Improved CPR Technique Would Increase Survival

BY CHRISTINE KILGORE
Contributing Writer

WASHINGTON — Cardiopulmonary resuscitation is often poorly performed by paramedics, physicians, and other well-trained hospital staff, and several problems—mainly frequent pauses and slow compression rates, shallow compression depths, and hyperventilation—are significantly reducing survival from cardiac arrest, emergency medicine leaders said.

"We can triple survival to hospital discharge by [addressing these problems] and doing good basic life support," said Dr. Ahamed H. Idris, director of emergency medicine research at Southwestern Medical Center, Dallas, during a panel discussion on resuscitation at the annual meeting of the Society of Academic Emergency Medicine.

Research presented earlier at the meeting by Dr. Henry Wang of the University of Pittsburgh was emblematic of the growing body of data. His study of out-of-hospital cardiac arrests treated by paramedics documented frequent and prolonged interruptions in chest compressions due to endotracheal intubation (ETI) efforts.

Of 129 cases of cardiac arrest, they identified ETI-associated chest compression interruptions in 64 cases. The median duration of all ETI-associated interruptions was 78 seconds, Dr. Wang reported, and 35% of the interruptions exceeded 120 seconds.

Published reports of in-hospital cardiac arrest care have similarly documented widely variable and suboptimal chest compression rates, among other problems.

"We need to better monitor the quality of CPR" in and out of our hospitals, said Dr. Benjamin Abella, clinical research director of the Center for Resuscitative Science at the University of Pennsylvania Health System, Philadelphia, during the panel discussion.

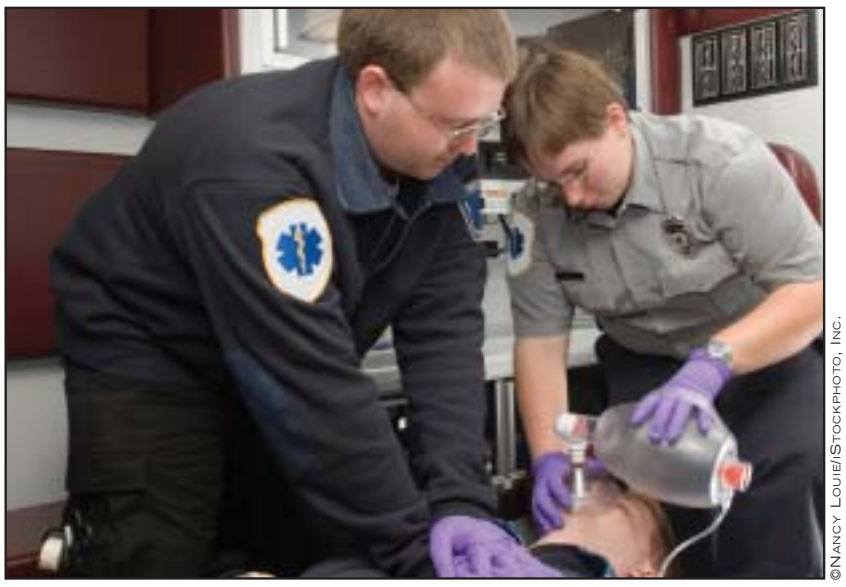
Among the most recent studies published on cardiac arrest care is one published in January 2008 showing that delayed defibrillation is common and is associated with lower rates of survival.

Investigators identified 6,789 patients who had cardiac arrest due to ventricular fibrillation or pulseless ventricular tachycardia at approximately 370 hospitals participating in the National Registry of Cardiopulmonary Resuscitation. They found that delayed defibrillation (more than a minute) was associated with a significantly lower probability of surviving to hospital discharge (22% vs. 39%) than was defibrillation that was not delayed (N. Engl. J. Med. 2008;358:9-17).

Dr. Abella said studies at his institution have shown that the chance of successful shock plummets with every 5, 10, or 15 seconds of additional pausing.

"If we can get the shock out in less than 10 seconds vs. 20 or 30 seconds, it makes a huge difference in terms of shock efficacy," he said.

"We now know … that pauses [in CPR] are lethal," Dr. Abella said in an interview, citing the landmark study published in 2000 that compared standard CPR (then cycles of 15 compressions and two breaths) with chest compression alone. The study utilized a dispatcher-assisted CPR program in Seattle, in which individuals who called 911 could be instructed in CPR. Investigators found that about 15% of the patients whose rescuers were instructed only in chest compression survived, compared with about 10% of those whose rescuers were instructed in rescue breathing and compression (Crit. Care Med. 2000;28:N190-2).



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Some EMS programs have begun telling paramedics to start compressions immediately and not intubate—to bag only—for the first 10 minutes.

The study had significant limitations, but "at the time, this was shocking," he said, "We all thought that breaths should be important."

With respect to compression depth, animal studies have also shown that a coronary perfusion pressure of approximately 15 mm is necessary for resuscitation. In one study, that pressure (and a good survival rate) was achieved with compressions that were 2 inches deep, but not with compressions of 1.5 inches. In fact, all of the animals that received 2-inch-deep compressions survived, while very few of the animals that received 1.5-inch compressions survived.

With 80-100 compressions/min, the survival rate more than triples, compared with 20 compressions/min.

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Hyperventilation during CPR is also a problem. Changes to the American Heart Association's CPR guidelines published in 2005—namely, the change in the recommended ratio of compressions to breaths from 15:2 to 30:2—were intended to address this point.

With regard to the optimal rate of chest compression during CPR for cardiac arrest, new data come partly from prospective observational studies that Dr. Abella and his associates have performed of in-hospital cardiac arrests. The studies have revealed an inconsistent quality of CPR that often does not meet published guideline recommendations.

One of the studies, which covered 67 patients, documented chest compression rates of less than 90/min in 28% of recorded 30-second segments of CPR. Current guidelines recommend a rate of 100 compressions/min. The study also documented a shallow compression depth of less than 38 mm for 37% of compressions, as well as high ventilation rates, with more than 20 breaths/min given during 61% of CPR segments (JAMA 2005;293:305-10).

Another of the studies similarly showed compression rates of less than 80/min in 37% of CPR segments, and rates of less than 70/min in 22% of segments. Such suboptimal rates were associated with poor return of spontaneous circulation, Dr. Abella explained (Circulation 2005;111:428-34).

The most important message from his own research, Dr. Idris said, is not that there is a specific ideal compression rate, but that the more chest compressions per minute a patient receives, the better the outcome. "If a patient receives 80-100 compressions/min, the survival rate more than triples, compared to 20 chest compressions/min," he explained.

Dr. Abella and his colleagues at the University of Pennsylvania, Philadelphia, have recently increased their rates of survival to hospital discharge for cardiac arrest patients by using defibrillators that monitor CPR, recording and providing feedback on the depth and rate of compressions. They also have initiated a "debriefing" program in which leaders routinely meet with rescue teams to review CPR data immediately after care is given.

EMS programs in Seattle and other locations, in the meantime, have begun telling their paramedics "to start compressions immediately and not intubate—to bag only—for the first 10 minutes," Dr. Idris said. ■

CT Scans May Disrupt Pacemakers, Other Medical Devices

BY ELIZABETH MECHCATIE
Senior Writer

The Food and Drug Administration is alerting health care professionals about reports of malfunctions in pacemakers and other electronic medical devices worn by patients during computed tomography scanning.

The agency has received a "small number" of adverse event reports "in which CT scans may have interfered with electronic medical devices, including pacemakers, defibrillators, neurostimulators, and implanted or externally worn drug infusion pumps," according to a public health notification issued by the FDA.

The adverse events that were likely caused by CT scans were unintended "shocks" (such as stimuli) from neurostimulators, malfunctions of insulin infusion pumps, and transient changes in the output pulse rate of pacemakers.

To date, no deaths have been reported.

These malfunctions can result from direct exposure of the medical device to the high radiation dose rates generated by some CT equipment and are different from the malfunctions related to magnetic resonance imaging, which are caused by strong electric and magnetic fields, the alert says.

The FDA has not received any reports of CT interference with cochlear implants or retinal implants, but says such interference is "theoretically possible." Problems that "might" be caused by CT scanner interference include resetting or reprogramming of devices and generation of spurious signals, including cardiac defibrillation pulses.

The alert recommends moving external devices out of the range of the scan, if possible, and asking patients with neurostimulators to shut off the device during a scan.

When a CT procedure requires scanning over the device continuously for more than a few seconds, such as during an interventional exam, "attending staff should be ready to take emergency measures to treat adverse reactions if they occur," the alert emphasized.

Patients should be advised to check their devices for function even if they turned them off during the procedure, and to contact their health care providers if they suspect malfunctioning of their device.

The increase in these reports may be related to greater use of CT scans, the higher dose capability of new CT machines, the larger number of patients wearing devices, and improvements in reporting, according to the FDA, which is continuing to investigate this issue. ■

The notice is available at www.fda.gov/cdrh/safety/071408-ctscanning.html. Adverse events related to CT equipment can be reported to the FDA's MedWatch program at 800-332-1088 or www.fda.gov/MedWatch/report.htm.