CASE STUDY

Flash Fire on the Ward

The deadly Hartford Hospital fire of 1961 resulted in changes that today make hospitals far safer than they were half a century ago.

By Lisa Nadile

I will remember that I remain a member of society, with special obligations to all my fellow human beings, those sound of mind and body as well as the infirm.

—Hippocratic Oath

On the afternoon of December 8, 1961, a fire broke out at Hartford Hospital, located near downtown Hartford, Connecticut. As the fire spread though the south end of the hospital's ninth floor, the Hartford Fire Department (HFD) raised Ladder 6's 100-foot (30-meter) ladder as close as possible to the 13-story grey-brick building. Positioned for maximum height, the ladder reached over the main entrance about halfway between the eighth and ninth stories of the building's center west section. Firefighter Richard Trejarian, in full turnout gear, raced up the ladder. At the top, Trejarian leapt to an open ninth-floor window. With his feet swinging free, he pulled himself through the window and dropped to the floor.

Inside Hartford Hospital during the fire on December 8, 1961.

Surrounded by thick black smoke from burning ceiling tile, linoleum, plastics, wood, and other combustibles, Trejarian moved fast, assessing the situation, closing doors, and shouting instructions to people on the floor. "He said, 'Run the water… wet towels and rags, line them around the doors,'" says Firefighter Frank Droney, 81, a retired 32-year HFD veteran. "Dick was skinny as a rail and tough as nails. Why did he do it? He saw people in trouble. They were hanging out the windows and he went in to save their lives."

Trejarian was quickly joined by Droney and his fellow firefighters, who carried 2 1/2-inch fire hose up the stairs. They also used standpipes and internal fire hoses that were present on all floors in the hospital.

Outside, onlookers watched as the firefighters converged on the building. One of the spectators that day was 14-year-old Timothy Kelliher, who had followed his firefighter father to the fire from the firehouse. Kelliher, now 62, went on to join the HFD and retired as a captain with 25 years service. He watched as firefighters broke windows and pulled a 2 1/2-inch hose up the outside of the building. "That's a lot of work to do that when it's charged, but they had some pretty big guys in those days," he says.

When Droney arrived on the ninth floor, he discovered that the walls were on fire. "There was no visibility because of the black smoke," he says. He and the other firefighters moved through the corridors, extinguishing the fire and preparing for the evacuation of patients. Newspapers reported firefighters and police calling for gas masks during the evacuation. "We had no masks… there were no requirements at the time. You had to go in for a second or two and then go out," says Droney.

The three-alarm fire was under control in 15 minutes and fully extinguished in 30, Fire Chief Thomas F. Lee told *Fire Engineering* in February 1962.

"My dad said that as he was moving through the corridor [opening the doors and looking for fire], he'd opened one and the men said, 'Shut the door, you're letting the heat and smoke in.' So he shut it," says Kelliher. The firefighters didn't evacuate until they were sure the fire was out.

That's when they began to see the toll the fire had taken. "When it cleared I saw there were bodies right at our feet near the elevators," says Droney. "There were bodies everywhere."

Even before firefighters arrived, doctors, nurses, orderlies, and staff placed patients first and fought to save their lives, refusing to leave their sides. Hospital staff, along with the Connecticut State Police and firefighters, evacuated patients from the ninth though the twelfth floors; in 30 minutes, 108 patients were evacuated from the ninth floor alone, many seriously ill and confined to beds. (The thirteenth floor was used for storage.) In some cases, hospital staffers and their patients died together. In all, sixteen people—one doctor, one nurse, two staff, five visitors, seven patients—died as a result of the fire. Two nurses and a hospital engineer were injured, suffering smoke inhalation and carbon monoxide poisoning. The damage to the 13-year-old structure was $350,000.

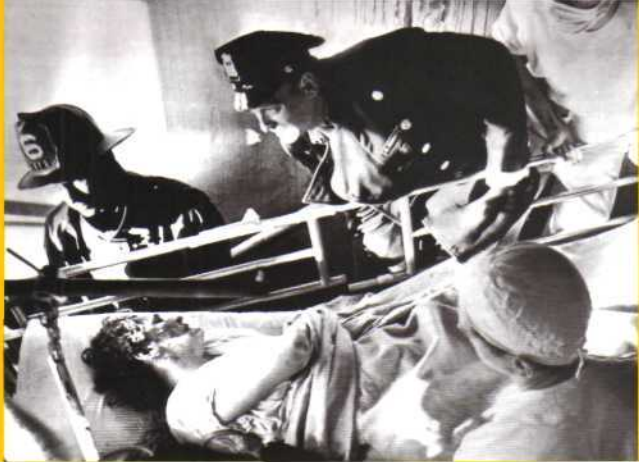
The ensuing investigation revealed a host of troubling findings, including an open fire door, patient room doors nearly burned through, burnt ceiling tiles and linoleum wainscoting, and a trash chute that was missing a door. Those findings would go on to affect hospitals across the country. The building materials used in Hartford Hospital, how it managed its trash and laundry, and how it trained its staff were all studied, and the findings prompted a variety of changes designed to improve facilities and reduce patient risk. In 1963, the lessons learned from this and similar fires were reflected in NFPA 101®, *Life Safety Code*®. But the Hartford Hospital fire also showcases challenges still facing health care institutions today, including emergency responder notification, crowd management, and building evacuation when a protect-in-place strategy fails.

The Hartford Hospital fire was also the scene of a massive, spontaneous mutual aid effort, highlighting more issues of disaster management that fire and other departments were to study (see "Managing the Helping Hands"). Not only were hospital emergency plans forever changed, but educational occupancies, hotels, and assembly occupancies took careful note, and the seeds for improved emergency communication were planted. And it all started with a trash chute.

When caregivers become protectors

The record of what happened that day is quite detailed. The state fire marshal, State Police Commissioner Leo J. Mulcahy, convened a formal hearing at 5 p.m. the day of the fire and heard the testimony of 25 witnesses under oath, some still in soot-covered robes and pajamas, according to published reports. (Two witnesses were also survivors of the infamous Hartford circus tent fire that claimed 168 lives in 1944.) State Police Major Carroll E. Shaw questioned the witnesses. His 14-year-old niece was the first body removed from the ninth floor.

All photographs: AP/Wide World



Rescuers carry a seriously ill patient to safety. Hospital staff, along with police and firefighters, evacuated 108 patients from the ninth floor in 30 minutes.

Based on preliminary testimony, witnesses indicated that the fire broke out in a trash chute whose "charging" doors opened directly onto the corridor of each floor. At first, there was no great sense of concern. Staff testified that they followed emergency procedures but assumed the situation was not serious because fires had occurred in the chute before and were extinguished, some without calling the HFD. Indeed, in the basement, when maintenance men smelled smoke they opened the trash chute terminus door. With a long-handled hook they began to remove the trash that accumulated in the bottom of the chute, which was elbow-shaped where trash gathered. On the first floor, a janitor saw smoke coming from the closed chute door, and ran water into the chute using a 1 1/2-inch standpipe line. When that didn't stop the smoke, he closed the door and headed to the upper floors to find a supervisor. Meanwhile, the hospital engineer was using a standpipe line on the thirteenth floor, again without success.

According to Chief Lee, Major Shaw, and others, there was a six-minute delay in reporting the fire. The assistant head nurse testified she pulled the fire box alarm at 2:39 p.m. when she noticed heavy smoke emitting from the trash chute in the twelfth floor corridor, which was the psychiatric ward. After a minute or two, her concern grew and she returned to the fire box alarm and pulled it again. She asked a male aide to put tape around the edges of the chute door to keep the smoke out, stating the smoke was "awfully black." At 2:41 p.m., the sprinkler in the chute activated, tripping another alarm, according to the *Hartford Times*. The hospital was only required to have sprinklers in hazardous and storage areas.

On the ninth floor, according to multiple reports and newspaper accounts, a nurse supervisor saw "a puff of smoke" billow out of the ninth-floor rubbish chute. She immediately closed and locked the two heavy fire doors, thick, solid-wood doors that spanned the width of the corridor and isolated the north wing and south wing from the hospital's center section. She ordered the nurses to close the doors to the patients' rooms. She also asked the staff member at the desk to call in the emergency. The nurse supervisor then moved to check the fire doors on the lower floors.

When nurses on the ninth floor saw the cross-corridor fire doors close, they immediately moved down the halls, securing patients and visitors and closing room doors. Nurses who reached the end of the corridors on the south side closed themselves in patients' rooms at the end of the wing.

In their statements after the fire, ninth-floor hospital personnel were "unanimous in their version" of the event, according to the *Hartford Courant*. They saw smoke billow from the trash chute, and

they saw the nurse supervisor close and latch the fire door. Witnesses then reported hearing an explosion and seeing doors sucked shut and flames traveling along the ceiling. The sound was the ninth-floor trash chute door being blown off its hinges. One doctor said that he was having a routine day and then saw "within 40 seconds a sheet of flame roaring down the corridor." One witness compared the fire to a flame thrower and another to a blast furnace, according to the *Hartford Times*.

Witnesses testified that they saw fire break through the top of the cross-corridor fire door. "All also testified that after the heavy smoke doors were closed, smoke and flames burst out from the top of the closed [south] door," the *Courant* reported. "Each also reported the flames racing along the ceiling of the corridor. The flames...reached about three or four feet down from the ceiling."

The *Report of the Commissioner of State Police as Fire Marshal*, submitted by Commissioner Mulcahy on February 20, 1961, cited testimony that witnesses saw the south fire door "blow open" after the explosion, yet the latch was later found sound.

As fire progressed down the ninth-floor hallway, the walls began to burn. The temperature of the fire was later estimated at 1200°F (648°C). The fire produced immense pressure that pushed at closed doors, forcing some open. According to the *Courant*, a 28-year-old resident, Dr. Anthony Fons, rescued three patients by pushing them onto a bed in a small room in the center section and bracing himself against the door, resisting the air pressure built by the fire.

Not all were so fortunate. "Six died in their beds. Some beside loved ones. A young doctor was killed while protecting his patients," the *Courant* reported. "Two women fell near elevators that stopped. Another woman dropped behind a fire door that failed. A kitchen aide trapped in the kitchen died while holding a fire extinguisher." The seventh patient died four days after the fire.

The doctor who died in the fire was on the third floor when he heard the ninth-floor alarm, which was where his patients were, according to the *Courant*. He raced to the ninth-floor south section and began closing doors on the east wing, moving so quickly one of his shoes fell off. He led a group of patients into a room and tried to shut the door, but eventually succumbed to smoke.

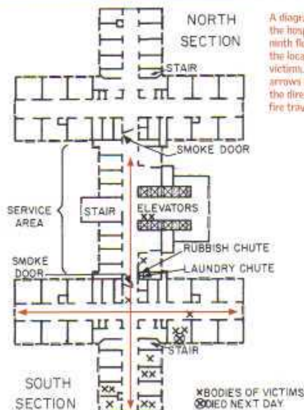
Other casualties were not officially listed. One woman in Canada died of a heart attack when she learned her daughter had perished in the fire. Another woman who was close to death was safely evacuated during the fire but died shortly afterwards. The fire was not considered a major factor in her death.

Many of the patients who were evacuated were seriously ill, said Arthur Bouchard, who was a hospital aide at the time of the fire and who currently works in the hospital's security department. "We had to carry them down in their beds and wheelchairs," he says. The evacuation began immediately after the extinguishment of the fire.

According to Hartford Hospital, in a little more that an hour, staff had discharged 263 patients. "They sent home everyone who was healthy enough," says Bouchard. The quick action meant the hospital, which was not filled to capacity, could relocate those patients evacuated from the ninth and higher floors.

The investigation

The investigation of the fire began immediately with the questioning of witnesses and an evaluation of the scene by Commissioner Mulcahy.



A diagram of the hospital's ninth floor, with the locations of victims. The red arrows indicate the direction the fire traveled.

From left: Firefighters and police pull fire hose up to the ninth floor on the outside of the building; the south fire door on the ninth floor that was opened during the blaze; and patients being evacuated down a hospital stairwell.

Major Shaw, and other officials. From the beginning, they sought to answer three fundamental questions: What caused the explosion that blew a steel trash chute door off its hinges? Where was the chute door? And what caused the fire's speed and intensity?

The contents of the trash chute were a subject of immediate discussion. The thick, dark smoke that colored everything a spooky grey, according to witnesses like Bouchard, was an important clue for Chief Lee. He told the *Courant* that he suspected X-ray film as a major culprit, because in his experience paper-based content usually burned with a grey smoke, not the thick, black smoke that poured from the chute. But the experienced Chief Lee and Major Shaw were well aware that this was the beginning of a long investigation. The day after the fire, NFPA representatives Robert S. Moulton, NFPA's technical secretary, and two other NFPA staff members toured the scene and carefully documented their observations.

Two days later, the chute door was found in a nearby ninth-floor bathroom in a bathtub half-filled with dirty water and debris, reported the *Hartford Times*. Investigators questioned staff, but decided the force of the blast had blown the chute into the room and it had not been moved. Still, the location pointed to the force of the explosion as described by witness.

The trash chute, constructed of unpainted, riveted aluminum and bent into an 18-inch (0.5-meter) diameter cylinder, was removed by investigators for study, and large sections of the ceiling tile and the corridor wall's wainscoting were taken to New York to Underwriters Laboratories, Inc. (UL) for testing. Slowly, the pieces began to come together.

The fire originated in the trash chute between the basement and the first floor, according to investigators as submitted in the Commissioner's report. The cause remains undetermined, but investigators developed "several instances of the disposal of cigarette butts and the contents of ash trays directly into the trash chute."

Indeed, Dr. T. Steward Hamilton, executive director of Hartford Hospital, said at a press conference after the fire that a few weeks before the blaze, a fire safety memo circulated the hospital after a nurse was seen throwing a cigarette down the trash chute. The Commissioner's report pointed to the incident as an example of how staff and visitors misunderstood the function of the chute. Each trash chute door bore the words, "Dry trash only. For safety of incinerator attendant, burnable waste only. Do not force large boxes into the chute." The confusion about the chute and this sign meant that staff thought the chute entered directly into the incinerator, when it fact trash dropped into large cans that maintenance men hand-trucked 25 feet (8 meters) to the incinerator.

Investigators concluded that the fire probably started by smoking materials and smoldered in a pile of trash "for at least 10 to 12 minutes because of incomplete combustion due to lack of oxygen." Tests of the inside of the chute found only organic material, such as paper and rags, and did not show the presence of X-ray film. Investigators stated that gases generated by the fire and too rich to burn accumulated in the upper area of the chute. The chute did have an outside vent, which was installed a month before the fire, but the 3-inch (8-centimeter) vent pipe was apparently too small to carry off the smoke and gases.

Managing the Helping Hands

The Hartford fire prompted important changes in how hospitals handle emergency communications.

In 1961, the community had no way of knowing how deadly the fire at Hartford Hospital would be. Knowing that the hospital could have as many as 1,000 patients and hundreds of staff, however, as well as hundreds of visitors at any given time, Hartford and surrounding communities threw everything they could into an impromptu evacuation and patient relocation effort. A few of the details:

- **Hartford police** responded to the first alarm immediately with traffic control, evacuation assistance gas masks, and numerous other services.

- **When word** reached the 11 Connecticut hospitals near Hartford Hospital, their staffs began reorganizing patients, clearing 560 beds within an hour. Mount Sinai Hospital received an alert of the fire at 3:15 p.m., and other hospitals reported a similar time frame. Most employee shift changes at these local hospitals occurred around the time of the alert, but many off-duty employees remained at their posts. Mount Sinai Hospital alone had 70 nurses stay at work. Off-duty clergy and doctors also began arriving at their facilities. Because these hospitals were unable to reach Hartford by phone due to glut and a policy to limit phone calls during a disaster, many sent telegrams to Hartford communicating their preparedness.

- **Expecting complete** building evacuation and a large number of injured, ambulances from local companies gathered at Hartford Hospital. Local stores sent cargo trucks, taxicab companies sent cars, and G. Fox and Co., a local clothing and retail store, sent six station wagons that it used for package delivery. Taxicabs donated transport and made six trips to deliver blood and 12 trips to deliver staff.

- **Within an hour**, without much information, more than 90 ambulances arrived in Hartford. The National Guard sent its buses, and dozens of pieces of fire apparatus were sent from all over the state. The State of Connecticut was the location of several large defense contractors, all of which sent help. Kamen Aircraft in Bloomfield sent its firefighters, medical staff, and four apparatus to the hospital. It also readied its helicopter and pilot at the plant. East Hartford-based Pratt & Whitney Aircraft sent three ambulances, a group of guards for litter bearers, two doctors, three nurses, and 40 air pack oxygen masks. It also requested employees use travel routes away from the hospital.

- **One hundred** National Guardsman were sent, bringing gas masks, blankets and cots, two ambulances, six 2.5-ton trucks, and 10 staff cars.

- **The local** Red Cross brought 200 stretchers and provided blankets, coffee, and food.

- **Dozens of** Salvation Army workers spent 10 hours at the scene of the fire providing firefighters, police, and rescue workers with thousands of sandwiches, 200 gallons of coffee, and beef stew. One unit of six workers was stationed on the ninth floor to help firefighters, investigators, and cleanup workers.

- **Southern New England** Bell Telephone added extra operators, sent mobile units to the hospital, and added trunk lines.

Such a large, unstructured response could have resulted in chaos. But it didn't. "The streets were lined with ambulances," recalls Frank Droney, a firefighter who was on the scene that day. "People, just spectators, were asking us if they could help evacuate and we, everyone, were happy for the help." Carrying over 100 patients in beds and wheelchairs, and escorting patients who were mobile, from the ninth floor was exhausting. "I can vividly remember people being brought out and placed into ambulances," says Tim Kelliher, a firefighter who witnessed the scene. "They loaded the people one right after the other. It was like a parade of ambulances."

Yet these ambulances were not transporting patients to other hospitals. They were taking them home. The hospital hurriedly discharged 263 patients in an hour. The 560 beds freed by the nearby 11 supporting hospitals weren't needed. Nor were many of the other resources offered by the community.

The nearby hospitals acutely felt the lack of immediate communication among themselves and Hartford Hospital. Within days, hospitals began plans to discuss a shortwave radio emergency communications system. On April 19, 1964, it became a reality.—LN

According to the Commissioner's report, oxygen was introduced into the chute, probably when a chute door was opened, and the smoldering fire "burst into flame, and a spark or a burning ember...was carried upwards to ignite the gases." The ninth-floor chute door blew off, and the eighth-floor chute was opened violently, but was kicked shut by an employee.

The failure of the south fire door on the ninth floor was a point of confusion for investigators. Some witnesses testified that it was closed and latched. Yet burn patterns on the door, as well as other witnesses' testimony, indicated it was open at the height of the fire. Witnesses testified it blew open, but the latch was found by investigators to be sound. The latch was on the south side of the door, so people in the center section could not have opened it. When the door opened and who opened the door, whether by accident or in panic, will never be known. But clearly the open fire door was a major factor behind the severity of the blaze.

The hospital's executive director said at a press conference after the fire that a few weeks before the blaze, a fire safety memo circulated after a nurse was seen throwing a cigarette down the trash chute.

Witnesses also reported fire burning over the closed fire door. Whether this was because the fire door was actually in the process of opening—or being opened—at the time of their observation or if the fire barrier was breached in another way was an important question for investigators. Inspection of the scene found that the fire revealed open lintels. According to a preliminary report released by NFPA four days after the fire, the undivided concealed ceiling space aided the spread of smoke beyond the barrier doors.

Combustible construction materials were also found to be responsible for the fire's severity. The hospital used acoustical ceiling tile made of cane fiber secured to a rock lath plaster. The tile was painted with fire-resistant paint, but at some point that had also been painted over with nonfire-resistant, conventional paint, which nullified the fire-resistant coating. The walls of the corridor were covered with linoleum wainscoting. UL's testing revealed both the tile and the wainscoting were clear fire hazards. Testing was based on three standard ratings: flame spread, fuel contributed, and smoke developed. As comparison factors, asbestos cement board has a zero rating for all three, and red oak is rated 100 for all three. The hospital's acoustic tile-rock lath assembly rated 180, 130, and 255. The linoleum wainscoting rated 300, 135, 653.

"Fire, pushing out of the ninth-floor chute door opening with a blow torch effect, ignited and fed on combustible ceiling tile, and spread flame and smoke along the north-south corridor between the north and south fire doors," Mulcahy's report said. "Under the influence of high heat, the tile loosened, subjecting the untreated under-side to fire which ate into and fed on this combustible material." The adhesive used to secure the tile was also combustible.

The reports states, "Burning tile dropping on the floor and caused a veritable bonfire, ignited the highly combustive wainscoting, causing fire to burn along the corridor walls and generate a tremendous amount of smoke." Chief Lee saw the bonfire of tile and mentioned it in his 1962 *Fire Engineering* interview.

The fire first burned high, then burned lower and along the walls as the tiles fell. The fire traveled 275 feet (84 meters)—north to the closed fire door and south down the corridor and down both the east and west wings of the ninth floor. The linoleum and the ceiling tile produced thick black smoke and dangerous gases.

Building a better safe haven

Immediately after the fire, Chief Lee banned the use of Hartford Hospital's trash and laundry chutes, and made the ban permanent four days later. According to the *Courant*, the hospital produced 5,500 pounds (2,495 kilograms) of trash and 17,000 pounds (7,711 kilograms) of linen daily. Other Connecticut hospitals continued to use chutes, but they had different designs than the system in Hartford. NFPA 101 was revised to address laundry and rubbish chutes issues. Such chutes were required to open in a "charging" room that is separated from the corridor by walls and doors constructed in accordance with hazardous area rooms. Sprinklers

are required inside the chute. Actual installation details are included in NFPA 13, *Installation of Sprinkler Systems*, and NFPA 82, *Incinerators and Waste and Linen Handling Systems and Equipment*.

Ten days after the fire, the state officials told newspapers of plans to make changes to the *Connecticut Safety Code* to limit smoking in hospitals and the use of combustible building materials such as cane fiber ceiling tile. Eleven days after the fire, New Haven hospitals banned smoking in hospital hallways. The same day, the *Courant* reported the fire marshal would revise the *Connecticut Safety Code* to make all buildings occupied by the public on par with schools, which required noncombustible construction. The fire marshal did not have to obtain permission from the state legislature to do this, the newspaper reported. A month later, the *Courant* reported that other hospitals had begun training maintenance workers in firefighting and rescue work.

In April 1962, Hartford Hospital created a formal fire safety committee, made up of employees and management, to review fire protection procedures involving patients and to oversee safety orientation of new employees and continued training of current employees. By 1964, the hospital had completely sprinklered the main building, including all patient rooms, corridors, and stairways, reported the *Courant*. The hospital also added additional corridor doors to create refuge areas, and removed all combustible materials in the corridors. It instituted a procedure for continuous searches for hidden fire hazards, and held regular day and nighttime fire drills.

The doors and door latches used in the hospital in 1961 were found to be a major safety risk. In a paper and presentation to the New England Chapter of the Society of Fire Protection Engineers in 1962, Major Shaw spoke of one of the main problems with fire doors, which was that people opened them or wedged them open.

Major Shaw also mentions the focus Hartford Hospital had on improving patient room doors. He said he was looking for new door designs based on heat or smoke activation, and described how Hartford Hospital's solid-core, 1.5-inch (4-centimeter) doors nearly burned through in less than 15 minutes. During the fire, all people in rooms with doors that remained closed survived, but witnesses told of having to brace those doors shut against the pressure of the fire.

In 1964, Hartford Hospital announced that, in cooperation with Sargent Lock Co., a local firm, its chief engineer had helped design a new door latch. The latches used in 1961 were of a friction design that used a rubber roller to keep the door lightly shut, functional for busy nurses and staff to open quickly and quietly. The new, UL-listed latches were made of chrome-covered brass with a curved arm that had to be pulled out to release—still allowing for quick, easy use, yet offering greater fire protection. The new latches were part of Hartford Hospital's $600,000 fire safety renovation project, according to the *Courant*. It also included the installation of Cerberus Pyr-Alarms, made by the Swiss firm Pyrotronics, which detected chemical products of combustion, according to Major Shaw.

In a precursor to today's emergency notification systems, the walkie-talkie wave length used by Hartford Hospital was opened in 1964 for other Connecticut hospitals to use for emergency communications and "civil defense," the *Courant* reported. This step was first mentioned in the *Courant* the day after the fire by Dr. John Soukimas, chairman of Saint Francis Hospital in Hartford, who recommended the hospitals look into a shortwave radio net that would bypass unreliable phone communications.

With these steps and others taken over the ensuing decades, Hartford Hospital now meets and in many areas exceeds the *Connecticut Fire Code*, the requirements of The Joint Commission, and Centers for Medicare and Medicaid Services requirements, according to Mike Garrahy, Hartford Hospital's current fire marshal. "It's still fresh in our minds up here," Garrahy adds. "We make sure to go through it with every employee. It's part of out new employee orientation."

The dark memories of that day in 1961 stay with Kelliher and Droney. "It was the worst fire I've ever seen in terms of fatalities," says Droney. But when these fire service veterans talk about the fire, there are other memories, too. As firefighters raced to save lives and knock down a deadly fire, two babies were born in Hartford Hospital's maternity ward, located at the other end of the building. "I had forgotten about that," Droney says. "Tim Kelliher was just talking about that the other day."

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