

Original Article

The 2017 Seventh World Congress of Pediatric Cardiology & Cardiac Surgery: week in review: congenital cardiac anaesthesia*

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Abstract The seventh meeting of the World Congress of Pediatric Cardiology and Cardiac Surgery was an opportunity for healthcare professionals from around the world to meet and discuss current issues affecting patients with acquired and CHD. A dedicated anaesthesia track facilitated the exchange of ideas and fostered many new friendships. This review highlights the congenital cardiac anaesthesia track and the involvement of the Congenital Cardiac Anesthesia Society in the congress.

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THE CONGENITAL CARDIAC ANESTHESIA SOCIETY (CCAS) is a societal partner with the World Congress of Pediatric Cardiology and Cardiac Surgery (WCPCCS). The world congress is held every 4 years. This year was the seventh meeting, and it was held during 16–21 July, 2017 in Barcelona, Spain. This congress was the first to have a dedicated “anaesthesia track” and also to have many “bridging together” sessions where speakers from different subspecialties could discuss and debate common topics. Initially planned to take place in Istanbul, Turkey, the congress was relocated after safety concerns to Barcelona, Spain. The organising committee lead by Dr Sertac Cicek should be commended for their leadership in making this difficult decision and with the smooth transition of the conference to another country. However, terror attacks occurred in Barcelona 1 month following the world congress meeting, demonstrating that every major city can

become a terrorist target. Malala Yousafzai, the youngest person to receive the Nobel Peace Prize at the age of 17 years, said, “with guns you can kill terrorists, with education you can kill terrorism”. The congenital cardiac community around the world will continue to advocate for children with congenital and acquired heart disease and at the world congress we can come together to educate one another, share new ideas, and strengthen old friendships and develop new ones.

The planning for the dedicated cardiac anaesthesia track at the congress started 4 years ago. The congress chairs, Dr Sertac Cicek and Dr Levent Saltik, welcomed the involvement of the CCAS, which as a society endeavours to represent the community of congenital cardiac anaesthesiologists from around the world. The anaesthesia track included representation at the pre-congress conference; “wake up” back-to-basics breakfast symposiums; dedicated anaesthesia sessions; bridging together sessions; and both poster and oral scientific abstract presentations.

Pre-congress conference: neurodevelopment

The fetal cardiology and neurodevelopment conferences shared a morning session about the

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developing brain in the neonate with CHD. The neurodevelopment phenotype, the delivery of oxygen to the brain in the fetus with complex CHD, and when, where, and how these babies should be born were discussed. The impact of the hospital course on the developing brain in these neonates was discussed from anaesthesia, surgery, and intensive care perspectives. The effects of anaesthetic and sedative agents on the developing brain is not yet fully understood.¹ This is a hot topic, with the United States Food and Drug Administration issuing a safety communication in December, 2016 with an update in April, 2017. In this communication, the United States Food and Drug Administration warns that exposure to anaesthetic and sedative medications for lengthy periods of time or over multiple surgeries or procedures may negatively affect brain development in children younger than 3 years. This warning is based on animal studies in young and pregnant animals that demonstrated that exposure to general anaesthetic and sedation drugs for more than 3 hours can cause widespread loss of nerve cells in the developing brain; and studies in young animals suggested these changes resulted in long-term negative effects on the animals' behaviour or learning. However, consistent with animal studies, recent human studies suggest that a single, relatively short exposure to general anaesthetic and sedation drugs in infants or toddlers is unlikely to have negative effects on behaviour or learning. Further research is needed to fully characterise how early life anaesthetic exposure affects children's brain development. Until this complex issue is fully solved, the United States Food and Drug Administration warns that health care professionals should balance the benefits of appropriate anaesthesia in young children and pregnant women against the potential risks, especially for procedures that may last longer than 3 hours or if multiple procedures are required in children under the age of 3 years. The challenges this presents for the paediatric cardiac community were discussed in the meeting.

Back-to-basics breakfast symposiums

There were two breakfast symposia with an anaesthesia component. The first was presented by Dr K. Brady (United States of America) on interpreting waveforms and haemodynamic data. This outstanding talk highlighted how technology and "big data" can be used in predictive analytics to help anticipate adverse events and alert health care providers before these occur. It was emphasised that the power of technology to detect and predict adverse events will only increase as more institutions become involved with data collection. These algorithms are the future of how large data can be harnessed to help

individual patients and enable us to take the next steps in improving outcomes for patients with CHD. Dr K. Brady highlighted this topic with his own work utilising ST-segment analysis to predict cardiopulmonary arrest in patients with single ventricle physiology.² The second breakfast symposium was provided by Dr S. Walker (United States of America) and Dr W. Miller-Hance (United States of America). This session presented the haemodynamic effects of sedative and anaesthetic drugs and discussed pearls and pitfalls of using these drugs in patients with CHD. This session was popular with cardiologists who provide sedation during cardiac catheterisation or other procedures. The recent consensus statement for anaesthesia and sedation practice for patients undergoing diagnostic and therapeutic procedures in the cardiac catheterisation laboratory from the Society for Cardiovascular Angiography and Interventions, Society for Pediatric Anesthesia, and the CCAS was brought up during the discussion.³ The goal of this statement is to provide practitioners and institutions performing these procedures with guidance consistent with national standards and to provide clinicians and institutions with consensus-based recommendations. The recommendations include patient monitoring in the cardiac catheterisation laboratory, regardless of whether minimal or no sedation is being used, or general anaesthesia is being provided by an anaesthesiologist.

Anaesthesia sessions

Three dedicated 2-hour sessions focussed on major anaesthesia topics. The first session discussed bleeding and coagulation. The first speakers provided an excellent debate on whether the monitoring of the coagulation system intraoperatively and the use of blood product protocols during congenital cardiac surgery should be a standard of care. Dr N. Guzzetta (United States of America) provided a convincing "pro" argument backed by considerable data and experience.⁴ However, Dr D. Faraoni (Belgium) was equally well prepared with the "con" arguments and his own data!^{5,6} There was good participation from the audience and it became clear from the discussion there was a wide range of practices around the world. The current use of antifibrinolytics, especially aminocaproic acid and tranexamic acid, was well presented by Dr Eaton (United States of America).^{7,8} Although more centres are using tranexamic acid, there is a concern of an increase in the incidence of seizures.⁹ Next, Dr P. Arnold (United Kingdom) discussed novel agents and techniques to help stop bleeding in the cardiac operating room.¹⁰ The availability of blood component therapy varies around the world and makes it challenging for anaesthesiologists to

interpret the data to facilitate their own practice. Although we spend much of our time stopping bleeding after surgery, anticoagulation is key for patients on extracorporeal support with assist devices. This balance of bleeding on mechanical support devices was well presented and discussed by Dr W. Ames (United States of America).

The second anaesthesia session focussed on neonatal congenital cardiac anaesthesia. The first talk on the limitations and vulnerabilities of the neonatal cardiovascular system presented by Dr K. Brady set an excellent backdrop for this session. This was followed by a fascinating talk on the impact of translational research on optimising neonatal cardiopulmonary bypass circuits and techniques. This was presented by Dr A. Undar (United States of America), a biomedical engineer by training who has helped establish research in this area.¹¹ The problems anaesthesiologists commonly face after bypass were then presented by experts in their field. Dr P. Laussen (Canada) discussed low cardiac output state,¹² Dr M. Bojan (France) discussed renal dysfunction,¹³ and Dr K. Brady (United States of America) took the stage again to discuss monitoring and protecting the infant brain during cardiac surgery.

The third anaesthesia session focussed on anaesthetic considerations in specific situations or disease. Dr J. DiNardo (United States of America) presented excellent data on patients undergoing non-cardiac surgery and how to stratify risk and understand the factors that may contribute to this risk.¹⁴ Dr H. Nair (India) followed with anaesthetic considerations in the cardiac catheterisation laboratory and gave a wonderful overview of how patients with CHD are managed in her own institution. Three specific areas were then presented by experts in their field. Dr M. Twite (United States of America) discussed anaesthetic considerations in the patient with

pulmonary hypertension,¹⁵ Dr J. Heggie (Canada) discussed anaesthetic considerations in the adult with CHD,¹⁶ and Dr H. Ravn (Denmark) presented the anaesthetic considerations for mechanical support devices.

All three anaesthesia sessions were outstanding and filled to capacity (Fig 1) The questions and discussions in every session were lively and enjoyable. The opportunity for the congenital cardiac anaesthesia community to come together and discuss common issues was tremendous, and by the end of the week, many new friendships had been established.

Bridging together

The strength of the world congress is that it puts everyone who cares for children and adults with CHD in the same location at the same time. This not only includes cardiac surgeons, cardiologists, anaesthesiologists, and nurses but also perfusionists, administrative leaders, and many other cardiac specialists. The problem at the conference is trying to decide what sessions to attend. Anaesthesiologists are unique because we interface with so many of these specialists every day and we have insight into many of the various cardiac areas. The opening plenary titled "Bridging Together: Teamwork in Caring for the Family touched by CHD" was presented by Dr R. Jonas (United States of America). This wonderful opening session grabbed the audience with its inclusiveness of every person in the room. Dr Jonas realises and values everyone's contribution in caring for the whole family with a child with CHD and improving what we do. The first joint anaesthesia session was a focussed learning session with the intensivists. In this session, Dr P. Checchia presented an excellent overview of the Pediatric Cardiac Intensive Care Society as a global organisation for change. This talk resonated with many CCAS members, as our own society shares many of the same goals for improving the care of children with CHD around the world. Sharing the same stage was Dr I. James (United Kingdom) who provided a wonderful historical overview of lessons learned from caring for children with single ventricle physiology. Together these speakers highlighted the complexities of congenital cardiac care but they also gave hope that through collaborating with colleagues around the world, it is possible to positively impact the lives of children with CHD.

The second joint anaesthesia session was a bridging together session with the cardiac surgeons. The first half of this session was a compelling debate of whether it is safe to conduct normothermic cardiopulmonary bypass. Dr E. Belli (France), a cardiac



Figure 1.
Full audience in the anaesthesia track sessions.

surgeon, was well positioned with years of practice using normothermic cardiopulmonary bypass safely for patients. However, Dr J. DiNardo (United States of America) presented very strong scientific arguments of why such techniques are not safe, simply based on oxygen utilisation. The audience was polarised on this topic and it became clear that there is a large variation in practices of how cardiopulmonary bypass is conducted. The second half of this session had experts giving their perspectives on early extubation after congenital heart surgery. The anaesthesia perspective was very well presented by Dr A. Mitnacht (United States of America)¹⁷ and the surgery perspective equally well presented by Dr J. Hammel (United States of America).¹⁸ What was clear from this session was that the anaesthesiologist and the surgeon have a common goal for their patients – early, safe extubation. This can be achieved with clear agreed upon criteria and good communication between surgeons and anaesthesiologists for each patient.

Anaesthesia key note address and scientific abstracts

One of the highlights of the week was the key note address, which was an excellent presentation by Dr E. Mossad (United States of America), the immediate past president of the CCAS, who was standing in for his Texas Children's Hospital chair and colleague, Dr D. Andropoulos (United States of America) (Fig 2). It is never an easy task to deliver someone else's presentation, but Dr Mossad demonstrated his command of the topic and his excellence in public speaking by delivering the key note address on the impact of anaesthesia on neurodevelopmental



Figure 2.
Key note address by Dr E. Mossad, immediate past president of the congenital cardiac anaesthesia society, on behalf of Dr D. Andropoulos.

outcomes in children with CHD. This topic provoked an excellent audience debate on how the issue should be presented to parents before their children undergo general anaesthesia. Thus, many of the children in our care do not have a choice regarding undergoing surgery or a procedure, and how anaesthesiologists should discuss the issue of anaesthesia drugs injuring the brain with families is not known. One avenue of research being pursued is the better understanding of drugs that may be protective to the developing brain, such as dexmedetomidine.

There were 40 scientific anaesthesia abstracts accepted by the WCPCCS and these posters were displayed the same day as the key note address. The quality of research being done was high and the scope of topics was large, as was the number of countries represented. The posters brought people together to discuss areas of common interest. The oral abstracts were the top five submissions from cardiac anaesthesia trainees and junior faculty, selected jointly by the CCAS and WCPCCS (Fig 3). These top abstracts are shown in Table 1. Each of the presenters were very generously supported by a grant from the WCPCCS to attend the meeting. The five oral presentations were all excellent. It was wonderful to hear about the



Figure 3.
The top five scientific abstract presenters. From left to right: Dr Michelle DaCosta, Dr Theodora Wingert, Dr Faith Ross, Dr Nathaniel Greene, and Dr Rebecca Scholl.

Table 1. Top five scientific anaesthesia abstracts.

Titles	Presenter
Baseline MA-FF, FLEV, and fibrinogen levels in neonates, infants and children with congenital heart defects	Dr Michelle DaCosta
Outcomes of children with CHD undergoing bypass surgery by route of tracheal intubation in the United States: an analysis of the Society of Thoracic Surgeons Congenital Heart Surgery Database	Dr Nathaniel Greene
Preoperative nutritional deficits worsen outcomes following pediatric cardiac surgery	Dr Faith Ross
Double blind randomized placebo controlled trial comparing the effects of anti-thrombin vs placebo on the coagulation system in infants with anti-thrombin deficiency undergoing congenital cardiac surgery	Dr Rebecca Scholl
Anesthetic management of ABO-incompatible pediatric orthotopic heart transplant: a case series	Dr Theodora Wingert

Table 2. Mission of the congenital cardiac anaesthesia society.

Education	Organising high-quality, in-depth educational programmes on the national and international levels
Collaboration	Bringing together Society members for discussion of clinical care, education, and research for the anaesthetic care of patients with CHD
Coordination	Coordinating with and supporting the goals and objectives of other related societies
Research	Encouraging and promoting research in the field of congenital cardiac anaesthesia
Database	Organising and maintaining a multi-institutional database of the anaesthetic care of patients with CHD
Training	Assisting in developing and supporting guidelines for residency and fellowship training for CHD
Advocacy	Advocating for high-quality anaesthetic and perioperative care for patients with CHD

research being undertaken by very bright physicians in our field, but more importantly it confirms the future of our specialty is in good hands.

The CCAS hosted an informative luncheon after the key note address. The CCAS is a society organised within the Society for Pediatric Anesthesia. The CCAS concept originated with cardiac anaesthesia directors and other key leaders at major CHD programmes, who believed there was a need for a new society because of rapid advancement of highly specialised knowledge in the field, and a great increase in the numbers of patients, including adults, with CHD. The mission of CCAS is shown in Table 2. At the luncheon, the most recent data from the joint STS/CCAS Database were presented by Dr D. Vener (United States of America). A specific example of how the database can be used to look at current clinical practices was shown using dexmedetomidine.¹⁹ Past projects that CCAS has undertaken were presented, as well as future directions of the society. Finally, the numerous benefits of CCAS membership were presented, including the educational resources on the website (www.ccasociety.org), regular newsletters, question of the week, poll of the month, and the opportunity to network with colleagues interested in the care of patients with CHD.

Conclusion

The week-long congress was like a Flamenco dance – a whirlwind of Gaudi colours and architecture in Barcelona, mixed with the science and art of congenital cardiac anaesthesia, dancing together with

our numerous partners with the common goal of excellence in the care of children with heart disease around the world. The WCPCCS was an outstanding success on many levels, but particularly in meeting its primary objective of bridging together people from different countries and cultures, with different areas of expertise but who all share a common goal. The congenital cardiac anaesthesia community would like to thank all of the WCPCCS organisers for including all specialties and societies in the meeting. We look forward to coming together again at the next WCPCCS in 2021 to be held in Washington, DC, United States of America.

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Conflicts of Interest

None.

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