



## COVID 19 AND PEDIATRIC CARDIAC ANESTHESIA PROGRAMS-WEBINAR

Saturday April 18<sup>th</sup>, 2020

Moderators: Viviane G. Nasr & Mona Momeni

### QUESTIONS & ANSWERS:

#### TESTING: (Mark Twite)

1. What are your pre/operative screening requirements for cardiac surgical and catheterization laboratory patients?

*All patients are tested preoperatively within 24-48hours*

2. Are you using nasal swab testing or antibody testing before you schedule a procedure?

*Nasal swab testing for SARS-CoV-2 RNA is currently the most common test used preoperatively. There are shortages of nasal swabs, so we are also doing nasal washes in some patients.*

3. Are you repeating COVID 19 tests in patients who test negative prior to catheterization laboratory and who are coming for surgery within 48hours?

*No. A test is not repeated within 48 hours.*

4. What are your thoughts on false negative?

*The viral RNA tests are very sensitive and specific (>95%). In other words, IF there is viral material present in the sample it is very likely to be detected by the test. The problem is with the sample collection. In one study out of China, the presence of viral particles was around 93% in bronchoalveolar lavage fluid, 60% of nasal swabs and 30% of oral swabs in known SARS-CoV-2 positive patients. (Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens [published online ahead of print, 2020 Mar 11]. JAMA. 2020;e203786. doi:10.1001/jama.2020.3786)*

5. Considering the proportion of asymptomatic carriers of COVID-19, should we test ALL patients AND caregivers involved in their care?

*In an ideal world we would frequently test all patients, caregivers and healthcare providers for SARS-CoV-2 viral RNA and antibodies. This would enable safe, appropriate care of families, protect healthcare staff and rationalize the use of PPE. However, there are currently not enough tests being produced to allow this to happen. Furthermore, we have to be able to trust the negative or positive test results. The best strategy at the moment is to target the testing to where the yield of information will have the most impact.*

6. What is the rate of COVID + in asymptomatic patients?

*The range in the literature is wide, with 25-60% of COVID-19 positive patients being asymptomatic. One of the largest studies comes for the US Navy Aircraft Carrier Theodore Roosevelt. All 4,800 crew were tested, with 600 of them being SARS-CoV-2 positive. Of these presumably young healthy crew, 60% reported no disease symptoms. There was one death. In the words of Rear Admiral Bruce Gillingham, the Surgeon General of the US Navy, "With regard to COVID-19, we're learning that stealth in the form of asymptomatic transmission is this adversary's secret power".*

7. Are you testing neonates? Some surgeons/cardiologists argue against the need to test a neonate whose mother is negative: What should we do?

*Yes. Neonates are being tested. Additional information provided during the webinar about transmission in neonates.*

8. Are you retesting patients?

*At some centers, all patients admitted to the hospital are tested and the test is repeated every 2 weeks or if the patient becomes symptomatic.*

9. When we ramp up the cases following COVID 19, do you expect testing everyone prior to cardiac surgery including asymptomatic patients?

*Yes. The expectation is to continue testing all patients preoperatively.*

10. Some companies (Abbott,...) say that their tests are better (more sensitive and specific). What are your thoughts about that?

*Every company bringing viral RNA tests and Antibody tests to the market want you to believe that their test is THE best one. There is a large market for these tests and large amounts of money to be made. Furthermore, these tests are being brought to market under the FDA-EUA (Emergency Use Authorization). This means the manufacturers do not have to show large clinical datasets supporting their product. However, eventually these companies will have to collect and show the data supporting their tests. It is this*

*clinical data which will help the scientific community decide which tests are better than others.*

TRIAGE: (Luis Zabala)

1. With the expectation of a surge and the potential need to convert ORs and ICU beds in a pediatric hospital, how do you manage the need for urgent/emergent procedures in newborns with congenital heart defects?

*Not all centers will have a surge that results in saturation of their infrastructure. One important aspect of preparedness is understanding your community needs and availability of resources. In addition, understand your "community rate of infection" to be able to predict how many patients with "urgent" status can be managed under conditions of high utilization. Resources must be available in centers that care for patients with congenital heart disease to manage "emergent" cases (life threatening disease).*

*Hospitals located in regions with high density population experiencing high rate of infection will be forced to manage "only" emergent cases. In these centers temporizing measures in the catheterization laboratory may be an option for urgent cases (E.g. PDA stents, percutaneous balloon valvuloplasty and balloon atrial septostomy). Another option is managing ductal dependent lesions with PGE forecasting resources becoming available within weeks. Transferring urgent patients is also an option, however, other regional hospitals will probably be suffering the same impact from the high rate of infection.*

*Monitoring the "urgent" list: following clinical progression of medically managed or post-cath intervention patients with urgent disease is the next step. This is important to be able to assign resources to those in need as they become available.*

2. How you define an elective pediatric CV case?

*Elective pediatric CV case: Procedures where there is no anticipated short-term or long-term negative impact as a result of delaying a procedure or surgery (> 2 months). The majority of these diseases are slow, progressive, medically managed and don't require hospitalization associated with the primary cardiac defect.*

3. What is the percent of surgeries done compared to pre-pandemic?

*This percentage will be different amongst institutions. It will depend on the availability of resources in your community, capacity, rate of infection and more importantly, access to emergent/ urgent cases. Most large centers with extensive referral for neonatal care and a large heart failure program will likely continue to stay busy. In our experience we saw a*

*slight decrease (20%) for the month of March and a more substantial decrease in the month of April (50%) to date.*

#### AIRWAY MANAGEMENT: (Gregory Latham)

1. How are you managing the intubation in COVID +patients? Non COVID? In symptomatic patients who tested negative?

*Airway management for patients positive for COVID-19 requires full PPE. This includes a respirator (N95, CAPR or PAPR), goggles, gown and gloves. A consensus guideline for pediatric airway management in COVID-19 patients has been published and lists many resources and considerations: [https://journals.lww.com/anesthesia-analgesia/Abstract/publishahead/Pediatric\\_Airway\\_Management\\_in\\_COVID\\_19\\_patients\\_.95683.aspx](https://journals.lww.com/anesthesia-analgesia/Abstract/publishahead/Pediatric_Airway_Management_in_COVID_19_patients_.95683.aspx) In COVID-19 negative patients who are asymptomatic, routine mask and protection may be used.*

2. For the anesthesiologists do you recommend use of PPE even in asymptomatic patients with no preoperative RT-PCR test?

*For asymptomatic children who have not received COVID-19 testing, clinicians should err on the side of overprotection with full PPE until more pediatric data is known.*

3. How do you manage extubation? Full PPE?

*PPE for extubation should follow the same guidance for intubations just discussed. In short, full PPE should be used for COVID-19 positive or unknown status. Standard PPE may be used for children who are COVID-19 negative who are also asymptomatic.*

4. Are you considering all intubations as high risk or only emergency intubations?

*All intubations should be considered high risk because intubations risk aerosolization of airway secretions, regardless of emergent or elective status.*

5. How are you determining the time people remain out of the or OR/ICU after aerosol generating procedures?

*This is based on the air exchanges per hour in the room in which the procedure occurred. The minimum time should be discussed with your institution's facilities and may range from 15-30min, as recommended by the CDC: <https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#table1>*

6. Are institutions limiting the number of people in the room for induction and intubation?

*Personnel in the room should be limited during intubation and extubation. Many institutions limit attendance to the anesthesia providers and the circulating nurse. The remaining members of the team are available at the door in the event of an emergency. At one of the author's institutions, hand-held radios are used to communicate with members outside the door in the event that additional supplies are required.*

7. What type of filter is being used in pediatric patients without increasing deadspace?

*It is crucial to understand the difference between an HME and filters with appropriate viral filtration efficacy (VFE). The former adds humidity to the circuit but does not filter viral particles. Conversely, 0.2-micron filters used on ventilatory circuits are categorized as electrostatic (VFE > 99.999%) or HEPA (VFE > 99.9999%). Nearly all commonly used circuit filters are electrostatic and effective to filter 99.999% of SARS-CoV-2 viral particles.*

*All filters increase deadspace when placed between the patient and the Y-piece of the circuit. When placed in this position, the smallest filter appropriate for the patient's size should be used. The filter deadspace should be listed on the packaging. If required, total deadspace of a circuit setup can be calculated ex vivo by filling circuit components distal to the Y-piece with water and measuring weight of the water (1 g water = 1 mL).*

*Alternatively, if filters are placed at the inspiratory and/or expiratory limbs of the circuit, they do not increase deadspace. There are two important points to note: all high VFE filters increase resistance during spontaneous ventilation, and excess humidity and oral secretions on electrostatic filters will reduce the VFE over time. Filters proximal to the patient are at much higher risk of saturation and decreased efficacy. At one author's institution, filters are placed on the inspiratory and expiratory limbs, not proximal to the Y-piece.*

#### MANAGEMENT INTRAOPERATIVELY/TEE: (Wanda Miller-Hance)

1. What is your ventilation strategy for COVID patients?

*In COVID-19 patients with respiratory compromise the intraoperative ventilatory management should be the same as in any patient with acute respiratory distress syndrome (ARDS). The goal is that of a lung-protective strategy using low tidal volumes, a respiratory rate appropriate to provide adequate minute ventilation, and parameters such as FiO<sub>2</sub> and PEEP adjusted to maintain target oxygenation.*

2. Is there a risk of viral exposure from the surgical field during open heart surgery? if the pleural space is opened?

*This being a novel virus, data on transmission has not been fully elucidated but has been paralleled to that of other coronaviruses. A systematic review of aerosol generating procedures and risk of transmission (open thoracotomy included) noted that for SARS-CoV among procedures potentially capable of generating aerosols tracheal intubation appeared to be the most consistently associated with transmission or risk factor for transmission. Tran K, Cimon K, Severn M et al. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. PLoS One. 2012;7(4):e35797. doi:10.1371/journal.pone.0035797*

3. Are there any reports/cases at your institution of COVID-19 positive patients undergoing urgent or semi-urgent surgery with cardiopulmonary bypass or CHD?

*There has not been a positive patient requiring a surgical procedure with cardiopulmonary bypass at the institutions represented during the webinar.*

4. Is the preference to use Epicardial echo vs Transesophageal echocardiography (TEE)?

*At most centers TEE represents the standard intraoperative imaging approach as it overcomes many of the limitations related to epicardial imaging and would be favored over epicardial echocardiography (additional details provided in the webinar). There are certain anatomic structures and repairs that may benefit from epicardial imaging, however, this is mostly used to supplement TEE information. Whether one modality should be favored when intraoperative imaging is needed in the COVID-era would be influenced by institutional preference, patient factors (indications, information to be obtained), SARS-CoV-2 status, available resources (including PPE), and related considerations.*

5. How do you disinfect the TEE?

*Probe cleaning and disinfection is usually guided by manufacturer recommendations (guidelines available at their websites) and institutional protocols. Standards for equipment disinfection are available from the American Institute for Ultrasound Medicine (<https://www.aium.org/officialStatements/57>). The recommendation is for the probe to be thoroughly cleaned, SARS-CoV-2 is thought to be sensitive to most viricidal disinfectants. The standard protocol for probe disinfection and reprocessing should be followed.*

6. Is TEE considered an aerosol-generating procedure during probe placement and removal or throughout the examination?

*TEE probe insertion and removal are the most likely times when aerosolization may occur as at these times are usually timely related to airway manipulations. It should be noted that all endoscopic procedures are aerosol generating.*

BYPASS AND BLOOD PRODUCT MANAGEMENT: (Nina Guzzetta and David Faraoni)

1. Do you expect a pronounced inflammatory response during cardiopulmonary bypass (CPB) in CHD children that are COVID+?

*NINA: That is unclear but does have potential to manifest if COVID+ children are exposed to CPB especially if those children have cyanotic heart disease and an underlying pro-thrombotic state.*

*DAVID: I agree with Nina. I don't think we will see a lot of COVID-19 children coming for cardiac surgery, but the adult experience suggests that they would be at risk of pronounced inflammatory response.*

2. Have your use of steroids or antifibrinolytics changed?

*NINA: No*

*DAVID: No, mainly because I have not seen a positive patient coming for cardiac surgery.*

3. Changes in blood product usage? Using Factor 7 or PCC earlier now?

*NINA: I have given these agents earlier in an attempt to conserve available products. It is also my belief that perhaps we should be using these products earlier.*

*DAVID: I agree with Nina. In my experience, 4F-PCC has replaced rFVIIa about a year ago. Our COVID-19 transfusion algorithm includes fibrinogen concentrate instead of cryoprecipitate and earlier administration of 4F-PCC (although, rarely required).*

4. Not doing cases which have high likelihood of ECMO? Or cases which may use significant amount of blood products?

*NINA: No. However, there was a significantly high-risk neonatal case that was likely going to require ECMO and ultimately have a poor outcome that, after prolonged discussions with the family, cardiac surgery and ICU team, we did not offer surgery. I do not believe this was specifically a result of the COVID-19 outbreak.*

*DAVID: No. We are mainly doing neonatal cases and redo (e.g., BCPS). We have not cancelled or declined to operate because of the risk of ECMO.*

5. Are you using blood product aliquot?

*NINA: Yes. I encourage everyone to communicate with their blood bank to see how best to conserve blood product usage.*

*DAVID: Yes. In Toronto, this practice was already in place before COVID-19. We have the option to order split unit of RBC and exact volume of platelets.*

6. Is the use of irradiated globular packages recommended?

*NINA: No, I am not aware of such a recommendation.*

*DAVID: Not because of the risk of SARS-CoV-2 infection, but the storage duration is changing because of COVID-19. Some blood banks will have a lower threshold to irradiate older units and recommend washing RBCs before transfusion.*

7. Albumin vs Fresh frozen plasma as a prime for CPB: which one is preferable?

*NINA: We have not seen a decline in our storage of FFP so we are still using FFP in the CPB prime for neonatal procedures.*

*DAVID: We prime with RBC and FFP up to 6-7 kg, and use albumin in patients >6-7 kg.*

8. Have there been any suggestions/ thoughts on cryopreservation of platelets prolonging the shelf life?

*NINA: Not at my institution. I also do not know how that would effect platelet function.*

*DAVID: Cryopreserved platelets are being used in trauma, and prospective randomized studies are being designed for cardiac surgical patient as well. The idea is that cryopreserved platelets are highly pro-coagulant and could help with hemostasis in the presence of bleeding. Cryopreserved platelets should not be used prophylactically to treat thrombocytopenia because of the potential risk of thrombosis. I don't think there is enough data to recommend the use of cryopreserved platelets in pediatric cardiac surgical patients yet. (Hegde S et al. Curr Opin Hematol 2018, 25:500 – 508)*

9. Are any of you considering autologous cord blood for neonatal procedures?

*NINA: I have performed autologous blood collection and re-infusion for neonatal procedures. One issue is how long the surgery will last. In at least one instance, the blood was going to expire, but we were still on CPB so I transfused it back to the baby before we were off CPB. Otherwise I have done it successfully a handful of times.*

*DAVID: Not in Toronto.*

10. Is Tranexamic acid safe on CPB? Yes.

*DAVID: We use TXA routinely. 30 mg/kg loading dose followed by 10 mg/kg/h (<12 mo. old), 10 mg/kg loading dose followed by 10 mg/kg/h (> 12 mo. old)*

11. Should we consider measuring D-dimers in cyanotic infants who are COVID positive and who need a shunt? What is the cutoff value of high levels that might put the infant at risk of early thrombosis of the shunt?

*NINA: I do not know an exact cut off value but I would aggressively treat a COVID+ child having a shunt placement. In fact, I would encourage a thorough discussion with cardiac surgery and cardiac ICU regarding the best timing of such a surgery. Post-operatively I would suspect one would want to be a therapeutic anticoagulation protocol as early as possible.*

*DAVID: The coagulopathy of COVID-19 has been extensively discussed in the thrombosis literature. I agree that I would consider therapeutic anticoagulation, but we are lacking evidence to recommend D-dimers cut-off or optimal anticoagulation strategy.*

#### POSTOPERATIVE MANAGEMENT/CONCERNS: (Susan Nicolson and James DiNardo)

1. How are you monitoring for cytokines storm in your patients that become positive in the postoperative period?

*Susan – To date we have not had a patient that has become positive in the postoperative period. The CICU staff is aware of the potential for cytokine storm in such patients and its treatment options. There is currently a study going on at PENN looking at pro-inflammatory cytokines (IL 2, 6, 7,8 and TNFa) and we would likely contact them should we encounter a patient.*

*Jim- We have had one BiVentricular repair become + in the postoperative period (POD 4) detected somewhat incidentally due to a fever out of proportion to and with timing unusual for a BiVentricular repair. As Susan has summarized our teams are aware of this as a possibility.*

2. How many family members are being allowed in the perioperative areas and cardiac intensive care? What if the patient is COVID+?

*Susan – IF the patient is COVID negative we are limiting visiting in both areas to 2 (parents only, without symptoms). IF the patient is COVID positive visitation is limited to 1 parent who is quarantined to the patient's room (we do not let the parents change off).*

*Jim- Same.*

3. How are families handling this restriction and is any extra support being provided to them?

*Susan – Have only a 2 patient experience.... Obviously stressful for single parent with concern about the patient's heart disease and COVID status. We put the child/parent in a private room with bathroom/shower, TV, computer and provide all the meals for the parent. Social work is actively involved.*

*Jim- A few more patients but same approach.*

4. What is the expectation post-pandemic for case load and schedule?

*Susan – We have a multi-disciplinary team working on plans once the institution can care for cases other than urgent/emergent. We have been doing about 50% of our surgical volume and 30% of the catheterization volume, we have done only a handful of MRIs during the current phase. Ramp up in OR cases will be limited by CICU bed capacity.*

*Jim- We have exactly the same situation.*

#### OTHER TOPICS: (Susan Nicolson and James DiNardo)

1. We have heard about cardiomyopathy associated with COVID-19. Is there any evidence of that (yet) in children or adolescents?

*Susan – we have not encountered in our limited number of COVID patients at CHOP to date.*

*Jim-Same.*

2. How do you handle premedication for the transfer of the pediatric patient with a mask? Do you use full-dose sedation and supplemental oxygen?

*Susan – So far we have only anesthetized COVID negative patients. None so far have required supplemental oxygen with the usual dose or oral or IV premedication despite wearing a mask*

*Jim- Same. We have had a couple of COVID+/PUI patients come to the OR and have followed all the well published guidelines for these patients.*

3. Any comments for Ivermectin for treatment?

*Susan – Heard that there are some trials looking at the efficacy of Ivermectin but not aware of data, nor do I know the safety profile of the drug in children.*

*Jim- Same.*

DISCLOSURE:

The information provided in this webinar and Q&A reflects the knowledge we have on COVID-19 at the time of the webinar. As additional data become available during the pandemic and the future, the information may not be applicable.