

Overall in-hospital cardiac arrest survival improves, lower survival on nights, weekends

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Overall survival has improved for the approximately 200,000 patients experiencing in-hospital cardiac arrest in the U.S. each year, but patients who arrest during nights or weekends continue to experience lower survival compared to patients who arrest during daytime hours. Survival to discharge in patients who arrested during "off-hours" was an absolute 3.8 percent lower compared to patients who arrested during "on-hours," according to a study published today in the *Journal of the American College of Cardiology*.

Surviving in-hospital cardiac arrest depends on early recognition and implementation of resuscitation, as well as high-quality post-resuscitation care. A previous study found rates of survival and neurological outcomes were 15 to 20 percent lower among patients who arrested during nights or weekends (off-hours). Researchers for this study sought to determine how survival differences have changed over time in patients who arrest during on-hours vs. off-hours. On-hours was categorized as 7:00 a.m. to 10:59 p.m. Monday to Friday. Off-hours was described as 11:00 p.m. to 6:59 a.m. Monday to Friday or anytime on weekends.

"Nearly 50 percent of in-hospital cardiac arrests take place during 'off-hours.' By determining how survival has changed in recent years, we may be able to identify opportunities for quality improvement efforts," said lead author Uchenna R. Ofoma, MD, MS, attending physician with the division of critical care medicine at Geisinger Health System in Danville, Pennsylvania. "If we can improve survival for cardiac arrests that occur

during off-hours, it could impact a substantial number of patients."

Researchers identified 151,071 patients at least 18 years old who experienced in-hospital cardiac arrest between January 2000 and December 2014 using the GWTG-Resuscitation registry. More than half of the included patients experienced cardiac arrest during off-hours; overall, 62.4 percent of patients survived acute resuscitation efforts and 18.6 percent survived to hospital discharge. Both on- and off-hours groups had a similar prevalence of co-morbidities, location of arrest and interventions in place at time of arrest.

Overall, survival to discharge increased in both groups over the 15-year study period—for on-hours: from 16 percent in 2000 to 25.2 percent in 2014; for off-hours: 11.9 percent in 2000 to 21.9 percent in 2014. However, the survival during off-hours remained significantly lower compared to on-hours.

"While it was encouraging to see that survival has increased in both groups of patients, the persistent survival disparities between on-hours and off-hours remains disheartening," Ofoma said. "Timing of in-hospital cardiac arrest has a major impact on a patient's outcome, so we must make this an area to focus quality improvement efforts to ensure that improved survival trends are sustained over time."

According to researchers, poor survival during off-hours is likely due to several factors:

- Changes to hospital staffing patterns during nights and weekends
- Physicians working nights and weekends provide coverage to patients they may be less familiar with
- Nurse-to-patient ratios are lower during off-hours
- The impact of shift work, particularly during nighttime, has been shown to impact psychomotor skills and performance of skilled

activities, such as cardiopulmonary resuscitation

The study had several limitations. Patients who arrest during off-hours may be sicker than their on-hours counterparts, in unmeasured ways. Data regarding mediator variables, such as physician and nurse staffing patterns and how they changed over the course of the study was not available. As the study cohort only included hospitals participating in a single registry, the findings may not be generalizable to all U.S. hospitals.

In an editorial accompanying the study, Julia H. Indik, MD, PhD, professor of medicine at the University of Arizona College of Medicine, said we must analyze the systems of care in hospitals with the smallest gaps in survival between on- and off-hours [patients](#). An analysis of these hospitals may identify system characteristics that allow for the design and testing of future system protocols for the in-hospital [cardiac arrest](#) patient.

"A gap still remains for survival for cardiac arrests that occur at night or on a weekend. To close this gap will require that we identify the barriers so that new hospital protocols can be made. Time is of the essence," Indik said.

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