

# Fire Safety Knowledge and Practices Among Residents of an Assisted Living Facility

David Jaslow, MD, MPH;<sup>1,2</sup> Jacob Ufberg, MD;<sup>1</sup> Russell Yoon, MD;<sup>1</sup> Clay McQueen;<sup>2</sup>  
Derek Zecher, PA-C, EMT;<sup>1,2</sup> Greg Jakubowski, MS, EMT<sup>2</sup>

1. Temple University Department of Emergency Medicine, Division of EMS, Philadelphia, Pennsylvania, USA
2. Bryn Athyn Fire Company, Bryn Athyn, Pennsylvania, USA

## Correspondence:

David Jaslow, MD, MPH  
Albert Einstein Medical Center  
Department of Emergency Medicine  
Division of EMS/Disaster Medicine  
60 E. Township Line Road  
Elkins Park, PA 19027  
E-mail: jaslowd@einstein.edu

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## Abbreviations:

ALF = assisted living facility  
EMS = emergency medical services  
FS = fire safety

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## Abstract

**Introduction:** Assisted living facilities (ALFs) pose unique fire risks to the elderly that may be linked to specific fire safety (FS) practices.

**Objective:** To evaluate self-reported FS practices among ALF residents.

**Methods:** All residents of a small ALF were surveyed regarding actual and hypothetical FS behaviors, self-perceived fire risk, and FS preparedness.

**Results:** Fifty-eight ALF residents completed the survey. Thirty-three (58%) individuals reported one or more disabilities. Seven (12%) residents ignored the fire alarm and 21 (35%) could not hear it clearly. Sixteen (28%) residents would attempt to locate the source of a fire rather than escape from the building. Only 24 (42%) residents were familiar with the building fire plan. Twenty-three (40%) people surveyed believed that they were not at risk of fire in the study facility.

**Conclusion:** Residents of an ALF may be at increased fire injury risk due to their FS practices and disabilities.

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## Introduction

Thirty-four million Americans (12.5% of the population) are >65 years of age.<sup>1</sup> According to the US Fire Administration, these older adults represent one of the highest fire-risk populations in the United States. Approximately 1,200 deaths and 3,000 injuries each year occur in the elderly due to fire, making fire the sixth leading cause of injury-related death among older adults. The rate of fire deaths increases after 65 years of age, and the rate is more than tripled among those over 85 years of age compared with national averages.<sup>2</sup>

According to the US Centers for Disease Control and Prevention, approximately 1.5 million Americans live in a group setting such as a nursing home or assisted living facility (ALF). More than 90% of these people are >65 years of age, and approximately 35% are >85 years of age. Of adults over the age of 85 years, nearly 25% of people live in group-living facilities.<sup>3</sup> Fires in group-living facilities pose greater-than-normal risks for several reasons including high resident-to-staff ratios, bedridden residents, and older construction.<sup>2,4,5</sup>

The US Fire Administration states that by practicing simple fire safety tips, older adults can reduce their chances of experiencing a fire and subsequent injury or death.<sup>6</sup> This study attempts to assess the fire-safety knowledge and practices of a group of elderly adults living in an assisted-living facility. The survey intends to assess the personal fire-safety practices of the inhabitants and their working knowledge of the fire safety plan in place at their assisted living facility.

## Methods

### Study Design

A 25-question survey concerning knowledge of fire safety practices and comfort level regarding fire safety was administered at a local assisted living facility in 2001 (Figure 1). Additional demographic information was collected on each participant including age, gender, educational background, disabilities, and number of years residing at the study facility.

### Population

All 58 residents of the facility were eligible for participation in the study. Only two participants were unable to complete the survey themselves; (1) a 95-year old woman whose niece read her the questions and filled in the responses; and (2) a handicapped 54-year old man who did not complete the survey. The majority of the participants completed the survey in a communal setting immediately preceding an annual lecture on fire safety. They were not informed of the actual study until just prior to administration.

### Setting

The study was conducted at a small, assisted-living facility in suburban Philadelphia. The facility is composed of a single, two-story, garden-style apartment building consisting of individual living units surrounding a central common area. All living units have access to the outside either by doorway or balcony.

The building is equipped with sprinklers and contains both smoke detectors and a fire alarm system. The local fire company has been summoned to the building several times in recent years for emergency events, which have included fire alarms, broken sprinkler heads, burnt food on a stove causing a smoke condition, and other minor problems. There has been no actual working fire in the facility within the last 15 years.

This facility was chosen because it is located within the fire protection district of the volunteer fire company in which several of the authors are members, including the primary author who is an assistant chief and the medical director. Once each year, fire company personnel provide a two-hour educational session about fire safety and review the building's fire safety and evacuation plans. This meeting attracts the majority of residents, which has greatly simplified the logistical issues surrounding survey administration. The few residents that did not attend the session were identified by the facility manager and completed surveys within one week following initial data collection.

### Human Subject Committee Review

The Temple University Institutional Review Board granted this study exemption from review provided that the survey was administered anonymously.

### Survey Tool and Measurements

The survey instrument used for the study is provided in Table 1. Participants were given five multiple-choice questions, ten "yes/no" questions, and ten questions utilizing a Likert-type scale. General instructions and an explanation

1. The first thing I would do upon smelling smoke or seeing fire would be to:
  - a. Call for help
  - b. Find the source
  - c. Run out of the building
2. The first phone call I would make upon smelling smoke or seeing fire is to:
  - a. Office/front desk
  - b. 911
  - c. Neighbor/friend
3. When I hear the fire alarm, I:
  - a. Ignore it
  - b. Exit the building
  - c. Call the office/front desk
4. The best way to exit a building when there is heavy smoke in the hall is to:
  - a. Walk
  - b. Crawl
  - c. Run
5. If I open my door and there is heavy smoke in the hall, I should:
  - a. Run out the door
  - b. Leave the door open
  - c. Close the door and stay inside

### YES/NO Questions

6. Do you live alone?
7. Is a copy of the fire plan posted in your apartment?
8. Is a map of the fire escape route posted in your apartment?
9. Did you participate in the last fire drill?
10. Do you live on the second floor?
11. Have you ever called 911 to report an emergency here?
12. Are you a smoker?
13. Does anyone who visits you smoke in your household?
14. Have you ever been forced from any residence due to fire?
15. I go to an assigned meeting place when I evacuate this facility.

### Likert Scale questions

16. I am familiar with the facility's fire plan.
17. We have enough fire drills each year.
18. I know the closest exit to my apartment.
19. I have practiced the fire escape plan enough and I feel comfortable with its instructions.
20. I can hear the fire alarm clearly when it rings.
21. I participate in the facility's fire drills if I am at home.
22. Fire is NOT a risk for me at this facility.
23. I have reviewed this facility's fire plan within the last year.
24. My disabilities would hinder escape during evacuation of the building.
25. The time for me to evacuate the building from my apartment is less than five minutes.

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**Table 1**—Survey instrument

of a Likert scale were provided prior to survey administration. Additionally, volunteer fire department personnel who had been in-serviced in survey administration by the primary author were present to assist residents in survey completion. Volunteers were instructed not to provide answers or hints to the answers. Their primary role was to explain the survey questions, point out the existence of the three pages of the questionnaire, and collect the completed surveys.

Given the age of the participants, survey items were designed to minimize confusion. Nine questions examined individual fire safety behavior and five of these nine questions were modeled after the actual building procedures for fire in place at the facility at the time of the survey. Ten questions were designed to evaluate personal beliefs concerning fire safety and fire safety practices. Six questions examined elements known to be associated with death or injury due to fires, such as living alone, smoking preference, and experiences in a real emergency situation. No question addressed more than a single action or decision. Although study participants left individual questions blank on a sporadic basis, no specific pattern of incomprehension appeared on review of completed surveys.

## Results

All 58 residents responded to the survey questionnaire, yielding a 100% response rate. Two of the 58 returned surveys were incomplete. A note on one incomplete survey indicated that the resident was severely handicapped and bedridden, could not read or write, and had minimal verbal abilities. Given the improbability of this person escaping a fire on his own or learning fire safety, this survey was excluded from analysis. The second incomplete survey belonged to a resident who unintentionally left the second page of the document (containing questions 6–15) blank. Since this complication did not affect statistical analyses, the remaining answers were included in the data pool. Thus, 57 surveys were included in the final analysis.

Eighteen (32%) of the respondents were male and 40 (68%) were female. The median age of respondents was 78 years with a range of 54–95 years. All but five of the respondents were >70 years of age. The median length of time residing full-time at the study facility was three years, with a range of 0–19 years. Thirteen apartments were occupied by two people. Most of the residents ( $n = 48$ , 84%) had at least some college education and 32 (56%) of these listed themselves as college graduates. None of the residents were smokers, and only one resident reported having any household visitors who were smokers. Eight (14%) of those surveyed reported that they had called the 9-1-1 emergency number about some emergency while living in the study facility, and six (11%) residents reported that at some time they had been forced from a residence by fire (not necessarily the study facility).

Thirty-three (58%) people had a disability. Fifteen (26%) participants had a visual deficit, 17 (30%) had an auditory deficit, and 17 (30%) had difficulty with ambulation. Fifteen (26%) persons used devices to assist their mobility. Nine of the 15 used only a cane to ambulate, two each used a walker or a scooter, one person used all three

devices, and one person used a cane and other unspecified means. Five of the respondents who had difficulty with ambulation indicated that they did not need any devices to assist them. Three respondents who did not indicate a difficulty with ambulation stated that they used a cane to assist with ambulation.

Nine questions were designed to evaluate the actions respondents would use in case of fire. When asked what they would do upon detecting fire conditions, sixteen (28%) people answered that they would attempt to locate the source rather than call for help or escape from the building. When asked what actions to take upon hearing the fire alarm, seven (12%) people stated they would ignore it, 15 (26%) people would call the front desk to inquire about the circumstances, and 12 (21%) people did not answer the question at all. Most respondents correctly answered to whom the first phone call should be placed upon detecting possible fire (46, 81%), how to correctly move (crawl) through a smoke-filled hallway, (41, 72%), and that they would stay inside their apartments if there was heavy smoke in the hallway (50, 88%). However, five (9%) participants answered that they would run into a smoke-filled hallway rather than close the door and remain inside. A total of 36 (63%) people indicated that they did not have a copy of the fire safety plan posted in their apartment, forty-nine (86%) answered that they did not have a map of the fire escape routes posted in their apartment. Thirty-one (54%) people indicated that they would not go to an assigned meeting place upon evacuating the building, although this action is referenced in their fire evacuation plan. At least 28 (49%) residents did not participate in the last fire drill.

Ten questions were designed to measure the participants' personal opinions about their knowledge of fire safety at the facility and their comfort level with this knowledge base. A majority of participants felt that they could evacuate the building in less than five minutes (47, 82%), that their disabilities would not hinder their escape (39, 68%), and that they knew the exit closest to their apartment (51, 89%). Fewer people agreed that they were familiar with the building fire plan (24, 42%), and that they had reviewed it within the last year (24, 42%). Only 21 (37%) participants agreed that they had practiced the fire escape plan enough to feel comfortable with it. Thirty-nine (68%) people surveyed did not agree that there were enough fire drills held each year. While 42 (74%) of the participants agreed that they had participated in fire drills when they were at home, only 37 (65%) agreed that they could hear the fire alarm clearly when it rang. Twenty-three (40%) people surveyed believed that they were not at risk of fire in the study facility.

## Discussion

By the year 2050, the elderly population of the US is expected to double and exceed 20% of the population.<sup>1</sup> The fastest growing subgroup among the elderly is the group 85 years of age and older. As people reach 65 years of age, the risk of fire-related death surpasses the national average. At 75 years of age, the risk is double the national average, and the risk is tripled >85 years of age.<sup>7</sup>

There are a number of factors that place the elderly at greater risk for injury or death from fire. Disabilities commonly are cited as a major contributor to the increasing risk of fire-related death as age progresses, presumably because they limit the ability of the individual either to recognize or respond quickly to an emergency situation.<sup>8</sup> Nearly half of people >65 years of age and nearly three-quarters of people >80 years of age can be classified as having a disability and more than half of all wheelchair users are >65 years of age.<sup>9,10</sup>

During the last decade, many elderly persons have chosen to move from their homes into assisted living facilities (ALF).<sup>11</sup> There is no universal definition of an ALF. However, it is generally accepted that a range of services are offered to the resident in order to maximize their independence while enabling them to complete their activities of daily living.<sup>12</sup> Unfortunately, the National Fire Incident Reporting System (NFIRS) does not collect data on the age of occupants in a fire, nor is elderly housing captured as a specific, fixed-property use or occupancy group. Thus, there are no national estimates of the incidence of fires in these facilities.<sup>13</sup>

There are additional fire risks incurred by those choosing to live in a group-living facility. Fluctuations in staffing may leave a high resident to staff ratio during the nights.<sup>4</sup>

In emergency situations, bedridden or severely disabled residents may be totally dependent on the staff, leaving those with milder disabilities unattended. The type of construction used in group-living facilities also contributes to the fire risk, since many buildings are designed with large, open, meeting places that facilitate the passage of smoke and toxic gases through several stories.<sup>14</sup> Additionally, many older retirement facilities were built with limited exits, combustible finishes, and a lack of automatic sprinklers.<sup>5</sup> Finally, the inhabitants may have certain fire hazards such as smoking materials and cooking appliances within their residential area.

There is relatively little information in the medical literature regarding the potential impact of senior citizen's individual behavior or actions on their fire injury risk. The Center for Fire Research recommends assessment of seven risk factors when evaluating the risk of injury or death from fire of an older adult. They include the: (1) risk that the individual will resist leaving the structure; (2) individual's response to fire drills; (3) individual's response to instructions; (4) individual's mobility impairments; (5) need for extra help; (6) individual's waking response to alarms; and (7) probability that the individual will lose consciousness in an emergency (i.e., is life support equipment necessary).<sup>15</sup> The goal of the study was to determine whether some of these actions may contribute to an increased fire risk.

The responses to this survey highlight the danger that fire poses to inhabitants of assisted-living facilities when considering the risk factors listed above. More than one-third of those surveyed could not clearly hear the fire alarm. The responses also indicate that technology alone may not be sufficient in preventing fire injuries or death, since the actions of those whom the technology is designed to alert may not follow commonly accepted fire safety prac-

tices. For example, more than one-third of respondents would either ignore a fire alarm or call to inquire about the circumstances of the alarm, rather than immediately exiting the building.

Lack of participation in fire drills and unfamiliarity with the building fire plan are personal actions that directly may increase the chances of death or injury in an actual fire event. It was not a surprise to find a relative indifference to fire-safety preparedness in this elderly population, since the same attitudes are prevalent in the general population.<sup>16</sup> However, almost half of the participants did not believe that they were at risk of death or injury by fire in their facility. Ninety-six percent of those surveyed were aware that their building was equipped with smoke detectors, a fire-alarm system, and a sprinkler system. It is possible that this perceived safety net provides a false sense of security to the respondents and dissuades them from appropriate recognition of the risk for injury or death due to fire. Finally, the dearth of injury-prevention education provided to this population may contribute to a certain level of ignorance regarding the true risks of injury.

The results of this study lead to several questions relative to the next step in reducing fire-injury risk among residents of ALF. First, can these results be reproduced in different populations? One small study of fire-safety knowledge among elderly people who lived at home found similar results and concluded that continued fire-safety educational programs targeting the elderly were essential.<sup>17</sup> Second, how is education best delivered to this population, and how frequently must it be delivered in light of the forgetfulness that occurs with age? There are unique challenges in delivering fire prevention and safety education to the elderly population. Such education is delivered routinely to school children during Fire Prevention Week, but this education only has been presented formally since the late 1950s, well after the elderly were out of primary or secondary school.<sup>18</sup> There are well-designed fire-safety education programs available from both the National Fire Protection Association and the US Fire Administration, but these materials are not widely available.<sup>19,20</sup> Thus, those >65 years of age are unlikely to ever have been serially exposed to these concepts. There are no studies to support how initial fire-safety education should be delivered to the elderly, nor are there studies looking at retention of this information.

This latter point provides a golden opportunity for local fire departments and emergency medical services (EMS) to fulfill one of the mission statements of the EMS Agenda for the Future regarding delivery of preventive healthcare education to the community.<sup>21</sup> Fire services and EMS routinely perform pre-incident surveys in order to respond effectively to an emergency at specific buildings, such as schools, factories, etc. Such "pre-plans" include modes of entry into the facility, locations of special patient populations, locations of standpipes, etc.<sup>22</sup> Pre-plans usually address the response phase of an emergency, but they may not adequately address the preparedness phase of emergency response. Such planning could include an analysis of at-risk populations in the coverage area and a plan for annual injury prevention education they should receive.

This study has several limitations. The study population suffers from selection bias since it does not reflect the typical make-up of a senior citizen group. It was comprised of a very educated core of non-smokers who are likely to be in relatively good health for their age based on self-described disabilities. The study group also is a very homogenous one. All study participants were Caucasian and most were raised in the tiny, affluent, and tightly knit community in which they currently reside. Although the study sample comprised the entire population of interest, it also represents a very small segment of the senior citizen population in the region. Thus, the ability to generalize the conclusions to a larger segment of society is limited.

### Conclusion

Elderly residents of the assisted living facility surveyed may be at increased risk for injury and death due to fire based on poor fire safety knowledge and practices. Educational curricula focused on basic concepts of fire safety, including recognition and escape from a fire emergency, should be implemented in these facilities in conjunction with improvements in technology to further enhance the chances of survival in a structural fire. Whether such a curriculum can be mastered or remembered by residents and if this impacts the fire death and injury rates remains to be seen.

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