Heart News for You

Get Educated to Prevent Sudden Cardiac Death

By Gordon A. Ewy, MD

No one likes to hear, think, or read about death, except how to prevent it. The bottom line of this article is that in adults, most unexpected sudden deaths are preventable as most are due to coronary artery disease—the same disease that causes heart attacks. In patients under the age of 30, a number of inherited or congenital heart disorders can lead to sudden death—and the physicians and scientists of the Sarver Heart Center are researching several of these conditions.

Most Americans die of cardiovascular disease—heart disease and stroke. Unfortunately the first sign of cardiovascular disease is often the last, as the first sign is often sudden death. After the age of 40, an American male has a one-in-eight chance of having sudden cardiac death. Since sudden cardiac arrest (stoppage of heart function) strikes adults during the sixth decade on average, many in the prime of their lives are claimed. But sudden cardiac death (SCD) at any age is a tragedy.

Since sudden cardiac arrest is unexpected, it usually happens outside the hospital. It occurs when the heart suddenly stops pumping blood. The official term for this condition is out-of-hospital cardiac arrest (OHCA). It is a major public health problem—every three days it takes the lives of as many Americans as were killed in the 9/11 World Trade Center attack. In Arizona, an average of 15 OHCAs occur every day.

The prevention and treatment of cardiac arrest are major research, educational and patient-care efforts of the physician scientists and research scientists of the University of Arizona Sarver Heart Center.

What causes sudden cardiac arrest? It is most often caused by the sudden onset of an abnormal heart rhythm called ventricular fibrillation (VF). In a normal heart beat, all of the muscle fibers of the ventricles (the bottom or pumping chambers of the heart) are contracting together like a well-functioning team to pump blood to the brain and the rest of the body. They relax together to fill the heart and contract together for the
In contrast with VF, the muscle fibers of the ventricles suddenly no longer work together as a team to pump the blood to the brain and other parts of the body. Rather some of these muscle fibers contract while others relax. The result is that the heart suddenly loses its pumping action, the blood pressure suddenly falls, the blood flow to the brain stops and the patient collapses.

If one is wearing an electrocardiographic (ECG) monitor during an OHCA, the regular tall, narrow spikes of the electrocardiogram that signal the synchronous contraction of the ventricles is suddenly replaced by a distinctive rapid wavy line, characteristic of ventricular fibrillation (Figure below).

Definitive therapy of ventricular fibrillation (VF) is a shock by a defibrillator, which causes all of the muscle fibers to contract at the same time and restore regular rhythm and thus blood pressure. Defibrillators, at one time were found only in hospitals (and could be used only by doctors and later by nurses in coronary care units). Next they were placed in ambulances (for use only by paramedics). Now, automated external defibrillators, or AEDs, are in most airports, schools, shopping malls and at athletic events—locations where a large number of people tend to congregate.

So, cardiac arrest is a witnessed (seen or heard), sudden (unexpected) collapse of an individual who is not responsive. These individuals often have an abnormal breathing pattern—gaspig, snoring or a gurgling noise. This gasping is at a slow rate—one to two per minute and only lasts three to four minutes. It is important to recognize that gasping is an early sign of cardiac arrest—and if you begin chest compressions in such individuals, they are more likely to continue to gasp—a sign that you are doing a good job! Do not stop chest compressions when someone is gasping.

If a person suddenly collapses, first check for responsiveness, then call 911 and start continuous chest compressions. If you are in an area where an AED is known or likely to be available, holler for someone to “get an AED.” When the AED arrives, turn it on and follow the simple instructions. After an AED delivers a shock, it changes the electrocardiogram of VF and the helter-skelter contractions of the pumping chambers of the heart return to synchronous contractions. If an AED is not available, continue chest compressions until the firefighters/paramedics arrive. They will take over chest compressions and use their defibrillator to restore regular rhythm.

Why has the UA Sarver Heart Center Resuscitation Research Group focused on sudden cardiac arrest? In spite of decades of national resuscitation guidelines for treatment of OHCA, the survival rates were low and were...
unchanged for almost three decades (1980-2008). With cardiocerebral resuscitation, the “new CPR,” the survival rate of patients in Arizona with witnessed arrest has increased dramatically. Survival of patients with cardiac arrest due to drowning, drug overdose or breathing problems remains very poor and only slightly improved. For these individuals, we have always and continue to recommend “Guidelines” cardiopulmonary resuscitation—that is, 30 chest compressions and two rescue breaths. Nevertheless, our analysis has shown that even in these cases, “something is better than nothing.”

As noted above, the majority of cardiac arrests in individuals over the age of 40 is caused by the same thing that causes heart attacks—heart muscle damage due to a blockage of a coronary artery—and, therefore, is preventable. Many of these patients will have chest discomfort prior to cardiac arrest. So, if you experience chest pain or severe shortness of breath, do not drive to the hospital (or waste time coughing). Call 911 and have the paramedics take you to the nearest hospital.

Almost 10 percent of OHCAs are witnessed by paramedics who were called because the patient had chest pains or other symptoms of a heart attack. This emphasizes the need to call 911. Don’t wait if you have chest discomfort, weakness or shortness of breath!

The majority of OHCAs can be prevented by aggressive treatment of the risk factors for coronary artery disease. (See previous issues of the Sarver Heart Center Newsletters, available online under “News & Information” at http://www.heart.arizona.edu; especially “Top 10 Tips” in issue 60.)

While coronary artery disease is by far the most common cause of OHCA over age 40, younger individuals and athletes are affected by other causes. Most of these are due to inherited abnormalities, either electrical (abnormal electrocardiograms which predispose a person to ventricular fibrillation) or abnormal heart muscle development, where the muscle of the ventricles becomes either too thick (hypertrophic cardiomyopathy) or too weak (dilated cardiomyopathy). Others have too much fat and scar tissue in the heart muscle (arrhythmogenic right ventricular cardiomyopathy) or congenital heart defects such as abnormalities of the coronary arteries, the vessels which supply the heart with blood. The UA Sarver Heart Center has experts in each of these areas or is recruiting new faculty members to fill any gaps.

Out-of-hospital cardiac arrest is a preventable and treatable public health problem. The UA Sarver Heart Center, in cooperation with our partners, such as the Steven M. Gootter Foundation, the Arizona statewide Save Hearts in Arizona Registry and Education (SHARE) program (www.azshare.gov) and support from contributors like you, is attacking this major public health problem. We need you to be a partner as well. Visit www.heart.arizona.edu (Be A Lifesaver) to see our schedule of training sessions and our six-minute training video and support our research programs designed to prevent or treat this major public health problem.

Celebrating 735 Lives Saved in Arizona and Counting!

Together they have changed resuscitation protocols in Arizona for bystanders, emergency responders and hospitals. SHARE has counted at least 735 lives saved in Arizona since the “new CPR” was instituted in 2004. Leaders of the UA Sarver Heart Center Resuscitation Research Group celebrating the progress include (left to right) Bentley J. Bobrow, MD, medical director of the Bureau of Emergency Medical Services & Trauma System at the Arizona Department of Health Services, Gordon A. Ewy, MD, director of the Sarver Heart Center, and Karl B. Kern, MD, chair of the Resuscitation Research Group and chief of cardiology at the UA College of Medicine.