Editorial

Impact of dedicated perioperative care in neonatal cardiac surgery

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Many cardiac surgical centers have created dedicated pediatric cardiac intensive care units (CICU) in the last few years. This policy was based on the idea that highly specialized teams are more able to reduce mortality and morbidity, especially in young children. Nevertheless, studies that assessed the impact of specialized perioperative care gave conflicting results (1,2). Considering also the specific constraints (financial, personnel resources, surgical volume, etc.) of each center, the location of perioperative care in children with congenital heart disease (CHD) still varies between and within institutions.

Johnson and colleagues recently published a large retrospective observational study on the economic impact of dedicated perioperative care for neonates who undergo cardiac surgery (3). They used a US national administrative database (collecting data from 44 pediatric hospitals and capturing approximately 86% of cardiac surgery cases), the Pediatric Hospital Information Systems (PHIS), to analyze the influence of initial (preoperative) admission location (considered as a proxy of the level of specialization) on costs and outcomes. Over a 10-year period (January 2004–December 2013), 19,984 neonates (<30 days) were identified as having had cardiac surgical procedure with a Risk Adjusted Classification for Congenital Heart Surgery score of at least 2. Patients were admitted either in CICU, in neonatal intensive care unit (NICU) or in pediatric intensive care unit (PICU), without knowing the reasons for such orientation. The primary endpoint was total hospital cost (data available for 90% of patients). Secondary endpoints were length of stay (LOS), days of mechanical ventilation and mortality. 39% of neonates were admitted to a CICU, 48% to a NICU and 13% to a PICU. Since the distinction between CICUs and PICUs is difficult to establish using this administrative dataset (multidisciplinary PICU may use charge codes for CICU and, inversely, some CICUs may code as PICU), a primary analysis compared admission to CICU and admission to NICU while a second analysis compared admission to PICU and admission to NICU. Admission to a CICU was associated with a significant lower total hospital cost when compared to NICU, even when premature infants were excluded from analysis. These findings were also observed for PICU (compared to NICU). According to the authors, these cost differences were attributable to (I) reduced clinical and pharmacy charges and (II) reduced room charges as reflected by a shorter LOS (both hospital LOS and ICU LOS). Additionally, admission to a CICU was associated with a fewer mechanical ventilation duration. Complications such as infections and chylothorax were more frequent in NICU. When stratified by age at admission and center volumes, total hospital cost for CICU was significantly reduced in high volume centers. When stratified by age, hospital mortality was not influenced by the location of admission. In their conclusions, the authors postulated that admission to a pediatric CICU allows to reduce hospital costs by streamlining resource use. As previously reported, the main shortcoming of this study lies in the use of an administrative database which does not allow to know both clinical and nonclinical factors that influenced the physician decision-making process with respect to admission unit (4).

Despite the biases inherent in any retrospective study, the interest of this work lies in the confirmation, in a larger and multicenter cohort, of previous findings made by the same group (5).

The specialization of care in many fields of pediatrics increasingly improved outcomes during the last decades (6,7). By analogy, this observation promoted the emergence of dedicated perioperative care for CHD patients and specialization of ICU has been associated with decreased mortality in the cohort of patients having the most severe CHD (1,2). Furthermore, the establishment of standardized postoperative management protocols allowed reduction in LOS and hospital charges (8). This financial interest was confirmed by Johnson and colleagues and was attributed to a more efficient resource use while patient-to-nursing ratio is frequently greater in CICU (3). Confirming previous results, no significant improvement was observed regarding overall mortality (any CHD combined). This finding can be explained by the fact that, nowadays in all centers, cares are provided by teams who were specifically trained in the practice of CHD (even if the unit is not completely dedicated to this activity). Because now, almost all the patients survive to surgery, mortality can no longer be a discriminating factor to compare the different care models. Indeed, after major progress that have been concomitant with surgical advances and resulted in dramatic improvement of mortality, perioperative care has entered a period of sophistication which effects will probably result in a less glaring improvement of morbidity. Given the extreme heterogeneity of CHD (subsequently of surgical procedures), morbidity is effectively difficult to assess and classical endpoints (LOS, mechanical ventilation duration, infections, etc.) are probably not relevant. Current studies focus more on neurological development (fewer years after cardiac surgery during the neonatal period). This type of outcomes is probably be more interesting to evaluate the impact of each care system on morbidity (9). In our opinion, preoperative management of newborns with CHD requires comprehensive knowledge both of hemodynamics and of neonatal physiology (10). We think that assessment of these newborns is often complex: only individual approach allows to overcome/minimize issues. Ideally, this "tailored-made" care should be proposed in a dedicated unit with a cardiac multidisciplinary team that can accept the patient immediately after birth (11). As illustrated by the difficulty to establish guidelines for the organization of perioperative care in CHD, further studies (with probably more relevant endpoints) are needed to assess the real clinical impact of dedicated ICU for patients with CHD.

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Footnote

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