under 19,000 year round residents covering 26 square miles. According to a recent demographic profile, Laconia is one of the fastest growing municipalities in the Lakes Region. It has the highest population density and is ranked number two for the highest number of homes constructed since 1995 (Lakes Region Planning Commission, 2003). The projected growth is staggering with 1800 building permit applications accepted in the past 18 months. This area has a high probability for loss of life and property. Each year the fire chief approaches the City Manager with a budget request to increase our staffing levels and each year the request is denied even though the firefighters of our department are among the busiest in the state with regards to number of incidents per firefighter. The reason that our budget is denied year after year is that Laconia is basically a poor city. The city currently has 31% of its assessed value in non-taxable property forcing a higher tax burden on the remaining properties. Laconia also serves as the county seat with several government buildings and county facilities adding to the tax-exempt properties. According to the *Lakes Region Demographic Profile,* the average resident of the city has an annual salary of less than $30,000 and currently our unemployment rate is 4.7% (2003). According to Laconia school district, 45 percent of the student population requires meal assistance. Additionally, we are considered a “receiver town” by state government, meaning that we are poor in comparison to other communities and must receive supplemental funding to keep our schools running adequately. This problem is twofold for Laconia. First, a lower socioeconomic background increases the risk of unintentional injuries to our pediatric

population and second, the lack of city funding decreases the possibility of hiring more firefighters to meet the growing needs of our community.

In the LFD, as in many fire departments across the country, the percentage of emergency medical calls far exceeds fire calls. Currently, eighty percent of our total call volume is the result of emergency medical incidents. The 2000 U. S. Census reveals that 20.7 percent of the population of Laconia is less than nineteen years old (Lakes Region Planning Commission, 2003). The median age for a Laconia resident is 38.1 years and the average persons per household is 2.57, which is slightly higher than the state average of 2.53. Although the Lakes Region of New Hampshire is a popular retirement destination, a very large percent of the population is families with children. Disconcertingly, 8.9 percent of the families of Laconia are living at or below the poverty level. The state average is 7 percent. As mentioned earlier, this lower socioeconomic level contributes to the incidence of unintentional injuries in the pediatric age group.

Over the last 5 years, LFD ambulance responded annually to an average of 138 calls for service and transported an average of 126 patients with unintentional injuries in the 0 to 14 years age group (Lakes Region General Hospital, 2005). By far, the highest percent were a result of motor vehicle collisions. Other calls included falls, dog bites, choking, sports injuries, electrocution, drowning, and even stab wounds. Over the last 5 years, LFD personnel witnessed an increase in the number of unintentional injuries in this pediatric age group. The administration of the Laconia Fire Department recognizes the immediate need for research into prevention efforts in order to stabilize and perhaps even reverse this upward trend of injuries to the children of our community.

This applied research project is directly linked to the Executive Fire Officer's role as taught in the Leading Community Risk Reduction class at the National Fire Academy. "The focus of this course is to enhance the skills needed by an Executive Fire Officer (EFO) to implement and lead a community risk-reduction initiative" (NFA, 2004, p. SM 0-15). Also, this applied research project relates to the United States Fire Administration (USFA) Operational Objectives.

> The first operational objective is to reduce the loss of life from fire by 15 percent. The second objective is to develop a comprehensive multihazard risk-reduction plan for 2,500 communities, led by or including the local fire service…The role of chief officer is to lead and facilitate the community risk-reduction process. (NFA, 2004, p. SM 0-15)

This research project is significant to the LFD as it will allow us to examine injury statistics in our community, learn what programs other fire departments are using and finding effective, and determine if there is a need to implement such programs as a catalyst for change in our community.

Literature Review

An extensive literature review was conducted to research and analyze the data, facts and critical findings of others related to the problem addressed in this applied research project. This review included a search of medical journals, fire service magazines and textbooks, internet articles, injury prevention articles, and safety journals in order to increase awareness and understanding of the pediatric injury dilemma in our country. Also, emergency medical incident reports of the LFD and emergency

department records of the Lakes Region General Hospital were reviewed to gather information on the pediatric injury statistics in the city of Laconia.

A World Health Organization report, *Investing in Health Research and Development: Report of the Ad Hoc Committee on Health Research Relating to Future Intervention Options,* warns that worldwide, "the epidemic of injuries may be among the most neglected health problems of the late 20th century" (1996).

> From 1987 to 2000, the unintentional injury death rate among children ages 14 and under has dropped by almost 40 percent- one of the most dramatic declines ever seen in a children's health issue…. Despite this tremendous progress, unintentional injury remains the number one killer of children ages 14 and under in the United States… (National Safe Kids Campaign, 2003).

To address injury prevention for young children, an injury surveillance system, that is, a data and statistics collection system needs to be in place. "Injury data can confirm, disprove, or refine an analysis of an injury problem and are essential for the design, implementation, and evaluation of an effective injury prevention and control program" (National Committee for Injury Prevention and Control, 1999). The literature review also revealed some program elements which have been proven to be effective in pediatric injury prevention. For example, when firefighters show up at an elementary school in uniform, they make an impression on the young children. But when they show up at that same school with a fire safety trailer where those children can practice escape plans, "stop, drop, and roll", and safety around the home, they have made a bigger impression on their target audience. This type of hands on learning has proven effective.

Games offer a method of education and reinforcement of facts that students find to be fun. “Gaming techniques add novelty to the learning situation, and therefore, many students are more attentive” (Mondozzi & Harper, 2001, p. 278).

When reading the literature on fire and injury prevention programs, the three “E’s” (education, engineering, and enforcement) are often mentioned. “Each of the three E’s can contribute to the development of comprehensive, realistic, and effective solutions” (North American Coalition for Fire and Life Safety Education, 1999, p.3) “Each of the three E’s exerts a synergistic effect on the others, however, and together they are much more effective than individually” (1999, p.3).

Finally, it has been found to be effective when parents, teachers and public safety personnel act as role models for positive behavior. “Children learn best when messages are reinforced by role models. If parents aren’t willing to follow their own rules, children are more likely to break the rules as well” (National SAFE KIDS Campaign, 2005).

There are several major areas of risk discussed when researching statistics on childhood injuries. This project addresses eight of the most common unintentional pediatric injuries. These categories include motor vehicle collision injuries, water injuries and drowning, fires and burn injuries, poisoning, falls, choking, suffocation, and strangulation, bicycle and pedestrian injuries and firearms injuries. This research project focuses primarily on injuries and deaths of children ages birth through 14.This review section includes discussion on findings in the aforementioned categories.

Motor Vehicle Injuries

Over the last several years, the leading cause of fatal unintentional injury among

children was motor vehicle occupant injury. “In 1995, 42 % of all fatal unintentional injuries to children were the result of motor vehicle accidents” (Spivak, 1999, p. 45). Children under one year of age continue to be at the highest risk for motor vehicle occupant injury with a death rate nearly 1.5 times that of children of all other ages. Organizations across the country have developed programs to help prevent childhood injuries and deaths associated with motor vehicle collisions. The National SAFE KIDS Campaign, one such organization, has established *Safe Kids Buckle Up,* a child occupant protection campaign. The primary focus of this organization is to reduce or prevent motor vehicle collision injuries and deaths among children. Also, this organization’s efforts have helped to reduce the number of traffic-related pedestrian injuries and deaths among children age 14 and under in the recent years.

“Nationally, the misuse and nonuse rate for car seats approaches 95%, a disturbing statistic” (Krimston, 2002). The National Highway Traffic Safety Administration (NHTSA) offers a 40- hour child passenger safety (CPS) technician course. This course teaches nurses, firefighters, police officers, emergency medical technicians and other community educators to help parents and caregivers correctly fit and install car seats. According to NHTSA, more than 40,000 Americans annually are killed in motor vehicle crashes and another 500,000 are hospitalized (Linville, 2000).

“Car accidents” are no accident at all, they are preventable. 28 percent of all fatal unintentional injuries to children age 14 and under are the result of being an occupant of a motor vehicle. Add to these statistics the number of children killed by motor vehicles as pedestrians (12 percent) and bicycle riders (3 percent), and it becomes clear that

because of the potential hazard, this is an area that should flag an immediate call to action (National SAFE KIDS Campaign, 2003). It would be imperative on a local level through the LFD to analyze the vehicle collision data to determine the risk for some of our most vulnerable citizens, the children of our community.

Water Injuries and Drowning

"Drowning is the second leading cause of unintentional injury-related death in children ages 14 and under" (Nonprofit Risk Management Center, 2001, p. 81). Because children can drown in as little as one inch of water, there are many risk areas around the home and the community. Wading pools, bathtubs, buckets, diaper pails, toilets, and decorative ponds all create a hazard for young children and toddlers. By far, the majority of drowning and near drowning incidents occur in home swimming pools and in open water. A child's drowning risk is associated to its developmental stage. An infant is more likely to drown in the home in a bathtub or bucket. Swimming pools pose the greatest risk for preschoolers, and school-age children and young teens are most likely to drown in lakes, ponds, rivers, streams, and swimming pools.

There is a very short time frame between a water injury and a drowning. "The majority of children who survive water incidents are found within two minutes of submerging" (2001, p.82). Unfortunately, 16 percent of all unintentional injuries to children in the defined age group are a result of drowning. Emergency Medical Services for Children (EMS-C) is one of the many organizations that are involved in drowning prevention campaigns (Spivak, 1999). Their campaign is geared toward educating families about safety measures around pools and use of flotation devices since the

majority of drowning take place in residential swimming pools. In addition to drowning deaths during swimming activities, children are at risk of drowning while boating, water skiing, diving and jet skiing. Other serious water related injuries during these activities include spinal cord injuries and head injuries.

Fires and Burn Injuries

According to *Solutions 2000,* a report from a symposium to examine fire safety challenges, age is one of the leading risk factors for fire deaths. “Fire death rates per million population are greatest for people under age 6 and over 65” (North American Coalition for Fire and Life Safety Education, 1999, p.7). Children in this age group have a fire-and burn-related death rate nearly twice that of all other children. Another risk factor for fire deaths is poverty. “Poverty and education levels may explain up to 1/3 of the variation in state fire death rates” (1999, p.7). A state with a higher percentage of high school and college graduates has a lower percent of fire deaths.

> The Death rate from fire and burn injury declined 56 percent among children ages 14 and under from 1987 to 2000, yet fire and burn injury remains the fifth leading cause of child unintentional injury-related death. In 2000, 603 children ages 14 and under died from unintentional fire and burn injury (National SAFE KIDS Campaign, 2003, p. 11)

Children are curious and like to explore their environment. This often leads young children to play with matches and cigarette lighters. Young children are also at higher risk for fire deaths because they may lack the physical coordination and cognitive skills to be able to know when and how to escape from fire. They are not aware of the

devastating effects of fire. Of particular note concerning children and fire is that over 50 percent of all people arrested for arson are under 18 years of age and arson is a leading cause of fire deaths, second only to fires caused by smoking materials (1999, p. 5).

Aside from fire deaths, children in the under 14 age group are also very susceptible to burns and scald injuries. In 2001, nearly 100,000 children ages 14 and under were admitted to hospital emergency departments for burn-related injuries. These included scald injuries, thermal injuries from flame, electric stove surfaces, and fireworks, chemical burns including flammable liquids, and electrical burns. Young children have thinner skin than adults leading to deeper burns and burns from lower temperatures.

Poisoning

Children age 14 and under are at a much greater risk than adults of being poisoned. They have less body mass and faster metabolic rates which make them less physically able to handle toxic substances according to National SAFE KIDS Campaign (2003). Children are at risk of poisoning from personal care products, medicines, plants, household cleaning products, lead, alcohol, and carbon monoxide. More than 90 percent of childhood poisonings happen in the home. Annually, more than 110,000 children in this age group are treated in hospitals for unintentional poisonings and more than 1.1 million are reported to U.S. poison Control Centers.

Among preschoolers, poison ingestion is unintentional as are 90 percent of poisonings in grade-school children. Beginning in the early teens, though, only 50

percent of poisonings are unintentional; the other 50 percent is related to suicide attempts or substance abuse (Nonprofit Risk Management Center, 2001).

Injuries and deaths as a result of poisonings demonstrate the least progress over the years for decline in numbers. Since 1987, there has only been a 5 percent decline in unintentional poisonings in children. Prior to 1987 there was a greater decline with the implementation of child-resistant packaging and efforts to reduce lead in consumer products (National SAFE KIDS Campaign, 2003).

Falls

Falls continue to be the leading cause of nonfatal unintentional injury in the 14 and under age group. “In 2001, more than 2.5 million children in this age group required hospital emergency room treatment for fall related injuries” (National SAFE KIDS Campaign, 2003, p. 13). Infants, toddlers and preschoolers are at the greatest risk of fall-related deaths and 50 percent more likely than children in other age groups to die from falls. As reported in *The Season of Hope: A Risk Management Guide for Youth-Serving Nonprofits*, Falls accounted for 85 percent of playground injuries and 1/3 of those were associated with the use of trampolines. Playground slides and climbing equipment cause the most falls for children 6 years of age and older. Bone fractures, joint dislocations and head injuries account for the majority of the hospitalizations from falls. Head trauma from falls is the cause of the most severe injuries and even death.

Choking, Suffocation, and Strangulation

Airway obstruction injury (AOI) caused by any of the above three factors, remains to be one of the most challenging risk areas for children in the birth through 14

year age group. “On average, infants account for approximately 64 percent of unintentional AOI deaths among children ages 14 and under, and have a death rate 10 times that of all children” (National SAFE KIDS Campaign, 2003, p. 10). Airway obstruction is the leading cause of unintentional injury-related death among infants under age 1. Infants and toddlers up to age three are especially vulnerable to this type of injury due to their physical size with small upper airways, and their curiosity of putting objects in their mouth. According to *Report to the Nation: Trends in Unintentional Childhood Injury Mortality*, nearly 800 children in the year 2000 died from inadvertent airway obstruction injuries, with 160 of those being choking deaths (2003). In addition to these deaths in 2000, more than 16,000 infants and children needed hospital emergency department treatment for AOI in the year 2001.

The causal factors of airway obstruction injuries and deaths include choking on food and small objects, suffocation by objects such as pillows and crib toys, suffocation caused by positional asphyxiation, and strangulation from clothing strings, cords from vertical blinds and playpen toys.

Bicycle and Pedestrian Injuries

Young children lack the cognitive, behavioral and physical abilities to fully understand and avoid traffic hazards. Toddlers and preschool children are at greatest risk of pedestrian death for that reason. Pedestrian injury, however, continues to be the second leading cause of unintentional injury-related death for children ages 5 through 14. Children up to 2 years old are more at risk for non-traffic related injuries; that is, those

that occur in parking lots and driveways, of which more than half happen from backing vehicles.

"Children are impulsive and have difficulty judging speed, spatial relations, distance and velocity…" according to National SAFE KIDS Campaign. "Not until age 10 are children's hearing and sight, depth perception and scanning ability mature enough for them to handle traffic threats on their own" (2003). Children in the identified age group accounted for 11 percent of pedestrian fatalities and an estimated 30 percent of nonfatal pedestrian injuries according to *CDC Fact Book: Different People, Different Injuries* (2002).

An estimated 500 bicycle related fatalities occur annually over the recent years. In 2001, just under 315,000 children ages 14 and under were treated in hospitals for bicycle collision injuries. Children in the 10 to 14 years age group have the highest bicycle-related death rate of all the age groups. Bicycles are associated with more childhood injuries than any other consumer product. Children are just as much at risk for brain injury as any other age group, according to a recent article in Public Risk magazine (Linville, 2000). Only 14 states currently have mandatory bike helmet laws contributing to the incidence of head and brain injury during bicycle related collisions and falls. "Nearly one third of bicyclists killed in traffic crashes are children ages 5 to 14" (Center for Disease Control, 2002).

Firearms Injuries

With an estimated 250 million firearms overall in the United States, of which over 80 million are handguns, children are exposed daily to the possibility of these injuries

(Injury Free Coalition for Kids, 2005, para. 1). Firearm injury is a grave concern in the identified age group because of the popularity and availability of handguns in residences today. “Although the problem has improved somewhat over the past decade, there are still approximately 10-12 firearm deaths daily to children under the age of 19” (Injury Free Coalition for Kids, 2005, para. 1).

Of all injury risk areas, firearm injuries have shown the greatest decline over the last 15 years. However, in 2000, 86 children ages 14 and under died from unintentional firearm-related injury. (National SAFE KIDS Campaign, 2003). It is estimated that for every child who suffers a fatal firearm injury, 16 children require treatment in a hospital emergency room for their injuries. This translates to 1,400 children seen in emergency rooms for firearm-related injuries of which 21 percent are severe enough to require hospitalization (2003).

In summary, despite tremendous strides across the United States, unintentional injury remains the number one killer of our innocent population, the children. An average of 15 children under the age of 14 each day succumbs to fatal injuries which could have been avoided through education, increased awareness and even new legislation. A recent statement by U.S. Surgeon General Richard Carmona, “Injury prevention is a critical component to ensuring healthy children, healthy adults, and a healthy nation”, calls on parents, caregivers and community educators to …”take the necessary steps to help prevent all that is preventable” (Press Release, April, 2005, para. 1).Conducting good local data research can help determine the area of need in an individual community.

Laconia Injury Statistics

Data from Lakes Region General Hospital (LRGH) and Laconia Fire Department medical records were reviewed from the year 2000 through 2004 in the 0-14 age group. A majority, 95 percent, of all pediatric patients transported by Laconia Fire Department personnel are brought to this large regional hospital located in the center of Laconia. The other 5 percent are brought to other facilities by ambulance or "medflighted" to trauma facilities or a children's hospital outside of the city.

Of all the years studied, motor vehicle-related injuries accounted for the largest percentage of emergency medical calls. Anywhere from 39 to 43 percent of ambulance transports in the identified age group were a result of injuries sustained in motor vehicle collisions. Of those, the numbers were spread fairly evenly throughout the pediatric age spectrum, though slightly higher on either end of the range in the 0 to 2 year group and the 13-14 year group. Data indicates that of those motor vehicle-related injuries an average of 5, which is approximately 13 percent of the children, were not restrained in a proper child passenger safety seat or seat belt. Data also indicates that the collisions were of significant impact in at least 20 percent of the cases to cause the vehicle airbag to deploy. In the years studied, motorcycle collisions accounted for injuries to a total of four children 14 years of age or under. This is significant because children in that age group are a lot less likely to be on motorcycles.

Injuries from falls accounted for the second highest number of emergency medical calls for the Laconia Fire Department. During the years studied, anywhere from 25 to 39 children were transported by Laconia ambulance for fall related injuries each

year. It was not evident in all of the cases what the cause of the fall was, but the majority reported indicated that playground equipment, stairs and wheeled sports, for example scooters and skateboards, caused a significant number of incidents.

Approximately 60 percent of the injuries from falls occur in the 0 through 6 years age group and the other 40 percent in the 7 through 14 years age group. The age with the highest reported number of unintentional injuries from falls was the under 1 year age group.

Bicycle and pedestrian injuries ranked third in Laconia for number of emergency medical transports. The majority of those, 92 percent, occurred in children ages 9 through 14. According to CDC, this is the age group least likely to wear bike helmets (CDC, 2002). This is one of the few injury categories that were not split evenly between males and females. The majority of the injuries, 66 percent, occurred in male children in the identified age group. During the time period studied, data indicates that there was one fatal pedestrian injury in a seven year old male child.

Organized sports accounted for a total of 22 unintentional injuries from 2000 through in 2004 in Laconia. The youth of Laconia who were injured during organized sports suffered sprains, strains, fractures, head injuries and spinal cord injuries which were all treated in the hospital emergency room. Of all the organized sports injuries, 100 percent occurred in the 9 through 14 years age range.

Assault accounted for a total of 10 ambulance transports during the time period studied. Of those victims, 3 or 30 percent were less than one year of age. This is a tragic statistic for such an innocent age.

The remaining categories of unintentional injuries were a small percentage of the overall injury data, but because of the potential to have lasting consequences, all injuries are worthy of mention. Of the data studied over the 5 year period there were 2 injuries in the pediatric population of Laconia as a result of fire. No fire deaths were reported in that time frame for children. In 2002 there was one near drowning injury in a 14 year old male and in 2003, there was one fatal drowning of a three year old female. A total of eight injuries in all of the data studied were a result of a stab wound. These injuries were categorized as being inflicted with a knife, a tool, or other object. Animal bites accounted for an average of two injuries per year and there was one reported foreign body obstruction injury reported in the five years studied. Also, there were 2 incidents involving electricity which caused injuries to children, both 14 years of age.

There were a total of 36 unintentional injuries in a category marked “other”. These injuries were spread evenly between males and females and across the pediatric age spectrum. According to a hospital spokesperson, these injuries were of unknown origin or unclassified, but did result in an ambulance transport to Lakes Region General Hospital (LRGH, 2005). There were at least 200 other pediatric emergency medical incidents which Laconia Fire Department personnel responded to. These were not classified as unintentional injuries because they included illness, disease, and other medical causes and were not included in this study.

The LFD has seen an increase in total call volume across the board for fire calls, medical calls, motor vehicle collisions and service calls. During the last year studied, 2004, the personnel of LFD responded to a four percent increase in calls from 2003. In

that same year there was a 5.5 percent increase in unintentional injuries to children from birth through 14 years.

Just as the national injury statistics revealed, the data define the problem. Whether on a national level or local level, it is quite clear which injuries are occurring most often and to whom. The CDC does not use the word "accident" in literature. Unintentional injuries are predictable and avoidable by studying identifiable risk factors. "CDC's Injury Center staff works hard to identify the groups that are disproportionately affected by various injuries and to address the prevention needs of those groups" (CDC, 2002, para. 1). By looking closely at data, we can identify the children most in need.

Procedures

Definition of terms

Accident- "a happening that is not expected or planned; an unfortunate happening or instance of bad luck that causes damage or injury" (Guralnik, 1989, p. 5).

Arson- "the crime of setting fire to a building or other property on purpose" (1989, p.40).

Early adolescence- "children in the age group of 11 through 14 years old (Nonprofit Risk Management Center, 2001, p.14).

Early childhood- "children in the age group from birth to 5 years old" (2001, p.14).

Injury cause- "the mechanism that initiated the chain of events that led to the injury" (www.cdc.gov/ncipc/wisqars, 2005).

Middle childhood- "children in the age group of 5 through 11 years old" (2001,

p. 14).

Prevention- “the act of stopping or hindering; to keep from happening” (1989, p. 579).

Risk- “the probability of an event occurring based on historical losses; the possible deviation from what you expect to occur” (2001, p. 7).

Unintentional- “not done or said on purpose; not intended” (1989, p. 810).

Research Methodology

The desired result of this research project was to collect statistics concerning pediatric unintentional injuries in Laconia and compare them to national statistics on these same injury categories in the same age group to determine if the injuries follow the same trends and if there is a need for an injury prevention program in the LFD. Also, it was important to look at injury prevention programs of other fire departments and what elements of their programs were found to be most effective.

To answer the research questions, the descriptive research method was employed. This methodology included an extensive search and review of injury prevention articles, medical journals, books, reports, fire service and EMS periodicals, and electronic sources to review the critical findings of others concerning national injury prevention statistics and trends. To ensure a wide range and comprehensive selection was used, a literature search was conducted using such key terms and phrases as childhood, injury, safety, injury prevention, unintentional injury, fire department injury prevention programs, and injury statistics. Only those sources that were relevant and appropriate to the subject of this research project were used.

Also included in the research methodology was a review of LFD medical incident reports and Lakes Region General Hospital emergency department data, collected by the hospital's data/application analyst, to determine what types of medical calls the LFD personnel respond to involving the pediatric population of the city. Reports and data were studied to isolate those that involved unintentional injuries in the age range from birth through 14 years. All of the data collected was from January 1, 2000 through December 31, 2004. This time frame was used in order to get an accurate picture of the average numbers of injuries and also to determine any trends throughout numbers or types of injury and age groups over the most recent five years.

As a final phase of the research, a questionnaire was developed entitled "Fire Department Injury Prevention Survey" (Appendix A) to determine what types of injury prevention programs, if any, other fire departments are using and what elements they find to be most effective. The respondent was asked to answer 5 closed-ended questions concerning their use of, or lack of, pediatric injury prevention programs. The final and sixth question was open-ended and asked for input regarding the effectiveness of program elements. Also, space was provided for any other comments or discussion on the topic matter. The survey and a request to complete it was sent via electronic mail to 18 attendees of the 2004 National Fire Academy (NFA) Leading Community Risk Reduction class and 18 New Hampshire fire departments. The surveys were sent out March 15 , 2005 and most of those returned were sent back in the first two weeks.

The sample of New Hampshire fire departments was chosen based on population served and number of personnel to get an accurate representation of a fire department

similar to LFD. The remaining surveys were sent to NFA students to compare other states' programs with those of New Hampshire. A total of 36 requests were distributed, 2 were returned undeliverable. Of the remaining 34 surveys, 29 (85.4 percent) were returned (81 percent of those distributed). A draft test of the survey was reviewed by our Fire Prevention Officer and Fire Chief to assess for ambiguity or leading questions.

Limitations and Assumptions

There were several limitations and assumptions of this applied research project. The main assumption in the literature review portion of this research is that the articles and reports that were chosen were unbiased and objective. Another limiting factor in the literature review was that because of privacy acts and laws, there was a limited amount of information in local case studies. Also, the literature sources generalized injury statistics in the country. Very few sources discussed different injury statistics from different regions of the country.

In regards to the surveys conducted, several limitations were noted. It is assumed that the respondents answered honestly and were accurate in answering questions regarding their department's injury prevention programs. Although the open-ended question asked for information on the effectiveness of their programs, no information was requested concerning the actual injury problem, if any, in their municipality.

While the return rate of the surveys was 81 percent, which is considered better than average and adequate to assure 95 percent accuracy, there was no follow-up electronic mail to attempt to increase the responses.

The sample population, though, was limited due to the number of New Hampshire fire departments similar in make-up to Laconia. Also, the sample size was somewhat further limited by the availability of electronic mail information. A larger number of surveys distributed among several departments in different areas of the country may have had more statistical significance and surveying departments across the country of similar call volume and number of personnel would have added to the validity of the research.

Results

Using the descriptive research methodology, a study was conducted through a literature review, medical data collection and survey instrument. The results of this research study were employed to answer the four original research questions. Survey data is documented in Appendix B.

1. What are the pediatric injury statistics in Laconia and how do they compare with national statistics?

By far, motor vehicle collisions caused the greatest number of nonfatal injuries in the children of Laconia ages birth through 14. This holds true on a national level for fatal injuries. Motor vehicle collisions continue to be the greatest risk for injury and death among children ages 14 and under. The literature review revealed that children under 1 year of age are at the greatest risk. In the year 2004, for example Laconia Fire Department personnel transported a total of 130 children with unintentional injuries. Of those, nearly 40 percent or 51, were a result of a motor vehicle collision. Also, hospital records indicate that 7 of those 51 were age 1 and under. Nationally, this age group also exceeds the others.

Nationally, falls are the leading cause of nonfatal unintentional injuries to children in the identified age group. In Laconia, falls accounted for the second highest number of emergency medical responses. An average of 33 children per year were transported to emergency rooms as a result of unintentional injuries from falls. The most common age for fall injuries is 1 year old and under. That Laconia statistic parallels the national statistics. As revealed in the literature review, playground equipment, bicycles and stairs cause the highest number of falls. This is also the case in Laconia.

The third leading cause for LFD response to an injury is bicycle and pedestrian injuries. In 2001, LFD personnel responded to a fatal pedestrian injury of a seven year old male. Both nationally and in Laconia, males are injured more often than females due to this mechanism of injury. Of all pedestrian and bicycle injuries, 92 percent were in children ages 9 through 14. Over the five years studied, an average of 24 or 19 percent of all transports were a result of this type of injury.

Lakes Region General Hospital data reveals organized sports as a common cause of injury for the children of Laconia predominantly in the early adolescence age category. Nationally, as well as in Laconia, males are more likely to suffer sports injuries than females. An average of 6-7 children in Laconia annually are treated in emergency rooms as a result of sports injuries, and of those, 80 percent are male.

Local hospital data revealed a disturbing statistic. Over the five years studied, 10 pediatric patients were transported as a result of assault. Of those, 30 percent were less than 1 year of age. “Head trauma, often the result of violent shaking, is the leading cause

of death and disability among abused infants and children" (CDC, 2002). Assault, unfortunately in this age group is seen around the country.

In the five years studied in Laconia there were no fire deaths in the birth through 14 years category. There were, however 2 fire injuries in this same age group. As mentioned earlier, children under 5 years of age nationally are at a higher risk of fire death than those in the middle childhood and early adolescence groups.

Nationally, drowning is a leading cause of unintentional pediatric injuries. In fact, as revealed in the literature review, it is the second leading cause of unintentional injury-related death in children ages 14 and under. Locally, there were 2 water-related injuries from 2000 through 2004. One fatal drowning of a three year old female and one near drowning injury of a 14 year old male.

After reviewing the injury statistics in our local area, there is overwhelming evidence that a pediatric injury prevention program is warranted. Because injuries can be so devastating and costly, *any* reduction in the numbers of injuries would benefit the community as a whole.

2. What types of programs are other fire departments using to meet the challenge?

A survey instrument was employed to determine what type of injury prevention program, if any, other fire departments are using. Of the 36 surveys distributed 29 were returned and answered.

Respondents were asked if their organization had a formal pediatric injury prevention program. Of the 29 surveys returned, 58 percent or 17 respondents answered

negatively. Respondents were also asked what type of programs are used by their organization. The most popular response was" fire safety trailer" followed by "home visits, inspections, public education". Respondents were also asked to check off from a list of activities which are used by their organization. "Child passenger safety seat installation training" was employed by 20 out of the 29 departments and 27 of the 29 departments practiced fire safety education. "Pedestrian and bicycle safety" was the third most popular response with 14 of the 29 departments teaching injury prevention in this area. Not one of the 29 respondents indicated "firearm/gun safety" or "fall/trip hazards" as an answer to that question. Only 3 departments, just over 10 percent, teach about poisons, choking hazards and suffocation and 4 departments teach their pediatric population about motor vehicle safety and seat belt use.

When asked how often the organization evaluated the effectiveness of any programs used, the majority (80 percent) responded "never". Of the few that used an evaluation tool to gauge the effectiveness of their public education program, "Risk Watch" and "fire safety trailers" were found to be effective programs.

3. What elements need to be present in an effective pediatric injury prevention program?

The first step in creating an injury prevention program is to evaluate your local injury and death statistics and acknowledge and identify the risks associated with those injuries. Have a goal to reach when implementing the program. For example, reduce the number of head injuries from bicycle collisions and falls in children 7-14 years of age.

Also, determine intervention strategies; education, enforcement or engineering or a combination of the three. The survey questionnaires and the literature review both revealed that a program coordinator or dedicated public educator contributes to the effectiveness of the program. Of course, the cost of the intervention must be considered. Programs that are supported by grants or other agencies and where partnerships are formed, are also found to be effective. For example, NFPA's Risk Watch Program is introduced to the school aged children through a partnership with a fire or EMS agency and the teachers and educators of that school. Building consensus among local agencies and the community on a need for action in the area of prevention will help support the program. Finally, look to others who have developed or used successful programs or who have expertise in certain areas. "Don't reinvent the wheel" is a popular phrase and appropriate in this case. Also, the program can be only as effective as those who present it. Use the personnel in your organization who find personal satisfaction and professional fulfillment to bring the prevention message to the children.

4. What can be done by Laconia Fire Department to effect positive change in the incidence of injuries and death in the pediatric population?

A good first step for the LFD in looking at changing injury statistics in the pediatric population would be to obtain support starting at the fire chief and upper management through to the firefighters and emergency medical technicians. A portion of this support requires funding. Generally, prevention budget requests are a small portion of an overall operating budget. Demonstrate a commitment to the community and the injury problem. Next, a data gathering and surveillance period is necessary to determine

how injuries are happening and to whom. Isolate the risk by looking at the source of injury: falls, burns, poisonings, and also identify the site where the injury occurs: playground, school or home, for example. Next, educate and involve the community by getting the message to others. Statistics help to convince others of the need for a program. Once the target audience is identified, construct a program that will have an impact on the problem. It was found in the literature review that the most effective learning takes place when children are doing things, not just listening or watching. This program will need to be evaluated and refined before full implementation can take place. Create coalitions and partnerships with police agencies, schools, public health agencies, hospitals, or service organizations. This will spread the funding and also increase the outreach of the program. Develop the program around education, enforcement, and engineering. Choose and train the organizations most talented educators. A well trained and highly motivated individual is essential. Implement the program and then develop a method to evaluate and revise the program, if necessary. Encourage and support continuous data collection to track trends and changes in the numbers of injuries. Finally, advocate for a policy or law change that addresses the identified issue.

In summary, an effective pediatric injury prevention program has a sound basis in research, a clear goal, multiagency collaboration, proficient educators, an implementation strategy and a structured evaluation process. Although the fire service does not “own” the prevention of unintentional injuries to the children of our community, it has an opportunity to bring about positive changes in the safety of our most innocent citizens.

Discussion

The results of this research revealed that after comparing the injury statistics of the children of Laconia with those national statistics found in literature, the same trends occur in both groups. The data clearly identifies the problem both locally and on a national level. The data also underscore the need to take action to prevent this number one killer of children. As National SAFE KIDS Campaign points out, "These injuries are not inevitable; they are *preventable"* (2003, p.1). Motor vehicle collisions caused the greatest number of injuries to the children of Laconia. As Spivak reported, almost half of all fatal injuries to children across the country occurred as a result of motor vehicle collisions (1999). Although effective injury prevention programs have been established in this high risk area, these injuries continue to claim the lives of children. As mentioned earlier, a motor vehicle versus pedestrian incident resulted in a fatality of a seven year old child from Laconia.

Nationally, significant resources have been devoted to prevention of motor vehicle collisions because it has been identified as a top risk to the safety of children. It is recognized nationally and locally that these tragedies can be significantly reduced. A very significant percent of children riding in automobiles (95 percent), for example, are reported to have nonuse or misuse of car seats according to Krimston (2002). Although a comprehensive injury prevention program cannot fully address the rate of motor vehicle collisions, it can however address the extent of injury to the passengers of that vehicle. The results of the study of local statistics revealed that 13 percent of children involved in collisions were not wearing passenger restraints. It was impossible to tell from that data

the number of restrained children who were *improperly* restrained. A CPS technician course would be warranted for members of LFD to help ensure the proper selection and installation of child passenger safety seats.

The area of research results that were surprising was that Laconia has only suffered two water related injuries over the last five years. Being that we are a community on the lakes, that figure was surprisingly low. The city of Laconia falls below the national averages for water injuries and drowning.

The percent of children injured due to falls in Laconia was slightly higher than the national averages. Also bicycle and pedestrian injuries were a leading cause of ambulance transports, particularly in the 7 through 14 years age group. These are two areas that, with an injury prevention program in place, could see a reduction in the number of children injured. There has been a reduction in deaths from pedestrian injuries, according to National SAFE KIDS Campaign (2003). It is thought that one reason for the reduction is that fewer children are walking than in the past. Also, campaigns and coalitions are dealing directly with roadway safety issues and bringing pedestrian safety classes into the schools and communities. In general, the local data findings were supported by national findings from the literature review; unintentional injuries in the pediatric population are similar to that of an epidemic.

The results of the second portion of the research, the survey instrument, revealed that most departments in New Hampshire and in other parts of the country have some types of prevention programs online. More than half admitted that they lacked a formal, comprehensive program. Only 25 percent of the departments that responded to the survey

had a dedicated public educator for their prevention programs. The literature review suggested that the most effective programs had a program coordinator or dedicated instructor who was able to gain support through coalitions and partnerships to enhance the chance for success (Krimston, 2002).

The research and literature review created a much greater understanding of the injury problem both locally and nationally. It became clear that fire departments and EMS agencies are in a prime position to implement programs which can result in positive change in the safety of the children of our communities. It is evident now that preventable injuries can have a huge financial and emotional impact on the children and their families. Also, it was found that injury rates do vary based on age, gender, and socioeconomic status. Young, poor children suffer at a disproportionate rate. The types and numbers of injuries that have been noted through local data was an awakening to the need for swift action.

The implications of the results of the research are many. First, because LFD does not have a comprehensive injury prevention program, it was found that the children and families of the community would benefit greatly from intervention and prevention efforts in terms of injuries suffered. Next, although Laconia has experienced only two pediatric fatalities due to unintentional injuries in the last five years, that is two too many. These were preventable deaths with a tragic cost to the community. Also, an understanding and awareness of the importance of injury surveillance programs was gained through this research. Our fire department dedicates time, money, personnel and resources to a fire

prevention program. Now there is a stinging awareness of the importance of dedicating the same effort and resources towards an injury prevention program.

Recommendations

The results of this research project indicate that pediatric unintentional injuries and death are a major health problem. Reducing the number and severity of pediatric injuries should be a goal of any fire department or emergency medical organization. Tax dollars spent on prevention efforts rather than on treating injuries would be dollars more wisely spent.

Based on the results of this study, the following recommendations are made for the City of Laconia:

- Gather and analyze injury statistics to identify which injuries have high hospitalization and mortality rates
- Determine a target population by assessing who is at the highest risk
- Determine intervention goals and strategies
- Analyze existing programs and take ideas from best practices in injury prevention
- Collaborate with other agencies and form partnerships for support
- Train and motivate department personnel
- Develop an implementation plan and test the intervention
- Put the prevention program into action
- Formally monitor and evaluate the intervention
- Revise the program if necessary
- Continue a comprehensive surveillance program

- Be accountable to the taxpayers by providing feedback on the outcomes of the program

By following these recommendations, the Laconia Fire Department will have a positive impact on the frequency, severity and costs of injuries of our communities' youngest members. In order to initiate such a program in our city, support must come from city officials, fire department administration, other fire department personnel, hospitals and other health care organizations. It is recommended to start small and focus on one high priority issue. Also, it is important to realize that change will not happen overnight. Continually evaluate statistics to determine if goals and objectives are being met because most prevention programs demand continual attention to be effective.

The final recommendation would be to encourage further research for other organizations in their communities to determine who is being injured, where it is happening, what the mechanism is, and how frequently it is happening. Ongoing research is necessary to improve the effects of injury prevention and recognize problem areas and help to reduce injuries to the children who are the future of our community.

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Appendix A

Fire Department Injury Prevention Survey

1. Does you fire department have a formal pediatric injury prevention program?
   Yes _____ No _____

2. What type of program is used?
   _____ Risk Watch, etc. in school program
   _____ Home visits, inspections, public ed.
   _____ City, Town, County/wide safety "village" or safety center
   _____ Fire Safety trailer
   _____ Other (explain) _____

3. Does your fire department have a dedicated public educator (s) for such programs?
   Yes _____ No _____

4. If your department does not have a formal program, check any of the following components that you may use during the year.
   _____ Child passenger safety seat installation training
   _____ Pedestrian/bicycle safety (helmet use, etc.)
   _____ Fire safety (stop, drop, roll, 911, EDITH, etc.)
   _____ MV safety (seat belt use)
   _____ Drug/alcohol programs
   _____ Water/ ice safety (boats, PFD's, swim lessons, etc.)
   _____ Choking hazards/poisons, suffocation
   _____ Firearm/ gun safety
   _____ Fall/trip hazards (baby walkers, stairs, and playground equipment)

5. Has you department evaluated the effectiveness of any pediatric injury prevention programs or components?
   _____ Never
   _____ Once
   _____ Annually
   _____Other

6. If so, what types of programs are found to be most effective?
   _____
   _____
   _____
   _____

Any other comments?

Appendix B

Fire Department Injury Prevention Survey

1. Does you fire department have a formal pediatric injury prevention program?
   Yes ____12_____ No ____17_____

2. What type of program is used?
   ___5__ Risk Watch, etc. in school program
   ___11__ Home visits, inspections, public ed.
   __0___ City, Town, County/wide safety "village" or safety center
   ___12__ Fire Safety trailer
   __1___ Other (explain) __Camp 911_____

3. Does your fire department have a dedicated public educator (s) for such programs?
   Yes ___7_____ No ____22_____

4. If your department does not have a formal program, check any of the following components that you may use during the year.
   ___20__ Child passenger safety seat installation training
   ___14__ Pedestrian/bicycle safety (helmet use, etc.)
   __27___ Fire safety (stop, drop, roll, 911, EDITH, etc.)
   __4___ MV safety (seat belt use)
   __0___ Drug/alcohol programs
   __1___ Water/ ice safety (boats, PFD's, swim lessons, etc.)
   ___3__ Choking hazards/poisons, suffocation
   __0___ Firearm/ gun safety
   __0___ Fall/trip hazards (baby walkers, stairs, and playground equipment)

5. Has you department evaluated the effectiveness of any pediatric injury prevention programs or components?
   ___23__ Never
   ___1__ Once
   ___2__ Annually
   ____1__Other

6. If so, what types of programs are found to be most effective?

_____
_____
_____
_____