

## Statistical Fact Sheet — Miscellaneous 2007 Update

### Out-of-Hospital Cardiac Arrest — Statistics

There is a wide variation in the reported incidence and outcome for out-of-hospital cardiac arrest. These differences are due in part to differences in definition and ascertainment of cardiac arrest, as well as differences in treatment after its onset.

Cardiac arrest is the cessation of cardiac mechanical activity, as confirmed by the absence of signs of circulation. (*Circulation*. 2004;110:3385-3397.) Available epidemiologic databases do not characterize cardiac arrest well or the subset of cases that occur with sudden onset (sudden cardiac arrest). Therefore, surrogate data are often used for epidemiological purposes, to estimate the incidence of cardiac arrest, especially in the out-of-hospital setting. Those surrogate data include deaths due to "coronary heart disease" (ICD codes I20-I25) and "cardiac arrest," defined as coronary death that occurred within one hour of symptom onset in the out-of-hospital setting, and without other probable cause of death. (Fox CS, Evans JC, Larson MG, Lloyd-Jones DM, O'Donnell CJ, Sorlie PD, Manolio TA, Kannel WB, Levy D. A comparison of death certificate out-of-hospital coronary heart disease death with physician-adjudicated sudden cardiac death. *Am J Cardiol*. 2005;95:856-859.) Datasets based on either definition are not optimal. Out-of-hospital data that are based on the latter definition of cardiac arrest can be especially unreliable because of the difficulty in determining the duration of symptoms, prior to the onset of the episode. The following information summarizes representative data from several sources in an attempt to characterize the incidence and outcome of out-of-hospital cardiac arrest and demonstrate the need for a comprehensive system of capturing more meaningful data.

- According to NCHS Data Warehouse, mortality data, 325,000 coronary heart disease deaths occur out-of-hospital or in hospital emergency departments annually (2003) (ICD-10 codes I20-I25). (*Vital Statistics of the U.S., Data Warehouse, NCHS*. <http://www.cdc.gov/nchs/datawh.htm>.)
- The annual incidence of out-of-hospital cardiac arrest in North America is about 0.55 per 1000 population. (Vaillancourt et al. *Cardiac arrest care and emergency medical services in Canada*. *Can J Cardiol*. 2004;20:1081-1090; Rea et al. *Incidence of EMS-treated out-of-hospital cardiac arrest in the United States*. *Resuscitation*. 2004;63:17-24.) With an estimated U.S. population of 299,210,182, (*Monthly Postcensal Resident Population (8/1/2005): U.S. Census data*. Available at: <http://www.census.gov>. Accessed October 19, 2005.) this implies that about 164,600 out-of-hospital cardiac arrests occur annually in the United States.
- About two thirds of unexpected cardiac deaths occur without prior recognition of cardiac disease. (Myerburg RJ, Kessler KM, Castellanos A. *Sudden cardiac death: epidemiology, transient risk, and intervention assessment*. *Ann Intern Med*. 1993;119:1187-1197)
- About 60 percent of unexpected cardiac deaths are treated by EMS. (Chugh SS, Jui J, Gunson K, Stecker EC, John BT, Thompson B, Ilias N, Vickers C, Dogra V, Daya M, Kron J, Zheng ZJ, Mensah G, McAnulty J. *Current burden of sudden cardiac death: multiple source surveillance versus retrospective death certificate-based review in a large U.S. community*. *J Am Coll Cardiol*. 2004;44:1268-1275)
- In a population aged at least 20 years, incidence of EMS-treated out-of-hospital cardiac arrest is 36/100,000—81/100,000. Chugh SS, Jui J, Gunson K, Stecker EC, John BT, Thompson B, Ilias N, Vickers C, Dogra V, Daya M, Kron J, Zheng ZJ, Mensah G, McAnulty J. *Current burden of sudden cardiac death: multiple source surveillance versus retrospective death certificate-based review in a large U.S. community*. *J Am Coll Cardiol*. 2004;44:1268-1275; Cobb LA, Fahrenbruch CE, Olsufka M, Copass MK. *Changing incidence of out-of-hospital ventricular fibrillation, 1980-2000*. *JAMA*. 2002;288:3008-3013) This implies EMS treats 77,000– to 174,000 cardiac arrests in the United States annually.

- Of these, 20–38 percent have ventricular fibrillation, or ventricular tachycardia as the first recorded rhythm. This implies 15,500–66,100 ventricular fibrillation arrests annually. (Vaillancourt et al. *Cardiac arrest care and emergency medical services in Canada. Can J Cardiol.* 2004;20:1081-1090; Rea et al. *Incidence of EMS-treated out-of-hospital cardiac arrest in the United States. Resuscitation.* 2004;63:17-24; Cobb LA, Fahrenbruch CE, Olsufka M, Copass MK. *Changing incidence of out-of-hospital ventricular fibrillation, 1980-2000. JAMA.* 2002;288:3008-3013)
- The incidence of cardiac arrest with an initial rhythm of ventricular fibrillation is decreasing over time. (Cobb LA, Fahrenbruch CE, Olsufka M, Copass MK. *Changing incidence of out-of-hospital ventricular fibrillation, 1980-2000. JAMA.* 2002;288:3008-3013) However, the incidence of cardiac arrest with any initial rhythm is decreasing.
- The median reported survival to discharge after any first recorded rhythm is 6.4 percent.<sup>21</sup> Survival during a recent one-year experience in Seattle of all treated cardiac arrests, considered to be of cardiac origin, was reported to be 20 percent. (Personal communication, L. Cobb, *Seattle Medic One*, December. 7, 2005).
- The average proportion of cases of out-of-hospital cardiac arrest that receive bystander CPR, is 27.4 percent. (Nichol G, Stiell IG, Laupacis A, Pham B, De Maio V, Wells GA. *A cumulative meta-analysis of the effectiveness of defibrillator-capable emergency medical services for victims of out-of-hospital cardiac arrest. Ann Emerg Med.* 1999;34:517-525)
- The incidence of lay responder defibrillation is low, 2.05 percent in 2002, but increasing over time. (Culley LL, Rea TD, Murray JA, Welles B, Fahrenbruch CE, Olsufka M, Eisenberg MS, Copass MK. *Public access defibrillation in out-of-hospital cardiac arrest: a community-based study. Circulation.* 2004;109:1859-1863)
- Unexpected death in the pediatric patient is usually due to trauma, sudden infant death syndrome, respiratory causes or submersion. (Young KD, Gausche-Hill M, McClung CD, Lewis RJ. *A prospective, population-based study of the epidemiology and outcome of out-of-hospital pediatric cardiopulmonary arrest. Pediatrics.* 2004;114:157-164) Ventricular fibrillation is an uncommon cause of cardiac arrest in children, but it is observed in approximately 5–15 percent of children with out-of-hospital cardiac arrest. (Mogayzel C, Quan L, Graves JR, Teidman D, Fahrenbruch C, Herndon P. *Out-of-hospital ventricular fibrillation in children and adolescents: causes and outcomes. Ann Emerg Med.* 1995;25:484-491)
- The reported incidences of out-of-hospital pediatric cardiac arrest vary widely (from 2.6–19.7 annual cases per 100 000). (Donoghue A, Nadkarni V, Berg RA, Osmond MH, Wells GA, Nesbitt L, et al. *Out-of-hospital pediatric cardiac arrest: an epidemiologic review and assessment of current knowledge. Ann Emerg Med.* 2005;46:512-522.)
- Since there are 72,293,812 individuals under age 18 in the United States, (Monthly Postcensal Resident Population (8/1/2005): U.S. Census data. Available at: <http://www.census.gov>. Accessed October 19 2005.) this implies that there are 1,900–14,200 pediatric out-of-hospital cardiac arrests, annually, from all causes (including trauma, sudden infant death syndrome, respiratory causes, cardiovascular causes and submersion).
- Studies that document voluntary reports of deaths among high school athletes suggest that the incidence of out-of-hospital cardiac arrest ranges from 0.28–1.0 deaths per 100,000 high school athletes annually nationwide. (Luckstead EF, Patel DR. *Catastrophic pediatric sports injuries. Pediatr Clin North Am.* 2002;49:581-591; Maron BJ, Gohman TE, Aeppli D. *Prevalence of sudden cardiac death during competitive sports activities in Minnesota high school athletes. J Am Coll Cardiol.* 1998;32:1881-1884.) Although incomplete, these numbers provide a basis for estimating the number of deaths in this age range.
- The reported average survival to discharge after pediatric out-of-hospital cardiac arrest is 6.7 percent. (Donoghue A, Nadkarni V, Berg RA, Osmond MH, Wells GA, Nesbitt L, et al. *Out-of-hospital pediatric cardiac arrest: an epidemiologic review and assessment of current knowledge. Ann Emerg Med.* 2005;46:512-522)

- The incidence of in-hospital cardiac arrest is unknown.
- The rate of survival to discharge after in-hospital cardiac arrest is 27 percent among children and 18 percent among adults. However, children and adults with an initial rhythm of ventricular fibrillation or ventricular tachycardia have a similar good prognosis (30 percent vs. 32 percent survival to discharge). (*Nadkarni V, Nadkarni VM, Larkin GL, Peberdy MA, Carey SM, Kaye W, Mancini ME, Nichol G, Lane-Truitt T, Potts J, Ornato JP, Berg RA, for the National Registry of Cardiopulmonary Resuscitation Investigators. First documented rhythm and clinical outcomes from in-hospital cardiac arrest among children and adults. JAMA. 2006;295:50-57*)

**For additional information see the Heart Disease and Stroke Statistics – 2007 Update, published in Circulation, available on our Web site.**