# Vital Organ Preservation during Surgery for Congenital Heart Disease in Children

An Essay for Partial Fulfillment of Master Degree in Anesthesia

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# Dedication

**This work is dedicated to my great mother, my father and rest of my family who stood beside me through my entire life and gave me all the support.**

**Dear mother nothing deserve to be back for your great deed.**

**Thank you for every thing.**

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# ABSTRACT

The incidence of congenital heart disease is 2-10 cases per 1000 live births. Management of CHD emphasize early complete repair before the heart adapt to the abnormal physiology.

Nevertheless despite improve surgical technique, children still succumbs to post-operative multiple organ failure with significant impact on short-long term outcome.

Improve of outcome of surgery requires identify patients vulnerable to organ failure, modifying perioperative risk factors and other effective intervention for organ preservation during surgery.

**(Key Word)**

Cardiopulmonary bypass

Deep hypothermia

Circulatory arrest

Organ preservation strategies

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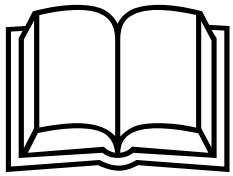
# LIST OF ABBREVIATIONS

| | |
|---|---|
| A-aO2 | Gradient alveolar - arterial oxygen gradient |
| ACP | Antegrade cardioplegia |
| ARF | Acute renal failure |
| ACT | Activated clotting time |
| ADP | Adenosine diphosphate |
| AT III | Antithrombin III |
| ATP | Adenosine trinhosphate |
| BAR | β-adrenergic receptor |
| BIS | Bispectral index |
| CBFV | Cerebral blood flow velocity |
| CHD | Congenital heart disease |
| CNS | Central nervous system |
| CRP | C-reactive protein |
| cNOS | Constitutive nitric oxide syntheses |
| $CMRO_2$ | Cerebral metabolic rate of oxygen consumption |
| CLS | Capillary leak syndrome |
| CPD | Cardiopulmonary by pass |
| CBF | Cerebral blood flow |
| CUF | Continuous ultra filtration |
| $CO_2$ | Carbon dioxide |
| DHCA | Deep hypothermic circulatory arrest |
| DUF | Dilutional ultra filtration |

| | |
|---|---|
| DXF | Dexamethasone |
| DHCPB | Deep hypothermic cardiopulmonary bypass |
| 2,3 DPG | 2,3 diphosphoglycerate |
| ELAM-1 | Endothelial leukocyte adhesion motecule-1 |
| EBV | Estimated blood volume |
| ECC | Extracorporeal circulation |
| EEGs | Electro encephalographs |
| EEG | Electroencephalogram |
| FFP | Fresh frozen plasma |
| $FIO_2$ | Partial pressure of 02 inspired air |
| G | Gram |
| GFR | Glomerular filtration rate |
| HR | Heart rate |
| Hct | Hematocrit |
| HC | Heparin-coated |
| $H^+$ | Hydrogen ion |
| $(H^*)$ | Toxic hydrogen radical |
| HLHS | Hypo plastic left heart syndrome |
| ICU | Intensive care unit |
| ICAMI | Intracellular adhesion molecule |
| IL | Interleukin |
| INOS | Inducible Nitric oxide syntheses |
| IVC | Interior vena cava |
| JBVT | Jugular venous bulb Temperature |

| | |
|---|---|
| $K^+$ | Potassium |
| KDa | Kilogram |
| LA | Left atrium |
| LV | Left ventricle |
| LD | Leukocyte |
| L | Liter |
| Lps | Lipopolysaccharide |
| LPD | Leukocyte and platelet depletion |
| µg | Microgram |
| MuF | Modified ultra filtration |
| mm | Millimeter |
| MSOF | Multisystem organ failure |
| mL | Milliliter |
| MPSS | Methylprednisolone |
| mmHg | Millimeter of mercury |
| min | Minute |
| MCP-1 | Monocyte chemo attractant-protein |
| mEq | Milliequivalent |
| NA-C | N-acetylcysteine |
| NEC | Necrotizing enterocolitis |
| NMDA | N-methyl D-aspratate |
| NIRS | Near infrared cerebral oximetry |
| NO | Nitric oxide |
| O2 | Oxygen |

| | |
|---|---|
| OH | Hydroxide |
| ($^{0}$OH) | Toxic hydroxyl radical |
| PDA | Patent ductus arteriosus |
| PAF | Platelet activating factor |
| $PGE_1$ | Prostaglandin $E_1$ |
| $PGE_2$ | Prostaglandin $E_2$ |
| PTFE | Polytetrafluoroethylene |
| PK | Dissociation constant |
| RCP | Retrograde cardioplegia |
| RV | Right ventricle |
| RA | Right atrium |
| RCM | Patient red cell mass |
| RLFP | Regional low flow cerebral perfusion |
| $SJVO_2$ | Jugular Venous bulb oximetry |
| $SCO_2$ | Cerebral oxygen saturation |
| SIRS | Systemic inflammatory response syndrome |
| SVC | Superior vena cava |
| SV | Stroke volume |
| $TNF_a$ | Tumor necrosis factor a |
| TAT | Thrombin-antithrombin III |
| TPV | Total priming volume |
| ZBUF | Zero balance ultra filtration |



# INTRODUCTION

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Congenital cardiac anomalies have been recognized for centuries. However, few or no treatments available until the twentieth century.

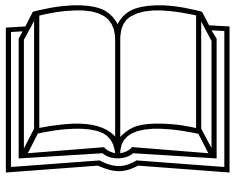
The clinical recognition and identification of congenital cardiovascular disease is very important for early management and to avoid untreatable complication.

The pediatric cardiac anesthesiologist must be closely involved with commencing, maintaining, and terminating cardiopulmonary by pass (CPB) circuit to aid the surgeon and per fusionist in diagnosis and treating the problems associated with extracorporeal circulation.

Systemic hypothermia is used during cardiopulmonary by pass (CPB) are generally defined as follows:

Mild, moderate, deep and profound <20 °C. Profound hypothermia circulatory arrest (DHCA) is a technique used to improve exposure of intracardiac defects and to facilitate total correction.

Improved outcome of surgery for congenital heart disease (CHD) depends on early identifying of lesion, modifying the preoperative and intraoperative risk factor, and effective interventions for organ preservation during surgery for CHD.



# AIM OF THE WORK