

Beating the Odds

Review of in-flight use of automated external defibrillators yields a more realistic picture of who survives.

BY WAYNE ROSENKRANS | FROM ORLANDO

An airline passenger's sudden cardiac arrest during flight creates a rare and stressful experience for the responding flight attendants, and health outcomes of these events have been significantly poorer than in gambling casinos although automated external defibrillators (AEDs) are widely used in both environments. Yet feedback to crews about in-flight "saves" and deaths involving AEDs has been scarce, says Paulo Alves, a cardiologist and vice president, aviation and maritime health, MedAire. He was among the presenters at the 27th International Aircraft Cabin Safety Symposium in Orlando, Florida, U.S., held April 27–29. His presentation,

like others highlighted in this article, emphasized practical applications of newly available data sources.

MedAire's data — representing 947 cases of in-flight use of an AED among airlines receiving assistance from the MedLink Global Response Center — showed that when the AED was used to analyze electrical activity in the victim's heart after signs of sudden cardiac arrest, and the synthetic voice said "shock advised," about one-fourth survived long enough to obtain hospital care (Figure 1). Before AEDs, this mortality rate would have been 100 percent; nevertheless, the rate of saves documented in casinos has been up to about 70 percent

for those shocked by an AED within three minutes of collapse, he said.

"In comparison with the passenger traffic, very few people die in flight," Alves said. "The reality is that the industry has 0.05 deaths per billion revenue passenger kilometers ... one death for every 7 million passengers carried. MedLink deals with 4.8 in-flight deaths every month."

Sudden cardiac arrest was one of several natural causes of these deaths; it has been the most common way an otherwise healthy person dies outside a hospital. Ventricular fibrillation — an arrhythmia in which the heart quivers rapidly — occurs in 70 percent of these

cases, Alves noted. The AED's shock is intended to stop the ventricular fibrillation, enabling the body to "reset" a normal heartbeat.

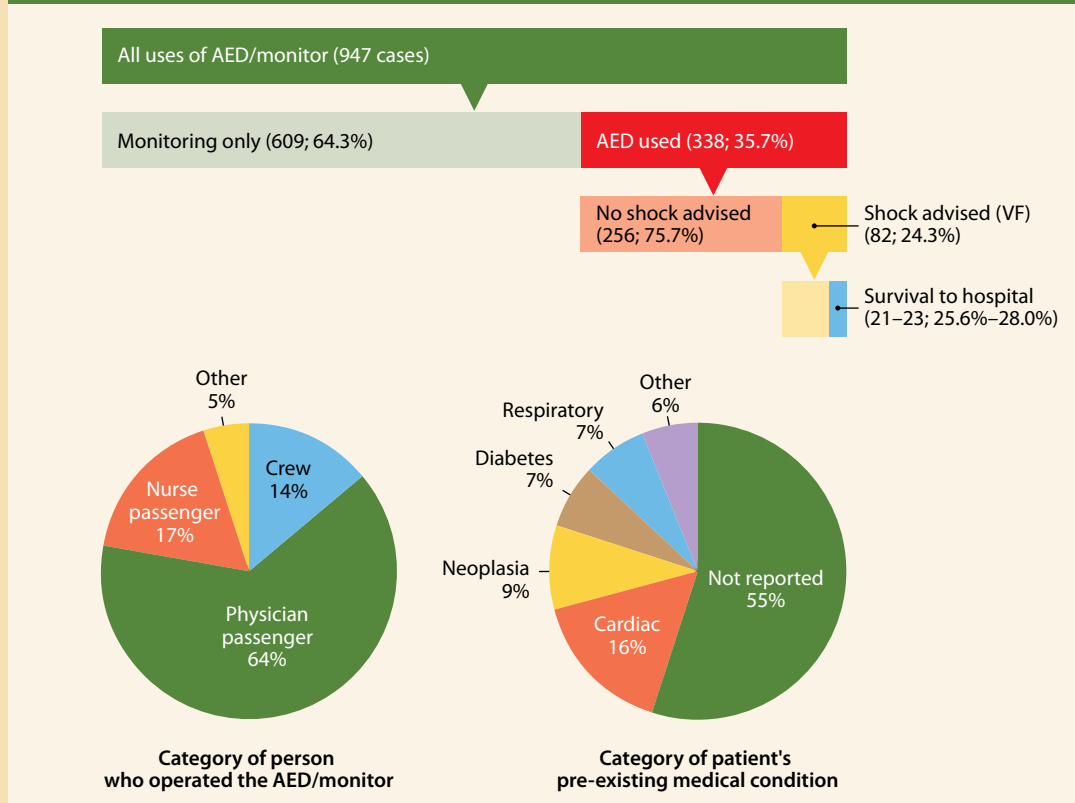
MedAire data reflect that although ventricular fibrillation most often was documented during the earliest parts of a flight, it also may have involved unwitnessed collapse in the middle of a long-haul flight — that is, the passenger's loss of consciousness was not observed within three minutes by other passengers or cabin crew. "Sometimes they were sleeping, so others did not identify the collapse," he said. "Many people who started feeling ill went to the aircraft lavatory and collapsed there. It was also difficult to notice whether a person was breathing or not, especially under low-light conditions." The primary distinction from casinos, Alves concluded, apparently

was the constant surveillance of casino customers by security systems and officers.

AEDs automatically record the sequence and timing of the first responder's actions to enable medical review. Alves found examples of in-flight rescuers performing cardiopulmonary resuscitation (CPR) with only five to 47 chest compressions per minute, most often five, and excessively long pauses between sets of 13 compressions to give two ventilation breaths. This was contrary to the 2005 guidance recommending more than 100 compressions per minute.

"Carrying AEDs has been a historic move for the aviation industry ... something fantastic ... and flight attendants saving lives in about 24 percent of cases has been remarkable given the remoteness of hospital care," Alves said. "But

In-Flight AED/Monitor Utilization, January 2001–December 2008



AED = automated external defibrillator; VF = ventricular fibrillation
Note: These in-flight medical events occurred among airlines receiving assistance from the MedLink Global Response Center. "Survival to hospital" numbers represent the range of data accuracy.
 Source: MedAire

Figure 1



Top to bottom:
Alves, Nesthus and
Karlsson

there are chances for improvement. We recommend a high level of awareness in the cabin to identify victims as early as possible to deliver a saving shock.”

Broadening CRM

Aviation safety action programs (ASAPs) in the United States — voluntary, nonpunitive safety reporting programs — increasingly provide insights into broader applications of crew resource management (CRM), said Sandra Ingram, manager, onboard service-safety and security, United Airlines, and Vicki Jurgens, chairperson, Safety, Health and Security Committee, Association of Flight Attendants-Communications Workers of America, and a United Airlines purser.

“CRM developed [originally] as an open-door concept,” Jurgens said. “We no longer have an open door ... and we are not sure that current CRM training goes far enough ... not only in the way that we handle passengers but in how we handle ourselves.” A common language, safety culture and synchronization of information must be integrated across all airline systems, Ingram added, and ASAP event review committees should not hesitate to delve deeply into flight attendant ASAP reports that may seem insignificant by their numbers alone.

“We have started seeing reports of incidents involving flow of information that are making us uncomfortable, one [incident] resulted in a diversion,” Jurgens said. “If the communication is flawed, we put ourselves at risk. ... So we have to make sure that our CRM training not only touches our crew but everyone who works with our crew.” Rifts between flight attendants and gate agents may result in one group or the other abdicating responsibility for decisions or actions that affect safety, for example, she said.

“We employ a risk ranking because we know that [the issue in] any one of the ASAP reports has the potential for great damage,” Ingram noted. “We have had minor incidents, just a personality conflict, all the way up to diversions of aircraft and other significant events. If some of the flight attendants and pilots had used their

CRM skills, perhaps the diversions could have been averted. So we put ASAP reports under the microscope to determine what was happening, what was causing degradation of crew camaraderie and effective outcomes.”

Communication Breakdowns

A paper on the causes and effects of recent communication breakdowns between flight crews and cabin crews will be published in mid-2010 in the FAA *International Journal of Applied Aviation Studies*, said Lori Brown, the paper's author and a faculty specialist in the College of Aviation, Western Michigan University, U.S. “The industry actually has added communication barriers,” Brown said. “The only barrier reported to have been improved over the past 14 years was aircraft systems familiarization for cabin crew. Survey respondents' main concern was obtaining an adequate preflight briefing. Many said briefings are only given to the purser/lead flight attendant.”

One respondent wrote, “Having just completed my annual CRM [training], I was reminded just how little the flight attendants know about what's happening up in the front. There needs to be a fundamental shift in thinking ... to rebuild the relationship.” Another said, “It is not uncommon, when working in the back, to have never met the flight deck crew when we fly just one segment. That is dangerous.”

Of 224 flight attendants surveyed, 55 percent reported that they have been hesitant to report a problem and 16 percent indicated that they had experienced a situation in which they did not report a problem to the flight deck because they assumed the pilots would already know about the problem, Brown said. “Of 51 pilots surveyed, 41 percent indicated they had situations where a flight attendant did not report a problem.”

Midway Overrun Lessons

Evacuation lessons from the December 2005 accident in which a Boeing 737-700 overran Runway 31C at Chicago Midway Airport (*ASW*, 2/08, p. 28) were summarized by Larry Parrigin, manager, in-flight services curriculum and program development, Southwest Airlines. The Midway

evacuation took an estimated five to 10 minutes. The collapsed nose landing gear caused the aircraft to come to a stop in a nose-down, tail-high attitude with forward doors close to the ground. Slides at the L1 door, overwing exits and aft doors were deployed, and aircraft rescue and firefighting (ARFF) personnel positioned stairs at the aft galley service door, Parrigin said.

“These passengers couldn’t understand what flight attendants using megaphones were saying, so the forward flight attendant started going back into the cabin, repeating announcements about once every four rows,” he said. “The flight attendants did exactly as they were trained, but we found that they were not holding the megaphones close enough to their mouths for the microphones to pick up what they were saying.” Every Southwest flight attendant now practices retrieving megaphones from brackets and loudly issuing intelligible commands during both initial training and annual recurrent training, he said.

The accident airplane flight attendants had been trained to wait for the captain’s evacuation command if the cabin was intact and there was no apparent threat such as interior damage, water, smoke, fumes or fire. Revised training emphasizes that an unusual aircraft attitude, in combination with other threats, is a valid evacuation trigger after flight attendants attempt to contact the flight crew.

In the minutes prior to this evacuation, one flight attendant left the assigned aft exit armed and unmanned to seek information about what to do. A much safer action would have been to enlist a passenger to relay information to and from other flight attendants, and to report and observe what was happening outside the aircraft, Parrigin said.

Revised training has flight attendants practice adapting memorized procedures and commands to fit the circumstances. “In this evacuation, the forward slides had inflated parallel to the ground onto a landscaping berm,” he noted. “The flight attendants at these doors had said, ‘Come this way, leave everything, cross your arms and jump’ onto these slides.” Passengers could not slide down, however; they had to maneuver themselves along the slide or be lifted off the side of the slide by firefighters on the ground.

FAA Fatigue Research

The final step in a flight attendant fatigue research project, directed in 2005 by the U.S. Congress, should be completed in 2010 and lead to “a look into potential regulatory revisions,” said Thomas Nesthus, a research psychologist in the Aerospace Human Factors Research Division, FAA Civil Aerospace Medical Institute (CAMI). This quantitative study of 210 flight attendants on duty and off duty has been examining “physiological and neuropsychological effects, fatigue, sleepiness, circadian rhythms and rest schedules,” he said.

“This field study is our most complex yet ... and the sole source of objective data,” Nesthus added. “[Before] possible revisions of regulations, we want to have ... objective data saying that the schedules are problematic and we need to make some changes.” As of late April, about 175 flight attendants had completed their data collection. Data have been generated by wrist-worn activity sensors, psychomotor vigilance tasks using mobile phone-based personal digital assistants, pedometers and other monitors of sleep, activity level, fatigue and alertness. Data collection was scheduled to be completed during May.

Free Realistic Training

Struggles to overcome budgetary constraints and provide realistic recurrent-training experiences have been alleviated at a small Swedish airline through partnerships based on bartering for resources, said Anna Mellberg Karlsson, emergency and CRM instructor, Novair. “We have a hard time getting our people to a cabin training mockup of the correct aircraft type,” Karlsson said, a situation that sometimes requires explaining Airbus door operational differences while substituting a 737 mockup.

Novair’s no-cost partnerships, however, have opened opportunities to experience sea survival and hyperbaric chamber training in cooperation with Swedish military training centers. Company instructors also have enlisted outside specialists, such as ARFF specialists who cover how they will interface with the crew in an evacuation; emergency-care nurses who demonstrate patient triage principles and methods of stabilizing injured people at the scene of an aircraft accident; and airport duty officers.

“All these experiences became possible by instructors showing interest, being very persuasive and exchanging favors,” Karlsson said. “For example, we lent an aircraft, a crew and instructors to the national police force for hijacking scenarios.”

Novair recently began integrating refresher-training tasks into line operations. “Three months before recurrent training, pilots and flight attendants received a document with five tasks to perform when time permits, requiring their cooperation [and mutual sign-offs] during the flight,” Karlsson said. “One task example was flight attendants entering the flight deck and operating a pilot seat to perform the pilot-incapacitation drill.”