Estimating Maternal Cardiac Arrest Incidence and Outcomes

A Rare and Challenging Complication of Pregnancy That Behooves Preparedness

Laurie J. Morrison, M.D., M.Sc., F.R.C.P.C., Farida M. Jeejeebhoy, M.D., F.R.C.P.C., F.A.C.C.

IN this issue, Dr. Mhyre *et al.*[1] report in-hospital maternal cardiac arrest estimates for the United States based on an important subgroup of pregnant women; namely all women who delivered a child by any means, in a representative sample of hospitals' administrative data. This is the first large-scale North American attempt to document the incidence and the potential etiologies of maternal cardiac arrest. Previous research in this area from the Confidential Enquiries into Maternal Deaths in the United Kingdom estimated the incidence of maternal cardiac arrest to be 1:20,000 to 1:50,000. This is a rare but devastating event with two potential victims, and to date, incidence, case fatality rates, outcomes, and etiologies for maternal cardiac arrest are unknown. This first look at the numbers must be balanced with the selection bias of this administrative data set and should encourage others to use available or prospective data collection to enhance this initial estimate. It is also a very hopeful article as it reports survival to discharge rates that exceed 55% which are some of the highest survival rates from cardiac arrest in the published literature and suggests pregnant women can survive this rare but extreme event. This high rate of survival reinforces the ongoing education and active response from all who work in labor and delivery to provide the highest quality of care to save the mother as the priority and, often consequently, save the child as well.

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This national data set which is weighted to be representative has been used in other publications to estimate disease and injury incidence and outcomes. It is a credible administrative data set with cross-representation across rural and urban settings extrapolating a population estimate based on 20% of all hospital admissions occurring from 1998 until 2011. What is missing in this article and the Healthcare Cost and Utilization Project Web site is a reliability and validity evaluation of the administrative data set against medical records as source documentation. Quality assurance documentation obtained from the Web site seems to be limited to logic checks and normative ranges to identify potential errors and a list of edit checks such that all inconsistent or missing data are managed in the same way across all data sets.

This study reported the largest sample of maternal cardiac arrest in the published literature and concludes the incidence of this subgroup of maternal cardiac arrests occurring in the delivery room or postpartum to be 1 in 12,000. This is much more frequent than previous estimates for all pregnant women regardless of stage of parturition suggesting that the in-hospital labor, delivery, and recovery are higher-risk periods for cardiac arrest than the antenatal period. This estimate by design does not include all maternal cardiac arrests occurring before delivery including those in the out-of-hospital setting. It also would not include any arrest before delivery that did not receive a perimortem cesarian delivery. Both out-of-hospital cardiac arrests and any antenatal arrest with a gravid abdomen that is not treated with a perimortem cesarian delivery have the lowest survival rates. Even with the introduction of simulator training, only 25% of eligible maternal arrests were treated with perimortem cesarian delivery. The exclusion of these patients could contribute to the explanation for the high

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survival rate in this subgroup of patients. In-hospital cardiac arrest outcomes from the same data set suggested survival rates of 30% in 2004 when events occurring in the intensive care unit and labor and delivery were excluded suggesting that the survival rate reported in this article for maternal cardiac arrests is almost double that observed for all in-hospital arrests.

This article reports that incidence was stable over time, whereas other studies from Canada, United States, Europe, South America, and China have suggested that maternal age and morbidity are both rising putting patients at higher risk for maternal cardiac arrest. The fact that incidence of maternal cardiac arrest in the delivery room and postpartum was relatively stable over time may suggest that the quality of prenatal care and high-risk obstetrical care is minimizing the risk of cardiac arrest during delivery. The observation may be different if we looked at maternal cardiac arrest occurring before delivery.

The authors have identified the cause-specific cardiac arrest frequency per 1,000 women with each condition in the delivery room. The top three are amniotic fluid embolism, acute myocardial infarction, and venous embolism which raise awareness and should inspire the team to diligently treat these conditions as they present before they lead to arrest.

As the authors pointed out they were missing neurological outcomes of the women at discharge and any outcomes on the neonates. In addition, they were unable to report rate and timing of perimortem cesarian delivery which would be helpful in guiding resuscitation guideline implementation in all hospitals.

This timely and well-done article by Mhyre and colleagues from the United States and Israel is our first look at maternal cardiac arrest incidence in the delivery room and it serves as a call to action for others to look carefully at existing data sets to see whether a broader, more comprehensive estimate could be reported. Additional existing national data sets such as the American Heart Association Get with the Guidelines-Resuscitation for in-hospital arrest and the jointly funded (United States and Canada) Resuscitation Outcomes Consortium for out-of-hospital arrests could contribute to this initial work to provide incidence, case fatality rates, outcomes, and etiologies for all maternal cardiac arrests.

Competing Interests

The authors are not supported by, nor maintain any financial interest in, any commercial activity that may be associated with the topic of this article.

Correspondence

Address correspondence to Dr. Morrison: morrisonl@smh.ca

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