

01-16-2011 Sandown NH – Harold Frey – FF - Ice Training Heart Attack

Sandown firefighter dies during training

<http://www.unionleader.com/article.aspx?headline=Sandown+firefighter+dies+during+trainin&articleId=3a5af81b-df31-45c4-a877-83001c9622ed>

Jan. 16, 2011 By JASON SCHREIBER Union Leader Correspondent

SANDOWN – A local volunteer firefighter suffered a fatal heart attack Sunday after climbing out of the Exeter River following a cold-water rescue training session, a fire official said.

Harold Frey, 46, of Sandown, had joined the department only recently. The former Epping firefighter/paramedic was a full-time paramedic with CAREPLUS Ambulance Service in Nashua.



Harold Frey

State Fire Marshal William Degnan said the heart attack happened around 11 a.m. As Frey was coming up over the bank of the Exeter River off Phillips Road, he began experiencing difficulty breathing, Degnan said.

Emergency personnel quickly administered aid and continued to treat him as he was transported to Parkland Medical Center in Derry, where he was pronounced dead.

Degnan acknowledged the dangers that come with firefighting and rescue work.

"Any firefighter function has a significant amount of stress," he said.

In a statement, Sandown Fire Chief Wilfred Tapley said that while Frey was relatively new to the department, he will be missed.

"It's been very difficult for the department," Degnan said. "It's a true brotherhood."

Other Sandown firefighters were too shaken to talk as they comforted one of Frey's daughters before she left the station Sunday night.

Frey was just settling in at the fire department after recently moving from Epping to Sandown, friends said.

"He was one of the better paramedics I've known," said Epping Deputy Fire Chief Bruce Chapman, who worked closely with Frey when he was a full-time firefighter/paramedic in Epping.

"It can be a dangerous job and you know it when you sign on the dotted line," Chapman said.

Chapman said he liked to tease Frey about his bald head and nicknamed him the "Hairless Wonder."

"We'd pull practical jokes on each other all the time," said Fremont Deputy Fire Chief Kevin Zukas, a retired Epping fire captain who worked with Frey in Epping.

Chapman still remembers the day when Epping firefighters responded to a structure fire and he asked Frey why he hadn't entered the building yet.

"It's dark and smoky in there," Frey joked before going inside and performing the job he loved.

Friends said Frey moved to New Hampshire from Tennessee. He was a member of the New Hampshire Chapter 5 Red Knights Firefighters' Motorcycle Club, which meets regularly in Epping. Chapman said the last time he saw Frey was last Sunday when he attended a club meeting.

"Harold was a great guy, was a great teacher and a great paramedic," said Steve Arneil, a firefighter/EMT from Epping who worked with Frey in Epping and at CAREPLUS Ambulance Service.

Firefighters recalled how much Frey loved his coffee and his General Robert E. Lee coffee mug.

"It was a big coffee mug," Zukas said with a laugh.

Members of the Granite State Fire Service Support Team were at the fire station to offer assistance.

NH firefighter dies during training exercise

http://www.necn.com/01/16/11/NH-firefighter-dies-during-training-exer/landing_newengland.html?blockID=392387&feedID=4206

Jan 16, 2011

NECN) - New Hampshire fire officials report that a firefighter died this morning during a training exercise.

Harold Frey, 46, of Sandown had a heart attack during an ice rescue training class. It happened on the Exeter River just before noon.

New Hampshire fire chief Wilfred Tapley says that although Frey was new to the department, he will be missed.

The New Hampshire state fire marshal's office will be conducting an investigation into what happened.

N.H. firefighter dies after ice rescue lesson

http://archive.boston.com/news/local/new_hampshire/articles/2011/01/17/n_h_firefighter_dies_after_ice_rescue_lesson/

January 17, 2011 By [Alexander C. Kaufman](#) Globe Correspondent

Collapse blamed on heart attack

The New Hampshire fire marshal is investigating the death of a firefighter from Sandown who suffered a heart attack during ice rescue training yesterday morning, the deputy marshal said.

Deputy State Fire Marshal Rob Farley said Harold Frey, 46, complained of shortness of breath as he emerged from training in the icy Exeter River about noon.

Moments later, as the firefighters began unzipping their wetsuits, Frey collapsed, Farley said.

Paramedics at the scene took Frey to Parkland Medical Center in Derry, roughly 20 minutes away. Farley said Frey slipped out of consciousness en route to the hospital, where he was pronounced dead.

Sandown Fire Chief Wilfred Tapley said in a statement that Frey died of a heart attack.

Farley said the ice rescue training, conducted in specialized wetsuits, is not overly strenuous on the body.

"I wouldn't consider it to be an arduous task," he said by phone yesterday. "It's basically swimming and moving your arms and legs around."

Parkland Medical Center officials declined to comment on Frey's medical history.

Frey, a longtime firefighter in nearby Epping, joined the Sandown Fire Department a few months ago.

He lived with family in Sandown.

"He was a new firefighter here but he'll be sorely missed," Farley said.

Frey's death shocked the fire department. Farley said this was the first firefighter training death in the department's memory, according to Sandown's deputy chief, Irving Bassett, a 54-year veteran of the agency. "He said something like this has never happened while he was on the department," Farley said.

Farley said the state fire marshal's office is providing support for Frey's colleagues.

"They're kind of numbed by the whole thing," Farley said. "We're here to help them out with documentation, how to prepare for [a] firefighter funeral — the whole nine yards."

Farley said he expects the state fire marshal's investigation to conclude in the next two days.

N.H. Firefighter Dies After Training Session

http://www.necn.com/news/new-england/NECN_N_H_Firefighter_Dies_After_Training_Session_NECN-251504971.html
Lauren Collins NECN

A fire department is in mourning in New Hampshire. A volunteer firefighter in Sandown died after participating in an ice rescue training session on Saturday.

The tracks are still fresh along the frozen Exeter river where volunteer firefighters practiced ice rescues early Sunday.

"Firefighter paramedic Harold Frey complained of difficulty breathing. Subsequently he went into cardiac arrest," says Sandown, New Hampshire Fire Chief Bill Tapley.

It happened just moments after the exercise wrapped up. Sandown's entire rescue squad was there: five EMTs and a paramedic.

"They jumped right on him," says Chief Tapley. "Couldn't have had any better help. There was just nothing you could do."

The training exercise was a standard one and firefighter Frey was experienced. Wherever he lived across the country, he always served saving lives. The 46 year old former Marine worked with fire departments in California and in his native Tennessee. He spent three years on the force in Epping.

"You could pick him out in a crowd, there's no doubt about it," smiles Epping Deputy Fire Chief Bruce Chapman who says Frey loved motorcycles and his family, but nothing else mattered when it came to the call.

"You'll see that. A volunteer or a professional firefighter who put their families second to help somebody else. And Harold was that type of a person."

Frey worked full time as a paramedic for a private ambulance service. He only moved to Sandown nine months ago and signed up as a volunteer in

November, side-lined for much of the year by an operation. Still, he made the department his second home.

"He had been coming down here, regularly, getting ready to join," says Tapley. "Real good guy, absolutely, this is what he loved to do."

NH Firefighter Dies Following Ice Rescue Training

<http://www.fireengineering.com/index/articles/display/4485767452/articles/fire-engineering/incidents/2011/01/nh-ff-training-death.html>

Jan 17, 2011

Harold Frey, 46, a firefighter with the Sandown (NH) Fire Department, suffered a heart attack during ice rescue training and died on January 16, 2011.

Reports indicate Frey complained of shortness of breath as he emerged from training in the Exeter River; he subsequently collapsed and was taken to a medical center about 20 minutes away.

Frey, a longtime firefighter in Epping, had joined the Sandown Fire Department only a few months ago. The State Fire Marshal is investigating the death.

Read more on the incident from the *Boston Globe* [HERE](#).

NH firefighter dies following ice rescue training

Sandown Firefighter Harold Frey, 46, had joined the department just a few months ago

<http://www.firerescue1.com/lodd-line-of-duty-deaths/957340-nh-firefighter-dies-following-ice-rescue-training/>

Duty Death: Harold Frey - [Sandown, New Hampshire]

By FireRescue1 Staff

SANDOWN, N.H. — A New Hampshire firefighter died Sunday during ice rescue training.

Sandown Firefighter Harold Frey, 46, had just emerged from training in icy water when he complained of shortness of breath, according to [The Boston Globe](#).

Firefighter Frey, who joined the department just a few months ago, collapsed soon after and was transported to a local hospital where he was pronounced dead.

"He was a new firefighter here but he'll be sorely missed," Deputy State Fire Marshal Rob Farley said.

Calling hours Thursday for Sandown firefighter

<http://www.nashuatelegraph.com/news/905742-227/calling-hours-thursday-for-sandown-firefighter.html>

January 18, 2011 By JOSEPH G. COTE Staff Writer

Local firefighters lined the overpasses along Interstate 93 on Monday when Sandown and Concord firefighters escorted the body of one of their own to Derry following his death this weekend during a training exercise.

An autopsy by the state's Chief Medical Examiner confirmed that Sandown Fire Department volunteer Harold Frey, 46, died of a heart attack following an ice rescue training exercise Sunday on the Exeter River in Sandown, according to State Fire Marshall Bill Degnan.

Frey's death is still being investigated, Degnan said.

"The hearts of New Hampshire fire service go out to the family of firefighter Frey and the members of the Sandown Fire Department as they struggle with this loss," Degnan said.

Calling hours will be held at Peabody Funeral Home in Derry from 4-8 p.m. Thursday, according to a release from the Derry Fire Department, followed by a private graveside service.

Frey, formerly of Epping, moved to Sandown two years ago. He was a Marine veteran and served in Beirut during the Gulf War, according to his obituary. He worked for Care Plus as a paramedic and was a volunteer firefighter with the Sandown department. He is survived by three daughters, five grandchildren, two sisters, his mother and girlfriend, according to his obituary.

LODD – Sandown Firefighter Harold Frey

<http://www.firecritic.com/2011/01/19/lodd-sandown-firefighter-harold-frey/>

January 19, 2011

Firefighter Harold Frey

[Sandown Fire and Rescue Department](#)

Sandown, New Hampshire

Firefighter Harold Frey, 46, died of a heart attack while packing up after ice rescue training.

From the USFA: Firefighter Frey passed away from an apparent heart attack while participating in an ice rescue training exercise. Incident Location: Fremont Road and Philips Road, Sandown, NH



ROLL OF HONOR

<http://www.firehero.org/fallen-firefighter/harold-f-frey/>

- **Firefighter**
- **Sandown Fire and Rescue**
- **New Hampshire**
- **Age: 46**
- **Year of Death: 2011**

Harold F. Frey, 46, of Sandown, New Hampshire, died January 16, 2011, after participating in ice rescue training with the Sandown Fire and Rescue Department.

He was born in Edmonds, Washington, on November 7, 1964, a son of Malcolm Frey and Virginia (Gillard) Clark. Harold was a resident of Sandown for two years and had formerly lived in Epping, New Hampshire. He was a United States Marine Corps veteran and served during the Gulf War in Beirut.



Harold was employed as a paramedic for Care Plus, and was also a volunteer firefighter with the Sandown Fire Department. He had volunteered previously with the Epping Fire Department. He loved anything to do with firefighting and paramedics. Harold enjoyed motorcycling and was an active member of the Red Knights Motorcycle Club. He enjoyed playing computer games and was a Civil War enthusiast.

He is survived by his mother, Virginia Clark of Elwood, Illinois; three daughters, Marlena Frey of Mississippi, Lauren Bundy of Louisiana, and Tabitha Frey of Sandown; five grandchildren; and two sisters, Lori Hunter of Baxter, Tennessee, and Kari Frey of Joliet, Illinois.

Services for NH firefighter who died training

http://www.boston.com/news/local/new_hampshire/articles/2011/01/18/services_for_nh_firefighter_who_died_training/

January 18, 2011

SANDOWN, N.H.—Services are being planned for a New Hampshire firefighter who suffered a heart attack and died during a training exercise.

Officials say 46-year-old Harold Frey of Sandown was taking part in cold water and ice rescue training in the Exeter River on Sunday when he was stricken.

Calling hours are set for Thursday at the Peabody Funeral Home in Derry. The funeral will be private.

WMUR-TV says Frey was properly equipped for the cold water training when he started having trouble breathing. He was rushed to a local hospital where he died.

Sandown Firefighter Dies after Ice Rescue Training

http://static.nutpub.net/pdfs/2011_tritown_times/TTT-Jan20-2011.pdf

January 20, 2011 MATT RITTENHOUSE Tri-Town Times

SANDOWN – At the tail end of a routine ice rescue training at Lily Pond Sunday, Sandown Firefighter/paramedic Harold Frey, 46, died after suffering cardiac arrest. According to Fire Chief Bill Tapley, before Frey complained of difficulty breathing and collapsed in the snow, the training was going smoothly and no sign of distress was noted.

Frey was smiling and laughing, even performing a couple of backstrokes in the icy water while bundled up in an ice rescue suit. Tapley described Frey as a “real good guy.” The department joked with the former Tennessean, calling him the “Redneck Paramedic.”

Five emergency medical technicians (EMTs) and at least one paramedic were at the scene and immediately and aggressively treated Frey and sent him via Trinity EMS to Parkland Medical Center in Derry. Despite efforts to revive him, Frey was pronounced dead at Parkland.



Harold Frey

“He couldn’t have had any better help,” said Tapley about the response. Frey was lauded by the department for his lifelong efforts at serving his country, as a U.S. Marine, firefighter and paramedic.

He had been active with the Sandown Fire Department for two months, previously served for three years with the Epping Fire Department - one year as a full-time member, and was employed as a full-time paramedic with CarePlus Ambulance.

"This is what he loved to do: fire and EMS (emergency medical services)," said Tapley. "He dedicated his life to it. It's a shame." Frey had lived in Sandown for about nine months, and though not active with the department until recently, had been visiting regularly since he moved. Tapley said all of the department's volunteers, including Frey, give 100 percent to the job, and both the department and community were blessed to have had the dedicated Frey among their ranks.

Lt. Jon Goldman, public information officer for the department, emphasized that though the incident did not occur while Frey was in the water, the ice rescue suit used in such trainings and emergencies will keep users relatively comfortable, but the user can still become cold. He noted that in such trainings, stress can play a role.

A certified instructor was present during the routine training and, Goldman said, all the safety precautions were followed. Bruce Chapman, Deputy Fire Chief in Epping, said he was floored when Tapley called him Sunday with the news, as he had just seen Frey in good health the previous weekend at a Red Knights Motorcycle Club meeting.

Chapman said Frey was the kind of guy who "would give you the shirt off his back," and he remembers the practical jokes the two played around the department, and the unique outlook the intelligent Frey had. "He wasn't afraid to tell you he was a Southerner. He was a rebel," said Chapman, noting how he loved to ride his motorcycle on just about any day of the year.

Chapman remembers Frey as someone who could joke even during dangerous situations. Chapman recalled one time, while exiting a basement of a structure fire, asking Frey why he hadn't gone in yet. "Because it's dark and smoky in there," Chapman remembers Frey saying before he headed into the fire. "And then he gave me this smirk he always had." Chapman had high praise for Frey's skills as both a paramedic and firefighter, and noted that he often went to Frey with medical questions.

"He had his own sense of humor and own outlook on life," said Goldman. "And he was always in good spirits." Chapman said that while it was a difficult loss, Frey's death would not change how his department operated. Firefighters agree, said the acting chief, that when you sign on the dotted line, you're going to be put into some dangerous situations.

"You train how you're going to play," said Chapman. "I know myself and all the members of my department will continue to give 110 percent. It hurts pretty deep when you lose one of your own, but you have a job to do. It's what Harold would have done." Hampstead Fire Chief Michael Carrier said that every time a department trains, the safety of the members is put first, but noted a lot of stress is placed on a firefighter continued from page 1 firefighter's system during any call or training.

On Sunday, Chester Fire was conducting the same ice training in its own town, and Fire Chief Rich Antoine said Frey's death drove home a truth about the fire service that many don't think about. He said he was certain Sandown had all of the safety precautions in place, and said trainings are necessary. Antoine visited the Sandown department Sunday for a few hours to offer support. He said that professionally speaking, he noted Tapley must shoulder the burden of the death for his department, despite the fact that he couldn't have done anything to prevent it.

"We borrow these brothers and sisters and wives and husbands from their homes for a few hours," said Antoine. "And their families expect us to return them home...It's a terrible thing for any department to go through." Tapley agreed that Frey's death was a tragic occurrence but that trainings were part of learning how to respond during emergencies. "This is what we do," said Tapley. Sandown had not previously sustained any line of duty deaths.

"These are trying times for the entire Sandown fire department and for the family," said Tapley, "Our thoughts and prayers are with Harold and his family." Members of the Granite State Fire Service Support Team were in Sandown providing assistance. An autopsy was performed Monday morning by the Office of the Chief Medical Examiner. State Fire Marshal J. William Degnan announced later that day that Frey died of a heart attack.

Firefighters from Sandown escorted Frey's body from Concord to the Peabody Funeral Home in Derry, accompanied by members of the Concord Fire Department who assisted with the escort out of the city. Overpasses along Interstate 93 were lined with local firefighters saluting the procession as it passed by. The State Fire Marshal's Office, with the Sandown Police and Fire Departments, is conducting an investigation into the incident. A wake will be held at Peabody Funeral Homes and Crematorium in Derry on Thursday, Jan. 20, from 4 to 8 p.m. A graveside service will be held Friday at 11 a.m. in the New Hampshire Veterans Cemetery in Boscawen.

A reception for friends, family and members of the fire and EMS service is at 1 p.m. Friday at Sandown Town Hall.

In lieu of flowers, memorial contributions may be made to the Sandown Volunteer Fireman's Association, P.O. Box 73, Sandown, NH 03873. To send a condolence, visit: www.peabodyfuneralhome.com.

Harold Frederick Frey

<http://www.cdc.gov/niosh/fire/reports/face201103.html>

Firefighter/Paramedic Frey was participating in ice water rescue training in the Exeter River. He wore an ice rescue protective suit and was in the water for approximately 30 minutes. After leaving the water under his own power,

Firefighter/Paramedic Frey complained to other firefighters about shortness of breath and laid himself down in the snow. As firefighters carried Firefighter/Paramedic

Frey to a rescue unit, Firefighter/Paramedic Frey began to have seizure-like activity. Firefighters began CPR and advanced life support emergency medical procedures. An ambulance arrived and Firefighter/Paramedic Frey was transported to the hospital. His condition did not improve and he was pronounced dead in the emergency room. The cause of death was a heart attack. For additional information regarding this incident, please refer to NIOSH Fire Fighter Fatality Investigation and Prevention Program report F2011-03 (www.cdc.gov/niosh/fire/reports/face201103.html). Incident Location: Fremont Road and Philips Road, Sandown, NH (USNG: 19T CH 2203 5645).

Department Information
Sandown Fire and Rescue
Department

316 Main ST
USNG: 19T CH 2150 5497
Sandown, New Hampshire
03873

Chief: Bill Tapley

Age: 46

Rank: Firefighter/Paramedic

Classification:	Volunteer
Incident Date:	Jan 16, 2011 11:00
Date of Death:	Jan 16, 2011
Cause of Death:	Stress/Overexertion
Nature of Death:	Heart Attack
Activity Type:	Other
Emergency Duty:	No
Duty Type:	Training
Fixed Property Use:	Outdoor Property

Fire Fighter-Paramedic Suffers Sudden Cardiac Death During Ice Rescue Training – New Hampshire



Death in the Line of Duty...A summary of a NIOSH fire fighter fatality investigation

F2011-03 Date Released: April 2011

SUMMARY

On January 16, 2011, a 46-year-old male volunteer fire fighter-paramedic (FF/P) participated in ice rescue training. During the training, the FF/P played the role of the victim. After the last evolution, the FF/P walked approximately 400 feet in 13 inches of snow toward the staging area when he complained of shortness of breath. After a transport ambulance arrived, the FF/P went into cardiac arrest. Crew members and ambulance personnel provided cardiopulmonary resuscitation (CPR) and advanced life support as the FF/P was transported to the local hospital's emergency department (ED). CPR and

advanced life support continued in the ED for an additional 31 minutes until the ED physician pronounced him dead. The death certificate and the autopsy listed "coronary artery atherosclerosis" as the cause of death. Given the FF/P's underlying coronary artery disease (CAD), NIOSH investigators concluded that the physical exertion involved in the training and in walking through the snow triggered a cardiac arrhythmia resulting in his sudden cardiac death.

NIOSH investigators offer the following recommendations to address general safety and health issues. However, it is unclear whether these recommendations could have prevented the FF/P's death.

- **Provide preplacement and annual medical evaluations to all fire fighters.**
- **Ensure fire fighters are cleared for return to duty by a physician knowledgeable about the physical demands of fire fighting, the personal protective equipment used by fire fighters, and the various components of National Fire Protection Association (NFPA) 1582.**
- **Phase in a comprehensive wellness and fitness program for fire fighters.**
- **Perform a preplacement and an annual physical performance (physical ability) evaluation.**
- **Provide fire fighters with medical clearance to wear self-contained breathing apparatus (SCBA) as part of the Fire Department's medical evaluation program.**
- **Conduct annual respirator fit testing.**

INTRODUCTION & METHODS

On January 16, 2011, a 46-year-old male volunteer FF/P died after participating in ice rescue training. NIOSH was notified of this fatality on January 18, 2011, by the U.S. Fire Administration. NIOSH contacted the affected FD on January 25, 2011, to gather additional information, and on January 27, 2011, to initiate the investigation. On February 7, 2011, a safety

and occupational health specialist from the NIOSH Fire Fighter Fatality Investigation Team conducted an on-site investigation of the incident.

During the investigation, NIOSH personnel interviewed the following people:

- Fire Chief
- FF/P's daughter

NIOSH personnel reviewed the following documents:

- FD training records
- FD standard operating guidelines
- FD incident report
- Police incident report
- Emergency medical service (ambulance) incident report
- Hospital ED records
- Autopsy report
- Primary care provider medical records

INVESTIGATIVE RESULTS

Incident. On January 16, 2011, the FD scheduled a training exercise in ice rescue ([Appendix A](#)). Crew members assembled at the fire station a little before 0800 hours and drove FD apparatus (engine, rescue, medic unit, and a pickup) to the frozen river/pond training site ([Figure 1](#)). Twenty crew members, including a paramedic, two emergency medical technician-basics (EMT-B), three EMT-intermediates, and 14 fire fighters participated. Weather conditions included a temperature of 26°Fahrenheit (°F) and 63% relative humidity. The pond was frozen, and the entire area was covered with approximately 13 inches of fresh snow [[Weather Underground 2011](#)].

At the training site, crew members first conducted sled-based ice rescue training. The FF/P, wearing civilian clothing including a winter coat, observed this training from shore. The training lasted approximately 1 hour.

Crew members moved to the end of the pond for in-water ice rescue training. The FF/P donned an ice rescue suit weighing approximately 10 pounds and

swam through a culvert to the training location ([Figure 2](#)). The water at this location was approximately 3 feet deep and at freezing temperature. Speaking to a crew member, the FF/P was concerned about aggravating a recent shoulder surgery. The crew member showed the FF/P how to hold onto the rescue rope while the crew member “rescued” the FF/P. The training lasted approximately 1 hour, and crew members exited the pond area by either climbing the steep snow bank or walking about 400 feet around the river bank. The FF/P walked around the river bank.

As the FF/P neared the staging area, he reported shortness of breath and lay down in the snow. Crew members brought a Stokes® basket to carry the FF/P to the rescue unit and summoned an ambulance (1102 hours). When the FF/P climbed into the Stokes® basket, he began to lose consciousness. Crew members rushed the basket to the rescue unit, 75 feet away, as the FF/P began to have seizure-like activity.

Inside the rescue unit, the FF/P was unresponsive. He stopped breathing and had no pulse. CPR (chest compressions and oxygen delivery via bag-valve mask) was begun. A cardiac monitor attached to the FF/P revealed two heart beats in rapid succession (bigeminy). One shock (defibrillation attempt) was administered without positive change in the FF/P’s clinical condition. A police officer notified the FF/P’s daughter of the incident; the daughter relayed pertinent medical history via the police officer to the crew members at the scene.

The ambulance arrived on the scene at 1111 hours and found the FF/P unresponsive, not breathing, with no pulse, and with CPR in progress. The FF/P was intubated, and lung sounds were verified by capnography [[AHA 2000](#)]. An intravenous line was placed, and cardiac resuscitation medications were administered through the IV line. The ambulance departed the scene en route to the hospital’s ED at 1130 hours. During those 19 minutes the FF/P’s heart rhythm alternated between ventricular fibrillation, pulseless electrical activity, ventricular/bradycardia, and supraventricular tachycardia. Three additional shocks were administered without improvement in the FF/P’s clinical condition. CPR and advanced life support continued throughout the transport. The ambulance arrived at the hospital’s ED at 1147 hours.

Inside the ED, advanced life support continued without positive change in the FF/P's clinical condition. Resuscitation measures continued until 1218 hours, when the attending physician pronounced the FF/P dead.

Medical Findings. The death certificate and autopsy listed "coronary artery atherosclerosis" as the cause of death. The FF/P's blood was not tested for carboxyhemoglobin (a measure of carbon monoxide exposure), but nicotine was identified.

The FF/P's known risk factors for CAD included smoking, high blood cholesterol (207 milligrams per deciliter [normal is <200] [elevated on the first and only cholesterol level measured]), and obesity (based on a body mass index of 34.7 kilograms per meters squared [> 30.0 kilograms per meters squared is considered obese]) [[AHA 2011](#); [CDC 2011](#)].

In 2005 the FF/P was hospitalized for chest pain, but testing showed no evidence of a heart attack. To screen for possible CAD, a stress echocardiogram was performed. The FF/P exercised for 10 minutes on the Bruce protocol [[Sport Fitness Advisor 2011](#)], achieving 9.7 metabolic equivalents (METs). He stopped when he reached 85% of his maximum age-predicted heart rate (160 beats per minute). He had no reported angina, normal blood pressure response, and no ischemic changes on electrocardiogram. Echocardiogram imaging revealed a normal left ventricle size, wall motion, and ejection fraction. He was diagnosed with pericarditis and discharged from the hospital.

The FF/P last visited his primary care physician in September 2010, but had more recent visits to his neurospinal specialist for shoulder surgery and follow-up. At his December 20 visit, he was released for duty by his neurospinal specialist.



DESCRIPTION OF THE FIRE DEPARTMENT

At the time of the NIOSH investigation, the FD consisted of one fire station with 45 uniformed volunteer personnel. It served 6,000 residents in a geographic area of 17 square miles.

Membership and Training. The FD requires new fire fighter applicants to be 18 years of age (21 years to drive fire apparatus), have a valid state driver's license, be a resident of the town, and have the approval of the committee of

fire engineers. The applicant is then voted in or out by the members at the next general meeting. New members receive 220 hours of fire fighter training to become certified as a Fire Fighter 1, an additional 160 hours to become certified as a Fire Fighter 2, and an additional 200 hours to become an emergency medical technician. The state has no mandatory minimum training levels for volunteer fire fighters. The FF/P had 3 years of fire fighting experience and was State-certified as Fire Fighter 1, Apparatus Operator, Paramedic, and in hazardous materials operations. He was a member of this FD for 2 months.

Preplacement and Periodic Medical Evaluations. The FD does not require preplacement or periodic (annual) medical evaluations for members. No annual SCBA medical clearance or annual SCBA facepiece fit test are required. Members injured on duty must be evaluated by their primary care physician who forwards a decision regarding return to work to the State Office of Workers' Compensation. The State Office of Workers' Compensation makes the final determination regarding return to duty.

Health and Wellness Programs. The FD has no formal wellness/fitness program. No strength training equipment is available in the fire station; however, a local gym offers a 30% membership discount to FD members. No physical ability test is required for candidates or members.

DISCUSSION

Atherosclerotic Coronary Artery Disease. In the United States, atherosclerotic CAD is the most common risk factor for cardiac arrest and sudden cardiac death [[Meyerburg and Castellanos 2008](#)]. Risk factors for its development include age older than 45, male gender, family history of CAD, smoking, high blood pressure, high blood cholesterol, obesity/physical inactivity, and diabetes [[AHA 2011](#); [NHLBI 2011](#)]. The FF/P had five CAD risk factors (age older than 45, male gender, smoking, high blood cholesterol, and obesity).

The narrowing of the coronary arteries by atherosclerotic plaques occurs over many years, typically decades [[Libby 2008](#)]. However, the growth of these plaques probably occurs in a nonlinear, often abrupt fashion [[Shah 1997](#)]. Heart attacks typically occur with the sudden development of complete

blockage (occlusion) in one or more coronary arteries that have not developed a collateral blood supply [[Fuster et al. 1992](#)]. This sudden blockage is primarily due to blood clots (thromboses) forming on top of atherosclerotic plaques.

Establishing the occurrence of a recent (acute) heart attack requires any of the following: characteristic electrocardiogram (EKG) changes, elevated cardiac enzymes, or coronary artery thrombus. In this case, the heart monitor in the rescue unit did not show changes indicating an acute heart attack. His cardiac enzymes were not tested, but the FF/P died before the enzymes would be expected to increase. These enzymes take at least 4 hours after a heart attack to become positive. No coronary artery thrombus was identified at autopsy. Based on the clinical scenario, the FF/P suffered either a primary heart arrhythmia (most likely) or an asymptomatic heart attack (less likely), either of which could have caused his sudden cardiac death.

Epidemiologic studies have found that heavy physical exertion sometimes immediately precedes and triggers the onset of acute heart attacks and sudden cardiac death [[Siscovick et al. 1984](#); [Tofler et al. 1992](#); [Mittleman et al. 1993](#); [Willich et al. 1993](#); [Albert et al. 2000](#)]. Heart attacks in fire fighters have been associated with alarm response, fire suppression, and heavy exertion during training (including physical fitness training) [[Kales et al. 2003](#); [Kales et al. 2007](#); [NIOSH 2007](#)]. The FF/P participated in ice rescue training and walked to and from the training site in 13 inches of snow. These activities expended about 8 METs, which is considered moderate physical activity [[AIHA 1971](#); [Ainsworth et al. 2000](#)].

Occupational Medical Standards for Structural Fire Fighters. To reduce the risk of sudden cardiac arrest or other incapacitating medical conditions among fire fighters, the NFPA developed NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments [[NFPA 2007a](#)]. This voluntary industry standard provides (1) the components of a preplacement and annual medical evaluation and (2) medical fitness for duty criteria. The FF/P was a smoker and had elevated blood cholesterol, but these conditions, by themselves, should not trigger fire fighter duty

restrictions. However, these two factors could have warranted a referral for an exercise stress test to screen for CAD. Recommendations for conducting exercise stress tests on asymptomatic individuals without known heart disease are varied. The following paragraphs summarize the positions of widely recognized organizations on this topic.

National Fire Protection Association (NFPA) 1582, a voluntary industry standard, recommends an exercise stress test performed "as clinically indicated by history or symptoms" and refers the reader to Appendix A [[NFPA 2007a](#)]. Items in Appendix A are not standard requirements, but are provided for "informational purposes only." Appendix A recommends using submaximal (85% of predicted heart rate) stress tests as a screening tool to evaluate a fire fighter's aerobic capacity. Maximal (e.g., symptom-limiting) stress tests with imaging should be used for fire fighters with the following conditions:

- abnormal screening submaximal tests
- cardiac symptoms
- known coronary artery disease
- two or more risk factors for CAD (in men older than 45 and women older than 55)

Risk factors are defined as hypercholesterolemia (total cholesterol greater than 240 milligrams per deciliter), hypertension (diastolic blood pressure greater than 90 mm of mercury), smoking, diabetes mellitus, or family history of premature CAD (heart attack or sudden cardiac death in a first-degree relative less than 60 years old).

The American College of Cardiology/American Heart Association (ACC/AHA) has also published exercise testing guidelines [[Gibbons et al. 2002](#)]. The ACC/AHA guideline states that the evidence to conduct stress tests in asymptomatic individuals with diabetes mellitus is "Class IIa," which is defined as "conflicting evidence and/or a divergence of opinion about the usefulness/efficacy but the weight of the evidence/opinion is in favor." The ACC/AHA guideline states the evidence is "less well established" (Class IIb) for the following groups:

- persons with multiple risk factors (defined similarly to those listed by the NFPA)
- asymptomatic men older than 45 years and women older than 55 years:
 - who are sedentary and plan to start vigorous exercise
 - who are involved in occupations in which impairment might jeopardize public safety (e.g., fire fighters)
 - who are at high risk for coronary artery disease due to other diseases (e.g., peripheral vascular disease and chronic renal failure)

The U.S. Department of Transportation provides guidance for those seeking medical certification for a commercial driver's license. An expert medical panel recommended exercise tolerance tests (stress tests) for asymptomatic "high risk" drivers [[Blumenthal 2007](#)]. The panel defines high risk drivers as those with any of the following:

- diabetes mellitus
- peripheral vascular disease
- age 45 and above with multiple risk factors for coronary heart disease
- Framingham risk score predicting a 20% coronary heart disease event risk over the next 10 years

The U.S. Preventive Services Task Force (USPSTF) does not recommend stress tests for asymptomatic individuals at low risk for coronary heart disease events. For individuals at increased risk for coronary heart disease events, the USPSTF found "insufficient evidence to recommend for or against routine screening with EKG, exercise tolerance test, or electron beam computerized tomography scanning...." Rather, they recommend the diagnosis and treatment of modifiable risk factors (hypertension, high cholesterol, smoking, and diabetes) [[USPSTF 2004](#)]. The USPSTF does note that "For people in certain occupations, such as pilots, and heavy equipment operators (for whom sudden incapacitation or sudden death may endanger the safety of others), consideration other than the health benefit to the individual patient may influence the decision to screen for coronary heart disease."

Given the FF/P's age and CAD risk profile, only the ACC/AHA would have "recommended" a symptom limiting exercise stress test. This recommendation, however, was based on a "category IIb" indication: "usefulness/efficacy is less well established by evidence/opinion" [[Gibbons et al. 2002](#)].

RECOMMENDATIONS

NIOSH investigators offer the following recommendations to address general safety and health issues. However, it is unclear if these recommendations could have prevented the FF/P's death.

Recommendation #1: Provide preplacement and annual medical evaluations to all fire fighters.

Guidance regarding the content and frequency of these medical evaluations can be found in NFPA 1582 [[NFPA 2007a](#)]. These evaluations are performed to determine fire fighters' medical ability to perform duties without presenting a significant risk to the safety and health of themselves or others. However, the FD is not legally required to follow this standard. Applying this recommendation involves economic repercussions and may be particularly difficult for small volunteer fire departments to implement.

To overcome the financial obstacle of medical evaluations, the FD could urge current members to get annual medical clearances from their private physicians. Another option is having the annual medical evaluations completed by paramedics and EMTs from the local emergency medical service (vital signs, height, weight, visual acuity, and EKG). This information could then be provided to a community physician (perhaps volunteering his or her time), who could review the data and provide medical clearance (or further evaluation, if needed). The more extensive portions of the medical evaluations could be performed by a private physician at the fire fighter's expense (personal or through insurance), provided by a physician volunteer, or paid for by the FD, City, or State. Sharing the financial responsibility for these evaluations between fire fighters, the FD, the City, the State, and physician volunteers may reduce the negative financial impact on recruiting and retaining needed fire fighters.

Recommendation #2: Ensure that fire fighters are cleared for return to duty by a physician knowledgeable about the physical demands of fire fighting, the personal protective equipment used by fire fighters, and the various components of NFPA 1582.

Guidance regarding medical evaluations and examinations for structural fire fighters can be found in NFPA 1582 [[NFPA 2007a](#)]. According to this guideline, the FD should have an officially designated physician who is responsible for guiding, directing, and advising the members with regard to their health, fitness, and suitability for duty. The physician should review job descriptions and essential job tasks required for all FD positions and ranks to understand the physiological and psychological demands of fire fighters and the environmental conditions under which they must perform, as well as the personal protective equipment they must wear during various types of emergency operations. The FD does not currently have a physician to oversee return to work clearances. Sharing the financial responsibility for this recommendation between the FD, the City, the State, and physician volunteers may reduce the negative financial impact on recruiting and retaining needed fire fighters.

Recommendation #3: Phase in a comprehensive wellness and fitness program for fire fighters.

Guidance for fire department wellness/fitness programs to reduce risk factors for cardiovascular disease and improve cardiovascular capacity is found in the National Volunteer Fire Council (NVFC) Health and Wellness Guide, NFPA 1583, Standard on Health-Related Fitness Programs for Fire Fighters, and in Firefighter Fitness: A Health and Wellness Guide [[USFA 2004](#); [NFPA 2008](#); [Schneider 2010](#)]. Worksite health promotion programs have been shown to be cost effective by increasing productivity, reducing absenteeism, and reducing the number of work-related injuries and lost work days [[Stein et al. 2000](#); [Aldana 2001](#)].

Fire service health promotion programs have been shown to reduce coronary artery disease risk factors and improve fitness levels, with mandatory programs showing the most benefit [[Dempsey et al. 2002](#); [Womack et al.](#)

[2005](#); [Blevins et al. 2006](#)]. A study conducted by the Oregon Health and Science University reported a savings of more than \$1 million for each of four large fire departments implementing the IAFF/IAFC wellness/fitness program compared to four large fire departments not implementing a program. These savings were primarily due to a reduction of occupational injury/illness claims with additional savings expected from reduced future nonoccupational healthcare costs [[Kuehl 2007](#)].

Given the FD's structure, the NVFC program might be the most appropriate model [[USFA 2004](#)]. NIOSH recommends a formal, structured wellness/fitness program to ensure all members receive the benefits of a health promotion program.

Recommendation #4: Perform a preplacement and an annual physical performance (physical ability) evaluation.

NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, requires the FD to develop physical performance requirements for candidates and members who engage in emergency operations [[NFPA 2007b](#)]. Members who engage in emergency operations must be annually qualified (physical ability test) as meeting these physical performance standards for structural fire fighters [[NFPA 2007b](#)]. Examples of these evaluations include tests found in the National Volunteer Fire Council (NVFC) Health and Wellness Guide, Candidate Physical Ability Test, and fitness evaluations as part of the IAFF/IAFC wellness/fitness initiative [[USFA 2004](#); [IAFF/IAFC 2007](#); [IAFF/IAFC 2008](#)].

Recommendation #5: Provide fire fighters with medical clearance to wear SCBA as part of the Fire Department's medical evaluation program.

The Occupational Safety and Health Administration (OSHA) Revised Respiratory Protection Standard requires employers to provide medical evaluations and clearance for employees using respiratory protection [[29 CFR 1910.134](#)]. These clearance evaluations are required for private industry employees and public employees in States operating OSHA-approved State plans [[OSHA 2011](#)]. New Hampshire does not operate an

OSHA-approved State plan. Therefore, the FD is not required to comply with this standard. However, NIOSH recommends voluntary compliance to ensure that all members are medically cleared to wear an SCBA.

Recommendation #6: Conduct annual respirator fit testing.

The OSHA respiratory protection standard requires employers whose employees are required to use a respirator (e.g., an SCBA) to have a formal respiratory protection program, including annual fit testing [[29 CFR 1910.134](#)]. As mentioned previously, New Hampshire does not have an OSHA-approved State plan; however, it is recommended that the FD follow this OSHA standard voluntarily [[OSHA 2011](#)].

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INVESTIGATOR INFORMATION

This incident was investigated by the NIOSH Fire Fighter Fatality Investigation and Prevention Program, Cardiovascular Disease Component in Cincinnati, Ohio. Mr. Tommy Baldwin (MS) led the investigation and coauthored the report. Mr. Baldwin is a Safety and Occupational Health Specialist, a National Association of Fire Investigators (NAFI) Certified Fire and Explosion Investigator, an International Fire Service Accreditation Congress (IFSAC) Certified Fire Officer I, and a former Fire Chief and Emergency Medical Technician. Dr. Thomas Hales (MD, MPH) provided medical consultation and coauthored the report. Dr. Hales is a member of the NFPA Technical Committee on Occupational Safety and Health, and Vice-Chair of the Public Safety Medicine Section of the American College of Occupational and Environmental Medicine (ACOEM).

Appendix A

Ice Rescue Training Lesson Plan for January 16, 2011

- Rescue – Alive familiarization
- Techniques to remove a patient from the ice/water

- Rescue alive
- Stokes basket
- Ropes
- Shoreline party activities
- In-water techniques for rescuers
 - Proper wear of ice-rescue PPE
 - Movement on ice
 - Movement to open water
 - Entering water
 - Exiting water
 - Movement in the water
 - Patient rescue techniques
 - Self-rescue
 - Dope-on-a-rope

Training Officer: Deputy Chief

Safety Officer: Fire Chief

Apparatus:

- 56F1 (Forestry pickup truck)
- 56R1 (Rescue-EMS)
- 56E2 (Engine)
- 56M2

EMS Support:

- Paramedic
- FF/EMT-B
- EMT-B

Appendix B

Autopsy Findings

- Atherosclerotic cardiovascular disease

- Severe (75%) focal narrowing of the left anterior descending coronary artery
- Mild focal narrowing of the circumflex coronary artery
- Mild focal narrowing of the right coronary artery
- Microscopic evidence of myocyte hypertrophy and diffuse moderate perivascular fibrosis with thickened intramural arterioles
- Left ventricular hypertrophy (LVH)
- Left ventricular wall and interventricular septum thickened (1.2 cm); normal measurement by autopsy is 0.76–0.88 cm [[Colucci and Braunwald 1997](#)];
- normal measurement by echocardiography is 0.6–1.1 cm [[Armstrong and Feigenbaum 2001](#)]
- Cardiomegaly
- Heart weight of 450 grams (g); predicted normal weight is 399 g (between 302 g and 526 g as a function of sex, age, and body weight) [[Silver and Silver 2001](#)]
- Mild thickening of the mitral and tricuspid valve leaflets
- No evidence of a thrombus (blood clot in the coronary arteries)
- No evidence of a pulmonary embolus (blood clot in the lung arteries)
- Severe infrarenal aortic atherosclerosis
- Toxicology results were negative for drugs and alcohol; positive for nicotine (carbon monoxide not tested)

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The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1998, Congress appropriated funds to NIOSH to conduct a fire fighter initiative that resulted in the NIOSH "Fire Fighter Fatality Investigation and Prevention Program" which examines line-of-duty-deaths or on duty deaths of fire fighters to assist fire departments, fire fighters, the fire service and others to prevent similar fire fighter deaths in the future. The agency does not enforce compliance with State or Federal occupational safety and health standards and does not determine fault or assign blame. Participation of fire departments and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency's reports do not name the victim, the fire department or those interviewed. The NIOSH report's summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency's recommendations and is not intended to be definitive for purposes of determining any claim or benefit.

For further information, visit the program Web site at www.cdc.gov/niosh/fire or call toll free 1-800-CDC-INFO (1-800-232-4636).