



Congenital Cardiac Surgery

2026



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

___ In The Name of Allah ___

1. PREFACE

- Curriculum represents a vital component of learning. In addition to informing trainees, trainers, and training supervisors regarding the goals and objectives of training, curriculum significantly affects program planning, execution, and the quality assurance of training outcomes.
- The Saudi Commission for Health Specialties (SCFHS) is the national regulatory body for postgraduate training programs across all health professions in Saudi Arabia.
- This manual is intended to function as a guide for members of the Curriculum Development Committee (CDC) and Curriculum Review Committee (CRC) in writing the curriculum for their respective specialties.
- Members of the CDC and CRC are expected to adhere to the curriculum structure outlined in this manual, as well as the standards specified in the accompanying materials. The CDC is responsible for developing the subject-matter content, while the CRC is responsible for overseeing the educational design and conducting reviews to ensure the curriculum's overall quality and integrity.
- The CDC must develop a blueprint of the curriculum content, which must then be submitted for approval by the program's Scientific Council/Committee.
- This manual provides pre-written sections and materials that are universally applicable for SCFHS programs; CDC and CRC members are advised to follow the instructions outlined herein to help customize curriculum content based on program needs.
- This template should be used in conjunction with the accompanying materials and reference documents to ensure consistency, quality, and alignment with best practices in curriculum development.

- For any additional support, please do not hesitate to contact us at curricula@scfhs.org.sa
- This document's primary goal is to enrich the training experience of postgraduate trainees by outlining the learning objectives and competencies necessary to produce independent and competent future practitioners.
- This curriculum may contain sections outlining training regulations; however, such regulations must be sought from the General Bylaws of Training in Postgraduate Programs and Executive Policies published by the SCFHS, which can be accessed online through the official SCFHS website. In case of discrepancies in regulation statements, those stated in the most updated bylaws and executive policies must be considered.
- As this curriculum is subject to periodic refinement, please refer to the electronic version posted online for the most updated edition at www.scfhs.org.sa



2. FOREWORD

The Saudi Medical Education Directions for Congenital Cardiac Surgery Training Program represents the first dedicated competency-based framework for surgeons in the Kingdom of Saudi Arabia who seek to pursue a professional career in this highly specialized field. This edition provides a structured guide to the essential competencies and delineates the sub-competencies within each domain. Successful completion of this educational program will enable the graduate to function as a consultant in congenital cardiac surgery, fully equipped to provide comprehensive and advanced surgical care to neonates, infants, children, and adults with congenital heart disease.

This curriculum encompasses significant innovations in the design of clinical rotations, as well as in the processes of evaluation and assessment. These elements are meticulously defined within the competency domains and have been informed by extensive feedback from the Scientific Council and program directors, together with the valuable insights of trainee . The Curriculum Development Committee extends its deepest appreciation to all individuals and bodies that contributed to the conception and realization of this work. From the initial situational analysis and strategic planning, through the formulation of development mechanisms via focus group deliberations and expert consultations, to the critical appraisal and refinement of successive drafts, the contributions of these stakeholders have been indispensable in shaping this document into its present authoritative form.

Acknowledgment is also due to the authors of the preceding national cardiac surgery curriculum, whose distinguished efforts provided a foundational framework upon which this subspecialty program has been constructed. Their work offered both inspiration and continuity, ensuring that the development of this curriculum remains aligned with the broader discipline of cardiothoracic surgery. The committee expresses profound gratitude to the various committees, colleagues, and trainees across the Kingdom whose dedication and professionalism have made this achievement possible. This edition is formally endorsed by the Scientific Council for Congenital Cardiac Surgery Training of the Saudi Commission for Health Specialties (SCFHS), and it stands as a significant milestone in the advancement of surgical education within the Kingdom. The successful implementation of this program will depend upon the sustained commitment of program directors, consultants, educational and training leaders in all participating centers, and the active engagement of trainees. Continued support from the executive leadership and staff of the SCFHS will likewise be essential in translating this vision into enduring success. Finally, the committee emphasizes that this curriculum constitutes only the first stage in an ongoing process of refinement and quality enhancement. It will remain subject to periodic review and continuous improvement, particularly as it evolves to integrate entrustable professional activities (EPAs) in accordance with the SCFHS's new generation of competency-based training programs. It is our conviction that this work will serve as a cornerstone for the future development of congenital cardiac surgery education and, ultimately, for the advancement of care for patients with congenital heart disease.

Curriculum Development Committee

Congenital Cardiac Surgery Training Program

3. CONTRIBUTORS

This Curriculum Was Prepared By The Specialty's Curriculum Development Committee:

- Dr. Hani Mufti
- Dr. Houda Al Qethamy
- Dr. Abdoulaouf Al Saeedi
- Dr. Maryam Al Omair

Reviewed By Advisory Committee Members (Curriculum Review Committee Members):

- Dr. Mazen Alqasmi MBBS, Msc.MedED, SBEM
- Dr. Sakra Balhareth Pharm.D., BCPS, BCACP

Reviewed and Approved by the Specialty's Scientific (Council/Committee) Members:

-

Approved by Head of the Curricula Review Committee:

- Dr. Ali Alyaha MD, MME, FRCSC

If This Is An Updated Version, Please List The Contributor List(s) Of The Previous Versions.

-

4. COPYRIGHT STATEMENTS

All rights reserved. © 2026 Saudi Commission for Health Specialties. This material may not be reproduced, displayed, modified, distributed, or used in any manner without prior written permission from the Saudi Commission for Health Specialties, Riyadh, Saudi Arabia. Any changes to this document must be endorsed by the Specialty Scientific Council and approved by the Central Training Committee. This document shall be considered effective from the publication date of the updated electronic version of this curriculum on the commission's website, unless otherwise stated.

We also acknowledge that the CanMEDS framework is a copyright of the Royal College of Physicians and Surgeons of Canada and that many of the competencies described have been acquired from their resources. Please refer to: Frank, J. R., Snell, L., Sherbino, J., & Boucher, A. (2015). CanMEDS 2015 Physician Competency Framework Series I. Ottawa: Royal College of Physicians and Surgeons of Canada.

Correspondence: Saudi Commission for Health Specialties P.O. Box: 94656, Postal Code: 11614, Contact Center: 920019393

E-mail: Curricula@scfhs.org.sa

Website: www.scfhs.org.sa

ISBN: 978-603-8624-04-3



This Curriculum Template document has been reviewed and updated utilizing the following references:

1. Frank, J. R., Snell, L., Cate, O. T., Holmboe, E. S., Carraccio, C., Swing, S. R., ... & Harris, P. (2010). Competency-based medical education: Theory to practice. *Medical Teacher*, 32(8), 638–645.
<https://doi.org/10.3109/0142159X.2010.501190>
2. Royal College of Physicians and Surgeons of Canada. (2015). Competency-Based Medical Education. Retrieved from <https://www.royalcollege.ca>
3. Frank, J. R., Snell, L., Sherbino, J., & Boucher, A. (2015). *CanMEDS 2015 Physician Competency Framework Series I*. Ottawa: Royal College of Physicians and Surgeons of Canada.
4. Norcini, J., Anderson, M. B., Bollela, V., Burch, V., Costa, M. J., Duvivier, R., Hays, R., Mackay, M. F. P., Roberts, T., & Swanson, D. (2018). 2018 Consensus framework for good assessment. *Medical Teacher*, 40(11), 1102–1109.
<https://doi.org/10.1080/0142159X.2018.1500016>
5. General Medical Council. (2019). *Designing and maintaining postgraduate assessment programmes*. Retrieved from <https://www.gmc-uk.org>
6. Royal College of Paediatrics and Child Health (RCPCH). (2019). RCPCH Progress: Paediatric curriculum for excellence assessment strategy, Paediatrics specialty postgraduate training (Version 1.2). General Medical Council.

7. World Federation for Medical Education. (2015). WFME global standards for quality improvement: Postgraduate medical education (Revised ed.). <https://formacionenradiologia.files.wordpress.com/2018/09/wfme-2015-global-standards-for-postgraduate-medical-education.pdf>
8. World Federation for Medical Education. (2023). WFME global standards for quality improvement: Postgraduate medical education (3rd ed.). https://wfme.org/wp-content/uploads/2023/03/WFME-STANDARDS-FOR-POSTGRADUATE-MEDICAL-EDUCATION_2023.pdf



5. TABLE OF CONTENTS

1. PREFACE	3
2. FOREWORD	5
3. CONTRIBUTORS	7
4. COPYRIGHT STATEMENTS	8
5. TABLE OF CONTENTS	11
6. INTRODUCTION	14
6.1 Context of Practice	14
6.2 Historical Context	15
6.3 Nature of the Specialty	16
6.4 Practice Environment	17
6.5 Current Challenges	17
6.6 Future Directions	18
6.7 Summary	18
7. GOALS AND RESPONSIBILITIES OF CURRICULUM IMPLEMENTATION	19
7.1 Purpose of the Curriculum	19
7.2 Responsibility for Curriculum Implementation	19
7.3 Key Innovations in This Edition	20
8. ABBREVIATIONS USED IN THIS DOCUMENT	22
9. PROGRAM ENTRY REQUIREMENTS	26
9.1 Program Entry Requirements	26
10. PROGRAM STRUCTURE	28

10.1 Program Duration	28
10.2 Program Rotations	28
10.3 Volunteering, Charity, and Humanitarian Activity in Congenital Cardiac Surgery	35
11. LEARNING AND COMPETENCIES	36
11.1 Introduction to Competency-Based Education	36
11.2 Principles of Competency-Based Medical Education (CBME)	38
11.3 CanMEDS Physician Competency Framework:	39
11.4 General Objectives:	40
11.5 Technical Skills – Levels of Supervision	41
11.6 Program Rotations	45
11.7 Mapping of Competencies, Roles, Assessment, and Educational Activities to Program Rotations	68
12. CONTINUUM OF LEARNING	165
13. EDUCATIONAL ACTIVITIES (TEACHING AND LEARNING STRATEGIES AND METHODS)	167
13.1 Teaching & Learning	167
13.2 Educational Activities:	168
13.3 Core Specialty Topics:	175
13.4 Simulation:	176
14. ASSESSMENT AND EVALUATION	180
14.1 Purpose of Assessment	180
14.2 Formative Assessment	182
14.3 Formative Assessment Tools	184



Congenital Cardiac Surgery	193
14.4 Summative Assessment	202
15. PROGRAM AND COURSE EVALUATION	207
16. POLICIES AND PROCEDURES	208
16.1 Leave and Holidays	209
17. APPENDICES	210
17.1 Appendix A: Competency-Assessment Mapping: to map Competencies, Educational Activities, and Formative and Summative Assessments (Systems of Assessment)	211
17.2 Appendix B (Academic Half-Day Topics)	212
17.3 Appendix C (Logbook Requirements)	218
17.4 Appendix D (Research Requirements)	225
17.5 Appendix E (Volunteering, Charity, and Humanitarian Activity)	231
17.6 Appendix F (Provide Detailed Appendices for Selected Educational Activities, e.g., Universal Topics, Simulation, Etc.)	234
17.7 Appendix G	240

6. INTRODUCTION

6.1 Context of Practice

Congenital cardiac surgery is one of the most technically demanding and profoundly rewarding disciplines in modern medicine. Since the first successful repairs of congenital heart defects in the mid-20th century, the field has evolved from pioneering life-saving procedures into a mature specialty that offers definitive solutions for an increasingly wide range of complex lesions. These advances in surgical techniques, perioperative care, and long-term outcomes are a testament to decades of collaboration among surgeons, cardiologists, anesthesiologists, intensivists, nurses, and scientists.

This program has been designed to prepare the next generation of congenital cardiac surgeons to meet the unique challenges of the specialty. Unlike adult cardiac surgery, where common pathologies and standardized operations predominate, congenital practice demands mastery of highly variable anatomy and physiology, careful long-term planning for staged interventions, and the ability to care for patients from fetal life through adulthood. The curriculum emphasizes not only surgical excellence and technical skill but also multidisciplinary teamwork, compassionate family-centered care, and an enduring commitment to innovation and research.

We live in a time of rapid change. Three-dimensional (3D) imaging and printing, hybrid catheter-surgical procedures, regenerative medicine, and tissue-engineered valves are reshaping the possibilities of congenital heart care. Our program embraces these developments while grounding trainees in the foundational principles and ethical standards that have defined the specialty for more than 70 years.



It is with great pride that we present this curriculum as a guide and a challenge: to cultivate surgeons who will carry forward the tradition of innovation, uphold the highest standards of patient care, and continue to push the boundaries of what is possible for children and adults with congenital heart disease.

6.2 Historical Context

The origins of congenital cardiac surgery are closely tied to the evolution of modern cardiothoracic surgery but diverged early to meet fundamentally different challenges. In the first half of the 20th century, adult cardiac surgery focused primarily on acquired heart disease, mainly rheumatic valvular lesions and later coronary artery disease, conditions typically presenting in middle age and amenable to relatively standardized surgical solutions. By contrast, congenital cardiac surgery was driven by the need to treat complex, often lethal structural malformations in newborns and children, where anatomy varies widely, and physiology is unique to each defect.

The first landmark congenital operations were extra-cardiac procedures performed without cardiopulmonary bypass, such as the surgical ligation of a patent ductus arteriosus (Gross, 1938) and the repair of coarctation of the aorta (Crafoord, 1944). In 1945, the Blalock–Taussig–Thomas shunt provided palliative relief for “blue babies” with tetralogy of Fallot, establishing a model of multidisciplinary innovation among surgeons, cardiologists, and pediatricians. These initial successes were not simply miniature adaptations of adult surgical procedures; rather, they demanded innovative techniques specifically designed for the delicate, small neonatal heart and the distinctive circulatory physiology associated with congenital defects.

The introduction of cardiopulmonary bypass by Gibbon in the 1950s paved the way for definitive intracardiac repairs, including the closure of septal defects, correction of transposition of the great arteries, and staged single-ventricle palliation. Whereas adult cardiac surgery during this era expanded toward

coronary artery bypass grafting and valve replacement, operations that could be standardized and performed in large volumes, congenital cardiac surgery remained highly individualized. Surgeons had to master a vast spectrum of rare, heterogeneous lesions and often plan staged interventions over years or decades, anticipating the child's growth and the long-term consequences of each operation.

Throughout the latter half of the 20th century, these differences solidified congenital cardiac surgery as a distinct subspecialty. Dedicated pediatric cardiac centers, specialized training fellowships, and congenital-specific outcome registries have emerged to support a practice environment that is markedly different from that of adult cardiac surgery. Whereas adult surgeons refined high-volume procedures for common pathologies, congenital surgeons continued to innovate in low-volume, high-complexity operations that require delicate microsurgical skills and close integration with pediatric cardiology, neonatology, and intensive care.

Today, congenital cardiac surgery stands as a discipline with its own body of knowledge, training requirements, and culture of multidisciplinary collaboration, shaped by its unique historical trajectory and the continuing need to care for patients across the entire lifespan, from fetal diagnosis to adulthood.

6.3 Nature of the Specialty

Congenital cardiac surgery encompasses the diagnosis, surgical correction, and long-term management of structural heart defects present from birth. Surgeons care for a wide spectrum of patients—from fetuses with prenatally diagnosed lesions, through neonates and infants requiring urgent intervention, to children and adults with complex or previously repaired congenital heart disease. Procedures range from closure of simple septal defects to multi-stage reconstructions for single-ventricle physiology, valve repairs and replacements, and heart–lung transplantation in selected cases. The specialty



demands intricate knowledge of variable cardiac anatomy, mastery of microsurgical and perfusion techniques, and the ability to plan staged interventions over the course of a patient's lifetime.

6.4 Practice Environment

Congenital cardiac surgeons work in tertiary or quaternary referral centers, typically as part of large, multidisciplinary teams. Collaboration with pediatric and adult congenital cardiologists, cardiac anesthesiologists, intensivists, perfusionists, nurses, geneticists, and maternal–fetal medicine specialists is essential. Care is delivered across a continuum, from fetal diagnosis and perinatal planning through neonatal intensive care and pediatric cardiac surgery to the transition of survivors into the adult congenital program. Surgeons are also engaged in research, outcomes analysis, and quality-improvement initiatives, often within academic medical centers.

6.5 Current Challenges

The field faces several pressing challenges:

- Rising complexity and acuity: More infants are surviving with complex lesions, requiring high-risk primary and re-operative procedures.
- Workforce and training pressures: The technical demands of the specialty, combined with the limited number of training positions, create a need for structured, competency-based curricula.
- Long-term care: Increasing numbers of adults with repaired or palliated congenital heart disease require re-interventions and coordinated lifelong follow-up.
- Quality and transparency: Continuous monitoring of outcomes through national and international registries is necessary to maintain public trust and improve standards.

6.6 Future Directions

Advances in imaging, biomaterials, and minimally invasive and hybrid procedures will continue to reshape the specialty. Three-dimensional printing and virtual or augmented reality are already transforming surgical planning and education. Developments in regenerative medicine, tissue-engineered valves, and mechanical circulatory support for children promise to expand therapeutic options. Meanwhile, the integration of precision medicine and genetic insights will improve prenatal diagnosis and individualized care. Congenital cardiac surgery should increasingly function within a regional network to ensure equitable access, multidisciplinary collaboration, and the highest standards of patient-centered care.

6.7 Summary

Congenital cardiac surgery is a dynamic, technically demanding discipline grounded in a rich history of innovation. Its practice environment is multidisciplinary and increasingly global, facing both the challenges of complex long-term care and the opportunities presented by rapidly advancing technology. A curriculum for future surgeons must therefore cultivate not only surgical excellence but also leadership, research engagement, and adaptability to emerging therapies and models of care.



7. GOALS AND RESPONSIBILITIES OF CURRICULUM IMPLEMENTATION

7.1 Purpose of the Curriculum

The primary objective of this curriculum is to provide a comprehensive guide for training centers, faculty trainers, and fellows, enabling them to develop competent congenital cardiac surgeons capable of delivering high-quality, evidence-based care within their own communities. This goal can only be achieved through the coordinated commitment of all stakeholders, ensuring that the subspecialty's rigorous standards of education, clinical practice, and research are consistently maintained.

7.2 Responsibility for Curriculum Implementation

The successful implementation of this curriculum requires a collective responsibility and effective leadership. The program director plays a pivotal role in guiding and coordinating the entire training team to ensure that the curriculum is delivered to the highest standards. In this endeavor, the program director is supported by the training committee members, chief fellow, faculty trainers, fellows, academic affairs offices, scientific councils or committees, and all allied healthcare professionals. Through close collaboration, these

contributors form a unified structure dedicated to the program's success and the development of competent congenital cardiac surgery specialists.

7.3 Key Innovations in This Edition

This edition introduces several significant developments designed to strengthen the quality and consistency of fellowship training:

- **Competency-Based Framework:** The curriculum adopts a fully competency-based approach, explicitly detailing the key learning domains—knowledge, technical skills, and professional behaviors—relevant to congenital cardiac surgery.
- **Progressive Milestones:** Clearly defined milestones outline the graded responsibilities and expected achievements at each stage of fellowship, ensuring progressive acquisition of independence and expertise.
- **Enhanced Supervision and Assessment:** A structured supervisory framework supports independent learning while providing enriched formative and summative assessments to guide fellows' professional development.
- **Refined Rotational Structure:** Substantial modifications have been introduced to both the junior and senior fellowship rotations, informed by feedback from program directors, the Scientific Council, faculty consultants, and current fellows. These changes ensure that each rotation effectively supports the acquisition of the knowledge, skills, and attitudes required for congenital cardiac surgery practice.
- **Operative Case Requirements:** Annual minimum operative case numbers are now specified to serve as a benchmark for the progressive development of surgical proficiency.
- **Comprehensive Evaluation and Assessment:** A newly developed evaluation framework combines practical, workplace-based assessments with formal



examinations to provide a more robust and objective measure of competence throughout the fellowship.

- **Refined Research Requirements:** The expectations for scholarly activity and research have been updated to ensure that fellows' academic efforts are directly relevant and beneficial to their future practice in congenital cardiac surgery.

This edition represents a significant advancement in the design and delivery of subspecialty training. By embracing a competency-based framework and incorporating structured assessments, enhanced rotations, and relevant research expectations, the program ensures that graduates emerge as skilled, independent congenital cardiac surgeons, prepared to meet the highest standards of patient care and to contribute to the ongoing advancement of the specialty.

8. ABBREVIATIONS USED IN THIS DOCUMENT

Table 1: List of Abbreviations

Abbreviation	Definition
ACGME	Accreditation Council for Graduate Medical Education
ACHD	Adult with Congenital Heart Disease
ASD	Atrial Septal Defect
ASO	Arterial Switch Operation
AVSD	Atrioventricular Septal Defect
BLS	Basic Life Support
BTT	Blalock-Taussig-Thomas
CanMEDS	Canadian Medical Education Directives for Specialists
CBD	Case-Based Discussion
CBE	Competency-Based Education
CBME	Competency-Based Medical Education
CcTGA	Congenitally Corrected Transposition of Great Arteries
CEX	Clinical Evaluation Exercise
CHD	Congenital Heart Disease
COM	Communication
CPB	Cardiopulmonary Bypass



Abbreviation	Definition
CPD	Continuous Professional Development
CRM	Customer Relationship Management
DHCA	Deep Hypothermic Circulatory Arrest
DOPS	Direct Observation for Procedural Skills
DORV	Double Outlet Right Ventricle
EA	Educational Activities
ECLS	Extracorporeal Life Support
ECMO	Extracorporeal Membrane Oxygenation
ECG	Electrocardiogram
EP	Electrophysiology
EPA	Entrustable Professional Activities
ER	Emergency Room
EYPT	End of Year Practical Test
FITER	Final In-Training Evaluation Report
HA	Health Advocate
HLHS	Hypoplastic Left Heart Syndrome
ICU	Intensive Care Unit
ITER	In-Training Evaluation Report
LVOT	Left Ventricle Outflow Tract
MCQ	Multiple Choice Questions
MCS	Mechanical Circulatory Support

Abbreviation	Definition
MEDS	Medical
MSF	Multisource Feedback
N/A	Not Applicable
OSCE	Objective Structured Clinical Exam
OSPE	Objective Structured Practical Exam
PA	Pulmonary Artery
PALS	Pediatric Advanced Life Support
PAPVD	Partial Anomalous Pulmonary Venous Drainage
PBL	Practice-Based Learning
PD	Peritoneal Dialysis
PDA	Patent Ductus Arteriosus
PPM	Permanent Pacemaker
RCPCH	Royal College of Paediatrics and Child Health
RCPSC	Royal College of Physicians and Surgeons of Canada
RV	Right Ventricle
RVOT	Right Ventricular Outflow Tract
RVOTO	Right Ventricular Outflow Tract Obstruction
SCFHS	Saudi Commission For Health Specialties
SLE	Saudi Licensing Exam
SSMD	Surgical Skills Milestone Documentation
SOE	Structured Oral Exam



Abbreviation	Definition
TAPVD	Total Anomalous Pulmonary Venous Drainage
TGA	Transposition of Great Arteries
TOF	Tetralogy Of Fallot
UK	United Kingdom
USMLE	United States Medical Licensing Exam
VAD	Ventricular Assist Device
VSD	Ventricular Septal Defect
WBA	Work-Based Assessment
WFME	World Federation for Medical Education
WPBA	Workplace-Based Assessment

9. PROGRAM ENTRY REQUIREMENTS

Please refer to the executive policy of the SCFHS on admission and registration, and ensure that a statement advising candidates to refer to the SCFHS website is present.

9.1 Program Entry Requirements

9.1.1 Admission:

- The selection process is governed by the SCFHS. Up-to-date information and application dates, as well as essential documents, can be easily found on the SCFHS web pages:

<https://www.scfhs.org.sa/en/MESPS/Admissions%20and%20Registration/Conditions%20of%20admission%20and%20registration/Pages/default.aspx>



9.1.2 Specific Conditions for the Congenital Cardiac Surgery

Fellowship Program:

9.1.2.1 Saudi Board of Cardiac Surgery or equivalent certification that the Scientific Council of Cardiac Surgery approves.

9.1.2.2 Valid license/registration from the Saudi Commission for Health Specialties.

9.1.2.3 A letter from a sponsoring organization stating that the candidate is eligible to participate in full-time training for the entire duration of the program.

9.1.2.4 A signature of obligation to abide by the rules and regulations of the training program and the Saudi Specialty Certificate of Surgery.

- Additional discriminating points can be imposed by different program administrations, which may affect trainee ranking in their acceptance list. These may include, but are not limited to, the following academic and non-academic spheres:
 - English language proficiency certificate and grades transcript
 - Years of experience in a cardiac center
 - Research work
 - International exams certification (such as USMLE certificate)
 - Life support courses and certification
 - Community initiatives and volunteerism

10. PROGRAM STRUCTURE

10.1 Program Duration

The duration of the congenital cardiac surgery training program is **3 years**. Training is structured to ensure a coherent and integrated educational program with progressively increasing fellow responsibility.

Education is designed as a spiral curriculum: through a process of repetition, re-exposure, and re-emphasis, candidates learn and continue to add to their overall knowledge and skills.

The training consists of TWO phases:

- First Phase (Junior Level): 2 years
- Second Phase (Senior level): 1 year

10.2 Program Rotations

10.2.1 Phase 1: Junior-Level Training for Congenital Cardiac Surgical Fellowship Program

This is a structured program of junior-level rotations:

- The fellow will rotate through various general and specialty-specific rotations during the first 2 years of training. The schedule for these rotations varies for each fellow, based on the training time assigned to each individual. These variations will not affect fellows' promotion or eligibility to sit for the exams if they have completed all the required rotations (See Table 2: List of Rotations).



- First Year:
 - It is mandatory that all fellows begin their training program with a 12-week rotation in congenital cardiac surgery at the training center where they are enrolled.
 - The fellow will complete a total of 20 weeks of non-surgical rotations in Pediatric Cardiology and Pediatric Cardiac Intensive Care at a center approved by the Scientific Council. These rotations will be undertaken in collaboration with accredited pediatric cardiac sciences training programs and under the supervision of the Congenital Cardiac Surgery Program Director. The rotations are designed to provide comprehensive exposure to the multidisciplinary management of patients with congenital heart disease, including preoperative diagnosis, patient and family counseling, perioperative decision-making, and postoperative care. The primary objective of these 20 weeks is to equip the trainee with the clinical knowledge, cognitive and technical skills, professional judgment, and interdisciplinary understanding required for the evaluation and management of patients with congenital heart disease throughout the continuum of care.
 - We recognize that the congenital cardiac surgery fellow is not a certified pediatrician and may not be equipped to handle the complexity of medical management for pediatric patients. To ensure patient safety and provide optimal care for this vulnerable patient population, during this block of essential non-surgical rotations, the fellow must be shadowed and supervised by a more senior pediatric cardiology or pediatric ICU fellow while performing their clinical duties (Table 2: List of Rotations).
 - The next rotation is another 12-week block in congenital cardiac surgery at the training center, where they are enrolled.

- A 4-week research block is mandatory by the end of the first year. During this rotation, the fellow is expected to organize and start a research project under the supervision of a congenital cardiac surgeon and receive institutional research board approval. The Congenital Cardiac Surgery program director must approve this project, and it will be included in the fellow's promotion to senior level and the graduation portfolio. The fellow is expected to provide feedback to the program director on the project's progress every 3 months. The fellow is expected to present this project at a national or international conference by the end of the second year and publish at least one paper based on this project prior to entering the final graduation exam.
- **Please note** that case reports or how-to-do-it videos/papers will not be accepted to fulfill this requirement.
- Second Year:
 - Should start with an adult congenital cardiac surgery 8-week block. The fellow is expected to focus on adolescent patients with congenital heart pathologies in this rotation. It is preferable to work in a unit that has a dedicated adult congenital service. However, we recognize that this is a niche subspecialty, and not all centers may have a dedicated team for patients with adult congenital heart disease, which may fall under the umbrella of congenital cardiac surgery. The program director should ensure that the fellow is assigned to all adult congenital cardiac surgery cases during this rotation.
 - 12-week rotation in congenital cardiac surgery at the training center where they are enrolled or in another center after approval from the training committee.



- The elective rotation is a 24-week rotation that fellows can organize with support from the program director to be taken at a national or international center (after approval from the Scientific Council of Cardiac Surgery). This rotation can be split into two separate blocks (a minimum of 12 weeks each) to be taken at two separate locations.
- Vacation is a 4-week block. This block cannot come in the middle of a rotation unless approved by the program director.

10.2.2 Phase 2: Senior-Level Training for Congenital Cardiac Surgical Fellowship Program

This is a structured program of senior-level rotations:

- The senior fellow will rotate through specialty-specific rotations during the last year of training. The schedule for these rotations varies for each fellow, based on the training time assigned to each individual. These variations will not affect fellows' promotion or eligibility to sit for the exams if they have completed all the required rotations.
- A candidate can reach this level of senior training through Promotion to the senior year, which depends on the successful completion of Phase 1 junior-level training and passing First Part of the Congenital Cardiac Surgery Examination.
- Senior trainees shall be responsible for performing basic and clinical hospital activities such as:
 - Inpatient care in their unit, especially clerking and following the admitted patients, with timely completion of patients' medical records, including a complete history and physical examination, an investigation of requests and results, a plan of management, postoperative orders and progress notes, a discharge summary, and other relevant reports.

- Trainees shall attend specialty surgical outpatient clinics at least once per week and participate in the management plans of surgical patients under the supervision of a senior staff member.
- Trainees shall be required to attend and participate in the operative sessions conducted in the operating rooms, outpatient units, or day surgery units, keeping an accurate and precise logbook throughout.
- Trainees shall have a minimum average on-call duty (24-hour duty) of 1 in every 4 nights, 91 times per year (1 in every 4 nights even during the elective research rotation).
- Trainees shall maintain healthy relationships with patients, their relatives, and medical, nursing, and administrative staff.
- Trainees shall maintain the confidentiality and ethics of the profession and shall abide by the governing rules and the laws of the Kingdom of Saudi Arabia.
- The program offers fellows the opportunity to learn and attain the prescribed competencies. The program provides experience in preoperative, operative, and postoperative care of patients in all areas that constitute the principal components for subspecialties related to congenital cardiac surgery. Objectives and designated level of competency are tabulated in the master roadmap along with assessment projection examples from which the scientific council will select and announce at the beginning of each academic year.
- The following is the required rotation for the senior year of training. The schedule for these rotations varies from one fellow to another, based on the available training time assigned to each fellow. These variations will not affect a fellow's promotion or eligibility to sit for the exams if the fellow has completed all the required rotations. It is mandatory that all senior fellows spend the final year of training in congenital cardiac surgery.



- Third Year:
 - Should start with an adult congenital cardiac surgery 12-week block. The fellow is expected to focus on adolescent patients with congenital heart pathologies in this rotation. It is preferable to work in a unit that has a dedicated adult congenital service. However, we recognize that this is a niche subspecialty, and not all centers may have a dedicated team for patients with adult congenital heart disease, which may fall under the umbrella of congenital cardiac surgery. The program director should ensure that the fellow is assigned to all adult congenital cardiac surgery cases during this rotation.
 - 36-week rotation in congenital cardiac surgery at the training center where they are enrolled.
 - Vacation is a 4-week block. This block cannot come in the middle of a rotation unless approved by the program director.

Table 2: List of Rotations

Stage	Training Year	Rotations			
		Rotation Name	Duration	Setting	Period of Training
Junior	F1	Congenital Cardiac Surgery *	12 Weeks	Mandatory	104 weeks
		Pediatric Cardiology (Ward and Clinic) *	4 Weeks	Mandatory	
		Pediatric Cardiology (Echo and Imaging) *	4 Weeks	Mandatory	
		Pediatric Cardiology (Cath and EP) *	4 Weeks	Mandatory	
		Pediatric Cardiac ICU *	8 Weeks	Mandatory	
		Congenital Cardiac Surgery *	12 Weeks	Mandatory	
		Research *	4 Weeks	Mandatory	
		Vacation *	4 Weeks	Mandatory	
	F2	Adult Congenital Cardiac Surgery *	8 Weeks	Mandatory	
		Congenital Cardiac Surgery *	16 Weeks	Mandatory	
		Elective **	24 Weeks	Elective	
		Vacation *	4 Weeks	Mandatory	
Senior	F3	Adult Congenital Cardiac Surgery *	12 Weeks	Mandatory	52 weeks
		Congenital Cardiac Surgery *	36 Weeks	Mandatory	
		Vacation *	4 Weeks	Mandatory	



*(*Mandatory core rotation: Set of rotations representing the program's core component that are mandatory to complete.*

***Elective rotation: Set of rotation(s) that are associated with the specialty, as determined by the scientific council/committee; the trainee is required to complete some of them. Elective can be done abroad (after approval from the Scientific Council), in a recognized center, provided approval is obtained from the SCFHS. Can be divided into two periods of a minimum of 12 weeks in each period.*

10.3 Volunteering, Charity, and Humanitarian Activity in Congenital Cardiac Surgery

Volunteering and humanitarian participation are integral components of the SCFHS training framework and are strongly encouraged as part of the trainee's professional and ethical development. Engagement in charity missions—particularly through national initiatives such as **KSrelief (King Salman Humanitarian Aid and Relief Center)**—provides opportunities to deliver specialized congenital cardiac care to children in underserved regions locally and internationally. Such experiences exemplify the values of compassion, service, and social responsibility that define the medical profession.

Participation in these missions enhances clinical judgment, adaptability, and teamwork in resource-limited environments while fostering leadership, professionalism, and cultural sensitivity. Trainees also contribute to sustainable impact by transferring skills and knowledge to local healthcare teams. These activities reinforce the Canadian Medical Education Directives for Specialists(**CanMEDS**) roles of **Health Advocate, Professional, and Collaborator**, cultivating a commitment to global health and humanitarian service.

For more details, please refer to [Appendix E \(Volunteering, Charity, and Humanitarian Activity\)](#).

11. LEARNING AND COMPETENCIES

11.1 Introduction to Competency-Based Education

Training should be guided by well-defined “enabling competencies” that are developed based on a particular program’s “competencies” to serve specific specialty needs. Enabling competencies should reflect the professional competencies and tasks with which trainees are expected to be “entrusted” upon graduation. This ensures that graduates fulfill the expected demands of the healthcare system and patient care in relation to their specialties. Competency-based education (CBE) is an approach to adult learning that is grounded in achieving pre-defined, fine-grained, and well-paced sub-competencies derived from complex professional competencies.

Professional competencies associated with healthcare are usually complex and contain a mixture of multiple learning domains (knowledge, skills, and professional behavior). CBE is expected to change the traditional approach to postgraduate education. For instance, the time spent on training, though a precious resource, should not be considered a proxy for competence (e.g., duration of rotation in certain hospital areas is not the primary marker of competence achievement). Furthermore, CBE emphasizes the critical role of informed judgment in assessing a trainee’s competency progress based on their staged and progressive performance, using data collected from multiple educational and assessment encounters, methods, and workplace-based observations. Several CBE models have been developed for postgraduate education in healthcare (e.g., CanMEDS by the Royal College of Physicians and



Surgeons of Canada [RCPSC], the CBME-Competency model by the Accreditation Council for Graduate Medical Education [ACGME], Tomorrow's Doctor in the UK, and multiple others). The concepts associated with CBE are as follows:

- a. **Competency:** Competency refers to a healthcare professional's observable ability, encompassing knowledge, skills, values, and attitudes/professional behavior. It reflects the potential to perform efficiently in a given situation based on the standards of the profession and involves applying these components practically in real-world settings. Professional roles (e.g., medical experts, health advocates, communicators, leaders, scholars, collaborators, and professionals) are utilized to define competency roles, making them malleable for learning and assessment.
- b. **Milestones:** Milestones represent the stages of the developmental journey along the competency continuum. Throughout their learning journey, trainees, from junior to senior levels, are assisted in transitioning from novice to master practitioners, moving from supervised to unsupervised roles. This should not undermine the role of supervisory/regulatory bodies toward the malpractice of independent practitioners. Milestones are expected to enhance the learning process by aligning training/assessment pace with the trainees' developmental levels (junior versus senior).
- c. **Learning Domains:** The categories or dimensions of learning that encompass the development of a learner's abilities and attributes. These domains are commonly divided into three key areas: K = Knowledge, S = Skills, and A = Attitude (also referred to as professional behavior).

11.2 Principles of Competency-Based Medical Education (CBME)

These include the following:

1. **Focused Outcomes:** CBME emphasizes defining and achieving clear outcomes based on societal needs, ensuring that graduates meet these standards.
2. **Competencies as a Framework:** The curriculum is developed around clearly defined abilities or competencies that integrate knowledge, skills, and attitudes/behaviors.
3. **Learner-Centered Approach:** It promotes individualized learning by allowing trainees to progress at their own pace, according to their ability to demonstrate competencies.
4. **Integrated Assessment:** It utilizes multiple assessment methods to comprehensively and continuously evaluate competencies.
5. **Flexibility in Learning Pathways:** It encourages adaptable learning experiences tailored to individual needs while fulfilling established competency standards.
6. **Focus on Real-World Application:** It emphasizes the ability to apply knowledge and skills in practical real-world contexts.
7. **Supervision and Feedback:** This approach incorporates close supervision and regular feedback to promote continuous improvement and ensure patient safety in practice.
8. **Emphasis on Lifelong Learning:** It prepares learners for ongoing self-directed learning and adaptation in a rapidly evolving healthcare environment.
9. **Accountability** to ensure that training aligns with societal needs and prepares competent professionals.



The SCFHS endorses the CanMEDS to articulate professional competencies. This curriculum applies the principles of CBME. The CanMEDS and ACGME represents a globally accepted framework that outlines competency roles. The “CanMEDS 2015/ACGME 2018 framework” has been adopted in this section.

The following references exemplify a general outline of:

1. the CanMEDS competency (Frank, J. R., Snell, L., Sherbino, J., & Boucher, A. [2015]. CanMEDS 2015 Physician Competency Framework Series I. Ottawa: Royal College of Physicians and Surgeons of Canada.)
2. ACGME reference and link:
<https://www.acgme.org/Portals/0/MilestonesGuidebook.pdf>.

11.3 CanMEDS Physician Competency Framework:

Rotations have three main components:

1. Duties
2. Safety
3. Learning

These intertwine knowledge, skills, and attitudes. On the outcome side, they blend again to fit the frameworks of the CanMEDS competencies. The following summarizes key roles for physicians in the CanMEDS 2015 project:

- Medical Expert
- Communicator
- Collaborator
- Leader
- Health Advocate
- Scholar
- Professional

11.4 General Objectives:

Upon successful completion of the program, the graduate will be fully competent to practice as a Consultant Congenital Cardiac Surgeon. Candidates must demonstrate comprehensive knowledge of cultural and ethnic factors relevant to the care of patients with congenital heart disease, ensuring sensitivity and equity in clinical practice.

In addition, all fellows are expected to acquire a sound understanding of research methodology, including the principles of study design, data analysis, and the presentation and interpretation of scientific findings.

Graduates of the program will be capable of fulfilling the following professional roles, as defined by the CanMEDS competency framework and adapted to the practice of congenital cardiac surgery.

These roles encompass knowledge and skills beyond the immediate technical domain of the subspecialty—for example, the ability to interpret complex diagnostic modalities, address general intensive care issues, and understand the genetic and syndromic conditions frequently associated with congenital heart disease.

Congenital heart disease management is a rapidly evolving subspecialty. Continuous professional development and ongoing evaluation are therefore essential throughout a surgeon's career. This includes maintaining an active appreciation of the role of research and the capacity for critical analysis of emerging scientific evidence and evolving clinical practices.

Graduates are strongly encouraged to participate in national and international congenital heart surgery societies, to remain current with advances in knowledge, technology, and best practices.

As dedicated professionals—and consistent with the ethical obligations of the medical profession—congenital cardiac surgeons are expected to deliver the



highest standard of care with integrity, honesty, and compassion, to demonstrate exemplary personal and interpersonal behavior, and to place the welfare and needs of individual patients at the forefront of their practice.

11.5 Technical Skills – Levels of Supervision

Below is a commonly used graduated supervision model for assessing technical (operative) skills in surgical training, adapted for a congenital cardiac surgery fellowship. It provides clear levels of supervision, which can be mapped to entrustable professional activities (EPAs) or milestone assessments. These levels align with SCFHS competency-based medical education and CanMEDS “Medical Expert” and “Leader” roles.

1. Level 0 – Only assist

- Definition: The fellow is only expected to assist the attending surgeon or a senior fellow during the procedure.
- Indications:
 - Early stage of training.
 - New or complex procedures.
- Goal: Exposure to operative steps and fundamental instrument handling.

2. Level 1 – Direct, Full Supervision

- Definition: The fellow performs the procedure with the attending surgeon scrubbed, who provides continuous, hands-on guidance.
- Indications:
 - Early stage of training.
 - New or complex procedures not previously performed by the fellow.
- Goal: Safe performance of basic operative steps and fundamental instrument handling.

3. Level 2 – Direct Supervision, Proactive Guidance

- Definition: The attending surgeon is scrubbed in the operating room, observing closely and providing intermittent verbal or manual guidance, but the fellow is the primary operator for defined steps.
- Indications:
 - Intermediate stage of training.
 - Fellow has demonstrated baseline technical skills and understanding of anatomy and procedure flow.
- Goal: Develop operative autonomy under close observation.

4. Level 3 – Indirect Supervision, Immediate Availability

- Definition: The attending surgeon is not scrubbed but is immediately available in the operating room and can scrub in if needed.
- Fellow Role: Performs the operation or defined components independently, calling for assistance only when necessary.
- Goal: Build confidence and demonstrate ability to anticipate and manage routine intraoperative challenges.

5. Level 4 – Oversight / Distant Supervision

- Definition: The attending surgeon is not physically present in the operating room but is available within the institution for consultation if needed.
- Fellow Role: Performs the procedure independently, including decision-making and problem-solving.
- Goal: Demonstrate readiness for unsupervised practice as a consultant.

6. Level 5 – Unsupervised Practice (Consultant Level)

- Definition: The fellow has achieved full independent practice capability and is qualified to teach or supervise others.
- Goal: Entrustment to perform the procedure without the need for any supervision.

Key Notes for Fellowship Programs:

- ◆ Progression through levels is procedure-specific: a fellow may be Level 4 for atrial septal defect repair but still at Level 2 for complex neonatal arch reconstruction.
- ◆ Assessment is based on:
 - Technical skill (precision, efficiency, tissue handling).
 - Judgment and decision-making (anticipating complications, intraoperative flexibility).
 - Professionalism (communication, teamwork, respect for safety).
- ◆ How to assess readiness to progress:
 - a) Procedure-specific entrustment: A fellow may be Level 4 for VSD repair but remain Level 2 for arterial switch.
 - b) Formative assessment: Regular operative evaluations (e.g., using tools such as the Ottawa Surgical Competency Operating Room Evaluation – O-SCORE) determine readiness to advance.
 - c) Surgical Milestone Documentation (SSMD): Training committees should record supervision levels, by at least two consultants, for each major index case to track progress and support final competency decisions (See Table 3).

Table 3: Surgical Skills Milestone Documentation (SSMD) statements and guide to recommendation of appropriate supervision

Technical Skills – levels of supervision	Definition	Trainer input at each supervision level			
		Does the trainee perform part or all the task?	Is guidance required? (Complete, Partial, or Independent)	The trainee can perform the task without direct supervision?	Is the trainee performing at a level beyond that expected of a day one consultant?
0	The fellow is only expected to assist the attending surgeon or a senior fellow during the procedure.	No	N/A	N/A	N/A
1	The fellow performs the procedure with the attending surgeon scrubbed and provides continuous, hands-on guidance.	Part	Complete	No	No
2	The attending surgeon is scrubbed in the operating room, observing closely and providing intermittent verbal or manual guidance, but the fellow is the primary operator for defined steps.	Part	Partial	No	No
3	The attending surgeon is not scrubbed but is immediately available in the operating room and can scrub in if needed.	Full	Partial	No	No
4	The attending surgeon is not physically present in the operating room but is available within the institution for consultation if needed.	Full	Independent	Yes	No
5	The fellow has achieved full independent practice capability and is qualified to teach or supervise others.	Full	Independent	Yes	Yes



11.6 Program Rotations

11.6.1 Competency-based Learning and Teaching Template Base for All Rotations

- Trainees are expected to progress from novice to mastery levels in a certain set of professional competencies.
- SCFHS has endorsed the CanMEDS to articulate professional competencies.

In general, trainees need to:

- a. Demonstrate diagnostic and therapeutic skills for ethical and effective patient care.
- b. Access and apply relevant information to clinical practice.
- c. Demonstrate effective consultation services with respect to patient care, education, and legal opinions.

Fellows are expected to acquire a set of knowledge and skills in each rotation and adhere to general professional behavior and attitude in all rotations.

Attitude

- The fellow will be monitored during their daily activities to assess their attitude and behavioral skills.
- The top behavioral skills required of a congenital cardiac surgery fellow before graduation are synergistic, primarily to ensure effective interpersonal communication with others.
- Fellows are expected to act in the patients' best interests, according to the level of their expected responsibility, and to communicate appropriately with medical personnel, patients, and their families.
- Fellows are expected to behave in an empathetic manner with patients and take into consideration cultural issues when dealing with them.

- Fellows are expected to be responsible for the safety of patients under their care and exhibit that behavior in preoperative, intraoperative, and postoperative management with a high degree of confidentiality.
- Fellows are expected to act as role models to other trainees and co-workers (such as residents, nurses, and allied health workers).
- Attention to attitudes across all targeted competencies should be stressed throughout the rotation, and timely and appropriate feedback should be given to the trainee. That is a major task of the mentors, program director, or their designees.

11.6.2 Competency-based Learning and Teaching Template for Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support in Congenital Cardiac Surgery:

I. Medical Knowledge

1. Identify and describe components of cardiopulmonary bypass for neonates and children
2. Select and justify appropriate cannulation techniques and management of bypass in complex neonates and children
3. Identify and describe myocardial protection strategies in neonates and children
4. Identify and describe the role and implications of deep hypothermic circulatory arrest (DHCA) and selective perfusion in neonates and children
5. Identify and describe the specific risks and complications of cardiopulmonary bypass in neonates and children, including advanced monitoring techniques
6. Explain and justify the use of modified and continuous ultrafiltration during congenital cardiac surgery



7. Explain and justify the indication for use of advanced cardiopulmonary support in neonates and children, including extracorporeal life support (ECLS) and extracorporeal membrane oxygenation (ECMO)

II. Clinical Judgment

1. Apply the principles and techniques for cannulation, initiation, and management of cardiopulmonary bypass, including myocardial protection in all aspects of emergency and elective congenital cardiac surgery (including unusual venous and arterial anatomy and re-operative surgery)
2. Implement different strategies for the management of re-operative surgery in children and adults with congenital heart disease
3. Apply principles and techniques for advanced temporary circulatory support for cardiogenic shock and respiratory failure (e.g., ECLS, ECMO, short-term ventricular assist devices)
4. Recognize and manage complications associated with cardiopulmonary bypass in children and adults (e.g., aortic dissection, massive air embolism)

11.6.3 First-Year Rotations:

11.6.3.1 Competency-based learning and teaching template for Congenital Cardiac Surgery

- This is the first rotation in the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 12 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Outline applied cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Describe the general physiology of the neonate and the child

3. Explain cardiac physiology, including shunt calculation
4. Describe the conduction abnormalities and electrophysiology in childhood
5. Outline complex combinations of anatomy and pathophysiology in congenital heart disease
6. Describe general applied pharmacology in childhood
7. Explain risk stratification and data collection systems in congenital cardiac surgery
8. Outline surgical techniques and strategies across the spectrum of congenital cardiac surgery
9. Describe strategies for complex re-operative surgery
10. Describe strategies for hybrid interventions (with cardiology) in congenital heart disease
11. Describe surgical techniques and strategies across the spectrum for adult congenital heart disease
12. Describe the principles of heart and lung transplantation in childhood
13. Outline the issues of transplantation in adults with congenital heart disease
14. Highlight common issues in advanced pediatric intensive care
15. Discuss tracheal disease in childhood
16. Describe the consent process in pediatric, adolescent, and adult patients undergoing surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose complex congenital heart disease in neonates, children, and adults
5. Describe strategies for complex re-operative surgery

6. Plan an operative strategy for the full range of congenital cardiac surgery conditions
7. Plan an operative strategy for the full range of adult congenital cardiac surgery conditions
8. Interpret risk stratification and data collection systems

III. Clinical Skills

1. Surgical incisions for patients with congenital heart defects
2. Vascular access for children and adult patients with congenital heart defects
3. Cannulation strategies for patients with congenital heart defects

11.6.3.2 Competency-based learning and teaching template for Pediatric Cardiology (Ward and Clinic)

- This is a rotation in the first year of the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 4 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Explain applied pharmacology in childhood
6. Interpret risk stratification and data collection systems in congenital cardiac surgery

7. Recognize the general medical management of children and adult patients with congenital heart disease
8. Describe the common presentation of children and adult patients with congenital heart disease
9. Outline the principles of heart and lung transplantation in childhood
10. Outline the issues of transplantation in adults with congenital heart disease
11. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Differentiate simple from complex congenital heart disease
3. Diagnose congenital heart disease in neonates, children, and adults
4. Execute appropriate tests and consults for patients
5. Develop a general medical management strategy for the range of congenital cardiac conditions

III. Clinical Skills:

1. History taking for patients with congenital heart defects
2. Counseling families and patients

11.6.3.3 Competency-based learning and teaching template for Pediatric Cardiology (Echo and Imaging)

- This is a rotation in the first year of the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 4 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Outline the principles of different imaging modalities used to diagnose congenital and acquired heart disease
6. Highlight the general indications for each imaging modality

II. Clinical Judgment

1. Interpret imaging modalities used in congenital heart disease
2. Develop a general medical management strategy for the range of congenital cardiac conditions, incorporating various imaging modalities

III. Clinical Skills

1. Recognize the indications for each imaging modality
2. Perform basic echocardiography images independently

11.6.3.4 Competency-based learning and teaching template for Pediatric Cardiology (Catheterization and Electrophysiology)

- This is a rotation in the first year of the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 4 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)

2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Describe the principles of different modalities used to diagnose and manage arrhythmias and structural abnormalities in a patient with congenital heart disease (including medications used)
6. Outline general indications, pros, and cons for each modality

II. Clinical Judgment

1. Interpret different modalities used in congenital heart disease
2. Develop a general medical management strategy for the range of congenital cardiac conditions, incorporating various modalities used in the catheterization or electrophysiology teams

11.6.3.5 Competency-based learning and teaching template for Pediatric Cardiology (Pediatric Cardiac ICU)

- This is a rotation in the first year of the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 8 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease



5. Highlight the principles of different modalities used to diagnose and manage patients with congenital heart disease in the cardiac ICU (including medications used)
6. Outline general indications, pros, and cons of different monitoring modalities used in the ICU
7. State the general indications, pros, and cons of different supportive tools and modalities used in the ICU (dialysis, ECMO, ventilator, and ventricular assist devices, others)

II. Clinical Judgment

1. Interpret different modalities used in congenital heart disease
2. Develop a general medical management strategy for the range of congenital cardiac conditions, incorporating various modalities used by the ICU team

III. Clinical Skills

1. Recognize the indications for each modality.
2. Perform basic interpretation and management of different supportive modalities semi-independently.

11.6.3.6 Competency-based learning and teaching template for Congenital Cardiac Surgery

- This is a rotation in the first year of the program.
- This is the second block of Congenital Cardiac Surgery that the candidate will do in their first year of training.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 12 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Describe risk stratification and data collection systems in congenital cardiac surgery
6. Outline the surgical management of congenital cardiac defects
7. Outline different surgical techniques and strategies across the spectrum of congenital cardiac surgery
8. Describe strategies for complex re-operative surgery
9. Describe strategies for hybrid interventions in congenital heart disease
10. Outline the surgical management of adult congenital cardiac surgery conditions
11. Outline the principles of heart and lung transplantation in childhood
12. Highlight the issues of transplantation in adults with congenital heart disease
13. Apply knowledge of advanced pediatric intensive care
14. Apply knowledge of tracheal disease in childhood
15. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose congenital heart disease in neonates, children, and adults
5. Apply strategies for complex re-operative surgery



6. Develop a comprehensive operative strategy for the full range of congenital cardiac surgery conditions
7. Implement risk stratification and data collection systems

III. Clinical Skills

1. Surgical incisions for patients with congenital heart defects
2. Vascular access for children and adult patients with congenital heart defects
3. Cannulation strategies for patients with congenital heart defects

11.6.3.7 Competency-based learning and teaching template base for Congenital Cardiac Surgery Research block

- This is a rotation in the first year of the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 4 weeks.

The candidate should be able to demonstrate:

I. Knowledge

1. Integrate clinical knowledge of congenital cardiac surgery with research questions that address relevant gaps in patient care or outcomes
2. Apply evidence-based medicine principles to formulate clinically meaningful hypotheses
3. Understand the ethical and regulatory requirements for research involving human participants
4. Design a structured research proposal, including a clear hypothesis, objectives, and methodology
5. Demonstrate proficiency in research methods: study design (retrospective, prospective, clinical trials, basic science), data collection, and statistical analysis

6. Identify research questions that address disparities in the care and outcomes of congenital heart disease

II. Collaborator, Leader, and Manager

1. Clearly articulate research goals, methods, and results to scientific, clinical, and lay audiences
2. Work effectively with multidisciplinary research teams, including biostatisticians, laboratory scientists, and clinical colleagues
3. Demonstrate effective teamwork and conflict resolution skills in a research setting
4. Adhere to the highest standards of research integrity, including honesty in data collection, analysis, and reporting
5. Demonstrate accountability in meeting timelines and respecting authorship and intellectual property guidelines
6. Protect patient confidentiality and comply with institutional and national research ethics regulations
7. Plan and manage the stages of a research project, including resource allocation, budgeting, and timelines
8. Coordinate tasks among team members and monitor project progress to ensure timely achievement of milestones

II. Expected Outcome

1. Prepare a manuscript suitable for submission to a peer-reviewed journal
2. Present research findings effectively in oral and written formats (abstracts, presentations, manuscripts)
3. Critically appraise scientific literature to identify knowledge gaps and assess the validity and applicability of published studies
4. Write structured research documents, including ethics applications, progress reports, and publications

5. Translate research findings into actionable recommendations that can enhance patient care, surgical outcomes, or inform health policy
6. By the end of the second year of fellowship, the fellow should be able to:
 - i. Produce a completed research project (clinical or basic science) suitable for presentation at a recognized scientific meeting
 - ii. Submit at least one abstract and, ideally, a manuscript for peer-reviewed publication
 - iii. Demonstrate the ability to critically analyze and apply emerging evidence in congenital cardiac surgery practice

11.6.4 Second Year Rotations:

11.6.4.1 Competency-based learning and teaching template base for Congenital Cardiac Surgery

- This is a rotation in the second year of the program.
- This is the third block of Congenital Cardiac Surgery that the candidate will do in their second year of training.
- The candidate can have this rotation at their medical center or in another high-volume cardiac center to gain a different perspective and experience.
- The duration of this rotation is 8 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease

5. Describe risk stratification and data collection systems in congenital cardiac surgery
6. Outline the surgical management of congenital cardiac defects
7. Outline different surgical techniques and strategies across the spectrum of congenital cardiac surgery
8. Describe strategies for complex re-operative surgery
9. Describe strategies for hybrid interventions in congenital heart disease
10. Outline the surgical management of adult congenital cardiac surgery conditions
11. Outline the principles of heart and lung transplantation in childhood
12. Highlight the issues of transplantation in adults with congenital heart disease
13. Apply knowledge of advanced pediatric intensive care
14. Apply knowledge of tracheal disease in childhood
15. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose congenital heart disease in neonates, children, and adults
5. Apply strategies for complex re-operative surgery
6. Develop a comprehensive operative strategy for the full range of congenital cardiac surgery conditions
7. Implement risk stratification and data collection systems

III. Clinical Skills

1. Surgical incisions for patients with congenital heart defects
2. Vascular access for children and patients with congenital heart defects



3. Cannulation strategies for patients with congenital heart defects

Competency-based learning and teaching template base for adult congenital cardiac surgery

- This is a rotation in the second year of the program.
- This is the first block of adult congenital cardiac surgery that the candidate will do in their second year of training.
- The candidate can have this rotation at their medical center or in another high-volume cardiac center to gain a different perspective and experience.
- The duration of this rotation is 12 weeks.
- **Please note** that the fellow is expected to focus on adolescent patients with congenital heart pathologies in this rotation. It is preferable to work in a unit that has a dedicated adult congenital service. However, we recognize that this is a niche subspecialty, and not all centers may have a dedicated team for patients with adult congenital heart disease, which may fall under the umbrella of congenital cardiac surgery. The program director should ensure that the fellow is assigned to all adult congenital cardiac surgery cases during this rotation.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Describe risk stratification and data collection systems in congenital cardiac surgery
6. Outline the surgical management of congenital cardiac defects

7. Outline different surgical techniques and strategies across the spectrum of congenital cardiac surgery
8. Describe strategies for complex re-operative surgery
9. Describe strategies for hybrid interventions in congenital heart disease
10. Outline the surgical management of adult congenital cardiac surgery conditions
11. Outline the principles of heart and lung transplantation in childhood
12. Highlight the issues of transplantation in adults with congenital heart disease
13. Apply knowledge of advanced pediatric intensive care
14. Apply knowledge of tracheal disease in childhood
15. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose congenital heart disease in neonates, children, and adults
5. Apply strategies for complex re-operative surgery
6. Develop a comprehensive operative strategy for the full range of congenital cardiac surgery conditions
7. Implement risk stratification and data collection systems

III. Clinical Skills

1. Surgical incisions for patients with congenital heart defects
2. Vascular access for patients with congenital heart defects
3. Cannulation strategies for patients with congenital heart defects
4. Conduct of re-operative surgeries

11.6.4.2 Competency-based learning and teaching template for the Elective rotation

- This rotation occurs during the second year of the program.
- It is the sole elective block that candidates are required to undertake during their second year of training.
- Fellows are advised to complete this rotation at a high-volume international cardiac center to acquire a broader perspective and gain valuable experience.
- Approval from the training committee is required for the training center.
- The training center must agree to provide a full evaluation of the trainee's performance at the end of the rotation.
- Ideally, the rotation should be conducted in a high-volume center where the trainee will be exposed to pediatric mechanical circulatory support and experience in heart/lung transplants.
- Fellows are encouraged to organize this rotation as early as possible, preferably as the commencement of the first year.
- The duration of this rotation is 24 weeks.
- Although not the preferred option, the elective rotation may be divided into two segments of 12 weeks each, subject to approval by the training committee.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease

5. Describe risk stratification and data collection systems in congenital cardiac surgery
6. Outline the surgical management of congenital cardiac defects
7. Outline different surgical techniques and strategies across the spectrum of congenital cardiac surgery
8. Describe strategies for complex re-operative surgery
9. Describe strategies for hybrid interventions in congenital heart disease
10. Outline the surgical management of adult congenital cardiac surgery conditions
11. Outline the principles of heart and lung transplantation in childhood
12. Highlight the issues of transplantation in adults with congenital heart disease
13. Apply knowledge of advanced pediatric intensive care
14. Apply knowledge of tracheal disease in childhood
15. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose congenital heart disease in neonates, children, and adults
5. Apply strategies for complex re-operative surgery
6. Develop a comprehensive operative strategy for the full range of congenital cardiac surgery conditions
7. Implement risk stratification and data collection systems

III. Clinical Skills

1. Surgical incisions for patients with congenital heart defects
2. Vascular access for children and adult patients with congenital heart defects



3. Cannulation strategies for patients with congenital heart defects

11.6.5 Third Year Rotations:

11.6.5.1 Competency-based learning and teaching template base for Congenital Cardiac Surgery

- This is a rotation in the third year of the program, and the fellow is a senior.
- This is the fourth block of Congenital Cardiac Surgery that the candidate will complete in their third year of training.
- The candidate can have this rotation at their medical center.
- At this stage, the fellow is expected to be semi-independent and able to manage patients under supervision.
- The fellow is expected to conduct ward and ICU rounds and develop a comprehensive treatment plan. The fellow should lead the surgical meeting discussion and be able to perform low-risk procedures semi-independently.
- The duration of this rotation is 36 weeks.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Describe risk stratification and data collection systems in congenital cardiac surgery
6. Outline the surgical management of congenital cardiac defects
7. Outline different surgical techniques and strategies across the spectrum of congenital cardiac surgery

8. Describe strategies for complex re-operative surgery
9. Describe strategies for hybrid interventions in congenital heart disease
10. Outline the surgical management of adult congenital cardiac surgery conditions
11. Outline the principles of heart and lung transplantation in childhood
12. Highlight the issues of transplantation in adults with congenital heart disease
13. Apply knowledge of advanced pediatric intensive care
14. Apply knowledge of tracheal disease in childhood
15. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose congenital heart disease in neonates, children, and adults
5. Apply strategies for complex re-operative surgery
6. Develop a comprehensive operative strategy for the full range of congenital cardiac surgery conditions
7. Implement risk stratification and data collection systems

I. Clinical Skills

- A. **Planning and execution of operative strategy** in primary and re-operative congenital cardiac procedures, optimizing exposure while minimizing trauma and preserving reconstructive options
- B. **Establishment and management of vascular access** in neonates, infants, and complex congenital cardiac patients, including central and peripheral approaches, ultrasound-guided techniques, and management of challenging or limited-access scenarios



- C. **Formulation and implementation of advanced cannulation strategies** for patients with simple and complex congenital heart defects, including selective cerebral perfusion, deep hypothermic circulatory arrest, and ECMO initiation protocols
- D. **Optimization of myocardial protection techniques** tailored to patient age, pathology, and surgical complexity, including different cardioplegia strategies and regional perfusion methods
- E. **Intraoperative decision-making and adaptation** in response to anatomic variability, unexpected findings, or intraoperative hemodynamic changes, demonstrating advanced judgment and procedural flexibility

11.6.5.1 Competency-based learning and teaching template base for adult congenital cardiac surgery

- This is a rotation in the third year of the program.
- This is the second block of Congenital Cardiac Surgery that the candidate will do in their third year of training.
- The candidate can have this rotation at their medical center or in another high-volume cardiac center to gain a different perspective and experience.
- The duration of this rotation is 12 weeks.
- **Please note** that the fellow is expected to focus on adolescent patients with congenital heart pathologies in this rotation. It is preferable to work in a unit that has a dedicated adult congenital service. However, we recognize that this is a niche subspecialty, and not all centers may have a dedicated team for patients with adult congenital heart disease, which may fall under the umbrella of congenital cardiac surgery. The program director should ensure that the fellow is assigned to all adult congenital cardiac surgery cases during this rotation.

The candidate should be able to demonstrate:

I. Medical Knowledge

1. Describe cardiac embryology and anatomy (including sequential segmental analysis of morphology)
2. Outline the general physiology of the neonate and the child
3. Outline cardiac physiology, including shunt calculation
4. Identify a range of anatomy and pathophysiology in congenital heart disease
5. Describe risk stratification and data collection systems in congenital cardiac surgery
6. Outline the surgical management of congenital cardiac defects
7. Outline different surgical techniques and strategies across the spectrum of congenital cardiac surgery
8. Describe strategies for complex re-operative surgery
9. Describe strategies for hybrid interventions in congenital heart disease
10. Outline the surgical management of adult congenital cardiac surgery conditions
11. Outline the principles of heart and lung transplantation in childhood
12. Highlight the issues of transplantation in adults with congenital heart disease
13. Apply knowledge of advanced pediatric intensive care
14. Apply knowledge of tracheal disease in childhood
15. Describe the consent process in pediatric, adolescent, and adult surgery

II. Clinical Judgment

1. Interpret complex abnormalities associated with congenital heart disease
2. Interpret pre-, peri-, and postoperative echocardiography
3. Differentiate simple from complex congenital heart disease
4. Diagnose congenital heart disease in neonates, children, and adults
5. Apply strategies for complex re-operative surgery



6. Develop a comprehensive operative strategy for the full range of congenital cardiac surgery conditions
7. Implement risk stratification and data collection systems

III. Clinical Skills

1. Surgical incisions for patients with congenital heart defects
2. Vascular access for patients with congenital heart defects
3. Cannulation strategies for patients with congenital heart defects
4. Conduct of re-operative surgeries

11.7 Mapping of Competencies, Roles, Assessment, and Educational Activities to Program Rotations

11.7.1 Rotation Descriptions:

This section aims to match each rotation's competencies and objectives. Trainees and trainers should collaborate to achieve these objectives during teaching, learning events, educational activities, and formative assessments. Expectations should evolve as the training level progresses (e.g., training stage, level, milestones).

In the narrative format, each rotation should have a clear description per stage and training year and should include the following:

- Rotation Name
- Training level
- Introduction
- Competency roles
- Competencies and Enabling Competencies tailored to the training year or stage (demonstrating progression throughout the years)
- Duration of the rotation for each level of training/year
- Setting
- Educational Activities
- Assessment Tools

Competency assessment: Map competencies, roles, educational activities, and assessment in the Matrix (See [Appendix A: Competency-Assessment Mapping: to map Competencies, Educational Activities, and Formative and Summative Assessments \(Systems of Assessment\)](#))



Year 1 rotation: Congenital Cardiac Surgery

Introduction:

This rotation will allocate the time required for the fellow to complete the required Congenital Cardiac Surgery rotation and become familiar with the department, facility, and system.

Duration: 12 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - risk stratification and data collection systems in congenital cardiac surgery - surgical techniques and strategies across the spectrum of congenital cardiac surgery - Obtain complete histories from patients with congenital heart disease undergoing surgery, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease undergoing surgery - Identify indications for surgical management of patients with congenital heart disease undergoing surgery and describe an approach for the workup of potential surgical candidates



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease undergoing surgery, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease undergoing surgery and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the indications for surgery; the reasons for the same; and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease undergoing surgery 2) Identify the measures required to ensure patient safety with congenital heart disease undergoing surgery 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.

Year 1 rotation: Pediatric Cardiology (Ward and Clinic)

Introduction:

This rotation will allocate the time required for the fellow to complete the necessary Pediatric Cardiology ward and clinic rotation.

Duration: 4 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, MSF

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis) - of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - applied pharmacology in childhood and adolescents with congenital heart disease - general medical management of children and adult patients with congenital heart disease - common presentation of children and adult patients with congenital heart disease - Obtain complete histories from patients with congenital heart disease, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease - Identify indications for surgical management of patients with congenital heart disease and describe an approach for the workup of such patients



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the pathology; the expectations from such disease; different treatment modalities and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease 2) Identify the measures required to ensure patient safety with congenital heart disease 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. While competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 1 rotation: Pediatric Cardiology (Echo and Imaging)

Introduction:

This rotation will allocate the time required for the fellow to complete the necessary Pediatric Cardiology Echo and Imaging rotation.

Duration: 4 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, MSF

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis) - of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - applied principles of different imaging modalities used to diagnose congenital and acquired heart disease - general indications for each imaging modality - Obtain complete histories from patients with congenital heart disease, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the pathology; the expectations from such disease; different treatment modalities and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease 2) Identify the measures required to ensure patient safety with congenital heart disease 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 1 rotation: Pediatric Cardiology (Catheterization and Electrophysiology)

Introduction:

This rotation will allocate the time required for the fellow to complete the necessary Pediatric Cardiology, Catheterization, and Electrophysiology rotation.

Duration: 4 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, MSF

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis - of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - applied principles of different modalities used to diagnose congenital and acquired heart disease by the catheterization and electrophysiology team - general indications for each approach and modality - hemodynamics assessment in the catheterization laboratory - applied principles of different modalities used to diagnose and manage arrhythmias and structural abnormalities in a patient with congenital heart disease (including medications used). - general indications, pros, and cons for each modality - recognition of complications associated with interventional procedures and antiarrhythmic medications - Obtain complete histories from patients with congenital heart disease, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the pathology; the expectations from such disease; different treatment modalities and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease 2) Identify the measures required to ensure patient safety with congenital heart disease 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 1 rotation: Pediatric Cardiac ICU

Introduction:

This rotation will allocate the time required for the fellow to complete the necessary Pediatric Cardiac ICU rotation.

Duration: 8 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, MSF

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - applied principles of different modalities used to diagnose and manage patients with congenital heart disease in the cardiac ICU (including medications used) - general indications, pros, and cons of different monitoring modalities used in the ICU - general indications, pros, and cons of different supportive tools and modalities used in the ICU (dialysis, ECMO, ventilator, ventricular assist devices, others). - Obtain complete histories from patients with congenital heart disease, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease - Plan the management of and devise a treatment strategy for the range of congenital cardiac conditions based on modalities used by the ICU team - Demonstrate the ability to perform procedures needed for children in the ICU <u>under direct supervision</u> (such as chest tube insertion, peritoneal dialysis catheter insertion, central line insertion, endo-tracheal tube insertion)



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with Pediatric Cardiac ICU team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the pathophysiology; the expectations in the ICU; different treatment modalities and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease 2) Identify the measures required to ensure patient safety with congenital heart disease 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps; a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 1 rotation: Congenital Cardiac Surgery

Introduction:

This rotation will allocate the time required for the fellow to complete the required Congenital Cardiac Surgery rotation and become familiar with the department, facility, and system. This will be the second Congenital Cardiac Surgery block in the first year.

Duration: 12 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - risk stratification and data collection systems in congenital cardiac surgery - surgical techniques and strategies across the spectrum of congenital cardiac surgery - Obtain complete histories from patients with congenital heart disease undergoing surgery, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease undergoing surgery - Identify indications for surgical management of patients with congenital heart disease undergoing surgery and describe an approach for the workup of potential surgical candidates



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease undergoing surgery, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease undergoing surgery and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the indications for surgery; the reasons for the same; and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease undergoing surgery 2) Identify the measures required to ensure patient safety with congenital heart disease undergoing surgery 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.

Year 1 rotation: Research in Congenital Cardiac Surgery

Introduction:

This rotation provides protected time for the fellow to acquire and apply the principles of clinical and/or basic science research in congenital cardiac surgery. The fellow will become familiar with research methodology, data management, scientific writing, and ethical standards.

This is the first formal research block and is designed to foster lifelong scholarly habits and critical appraisal skills.

Duration: 4 weeks

Setting: Hospital: Affiliated academic medical center or research institute, under the supervision of a designated research mentor.

Educational Activities:

- Weekly research meetings and mentor reviews
- Journal club focused on research methods and critical appraisal
- Workshops on statistics, study design, and scientific writing
- Attendance at relevant institutional research seminars

Assessment Tools:

- Research presentations
- Specific research tasks (e.g., data collection techniques, laboratory procedures if applicable)
- ITER (In-Training Evaluation Report) from research supervisor

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1: Integrate clinical knowledge of congenital cardiac surgery into the formulation of relevant research questions - ME 2: Apply principles of research design, data analysis, and critical appraisal to address gaps in patient care	1) Describe fundamental principles of clinical and translational research, including study design, biostatistics, and evidence appraisal. 2) Identify clinically meaningful questions in congenital cardiac surgery and formulate testable hypotheses. 3) Demonstrate understanding of research ethics, patient confidentiality, and regulatory requirements. 4) Translate research findings into potential improvements in surgical practice and patient outcomes.



Collaborator

Competencies	Enabling Competencies
- Col 1: Work effectively with multidisciplinary research teams, including biostatisticians, laboratory scientists, and clinical colleagues - Col 2: Manage differences and resolve conflicts constructively within a research environment	1) Recognize and respect the roles of all research team members (e.g., statisticians, data managers, ethics board staff) 2) Demonstrate effective collaboration when designing and conducting research studies 3) Communicate progress and challenges openly and professionally to supervisors and collaborators

Communicator

Competencies	Enabling Competencies
COM 1: Communicate scientific concepts and results clearly to a variety of audiences	1) Present research proposals and findings in oral and written formats suitable for scientific meetings and peer-reviewed journals 2) Write clear and concise research documents, including ethics applications, progress reports, and manuscripts 3) Adapt language and style to suit clinical colleagues, scientific peers, and lay audiences



Health Advocate

Competencies	Enabling Competencies
HA 1: Use research evidence to advocate for improvements in congenital cardiac surgery care and outcomes	1) Identify knowledge gaps and health-system issues that research can address 2) Advocate for the translation of research findings into clinical guidelines and policy to improve patient care 3) Promote equitable access to research participation and dissemination of results

Leader

Competencies	Enabling Competencies
▪ Led 2: Steward research resources and manage projects efficiently ▪ Led 4: Manage personal time and career development within an academic environment	1) Plan and monitor project timelines, budgets, and resource allocation 2) Employ project-management strategies to meet key research milestones 3) Balance clinical duties, research responsibilities, and personal well-being 4) Utilize information technology for data management and literature retrieval

Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Critically appraise the scientific literature related to congenital cardiac surgery 2) Develop a structured research proposal and data collection plan 3) Apply appropriate statistical methods and interpret results accurately 4) Prepare at least one abstract and/or manuscript suitable for peer-reviewed publication 5) Participate in journal clubs, research seminars, and departmental educational activities

Professional

Competencies	Enabling Competencies
▪ P 1: Demonstrate integrity, honesty, and ethical conduct in all aspects of research ▪ P 2: Fulfill professional responsibilities to society and the scientific community	1) Adhere to institutional and national research ethics regulations. 2) Maintain accurate, honest, and complete research records. 3) Recognize and manage conflicts of interest and issues of authorship appropriately. 4) Demonstrate punctuality, reliability, and accountability for research tasks and deadlines.

Teaching and assessment strategies should address competencies collectively and holistically. Progression should be documented in a Competency-Assessment Matrix, demonstrating development from a novice researcher to an independent clinician-scientist ready to contribute to the field of congenital cardiac surgery.

Year 2 rotation: Adult Congenital Cardiac Surgery

Introduction:

This rotation provides the fellow with dedicated time to gain comprehensive exposure to adult congenital cardiac surgery, to become familiar with the relevant clinical services, the multidisciplinary team, the facilities, and the systems of care. The fellow will acquire the knowledge, technical skills, and professional behaviors necessary to manage adults with congenital heart disease (ACHD), integrating both surgical and perioperative care. This will be the first dedicated ACHD rotation and will be in the second year of training.

Duration: 8 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe key principles of: - Applied cardiac embryology and anatomy relevant to adult congenital lesions, including sequential segmental analysis of morphology. - Adult physiology and pathophysiology in patients with repaired or unrepaired congenital heart disease - Long-term sequelae and complexity of combined anatomy and acquired comorbidities (e.g., pulmonary hypertension, arrhythmias, heart failure) - Risk stratification and data collection systems applicable to adult congenital cardiac surgery - Surgical techniques and strategies across the spectrum of adult congenital cardiac procedures (e.g., reoperations, conduit revisions, complex valve repairs) - Obtain comprehensive histories from ACHD, recognizing the importance of collateral and historical operative information - Perform appropriate and efficient physical examinations tailored to the adult congenital population - Identify indications for surgical intervention in ACHD, and outline a structured approach to the preoperative workup and multidisciplinary decision-making



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of all healthcare professionals involved in the care of adults with congenital heart disease—including cardiologists (ACHD specialists), anesthesiologists, intensivists, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical/laboratory support staff 2) Work in close collaboration with the adult congenital cardiology team and other subspecialists to design patient-centered management plans.

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with adult congenital patients and their families, responding to questions with clarity and sensitivity, using lay language when appropriate 2) Anticipate and address challenges in understanding complex surgical histories and implications for future care 3) Clearly explain surgical indications, rationale, risks, complications, and potential benefits 4) Communicate effectively with referring physicians and multidisciplinary colleagues in person, by telephone, and in written or electronic documentation 5) Provide adequate clinical information when requesting investigations to ensure appropriate selection and interpretation 6) Maintain courteous, clear, and professional communication with all members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in supporting ACHD and make appropriate referrals 2) Advocate for timely access to specialized imaging, interventions, and resources according to the urgency and complexity of each case 3) Recommend additional investigations when clinically appropriate to ensure optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance relevant to the care of ACHD 2) Apply measures to ensure patient safety in complex re-operative surgery 3) Understand basic principles of physician billing and the distinctions between technical and professional components 4) Balance patient care responsibilities, learning needs, and personal well-being through effective time and energy management 5) Evaluate the cost-benefit of interventions and develop strategies for the judicious use of finite healthcare resources 6) Employ information technology to optimize patient care and foster lifelong learning



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.

Year 2 rotation: Congenital Cardiac Surgery

Introduction:

This rotation will allocate the time required for the fellow to complete the required Congenital Cardiac Surgery rotation and become familiar with the department, facility, and system. This will be the first Congenital Cardiac Surgery block in the second year.

Duration: 16 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequence of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology of disease - risk stratification and data collection systems in congenital heart disease - surgical techniques and strategies across the spectrum of congenital heart surgery - Obtain complete histories from patients with congenital heart disease undergoing surgery, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease undergoing surgery - Identify indications for surgical management of patients with congenital heart disease undergoing surgery and describe an approach for the workup of potential surgical candidates



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease undergoing surgery, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease undergoing surgery and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the indications for surgery; the reasons for the same; and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease undergoing surgery 2) Identify the measures required to ensure patient safety with congenital heart disease undergoing surgery 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 2 rotation: Elective in Congenital Cardiac Surgery

Introduction:

The elective rotation is a 24-week rotation that fellows can organize with support from the program director to be taken at a national or international center (after approval from the Scientific Council of Cardiac Surgery). This rotation can be split into two separate blocks (a minimum of 12 weeks each) to be taken at two separate locations.

Duration: 24 weeks

Setting: Hospital: The candidate should have this rotation in a high-volume medical center, preferably an international one.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequence of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology of disease - risk stratification and data collection systems in congenital heart disease - surgical techniques and strategies across the spectrum of congenital heart surgery - Obtain complete histories from patients with congenital heart disease undergoing surgery, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease undergoing surgery - Identify indications for surgical management of patients with congenital heart disease undergoing surgery and describe an approach for the workup of potential surgical candidates



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease undergoing surgery, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease undergoing surgery and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 3) Anticipate problems of interpretation by patients and their families 4) Clearly explain the indications for surgery; the reasons for the same; and their risks, complications, and potential benefits 5) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 6) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 7) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease undergoing surgery 2) Identify the measures required to ensure patient safety with congenital heart disease undergoing surgery 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 3 rotation: Adult Congenital Cardiac Surgery

Introduction:

This rotation provides the fellow with dedicated time to gain comprehensive exposure to adult congenital cardiac surgery, to become familiar with the relevant clinical services, the multidisciplinary team, the facilities, and the systems of care. The fellow will acquire the knowledge, technical skills, and professional behaviors necessary to manage adults with congenital heart disease (ACHD), integrating both surgical and perioperative care. This will be the second dedicated ACHD rotation and will be in the third year of training.

Duration: 12 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe key principles of: - Applied cardiac embryology and anatomy relevant to adult congenital lesions, including sequential segmental analysis of morphology - Adult physiology and pathophysiology in patients with repaired or unrepaired congenital heart disease - Long-term sequelae and complexity of combined anatomy and acquired comorbidities (e.g., pulmonary hypertension, arrhythmias, heart failure) - Risk stratification and data collection systems applicable to adult congenital cardiac surgery - Surgical techniques and strategies across the spectrum of adult congenital cardiac procedures (e.g., reoperations, conduit revisions, complex valve repairs) - Obtain comprehensive histories from ACHD, recognizing the importance of collateral and historical operative information - Perform appropriate and efficient physical examinations tailored to the adult congenital population - Identify indications for surgical intervention in ACHD, and outline a structured approach to the preoperative workup and multidisciplinary decision-making



Collaborator

Competencies	Enabling Competencies
▪ Col 1 Work effectively with physicians and other colleagues in the healthcare professions ▪ Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of all healthcare professionals involved in the care of adults with congenital heart disease—including cardiologists (ACHD specialists), anesthesiologists, intensivists, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical/laboratory support staff 2) Work in close collaboration with the adult congenital cardiology team and other subspecialists to design patient-centered management plans

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with adult congenital patients and their families, responding to questions with clarity and sensitivity, using lay language when appropriate 2) Anticipate and address challenges in understanding complex surgical histories and implications for future care 3) Clearly explain surgical indications, rationale, risks, complications, and potential benefits 4) Communicate effectively with referring physicians and multidisciplinary colleagues in person, by telephone, and in written or electronic documentation 5) Provide adequate clinical information when requesting investigations to ensure appropriate selection and interpretation 6) Maintain courteous, clear, and professional communication with all members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in supporting ACHD and make appropriate referrals 2) Advocate for timely access to specialized imaging, interventions, and resources according to the urgency and complexity of each case 3) Recommend additional investigations when clinically appropriate to ensure optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance relevant to the care of adults with congenital heart disease. 2) Apply measures to ensure patient safety in complex re-operative surgery 3) Understand basic principles of physician billing and the distinctions between technical and professional components 4) Balance patient care responsibilities, learning needs, and personal well-being through effective time and energy management 5) Evaluate the cost-benefit of interventions and develop strategies for the judicious use of finite healthcare resources 6) Employ information technology to optimize patient care and foster lifelong learning



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.



Year 3 rotation: Congenital Cardiac Surgery

Introduction:

This rotation will allocate the time required for the fellow to complete the required Congenital Cardiac Surgery rotation and become familiar with the department, facility, and system. This will be a Congenital Cardiac Surgery block in the third year for the fellow who is considered to be senior.

Duration: 36 weeks

Setting: Hospital: The candidate should have this rotation at their home institution to become familiar with the team.

Educational Activities: Half-day activity, OSCE, Journal Club

Assessment Tools: CBD, CoT, Mini-CEX, DOPS, ITER

Competencies:

At the end of this rotation, the fellow will:

Medical Expert

Competencies	Enabling Competencies
- ME 1 Practice medicine within their defined practice and expertise scope - ME 2 Perform a patient-centered clinical assessment and establish a management plan - ME 3 Plan and perform procedures and therapies for assessment and/or management	- Describe the basic principles of: - applied cardiac embryology and anatomy (including sequential segmental analysis of morphology) - general physiology of the neonate and the child - complexity of combinations of anatomy and pathophysiology in congenital heart disease - risk stratification and data collection systems in congenital cardiac surgery - surgical techniques and strategies across the spectrum of congenital cardiac surgery - Obtain complete histories from patients with congenital heart disease undergoing surgery, recognizing the importance of collateral history - Perform appropriate and efficient physical examinations on patients with congenital heart disease undergoing surgery - Identify indications for surgical management of patients with congenital heart disease undergoing surgery and describe an approach for the workup of potential surgical candidates



Collaborator

Competencies	Enabling Competencies
- Col 1 Work effectively with physicians and other colleagues in the healthcare professions - Col 2 Work with physicians and other colleagues in the healthcare professions to promote understanding, manage differences, and resolve conflicts	1) Recognize and respect the roles of other healthcare professionals involved in the care of patients with congenital heart disease undergoing surgery, including physicians, technicians, nurses, physiotherapists, occupational therapists, social workers, nutritionists, and clinical and laboratory support staff 2) Recognize the importance of close collaboration with pediatric cardiology team members when designing studies tailored to an individual patient

Communicator

Competencies	Enabling Competencies
COM 1 Establish professional therapeutic relationships with patients and their families	1) Communicate effectively with patients with congenital heart disease undergoing surgery and their families and with other specialties, responding to questions considerately, sympathetically, and factually, appropriate to the clinical situation, in terms that are understandable to the layperson 2) Anticipate problems of interpretation by patients and their families 3) Clearly explain the indications for surgery; the reasons for the same; and their risks, complications, and potential benefits 4) Communicate effectively with medical colleagues, including referring physicians, in person, via telephone, and through dictated/written reports 5) Request appropriate investigations and studies by providing sufficient information on the requisitions to permit the selection of studies 6) Communicate courteously, clearly, effectively, and appropriately with members of the healthcare team



Health Advocate

Competencies	Enabling Competencies
HA 1 Respond to the needs of the communities or populations that they serve by advocating with them for system-level change in a socially accountable manner	1) Recognize the role of community services and lay organizations in providing support for individuals with congenital heart disease and make appropriate referrals to such organizations and services 2) Advocate effectively for timely access to specific resources, imaging, and other investigations or studies based on the presenting problem's urgency 3) Recommend studies beyond those requested by the referring physicians when appropriate, to offer optimal care

Leader

Competencies	Enabling Competencies
▪ Led 2 Engage in the stewardship of healthcare resources ▪ Led 4 Manage their practice and career	1) Identify principles of quality assurance important in managing patients with congenital heart disease undergoing surgery 2) Identify the measures required to ensure patient safety with congenital heart disease undergoing surgery 3) Identify basic principles of physician billing for medical services, including billing for the technical and professional components 4) Utilize personal time and energy effectively to balance patient care responsibilities, learning needs, and personal needs 5) Demonstrate an appreciation of the costs and benefits of various interventions and develop strategies for wisely utilizing finite healthcare resources for patients with congenital heart diseases 6) Employ information technology to provide optimal patient care and foster lifelong learning opportunities



Scholar

Competencies	Enabling Competencies
▪ S 1 Engage in the continuous enhancement of professional activities through ongoing learning ▪ S 3 Integrate best available evidence into practice	1) Develop a strategy to maintain professional competence through diverse means of continuing medical education 2) Critically assess the cardiac literature as it relates to patient diagnosis, investigation, and treatment 3) Identify knowledge gaps and seek educational methods whereby these gaps may be addressed, including reviewing key readings relevant to an understanding of the basic principles 4) Develop the ability to pose effective learning questions relevant to patient care 5) Attend and participate in formal and informal team learning sessions, educational sessions, daily reviews, and rounds

Professional

Competencies	Enabling Competencies
▪ P 1 Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards ▪ P2 Demonstrate a commitment to society by recognizing and responding to societal expectations in healthcare	1) Demonstrate personal and professional attitudes, including integrity, honesty, and compassion, consistent with developing into the consulting physician role 2) Include the patient in discussions and decisions concerning appropriate diagnostic and management procedures 3) Recognize the ethical principles that guide the practice of congenital heart disease, including principles of informed consent and specific treatments 4) Demonstrate self-awareness, including recognizing their own limitations 5) Demonstrate professional behaviors, including punctuality and reliability

To complete this, an accompanying Competency-Assessment Matrix Mapping is required to ensure quality and identify any gaps, for which a template is provided in the accompanying materials. Although competencies are presented in separate categories for educational clarity, teaching and assessment strategies should address them collectively and holistically to support integrated learning and evaluation. Additionally, each competency should include descriptors that outline the expected progression across training levels, ensuring a clear developmental trajectory from novice to mastery.

12. CONTINUUM OF LEARNING

Domain	F1–2 (Junior level)	F3 (Senior level)
Level of practice	Dependent/supervised practice	Semi-dependent/supervised practice
Knowledge	Obtain fundamental knowledge related to the specialty's core clinical problems	Apply knowledge to provide appropriate clinical care related to the specialty's core clinical problems
Clinical Skills	Apply clinical/practical skills such as physical examination and practical procedures related to the core presenting problems and procedures of the specialty	Analyze and interpret the findings from clinical skills to develop appropriate differential diagnoses and a management plan for the patient
Professionalism and Patient Safety	Demonstrate professionalism, ethical behavior, and safety within supervised settings	Apply principles of professionalism and patient safety in independent scenarios with appropriate supervision
Decision-Making	Contribute to clinical decisions under supervision	Make clinical decisions with oversight for complex scenarios
Supervision/Teaching Role	Learn from supervision and accept feedback	Begin peer teaching and provide feedback under supervision

This includes learning that should occur at each key stage of progression within the specialty. Trainees are reminded of lifelong Continuous Professional Development (CPD). Trainees should remember the necessity of CPD for every healthcare provider to fulfill the evolving demands of their vital professions. The following table outlines how each role is progressively expected to develop throughout the junior, senior, and consultant levels of practice.

13. EDUCATIONAL ACTIVITIES (TEACHING AND LEARNING STRATEGIES AND METHODS)

13.1 Teaching & Learning

13.1.1 Clinical, Academic, and Scholarly Content of the Program-

Specific Learning Activities:

The training program is a competency-based curriculum wherein the trainer and trainee will use different strategies to teach and learn various types of knowledge and skills throughout the program. Additionally, different methods may enhance teaching and learning in diverse settings to guide trainers and trainees. The program addresses the essential elements necessary for the practical preparation, implementation, and facilitation of teaching and learning, focusing on the competencies required for mastery.

Additionally, it identifies opportunities for teaching and enabling learning in daily clinical practice. Moreover, it informs students how to apply well-known learning and teaching theories from higher education and healthcare contexts to teaching practice, how to utilize a comprehensive range of teaching methods, and how to develop a reflective approach to teaching and learning that can be utilized for continued professional development. Teaching and learning are accomplished through educational activities across diverse settings and encounters. These activities could be arranged in the clinic, inpatient wards, ER, simulation lab, or academic activities in the rotation or during the weekly academic day. Other practices as part of the educational activity that may

enhance trainees' learning and professional development include implementing the mentorship program and reflective practice in the postgraduate curriculum. The choice of educational methods should:

- maintain congruence between objectives/competencies and methods,
- use multiple educational methods, and
- select educational methods that are feasible in terms of resources.

13.2 Educational Activities:

Educational Activities (EA) are part of the trainees' training program, involving teaching and learning activities to acquire specialty competencies. EA convey knowledge, skills, and attitudes/professional behavior. Thus, they should focus on holistic development, practical skills, problem-solving abilities, and personal growth. Furthermore, this work can be accomplished within a broader scope to assist learning and growth across multiple cognitive, social, emotional, and physical domains. These activities may include experiential learning, group projects, skill-building exercises, or mentorship programs. These activities can occur within both formal and informal educational settings.

The educational framework for residency/fellowship/diploma training programs in **congenital cardiac surgery** is grounded in adult-learning theory's principles. Trainees are expected to recognize the significance of their learning journey and assume an active role in both the content and process of their education and learning. Training programs implement the adult-learning concept across most EA, placing the responsibility for meeting learning requirements on the trainees themselves.



Through various EA, the **congenital cardiac surgery** program aims to fulfill the competencies outlined in the curriculum. The program is designed to develop both cognitive and technical skills while fostering an understanding of their application within the context of **congenital cardiac surgery**. Furthermore, the training encompasses practical procedures and interpretative techniques delivered in a sequential and integrated manner through lectures, tutorials, seminars, and hands-on apprenticeships.

EA play a vital role in health training programs by equipping health professionals with essential knowledge, values, and skills. Additionally, EA facilitate the dissemination of knowledge, encourage healthy practices, and enhance health professionals' competencies, ultimately contributing to improved overall well-being and safety.

Program administration should actively support EA by ensuring that protected time is allocated for trainees to attend and participate. Trainees should be encouraged to meaningfully engage in these educational and scholarly activities as part of their professional development. The program's EA will encompass the following themes, as illustrated in Figure 1:

1. Academic Activity
2. Practical-Based Learning
3. Skills Training and Procedures
4. Scholarly Projects
5. Professional and Personal Development

13.2.1 General Principles

- Teaching should contain both:
 - a) a structured-programmatic component
 - b) a practice-based component.
- Efforts should be directed to move trainees toward greater responsibility for self-directed learning.
- **Academic Half Day Every 4 weeks:** At least 3 to 4 hours of formal training time (commonly referred to as an academic half day) should be reserved. A formal teaching time is an activity that is planned in advance with an assigned tutor, time slot, and venue. Formal teaching time excludes bedside teaching, clinic postings, and other similar activities.
- Formal training time would include the following three formal teaching activities:
 - a) Universal topics: 10–20% (See Table 4: Universal Topics for The Congenital Cardiac Surgery Program).
 - b) Core specialty topics: 70% (See [*Appendix B*](#): Academic Half-day topics)
 - c) Trainee-selected topics: 10–20%. These points of interest are outside the scope of routine teaching for some fellows, but they may hold significant public or institutional interest. These topics are changeable based on the fellow's interests.
- Formal training time should be supplemented by other practice-based learning (PBL), such as:
 - a) Morning report or case presentations
 - b) Morbidity and mortality reviews
 - c) Journal clubs
 - d) Grand rounds



- e) Continuous professional development activities (CPD) relevant to the specialty
- **Performance review every 4 weeks:** trainees should allocate at least 1 hour to meet with their mentors to review performance reports (e.g., ITER, e-portfolio, Mini-CEX).
 - The fellowship-training committee, program directors, and chief fellow, in coordination with academic and training affairs and regional supervisory committees, should work together to ensure the planning and implementation of academic activities as indicated in the curriculum. This should aim for the efficient use of available resources and the optimal exchange of expertise.

The following educational activity map outlines the main themes, sub-themes, and educational methods.

For each selected theme and sub-theme, a description is provided in the resource document “Educational Activities,” which outlines these activities’ definitions and context. Additionally, a comprehensive overview of the methodologies selected for each rotation should be included in this document, detailing their frequency, setting, and anticipated contributions from trainees.

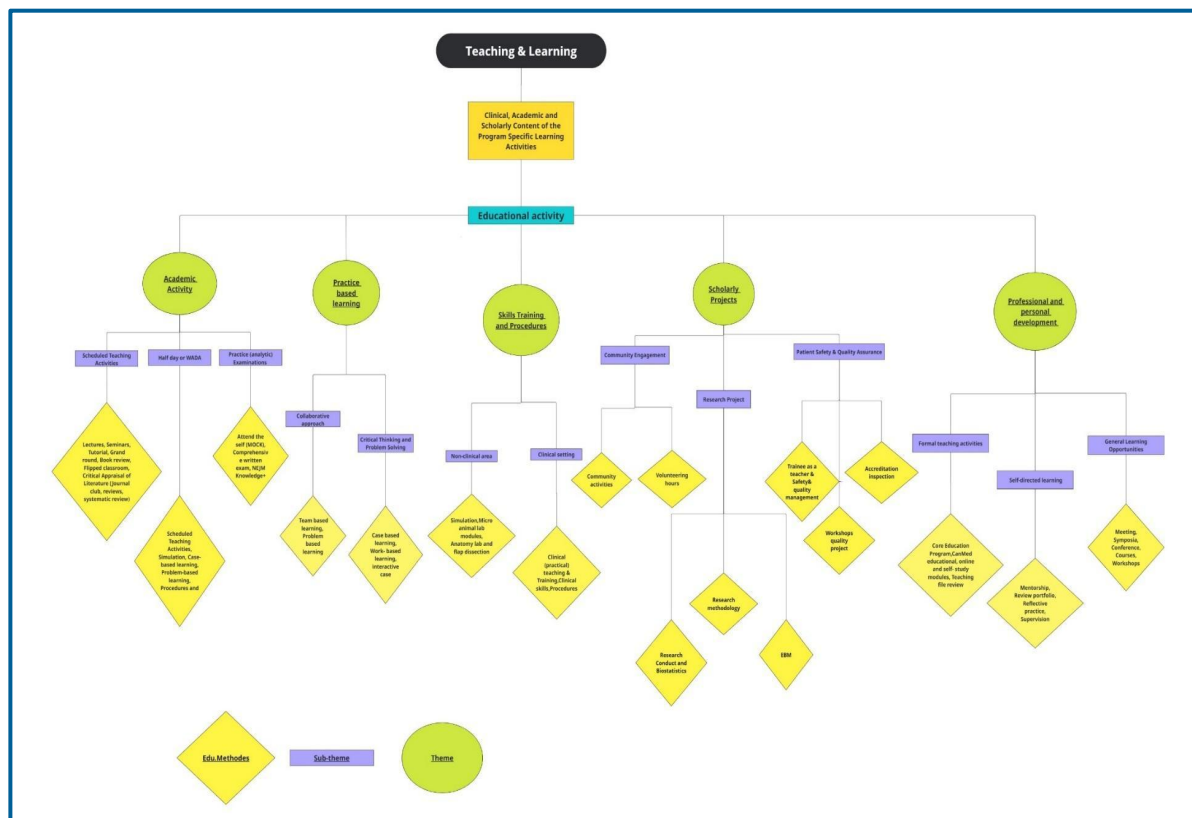


Figure 1: Teaching and learning academic activity map

13.2.2 Universal Topics

Universal topics are EA developed by the SCFHS and intended for all specialties. Priority is given to topics related to these qualities.

- High value
- Interdisciplinary and integrated
- Expertise that is potentially beyond the availability of the local clinical training sites

The SCFHS has developed universal topics that are available through e-learning via personalized access for each trainee (to access the online modules). Each universal topic has a self-assessment at the end of the module. Universal topics will be distributed throughout the training period.

Universal Topics distributed over training years:

Table 4: Universal Topics for the Congenital Cardiac Surgery Program

Training year	Modules		Topics name	
	Number	Name	Number	Name
F1	Module-1	Introduction	Topic-2	Hospital acquired infections
	Module-1	Introduction	Topic-3	Sepsis and Systematic Inflammatory response
	Module-1	Introduction	Topic-4	Antibiotic stewardship
	Module-1	Introduction	Topic-5	Blood transfusion
	Module-3	Diabetes and Metabolic Disorders	Topic-13	Comorbidities of obesity
F2	Module-5	Acute Care	Topic-21	Pre-operative assessment
	Module-5	Acute Care	Topic-22	Post-operative care
	Module-7	Ethics and Healthcare	Topic-34	Ethical issues: transplantation/organ harvesting; withdrawal of care
	Module-7	Ethics and Healthcare	Topic-35	Ethical issues: treatment refusal; patient autonomy
	Module-7	Ethics and Healthcare	Topic-36	Role of doctors in death and dying
PLEASE NOTE: If the fellow has taken any of the topics during their residency, they can be exempted from that topic provided they submit a certificate of completion/attendance.				



13.3 Core Specialty Topics:

Congenital cardiac surgery encompasses a broad range of specialized knowledge and technical expertise aimed at diagnosing and surgically managing structural heart defects present from birth. Core specialty topics include a detailed understanding of cardiac embryology, anatomy, and physiology, as well as the pathophysiology of common and complex congenital heart lesions such as septal defects, outflow tract obstructions, transposition of the great arteries, and single-ventricle physiology. Training also covers surgical techniques for neonatal, infant, and pediatric repairs, reoperations, and palliative procedures, in addition to the management of congenital heart disease in adults (ACHD). Mastery of cardiopulmonary bypass principles, myocardial protection strategies, and perioperative care—including hemodynamic monitoring, ventilation, and postoperative management in specialized cardiac intensive care units—is essential. Furthermore, trainees are expected to develop competence in preoperative imaging interpretation, multidisciplinary team coordination, and long-term patient follow-up after repair or palliation of congenital heart conditions. Together, these core topics form the foundation for safe, effective, and evidence-based practice in congenital cardiac surgery. For the detailed list of topics, please refer to [Appendix B \(Academic Half-Day Topics\)](#).

13.4 Simulation:

As a national supervising body, the SCFHS initiated a move toward integrating simulations into residency training programs.

Medical simulations involve creating artificial clinical scenarios through which trainees can learn. This process has educational advantages, such as the opportunity to practice rare and/or high-risk clinical scenarios and procedures in a controlled, standardized environment with immediate, effective feedback that significantly affects knowledge, skills, and attitude. (1,2,3,4)

The scenarios for the simulation must be as close to real clinical situations as possible, including team members, equipment, and environment, followed by timely and effective feedback. According to McGaghie et al., effective feedback has three key components: planning, debriefing, and feedback provision. (5,6)

The use of simulations in postgraduate training programs is currently necessary, especially in competency-based curricula. Current programs aim to graduate skilled, competent, and independent physicians while maintaining the focus on quality and patient safety. Practically, a high level of variability may exist in using simulations to implement competency-based curricula, and the specialty's nature is likely to play another role in increasing this variability. Establishing standardized needs assessment methods for simulation may pose a challenge to any national organizational body dealing with various ongoing postgraduate training programs.

Simulation has emerged as an essential component in the education and skill development of congenital cardiac surgeons. Given the complexity, rarity, and diversity of congenital heart defects, exposure to a comprehensive range of pathologies during traditional surgical training is often limited. Simulation provides a controlled, reproducible, and risk-free environment that allows trainees to practice and refine both technical and non-technical skills essential for pediatric and congenital cardiac surgery (Austin et al., 2019; Najm, 2021).



High-fidelity cardiac simulators, 3D-printed heart models, and virtual or augmented reality platforms have significantly advanced the realism of simulated procedures. These technologies allow trainees to rehearse intricate surgical repairs—such as arterial switch operations, ventricular septal defect closures, and Norwood procedures—on patient-specific models derived from imaging data (Luo et al., 2016; Costello et al., 2014). This not only enhances spatial understanding of complex cardiac anatomy but also improves hand–eye coordination, dexterity, and procedural planning.

Beyond technical skill acquisition, simulation plays a crucial role in developing team communication, leadership, and crisis management skills through scenario-based training. Multidisciplinary team simulations involving surgeons, anesthesiologists, perfusionists, and nursing staff can recreate high-stakes intraoperative situations, promoting effective decision-making and situational awareness (Kirkpatrick et al., 2020; O’Byrne et al., 2018).

Moreover, simulation-based assessments offer objective means to evaluate surgical proficiency, allowing trainers to track progression, identify skill gaps, and deliver targeted feedback (Cohen et al., 2017). As the field moves toward competency-based education, simulation provides a structured and ethical pathway to ensure that trainees achieve the required level of competence before performing complex procedures on patients (Najm, 2021).

Simulation serves as a bridge between theoretical knowledge and operative experience in congenital cardiac surgery. Its integration into training curricula enhances both the safety of patient care and the preparedness of the next generation of congenital heart surgeons.

Incorporating structured simulation-based training into the SCFHS congenital cardiac surgery fellowship program represents a vital step toward enhancing surgical education, patient safety, and competency-based assessment. Simulation offers a reproducible, risk-free environment for fellows to acquire and refine complex technical skills, improve decision-making, and develop effective teamwork in managing congenital cardiac cases.

Integrating high-fidelity simulation, 3D-printed cardiac models, and team-based crisis management scenarios within the SCFHS training framework will bridge the gap between theoretical knowledge and operative experience. This approach aligns with international best practices and supports the SCFHS vision of developing highly skilled, competent, and confident cardiac surgeons capable of delivering world-class care to pediatric and congenital heart patients across the Kingdom.

Simulation-based milestones and objective assessment tools can further strengthen the evaluation process, ensuring that trainees achieve measurable proficiency before advancing to independent practice. By embedding simulation into the curriculum, the SCFHS can foster a culture of continuous learning, innovation, and excellence in congenital cardiac surgery training.



References

- ◆ Austin, E. H., Edmonds, L. H., & Jacobs, J. P. (2019). Simulation in congenital heart surgery training: A paradigm shift toward competency-based education. *World Journal for Pediatric and Congenital Heart Surgery*, 10(5), 573–580.
- ◆ Cohen, R. G., Deutsch, E. S., & Nudelman, B. (2017). Simulation-based assessment and training in pediatric and congenital cardiac surgery. *Seminars in Thoracic and Cardiovascular Surgery*, 29(4), 486–493.
- ◆ Costello, J. P., Olivieri, L. J., Su, L., Krieger, A., & Kim, P. C. W. (2014). Incorporating three-dimensional printing into a simulation-based congenital heart surgery training curriculum. *The Annals of Thoracic Surgery*, 98(2), 691–697.
- ◆ Kirkpatrick, J. N., Zeger, S. L., & Baez, J. A. (2020). Team-based simulation to improve crisis management in congenital cardiac surgery. *Journal of Thoracic and Cardiovascular Surgery*, 160(5), 1320–1328.
- ◆ Luo, H., Wu, W., Zhou, Y., & Li, C. (2016). Three-dimensional printing and simulation in congenital heart surgery: Current applications and future directions. *Interactive CardioVascular and Thoracic Surgery*, 22(5), 534–540.
- ◆ Najm, H. K. (2021). Simulation in congenital cardiac surgery training: Present and future perspectives. *Frontiers in Pediatrics*, 9, 670541.
- ◆ O'Byrne, M. L., Glatz, A. C., & Fogel, M. A. (2018). Simulation and team training in congenital cardiac care. *Progress in Pediatric Cardiology*, 49, 93–99.

14. ASSESSMENT AND EVALUATION

14.1 Purpose of Assessment

Assessment plays a vital role in the success of postgraduate training. Assessment guides trainees and trainers to achieve defined standards, learning outcomes, and competencies. Simultaneously, assessment provides feedback to learners and faculty regarding curriculum development and implementation, teaching methods, and the learning environment's quality. A reliable and valid assessment is essential for examining curriculum alignment with respect to its objectives, learning methods, and assessment tools. Finally, the assessment assures patients and the public that health professionals are safe and competent to practice.

Assessment serves the following purposes:

- a. **Assessment for learning:** also known as formative assessment; trainers utilize information from trainees' performances to diagnose their learning needs and tailor instructions for improvement. This enables faculty and educators to use information regarding trainees' knowledge, understanding, and skills to deliver timely, specific, and constructive feedback. Additionally, it fosters the development of trainees' metacognitive and practical skills, encourages reflection and self-regulated learning, and ultimately helps them become lifelong learners.



- b. **Assessment of learning:** also referred to as summative assessment; this approach is designed to evaluate whether trainees have achieved their intended learning outcomes. It is typically scored and contributes to high-stakes decisions, including progression, certification, or completion of training.
- c. **System of assessment:** Also known as Program of Assessment; it represents the relationship among multiple assessment methods collated together, where formative and summative assessments are integrated, complementary, and aligned throughout the specialty training program. It is blueprinted (mapped) against the curriculum roles, competencies, and outcomes. This overall system blueprint, which differs from the exam blueprint, articulates how diverse assessment tools collectively provide evidence of competence. It may include varying levels of detail according to its purpose and is also known as “assessment mapping.” This mapping outlines the competencies to be assessed by all types of assessment methods to build a comprehensive, balanced, and fit-for-purpose assessment strategy and helps identify areas wherein assessment is lacking or needs strengthening.
- d. **Feedback and evaluation** as assessment outcomes represent quality metrics that enhance the learning experience. Moreover, they can be utilized for training progression and determining the suitability of undertaking different levels of summative assessment. High-quality feedback should be specific, actionable, and longitudinal and should promote self-assessment. Narrative and meaningful feedback on trainees’ performance in work-based assessment and evaluation forms should inform structured action plans, support deliberate practice, and facilitate trainee improvement and progression.

For the sake of organization, assessment will be further classified into two main categories: *formative* and *summative*.

14.2 Formative Assessment

14.2.1 General Principles

Formative assessment should be integrated into the curriculum design, grounded in best practices and evidence-based approaches, and aligned with the stated competencies and appropriate tools.

14.2.1.1 Purpose of formative assessment:

Formative assessment aims to actively support trainees' growth by guiding learning, verifying progression, and ensuring that they acquire the competencies essential for high-quality professional practice across all health disciplines.

- Enhance learning by offering trainees opportunities to practice, receive immediate feedback, measure their performance, and identify areas for further development and improvement.
- Drive learning and optimize the training process by clarifying expectations for trainees and motivating them to actively pursue suitable training and experiences.
- Provide robust and comprehensive evidence that trainees are progressing toward fulfilling curriculum standards throughout the training program.
- Ensure that trainees are acquiring the required competencies across all domains of effective healthcare practice.
- Verify that trainees possess the essential foundational knowledge, skills, and professional attitudes required for their specialty.
- Confirm that trainees are advancing appropriately in their performance relative to their training stage.



Trainees, as adult learners, should actively seek feedback and use it to develop their performance throughout their journey from “novice” to “mastery” levels of competence. Formative assessment (also referred to as continuous or ongoing assessment) is a component of assessment deliberately distributed across the academic year to provide trainees with timely, meaningful, and actionable feedback that drives learning and improvement.

A specified time should be allocated for trainees to meet with their program director or equivalent to review performance reports and logs (e.g., ITER, logbook, workplace-based assessment tools). Trainees are expected to assume ownership of their development through self-directed learning. The input from the overall formative assessment tools is integrated at the end of the year to inform decisions about whether individual trainees will advance to the next training level. The formative assessment instruments will be periodically reviewed and updated as needed to ensure alignment with SCFHS guidelines and standards.

Consistent with the best practices in health professions education, formative assessment will have the following features, tailored to the targeted competencies:

- a. Multisource: select all appropriate tools, including relevant workplace-based assessments, according to competency, training level, and rotation.
- b. Comprehensive: covering all learning domains (i.e., knowledge, skills, and attitude—professional behavior).
- c. Relevant: focused on workplace-based observations for performance in authentic practice settings.
- d. Milestone-oriented competency: reflecting the trainee’s expected competencies that match their developmental level.

14.3 Formative Assessment Tools

- This section:
 - Complies with SCFHS executive policy on continuous assessment (available online at www.scfhs.org)
 - Lists the formative assessment tools that are approved by the scientific council/committee of the program
 - Is outlined based on the learning domain (knowledge, skills, and attitude)
 - Describes relevant information: aim, expectation, and frequency
 - Provides a comprehensive assessment that can be applied to borderline failure
 - For more details relevant to the congenital cardiac surgery program, please refer to Table 5: Congenital Cardiac Surgery Formative Assessment (2025)

Indicator	Minimum for promotion	Domain	Sub-Domain	F1	F2	F3
Attendance of Academic Activity	>70%	Knowledge	Academic Activity	X	X	X
BLS and PALS Active Certification	Yes	Knowledge	Academic Activity	X	X	X
Topic Presentation	3/year	Knowledge	Academic Activity	X	X	X
Logbook Completion	> 50%	Skills	DOPS	X	X	X
ITER/FITER	> 50%	Attitude	Attitude	X	X	X

14.3.1 Work-based Assessment:

Work-based assessment (WBA) is occasionally used interchangeably with workplace-based assessment (WPBA), which refers to the direct observational assessment of a trainee in a real work environment. Recently, it has also been referred to as a supervised learning event (SLE).

WBA is among the most recognized and widely utilized approaches for enhancing learning through formative assessment and feedback.

Numerous WBA tools assess a range of competencies, including communication and consultation skills, clinical decision-making and reasoning, and management of patients in contexts wherein diagnostic uncertainty, resource constraints, and public health considerations may exist. Moreover, WBA tools facilitate the assessment of more complex domains, including professionalism,

procedural skills, and ethical and legal aspects inherent to clinical practice, which may not be adequately evaluated using traditional assessment methods.

14.3.1.1. Logbook:

This is based on the skills learning domain. The required numbers should be reviewed and revised during each cycle of the Scientific Council terms.

Each fellow should maintain a complete, accurate, and timely procedure logbook throughout the program. Any format will be acceptable until the One45 online logbook is endorsed by the scientific council, when it will become the only acceptable format. The number of required cases as well as the index cases are listed in the Table 3 with complete stratification by the fellow level. F4 denotes any extra time needed to compensate or repeat any part to fulfill the curriculum requirements. Index cases are the following with minimum number required as a level 3 or 4 (*See Table 3: Surgical Skills Milestone Documentation (SSMD) statements and guide to recommendation of appropriate supervision*) to be able to graduate:

- Atrial septal defect closure (including PAPVD, minimum 5)
- Ventricular septal defect repairs (minimum 5)
- Atrioventricular septal defect repairs (minimum 5)
- Tetralogy of Fallot repairs (minimum 3)
- Aortic arch reconstruction (including coarctation) procedures (minimum 3)
- Systemic-to-pulmonary artery shunt procedures (minimum 3)
- Bidirectional Glenn/Hemi-Fontan and/or Fontan procedures (any combination to a total of a minimum 5)
- Re-operative procedures (includes adult congenital reoperation, minimum 5)
- Arterial switch procedure (minimum 2)
- RV to PA conduit (minimum 4)

Aim: to capture the surgical experience of the trainee throughout the program with particular emphasis on the index case delineated above (See table 3).

Expectation: the fellow should strive to attain more than what is listed, and can be given supportive consideration down to 75% of these numbers with a strong recommendation of the program director and support of at least two other senior cardiac surgery consultants. Anything below that will need support from the majority of the scientific council with specific recommendations to attain lacking skills (such as in the case of the COVID-19 pandemic).

Frequency: it is recommended that the fellow files their report on a daily basis, and it be released by the program director not more than 1 week later on the One45 web page.

14.3.1.2 ITER and FITER: In-training evaluation and final report

The supervisor should draft the ITER at the midpoint of the clinical rotations by correlating the fellow's clinical excellence with good professional behavior and using it for giving meaningful feedback to the fellow, which is then finalized by the end of the rotation.

- ITERs should be conducted with each clinical rotation.
- ITERs are submitted to the local supervisory or academic affairs committee for each trainee based on the expected accomplishments during the clinical rotation; at least three ITERs should be used for promotion purposes. Similarly, the FITER will be used for the purpose of testifying to the qualification of the trainee to sit for the final exams.

Aim: This is based on the attitude domain.

These are assessment forms based on the direct interaction of the trainees with the faculty and the program director. These well-designed forms cover all aspects of a qualifying competency evaluation. Therefore, great attention and

emphasis on the program director is needed to fulfill this very important responsibility.

Expectation: Each trainee is expected to score very high in this tool, as a general rule. The SCFHS grading will apply when considering promotion or obtaining a certificate of completion of the training requirements.

Frequency: This will depend on the number of rotations performed each year, but a minimum of three ITER evaluations will need to be considered in the scientific council.

14.3.1.3 Structured academic activities; monthly academic day activities

This is based on the knowledge learning domain.

This component of formative assessment aims to evaluate the fellow's capacity to actively participate, to demonstrate understanding, and to deliver the learning contents of the academic day activities.

Aim: To acquire and demonstrate basic science and clinical knowledge appropriately related to the practice of congenital cardiac surgery, including:

- Applied anatomy
- Physiology and pathophysiology
- Pharmacology of common and pertinent drugs
- Pathology and sequelae
- Various diagnostic and interventional imaging methods
- Technical knowledge for surgical procedures (preparations, incisions, materials, and instruments)
- Post-operative course and potential complications

Expectation: Each fellow should attend at least 75% of these activities and will be assessed through immediate feedback in the same sessions.

Frequency: This activity takes place throughout the year as a fellow-based activity during the half day of academic enrichment as dictated by the SCFHS.

14.3.1.4 Case-based discussion (CBD) (case presentation and discussion)

This is based on the knowledge learning domain.

Details related to timing and venue or telecommunication tools that will be implemented will be announced early in each training year by the scientific council.

The standard presentation structure has four parts:

1. Clinical case scenario, with one major complication.
2. Topic review.
3. Demonstration of a depth of knowledge and its contribution (for example, stating any controversy about the topic, together with the evidence from current literature). Aims include teaching the trainees how to present their point of view and accept conflicting points of view in a respectful manner.
4. Jury discussions: evaluation and feedback per SCFHS policy. For each trainee it will happen at least once per year.

14.3.1.5 DOPS: Direct observation for procedural skills

- Definition:

Direct observation in cardiac surgery trainees' formative assessment refers to observation, assessment, immediate feedback, early debriefing, and documentation of actions taken by both teachers and learners during cardiac operations in real time. The critical factor that distinguishes direct observation from other forms of assessment is that the learner is observed performing authentic actions that occur naturally as part of routine operative experience.

- Description

Assessed actions are focused mainly on the technical skills, but can be expanded to any of the CanMEDS roles and can involve interactions with patients, their relatives, hospital staff, colleagues, students, or supervisors. Although any of these individuals could contribute to a learner's assessment (multisource feedback), direct observation generally implies the observations of an expert (usually the program director) in a strictly authentic formal arrangement as the learner is asked to perform a specific part of the surgical procedure and would be assessed both instantaneously and later by means of a standardized rating form. Ideally, learners would be provided with an early debriefing session to shape their learning.

- Advantages

1. Enables assessment of real-time performance of some aspects of CanMEDS roles
2. Provides opportunities to assess important but infrequent actions
3. Enables assessment of technical skills that cannot be measured in examinations or logbook tracking
4. Highly useful as formative (learning) assessment, as immediate feedback is usually possible
5. Assessments by experts in the field with a variety of perspectives
6. Extreme (good or bad) behaviors in any of the CanMEDS roles can easily be identified, with important educational consequences
7. Proven high value and validity

- Success requisites:

1. Need time to train observers to maturity to perfect a standardized structured assessment to maintain validity and reliability
2. The situations observed may be extremely variable, so the resulting behaviors are highly varied

3. Need timely, labor-intensive, deliberate feedback, documentation, and debriefings
 4. May have limited ability to assess other non-technical skills
- Key points: Direct observation is one of many methods that assess actual behavior in the reality of clinical practice. Direct observation provides good conditions for formative evaluation (immediate feedback). Appropriate training of assessors is essential for the effective and reliable use of assessment tools that rely on direct observation of trainee performance.. Although most input is based on unstandardized assessment, the many occasions for observation can cumulatively achieve reasonable validity and reliability.
 - Aim:
 1. DOPS: a universal tool used to assess the trainee's performance in the required essential and advanced clinical skills; the tool can be applied to assessing trainee skills in real or simulated situations.
 2. To ensure successful application of the tool, the following rules must be implemented in the program: The scientific council must encourage the use of a standardized form to map the required skills and generate opportunities for trainees to be trained and evaluated for the required skills. Use of simulation is encouraged to limit the patients' inconvenience and potential harm, as long as the simulation techniques are acceptable.
 3. To complete the process, the trainee should evaluate the assessment session and reflect on its findings.
 - Expectation:

Each trainee subjected to DOPS should expect immediate feedback and appropriate debriefing.

- Frequency:

This activity takes place throughout the year. Each trainee should be subject to DOPS at least once per academic year.

14.3.2 Educational Activities (Non-WBA Assessment)

EA are part of the trainees' training program, which involves teaching and learning activities to acquire specialty competencies. Examples of contributions to EA can be, but are not limited to, presenting in journal clubs, lectures, morbidity and mortality rounds, grand rounds, and research and scholarly activities.

All formative assessment tools used for formative assessment purposes **MUST** abide by the **Scoring Categories and Scaling Definitions** in the SCFHS policies.

Does not Meet Expectation	Borderline	Meets Expectation	Exceeds Expectation
(<50%)	(50–69.99%)	(>70–89.99%)	(>90%)

To attain the optimum training-level outcome, the candidate must complete the compulsory requisition of all selected formative assessment tools.

Congenital Cardiac Surgery

Formative Assessment (2025)

Table 5: Congenital Cardiac Surgery Formative Assessment (2025)

Gen./Sub.	Level	Knowledge				Skills							Attitude
		SOE	Academic Activities	CBD	EYPT- Local	OSCE/OSPE	Research	DOPS	Logbook	Volunteering	Other	Mini -CEX	ITERS
Congenital Cardiac Surgery	F1		✓	✓	✓		✓		✓	*		✓	✓
	F2	✓	✓	✓	✓	✓	✓		✓	*		✓	✓
	F3	✓	✓	✓		✓	✓		✓			✓	✓

SOE: Structured Oral Exam

EYPT-Local: End of Year Practical Test (Including MCQs and Quizzes)

DOPS: Direct observation of procedural skills

OSCE: Objective Structured Clinical Examination

CBD: Case-based Discussion

OSPE: Objective Structured Practical Examination

Mini-CEX: Mini-Clinical Evaluation Exercise

ITER: In-Training Evaluation Report

** Volunteering is optional, but highly encouraged for gaining experience and exposure to basic pathologies and help with fulfilling the logbook. For more details, please refer to Appendix E (Volunteering, Charity, and Humanitarian Activity).*

Description Table of Formative Assessment Tools

Learning Domains	Assessment/Educational Activity Tool	Requirements (Important Details, Description, and Total Frequency of The Tool/Academic Year)
Knowledge	Academic Activities	F1–F3: Trainees are required to attend the weekly academic half day (13 academic half-day activities) during the academic activity sessions as per the curriculum. Trainees must attend the academic activities as scheduled. Any excused absence must be approved by the program director. (Detailed topics can be found in Appendix B.)
	EYPT-Local	Trainees are required to take a written progress test twice/academic year, comprising a minimum of 100 MCQs.
	CBD	(F1–F3): Trainees are required to complete a minimum of 22 CBD per academic year (minimum of twice/month) with at least seven satisfactory CBD.
Skills	Research	(F1–F3): Trainees are required to conduct one research project during their training. The research project is conducted over the 3 years of training as follows: First year (F1): - Planning: Engage in critical thinking around clinical questions and reviewing the literature and available resources. - Finalize the hypothesis for the research project and the research methodology. - Write the proposal and obtain approval. Second year (F2):



Learning Domains	Assessment/Educational Activity Tool	Requirements (Important Details, Description, and Total Frequency of The Tool/Academic Year)
		- Start working on the research project; collect the data and present it at meetings. Third year (F3): - Complete the study. - Analyze the data. - Complete writing and provide evidence of submission to a journal at least 3 months before the exams. - Presentations/publications.
	Logbook	(F1-F3): Trainees are required to complete a logbook during the training program. The fellow should register for a minimum of 80 cases per academic year while in training; that is, the minimum total number of cases required during the 3 years of training is 223 cases. A total of 223 cases obtained during the 3-year fellowship-training period should be distributed as per the attached logbook template with clear Technical Skills – Levels of Supervision. In addition to the numerical requirement, logbooks will be evaluated for overall case diversity, complexity of case experience, and distribution of diagnoses within each category. The logbook should be discussed with the program director every 6 months. Trainees are required to complete all logbook requirements in the electronic system. (Additional details for log cases are provided in Appendix C (Logbook Requirements)).
	Mini-CEX	(F1–F3): Trainees are required to complete a minimum of nine Mini-CEX per academic year (minimum of 1 every 6 weeks, a total of 27) with at least 50% of cases having satisfactory assessment.
Attitude	ITER	(F1–F3): All ITERs must be completed. ITERs are used as the end-of-rotation evaluation following SCFHS policies and criteria for ITERs.

14.3.3 Educational Activities (Academic Half Day):

- a) Case presentation (F1–F3): Trainees are required to give at least four presentations per academic year. *Results from these case presentations are for formative feedback purposes.*
- b) Topic special assignments/ journal club (F1–F3):
- Trainees are required to present four (4) topic assignments/journal club (topics related to the specialty modules in the curriculum, e.g., articles and topic presentations) as assigned by the program director/trainer.
 - Results on the topic assignment are intended for formative feedback.
 - Feedback should be provided for trainees' performance on case presentations and topic assignments.
- c) Quizzes (F1–F2): Trainees are required to complete two formal quizzes at 10 and 20 months of training to assess their progress and prepare for the First Part exam.

Important Notes:

All formative and work-based assessments should be performed following the SCFHS definitions and methodologies. Failure to comply with these parameters will result in trainees facing disciplinary actions as outlined in the SCFHS bylaws.

Please see the following for more details:

- Appendix A: Competency-Assessment Mapping: to map Competencies, Educational Activities, and Formative and Summative Assessments (Systems of Assessment)
- Appendix B (Academic Half-Day Topics)



- Appendix E (provide detailed appendices for selected educational activities, e.g., Universal Topics, Simulation, etc.)

14.3.4 Evaluation:

Trainees should actively seek feedback throughout their training, while trainers are expected to provide timely formative assessment. The SCFHS will provide an electronic system to facilitate the communication and analysis of data from formative assessment. Both trainers and trainees are expected to adhere to the requirements related to the use of assessments and EA, including specified forms, frequencies, distributions, and deadlines for implementing the evaluation processes. To attain the optimum training-level outcome, trainees must complete all training requirements.

Trainees will be evaluated based on their program's specific requirements, which include EA and assessment tools such as formative assessments and WBA. Each assessment will be documented using standardized forms and reflected in evaluation reports that capture feedback, track improvements, and demonstrate progression. Trainees are expected to fully comply with their program's requirements and activities; failure to do so may result in disciplinary action.

14.3.5 Promotion of the Trainee:

Trainee promotion from one level to the next will be determined in accordance with SCFHS regulations and applicable bylaws. Promotion is based on satisfactory overall performance and successful completion of all required curricular assessments, end-of-year assessments, evaluation forms, specialty-specific requirements, and any applicable remediation or action plans.

In addition, progression from the junior to the senior level requires trainees to undertake and successfully pass both the written and clinical components of the Promotion Specialty Examination. Passing this examination is mandatory for promotion but does not replace the other training and assessment requirements.

Failure to satisfy these requirements may result in repeating all or part of the academic year or other actions in accordance with SCFHS regulations and applicable bylaws.

- Promotion from F1 to F2:
 - To be promoted from F1 to F2, the trainee must satisfactorily complete at least 70% of the first-year requirements, including:
 - In-Training Evaluation Reports (ITERS)
 - Academic activities
 - Direct Observation of Procedural Skills (DOPS)
 - Mini-Clinical Evaluation Exercises (Mini-CEX)
 - Other prescribed curricular and assessment requirements
- Promotion from F2 to F3:
 - To be promoted from F2 to F3, the trainee must:



- Satisfactorily complete at least 70% of the second-year requirements, including ITERs, academic activities, DOPS, Mini-CEX, and other prescribed curricular and assessment requirements; and
 - Undertake and successfully pass both the written and clinical components of the Promotion Specialty Examination. This examination will be conducted during the middle of the second fellowship year. Further details are provided in Section 14.3.6. Promotion Specialty Examination.
- Passing the First Part (Promotion) Specialty Examination is mandatory for progression from the junior to the senior level but does not replace the other promotion requirements.

14.3.6 Promotion Examination

The promotion examination serves as a summative assessment component that ensures the trainees' readiness to progress from the "junior" to the "senior" level of training. All trainees must undertake the exam. It comprises the following two elements:

- a) Promotion written examination: Around 100 MCQs will be prepared.
- b) Promotion clinical examination:
 - i. Six (6) clinical stations will be prepared, comprising one Objective Structured Clinical Examination (OSCE) station and five Structured Oral Examination (SOE) stations.
 - ii. The candidate must achieve a score of at least 65% in each station.

- c) Overall Passing Standard: To be eligible for promotion from the junior to the senior level of training, the candidate must achieve a combined overall score of at least 65% across the written and clinical examinations.
- d) The written and clinical examinations shall each contribute 50% to the combined overall score.

Tables 6-A and 6-B present the blueprints for the promotion written and clinical examinations. These blueprints provide a general framework and may be reviewed and amended by the relevant subspecialty scientific council, in coordination with the curriculum and examination committees, as applicable. Any approved changes or amendments will be formally announced through the appropriate official channels.

Table 6-A: Congenital Cardiac Surgery Promotion Written Exam Blueprint

No.	Sections	Percentage
1	Cardiac Embryology & Congenital Cardiac Anatomy	13%
2	Congenital Cardiac Physiology & Pathology	12%
3	Congenital Echocardiography	10%
4	Congenital Cardiac Imaging	10%
5	Congenital Cardiac Catheterization	10%
6	Congenital Cardiac Electrophysiology	5%
7	Congenital Cardiac Critical Care	15%
8	Congenital Cardiac Surgery	25%
Total		100%

Table 6-B: Congenital Cardiac Surgery Promotion Clinical Exam Blueprint

Congenital CVS Fellowship Clinical Exam – First Part			
Station	Type	Time	Section
1	OSCE / SOE	15-20 min	Aortic pathology (e.g.: PDA, Vascular Rings, Coarctation of the Aorta)
2	OSCE / SOE	15-20 min	Congenital Valvular Pathologies
3	OSCE / SOE	15-20 min	Pulmonary Venous pathologies (e.g.: TAPVD, PAPVD, Cor Termitarium)
4	OSCE / SOE	15-20 min	ASD, VSD, and AVSD
5	OSCE / SOE	15-20 min	RVOTO (e.g.: Sub, Valvular, and Supra including TOF and PA with or without VSD)
6	OSCE / SOE	15-20 min	Coronary Artery Anomalies, Cardiac Tumors, and Diseases of the Pericardium
Note: All stations can have any of these pathologies included: Cardiac Embryology, Congenital Cardiac Anatomy and Physiology, Congenital Cardiac Peri-operative Care (Including ICU), Congenital CPB and Anesthesia, PDA, ASD, VSD, and AVSD, Surgical or Transcatheter Management of Arrhythmias, Mechanical Circulatory Support and Transplant.			

For additional details on the final examinations, please refer to the General Bylaws of Training in Postgraduate Programs and General Assessment Bylaws (available online: www.scfhs.org).

14.4 Summative Assessment

14.4.1 General Principles

Summative assessment is the assessment component primarily designed to make informed decisions regarding trainees' competence and readiness to progress or enter independent practice. Unlike formative assessment, it does not principally aim to provide constructive feedback but rather to judge whether the required standards have been fulfilled. For additional details, please refer to the General Bylaws and Executive Policy of Assessment (available online at www.scfhs.org).

To be eligible to sit for final examinations, trainees will be issued a "Certification of Training-Completion" upon their successful completion of all training rotations in accordance with the SCFHS regulations.

14.4.2 Final In-Training Evaluation Report (FITER)

FITER is a comprehensive final evaluation required at the end of training to determine a trainee's readiness for independent practice. Its format and content are governed by the SCFHS regulations and may evolve over time. Submission of the FITER is part of the process for certification eligibility, in accordance with SCFHS requirements.

14.4.3 Certification of Training-Completion

The Certification of Training-Completion and trainees' eligibility for final examinations are governed by SCFHS regulations and policies. Trainees must fulfil all the requirements outlined by the SCFHS and their training program, including the successful completion of rotations, assessments, and any additional mandated components (please refer to www.scfhs.org). This



certification will be issued and approved by the supervisory committee or its equivalent, according to SCFHS policies.

14.4.4 Final Specialty Examinations

The Final Specialty Examination is a summative assessment designed to determine trainees' eligibility for certification in Congenital Cardiac Surgery. It comprises the following two components:

- a) Final Written Examination: To be eligible to undertake the written examination, the trainee must obtain a Certificate of Training Completion. The examination will consist of approximately 100 multiple-choice questions (MCQs).
 - i. The candidate must achieve a score of at least 70% to be eligible to undertake the Final Clinical Examination.
- b) Final Clinical Examination: To be eligible to undertake the clinical examination, the candidate must successfully complete the Final Written Examination.
 - i. Six (6) clinical stations will be prepared, comprising one Objective Structured Clinical Examination (OSCE) station and five Structured Oral Examination (SOE) stations.
 - ii. The clinical exam Passing Standard: To be eligible for final certification in Congenital Cardiac Surgery, the candidate must:
 - 1. Achieve a score of at least 75% in three of the six clinical stations; and
 - 2. Achieve a score of at least 65% in each of the remaining clinical stations.

Tables 7-A and 7-B present the blueprints for the final written and clinical examinations. These blueprints provide a general framework and may be reviewed and amended by the relevant subspecialty scientific council, in coordination with the curriculum and examination committees, as applicable. Any approved changes or amendments will be formally announced through the appropriate official channels.

Table 7-A: Congenital Cardiac Surgery Final Written Exam Blueprint

No.	Sections	Percentage
1	Cardiac Embryology & Congenital Cardiac Anatomy	10%
2	Congenital Cardiac Physiology & Pathology	10%
3	Congenital Echocardiography	10%
4	Congenital Cardiac Imaging	7%
5	Congenital Cardiac Catheterization	8%
6	Congenital Cardiac Electrophysiology	5%
7	Congenital Cardiac Critical Care	10%
8	Congenital Cardiac Surgery	40%
Total		100%



Table 7-B: Congenital Cardiac Surgery Final Clinical Exam Blueprint

Congenital CVS Fellowship Clinical Exam – Final			
Station	Type	Time	Section
1	OSCE / SOE	15-20 min	Aortic pathology (e.g.: Interrupted or hypoplastic aortic arch)
2	OSCE / SOE	15-20 min	Cono-truncal pathology (e.g.: Common Arterial Trunk, Aortopulmonary Window and Aortic Origin of a Pulmonary Artery)
3	OSCE / SOE	15-20 min	Pulmonary Venous pathologies (e.g.: TAPVD, Pulmonary Vein Stenosis, and Atresia of the Common Pulmonary Vein)
4	OSCE / SOE	15-20 min	The Functionally Univentricular Heart
5	OSCE / SOE	15-20 min	TGA (e.g.: D-TGA, Double-Outlet Right Ventricle, L-TGA, CCTGA)
6	OSCE / SOE	15-20 min	LVOTO (e.g.: Sub, Valvular or Supra aortic or Hypertrophic Cardiomyopathy)
Note: All stations can have any of these pathologies included: Cardiac Embryology, Congenital Cardiac Anatomy and Physiology, Congenital Cardiac Peri-operative Care (Including ICU), Congenital CPB and Anesthesia, PDA, ASD, VSD, and AVSD, Surgical or Transcatheter Management of Arrhythmias, valvular pathologies, common cardiac pathologies, Mechanical Circulatory Support, and Transplant.			

For additional details on the final examinations, please refer to the General Bylaws of Training in Postgraduate Programs and General Assessment Bylaws (available online: www.scfhs.org).

Learning Domain	Summative Assessment Tools	Passing Score
Knowledge	- Final Written Examination	At least borderline pass in each tool according to the standard-setting method used by the executive administration of assessment
Skills	- Objective Structured Clinical Examinations (OSCE) - Structured Oral Examinations (SOE)	At least borderline pass in each tool according to the standard-setting method used by the executive administration of assessment
Attitude	FITER: In-Training Evaluation Report	Successfully pass the FITER



15. PROGRAM AND COURSE EVALUATION

The SCFHS will apply various measures to evaluate this curriculum's implementation. The training outcomes of this program will be reviewed using the quality assurance framework endorsed by the Central Training Committee of the SCFHS. The trainee assessment results (both formative and summative) will be analyzed and mapped against the curriculum content. Additional indicators incorporated into the evaluation process include:

- Annual trainees' satisfaction survey reports.
- Reports from trainees' evaluation of faculty members.
- Reports from trainees' evaluation of training rotations.
- Annual survey data from program directors.
- Data obtained through program accreditations and accreditation review reports.

Goal-Based Evaluation: The achievement of the intended outcomes or competencies will be evaluated at the end of each stage to assess the effectiveness of curriculum delivery. Any deficiencies will be addressed in the subsequent stage by utilizing the time allocated to trainee-selected topics and professional sessions.

In addition to expert subject-matter input and best practices drawn from benchmarked international programs, the SCFHS will apply a robust approach to ensure that this curriculum incorporates all the relevant data available at the time of its future revisions.

16. POLICIES AND PROCEDURES

This curriculum outlines the means, materials, and learning objectives that trainees and trainers will utilize to achieve the identified educational outcomes. The SCFHS maintains a comprehensive set of “General Bylaws of Training in Postgraduate Programs” and “Executive Policies” published on the official SCFHS website, which governs all training-related processes. These include, but are not limited to, general bylaws of training, assessment, and accreditation, as well as executive policies on admission, registration, formative assessment and promotion, examination, trainees’ representation and support, duty hours, and leave entitlements—all of which are examples of regulations that must be implemented. Under this curriculum, trainees, trainers, and supervisors are required to adhere to the most current versions of these bylaws and policies, which are accessible online via the official SCFHS website.

The applicable regulations include, but are not limited to:

- General bylaws for postgraduate training, assessment, and accreditation.
- Executive policies governing admission, registration, continuous assessment and promotion, examinations, fellows’ representation and support, duty hours, and leave entitlements.

The most recent versions of these bylaws and policies, available on the SCFHS website (<https://www.scfhs.org.sa/en/MESPS/Policies/Pages/default.aspx>), shall be regarded as the definitive reference in all administrative and legal matters.



16.1 Leave and Holidays

In accordance with SCFHS policy, each fellow is entitled to 4 weeks of vacation during each academic year, in addition to all official national holidays. The scheduling of vacation periods and the alignment with fellowship rotations shall be coordinated jointly by the fellow, the chief fellow, and the program director.

17. APPENDICES

- A. Assessment Mapping
- B. Academic Half-Day Topics
- C. Logbook Requirements
- D. Research Requirements
- E. Examples: Simulation
- F. References



17.1 Appendix A: Competency-Assessment Mapping: to map Competencies, Educational Activities, and Formative and Summative Assessments (Systems of Assessment)

17.1.1 Assessment Mapping

Please refer to the Excel sheet in this link [SCFHS - 2025 CHS Program mapping assessment with rotation.xlsx](#).

Adapted from/Courtesy of McMaster University, Faculty of Health Sciences, 2021, by Drs. Whitehead & Mukherjee.

As part of the resources provided to support curriculum planning, an example of a curriculum mapping table from McMaster University (developed by Drs. Lori Whitehead and Som Mukherjee, Faculty of Health Sciences, 2021) is included in both the accompanying documents and other documents.

17.2 Appendix B (Academic Half-Day Topics)

- The academic half day will span 2 years to cover all the material and prepare the fellows for the First Part exam (See Table 9: Academic Half-Day Schedule over 2-year cycle).
- Please note:
 - a. Senior fellows (level F3) should focus on completing their surgical experience and logbook. They can attend the academic activity if they are required to or if they have no clinical obligations. We highly encourage senior fellows to organize with their program director a study schedule to prepare them for the final exam.
 - b. In the 3-year fellowship, each fellow will have to present at least two Journal clubs (out of 4) and attend two simulation or wet-lab case-based studies (out of 4).



Table 9: Academic Half-Day Schedule over 2-year cycle

<i>Academic Month</i>	<i>Section</i>	<i>Sessions</i>	<i>Given By</i>	<i>Level of Fellow</i>
1	Basics of Congenital Heart Disease	Welcome to the Program	Program Director	F1, F2, and F3
		Cardiovascular embryology and development	Pediatric Cardiologist	F1 & F2
2	Basics of Congenital Heart Disease	Cardiovascular physiology in CHD (Non-cyanotic)	Pediatric Cardiologist	F1 & F2
		Cardiovascular physiology in CHD (Cyanotic)	Pediatric Cardiologist	F1 & F2
		Cardiovascular physiology in CHD with single ventricle	Pediatric Cardiologist	F1 & F2
3	Basics of Congenital Heart Disease	Pre-operative assessment for CHD	Pediatric Cardiologist	F1 & F2
		Principles of Echocardiography in CHD	Pediatric Cardiologist	F1 & F2
		Principles of Imaging in CHD	Pediatric Cardiologist	F1 & F2
4	Basics of Congenital Heart Disease	Principles of catheterization and hemodynamics assessment in CHD	Pediatric Cardiologist	F1 & F2

<i>Academic Month</i>	<i>Section</i>	<i>Sessions</i>	<i>Given By</i>	<i>Level of Fellow</i>
		Principles of arrhythmias and electrophysiology assessment in CHD	Pediatric Cardiologist	F1 & F2
5	Evidence-Based and Interactive Clinical Practice	Journal club	Fellow	F1, F2, and F3
		Simulation or Wet Lab Case-based study	Congenital Cardiac Surgeon or F3	F1, F2, and F3
6	Basics of Congenital Heart Disease	Principles of anesthesia in CHD	Pediatric cardiac anesthesia	F1 & F2
		Principles of intensive care in CHD	Pediatric cardiac intensive care	F1 & F2
		Principles of palliative and end-of-life care	Pediatric cardiac intensive care	F1 & F2
7	Basics of Congenital Heart Disease	Principles of Heart failure and transplant in patients with CHD	Pediatric Cardiologist	F1 & F2
		Lifelong management of patients with CHD	Pediatric Cardiologist or Adult Congenital Cardiologist	F1 & F2
8	Basics of Congenital Cardiac Surgery	Principles of CPB for CHD	Perfusionist	F1 & F2
		MCS in CHD	Congenital Cardiac Surgeon +/- Pediatric cardiac intensive care	F1 & F2



<i>Academic Month</i>	<i>Section</i>	<i>Sessions</i>	<i>Given By</i>	<i>Level of Fellow</i>
9	Basics of Congenital Cardiac Surgery	Palliative operations for CHD	Congenital Cardiac Surgeon	F1 & F2
		PDA and coarctation of the aorta	Congenital Cardiac Surgeon/Fellow	F1 & F2
		Vascular Ring	Congenital Cardiac Surgeon/Fellow	F1 & F2
10	Quiz	Quiz (MCQ & OSPE)	Program Director	F1, F2 and F3
11	Basics of Congenital Cardiac Surgery	ASD and PAPVD	Congenital Cardiac Surgeon/Fellow	F1 & F2
		VSD	Congenital Cardiac Surgeon/Fellow	F1 & F2
12	Basics of Congenital Cardiac Surgery	AVSD	Congenital Cardiac Surgeon/Fellow	F1 & F2
		Cardiac Tumors	Congenital Cardiac Surgeon/Fellow	F1 & F2
13	Basics of Congenital Cardiac Surgery	TOF	Congenital Cardiac Surgeon/Fellow	F1 & F2
		RVOT Obstruction	Congenital Cardiac Surgeon/Fellow	F1 & F2
		DORV	Congenital Cardiac Surgeon/Fellow	F1 & F2
14	Basics of Congenital	Interrupted and Hypoplastic Aortic Arch	Congenital Cardiac Surgeon/Fellow	F1 & F2

<i>Academic Month</i>	<i>Section</i>	<i>Sessions</i>	<i>Given By</i>	<i>Level of Fellow</i>
	Cardiac Surgery	Common Arterial Trunk Abnormalities	Congenital Cardiac Surgeon/Fellow	F1 & F2
15	Evidence-Based and Interactive Clinical Practice	Journal club	Fellow	F1, F2 and F3
		Simulation or Wet Lab Case-based study	Congenital Cardiac Surgeon or F3	F1, F2 and F3
16	Basics of Congenital Cardiac Surgery	D-TGA	Congenital Cardiac Surgeon/Fellow	F1 & F2
		CCTGA	Congenital Cardiac Surgeon/Fellow	F1 & F2
17	Basics of Congenital Cardiac Surgery	TAPVD	Congenital Cardiac Surgeon/Fellow	F1 & F2
		Coronary Anomalies	Congenital Cardiac Surgeon/Fellow	F1 & F2
18	Basics of Congenital Cardiac Surgery	Univentricular Heart	Congenital Cardiac Surgeon/Fellow	F1 & F2
		HLHS	Congenital Cardiac Surgeon/Fellow	F1 & F2
19	Basics of Congenital Cardiac Surgery	LVOT Obstruction	Congenital Cardiac Surgeon/Fellow	F1 & F2
		Pericardial Disease in Children	Congenital Cardiac Surgeon/Fellow	F1 & F2
20	Quiz	Quiz (MCQ and OSPE)	Program Director	F1, F2, and F3



<i>Academic Month</i>	<i>Section</i>	<i>Sessions</i>	<i>Given By</i>	<i>Level of Fellow</i>
21	Basics of Congenital Cardiac Surgery	Congenital mitral valve pathologies	Congenital Cardiac Surgeon/Fellow	F1 & F2
		Congenital tricuspid valve pathologies and Ebstein anomaly	Congenital Cardiac Surgeon/Fellow	F1 & F2
22	Basics of Congenital Cardiac Surgery	VAD and Heart Transplant for CHD	Congenital Cardiac Surgeon/Fellow	F1 & F2
		Surgery on patients with Adult Congenital Heart Disease	Congenital Cardiac Surgeon/Fellow	F1 & F2
23	Evidence-Based and Interactive Clinical Practice	Journal club	Fellow	F1, F2, and F3
		Simulation or Wet Lab Case-based Study	Congenital Cardiac Surgeon or F3	F1, F2 and F3
24	First Part Exam			

17.3 Appendix C (Logbook Requirements)

Top Conditions and Procedures in the Specialty

Table 10: Congenital Cardiac Surgery Logbook

Procedure	Year 1 Expected SSMD Level	Year 1 Minimum Number of Cases	Year 2 Expected SSMD Level	Year 2 Minimum Number of Cases	Year 3 Expected SSMD Level	Year 3 Minimum Number of Cases	Total Over 3 Years
Sternotomy - Virgin Chest	1-2	3	2-3	3	3-4	4	10
Sternotomy - Redo	0-1	2	1-2	2	2-3	3	7
Cannulation - Central	1-2	3	2-3	3	3-4	4	10
Cannulation - Peripheral	1-2	2	2-3	1	3-4	2	5
Vascular cutdown	1-2	2	1-2	2	2-3	2	6
ECMO Initiation	1-2	2	2-3	2	3-4	3	7
ECMO weaning	1-2	2	2-3	2	3-4	3	7
Chest Exploration	1-2	2	2-3	3	3-4	4	9
Chest closure	1-2	2	2-3	3	3-4	4	9
ASD Closure - Sternotomy	1-2	2	2-3	2	3-4	3	7



Procedure	Year 1 Expected SSMD Level	Year 1 Minimum Number of Cases	Year 2 Expected SSMD Level	Year 2 Minimum Number of Cases	Year 3 Expected SSMD Level	Year 3 Minimum Number of Cases	Total Over 3 Years
VSD closure (Simple) - Sternotomy	1-2	2	2-3	2	3-4	3	7
PAPVD Repair (Simple) - Sternotomy	0-1	2	1-2	2	2-3	3	7
PDA ligation - Sternotomy	0-1	2	1-2	2	2-3	2	6
PDA Ligation - Thoracotomy	0-1	2	1-2	2	2-3	2	6
Shunt Creation (BTT, Central and others) - Sternotomy	0-1	2	1-2	2	2-3	2	6
Shunt Creation (BTT, Central and Others) - Thoracotomy	0-1	1	0-1	1	1-2	1	3
Bidirectional Cavopulmonary Connection/Sh unt	0-1	1	1-2	2	2-3	2	5

Procedure	Year 1 Expected SSMD Level	Year 1 Minimum Number of Cases	Year 2 Expected SSMD Level	Year 2 Minimum Number of Cases	Year 3 Expected SSMD Level	Year 3 Minimum Number of Cases	Total Over 3 Years
Total Cavopulmonary Connection/Shunt	0-1	1	1-2	2	2-3	2	5
Partial AVSD Repair	1-2	2	1-2	2	2-3	2	6
Complete AVSD Repair	1-2	1	1-2	2	2-3	2	5
Sub-aortic Membrane resection	1-2	1	1-2	2	2-3	2	5
Aortic Valve Repair	0-1	1	0-1	1	1-2	1	3
Aortic Valve Replacement	1-2	1	2-3	1	3-4	1	3
Supra-Aortic Stenosis Repair	1-2	1	1-2	1	2-3	1	3
Ascending Aorta and Aortic Arch Repair	1-2	1	1-2	1	2-3	1	3
Coarctation Repair - Sternotomy	0-1	1	1-2	2	2-3	2	5



Procedure	Year 1 Expected SSMD Level	Year 1 Minimum Number of Cases	Year 2 Expected SSMD Level	Year 2 Minimum Number of Cases	Year 3 Expected SSMD Level	Year 3 Minimum Number of Cases	Total Over 3 Years
Coarctation Repair - Thoracotomy	0-1	1	1-2	1	1-2	1	3
Mitral Valve Repair	0-1	1	1-2	1	1-2	1	3
Mitral Valve Replacement	0-1	1	1-2	1	2-3	1	3
Tricuspid Valve Repair	0-1	1	1-2	1	1-2	1	3
Tricuspid Valve Replacement	0-1	1	1-2	1	2-3	1	3
Pulmonary Valve Repair	0-1	1	1-2	1	2-3	1	3
Pulmonary Valve Replacement	0-1	1	1-2	1	2-3	1	3
RV To PA Conduit Placement	1-2	1	1-2	2	2-3	2	5
Epicardial PPM insertion	1-2	1	1-2	2	2-3	2	5
Epicardial PPM Battery Change	1-2	1	2-3	2	3-4	2	5
Diaphragmatic Plication	1-2	1	1-2	1	2-3	1	3

Procedure	Year 1 Expected SSMD Level	Year 1 Minimum Number of Cases	Year 2 Expected SSMD Level	Year 2 Minimum Number of Cases	Year 3 Expected SSMD Level	Year 3 Minimum Number of Cases	Total Over 3 Years
Thoracic Duct Ligation	1-2	1	1-2	1	2-3	1	3
Insertion of PD catheter	1-2	1	2-3	1	3-4	1	3
TOF Repair	1-2	1	1-2	2	2-3	2	5
ASO Repair	0-1	1	1-2	1	2-3	1	3
Ross Procedure (Aortic Root Replacement with Pulmonary Autograft)	0-1	0	0-1	0	1-2	1	1
Norwood Stage 1	0-1	0	0-1	1	1-2	1	2
Repair of Vascular Ring	0-1	1	1-2	1	2-3	1	3
Heart Transplant - Donor Harvest	1-2	0	2-3	1	2-3	1	2
Heart Transplant - Recipient Implantation	0-1	0	1-2	0	2-3	0	0
Implantation of VAD	0-1	0	1-2	0	1-2	0	0



Procedure	Year 1 Expected SSMD Level	Year 1 Minimum Number of Cases	Year 2 Expected SSMD Level	Year 2 Minimum Number of Cases	Year 3 Expected SSMD Level	Year 3 Minimum Number of Cases	Total Over 3 Years
Intracardiac Baffles	0-1	1	0-1	1	1-2	1	3
ASO with LVOTO (Rastelli, Nikaidoh Procedures or any other variant)	0-1	0	1-2	1	1-2	1	2
Konno Procedure	0-1	0	1-2	0	1-2	1	1
Atrial Switch (Mustard or Senning Procedure independently or as part of a double switch)	0-1	0	0-1	0	1-2	1	1
Total		61		74		88	223

Table 11: Surgical Skills Milestone Documentation (SSMD) statements and guide to recommendation of appropriate supervision

Technical Skills – levels of supervision	Definition	Trainer input at each supervision level			
		Does the trainee perform part or all the task?	Is guidance required? (Complete, Partial, or Independent)	The trainee can perform the task without direct supervision?	Is the trainee performing at a level beyond that expected of a day one consultant?
0	The fellow is only expected to assist the attending surgeon or a senior fellow during the procedure.	No	N/A	N/A	N/A
1	The fellow performs the procedure with the attending surgeon scrubbed and provides continuous, hands-on guidance.	Part	Complete	No	No
2	The attending surgeon is scrubbed in the operating room, observing closely and providing intermittent verbal or manual guidance, but the fellow is the primary operator for defined steps.	Part	Partial	No	No
3	The attending surgeon is not scrubbed but is immediately available in the operating room and can scrub in if needed.	Full	Partial	No	No
4	The attending surgeon is not physically present in the operating room but is available within the institution for consultation if needed.	Full	Independent	Yes	No
5	The fellow has achieved full independent practice capability and is qualified to teach or supervise others.	Full	Independent	Yes	Yes



17.4 Appendix D (Research Requirements)

- A 4-week research block is mandatory by the end of the first year. During this rotation, the fellow is expected to organize and start a research project under the supervision of a congenital cardiac surgeon and receive institutional research board approval. The Congenital Cardiac Surgery program director must approve this project, and it will be included in the fellow's promotion to senior level and the graduation portfolio. The fellow is expected to provide feedback to the program director on the project's progress every 3 months. The fellow is expected to present this project at a national or international conference by the end of the second year and publish at least one paper based on this project prior to entering the final graduation exam.
- **Please note** that case reports or how-to-do-it videos/papers will not be accepted to fulfill this requirement.

17.4 1 Competency-based Learning and Teaching Template Base for Congenital Cardiac Surgery Research Block

- This is a rotation in the first year of the program.
- The candidate should have this rotation at their home institution to become familiar with the team.
- The duration of this rotation is 4 weeks.

Number of rotation months	First year	Second year	Third year	Total
	1	0	0	1

The candidate should be able to demonstrate:

I Knowledge

1. Integrate clinical knowledge of congenital cardiac surgery with research questions that address relevant gaps in patient care or outcomes.
2. Apply evidence-based medicine principles to formulate clinically meaningful hypotheses.
3. Understand the ethical and regulatory requirements for research involving human participants.
4. Design a structured research proposal, including a clear hypothesis, objectives, and methodology.
5. Demonstrate proficiency in research methods: study design (retrospective, prospective, clinical trials, basic science), data collection, and statistical analysis.
6. Identify research questions that address disparities in the care and outcomes of congenital heart disease.

II. Collaborator, Leader, and Manager

1. Clearly articulate research goals, methods, and results to scientific, clinical, and lay audiences.
2. Work effectively with multidisciplinary research teams, including biostatisticians, laboratory scientists, and clinical colleagues.
3. Demonstrate effective teamwork and conflict resolution skills in a research setting.
4. Adhere to the highest standards of research integrity, including honesty in data collection, analysis, and reporting.
5. Demonstrate accountability in meeting timelines and respecting authorship and intellectual property guidelines.
6. Protect patient confidentiality and comply with institutional and national research ethics regulations.



7. Plan and manage the stages of a research project, including resource allocation, budgeting, and timelines.
8. Coordinate tasks among team members and monitor project progress to ensure timely achievement of milestones.

III Expected Outcome

1. Prepare a manuscript suitable for submission to a peer-reviewed journal.
2. Present research findings effectively in oral and written formats (abstracts, presentations, manuscripts).
3. Critically appraise scientific literature to identify knowledge gaps and assess the validity and applicability of published studies.
4. Write structured research documents, including ethics applications, progress reports, and publications.
5. Translate research findings into actionable recommendations that can enhance patient care, surgical outcomes, or inform health policy.

By the end of the second year of fellowship, the fellow should be able to:

- i. Produce a completed research project (clinical or basic science) suitable for presentation at a recognized scientific meeting.
- ii. Submit at least one abstract and, ideally, a manuscript for peer-reviewed publication.
- iii. Demonstrate the ability to critically analyze and apply emerging evidence in congenital cardiac surgery practice.

17.4.1.1 MEDICAL RESEARCH EXPERT

17.4.1.1.1 Goals:

- To demonstrate an understanding of the basic principles of research design, methodology, data analysis, and clinical epidemiology.
- To familiarize themselves with the ethical requirements of the research and demonstrate an understanding of the responsible use of informed consent.
- To practice appropriate methods for writing research proposals, manuscripts, data collection, and result analysis and discussion.
- To demonstrate the awareness of current research topics in congenital cardiac surgery using available medical informatics systems.
- To skillfully present scientific presentations and participate in public discussions.

17.4.1.1.2 Training Methods

- Specify the period appropriately dedicated to research *or* full-time rotation in the research to be conducted.
- Attendance at dedicated courses or workshops that enhance research skills may be required by the program.
- This project is expected to last over a month. Therefore, its completion should align with the fellow's subsequent rotations.
- The trainee must select a supervisor to help access essential resources that will allow appropriate utilization of research skills and periodically discuss progress.
- The trainee must finish the research proposal by the end of the first 6 months, and it must then be accepted by the institutional review board.
- The oral abstract of the study results should be presented at a specified time point (e.g., end of the final year before entering the final exam) on the Specialty's Research Day.



- The research paper should be submitted at least 2 weeks before the Specialty's Research Day.
- It is highly desirable for trainees to present research results at national and/or international meetings and aim to publish their work in indexed journals.

17.4.1.1.3 Evaluation

1. Attendance at designated courses/lectures/workshops will be monitored and incorporated into the annual evaluation score.
2. Panel scoring of the research abstract presentation will be conducted at the end of the pre-specified point year on the Specialty's Research Day. This will count toward the rotation score for that month.

17.4.1.2 COMMUNICATOR

- Demonstrate skills in conveying and discussing scientific research to scientific communities through posters, abstracts, teaching slides, manuscripts, or other scientific communication modalities.
- Communicate and collaborate effectively with the research supervisor to conduct the research.

17.4.1.3 COLLABORATOR

- Identify, consult, and collaborate with appropriate experts, research institutions, and/or organizational bodies to conduct the research.

17.4.1.4 LEADER

- Identify an area of research interest and find a research supervisor to engage in the scholarship of scientific inquiry and dissemination.
- Utilize available resources and regularly meet with an identified research mentor.
- Set realistic priorities and use time effectively to optimize professional performance.

- Utilize healthcare resources cost-effectively.

17.4.1.5 HEALTH ADVOCATE

Recognize the contributions of scientific research in improving patient and community health.

17.4.1.6 SCHOLAR

- Pose appropriate research questions, recognize and identify gaps in knowledge and expertise pertaining to this question, and formulate an appropriate study design to answer them.
- Conduct the research as outlined in the proposal.
- Collect and analyze data utilizing appropriate methods.
- Prepare abstracts and manuscripts suitable for publication in peer-reviewed journals and/or international scientific meetings.
- Identify research limitations and areas for further research.

17.4.1.7 PROFESSIONAL

1. Uphold ethical and professional research expectations consistent with the institutional review board guidelines, including maintaining meticulous data and conducting ethical research.
2. Demonstrate personal responsibility for establishing research goals and working with the supervisor to set and achieve research timeline objectives.
3. Appropriately attribute authorship and contributions when publishing research.
4. Disclose potential financial conflicts of interest (including speaker fees and consultative relationships), as appropriate, when engaging in and disseminating research results.



17.5 Appendix E (Volunteering, Charity, and Humanitarian Activity)

Volunteering, charity, and humanitarian engagement are essential elements in the professional development of congenital cardiac surgeons and are strongly encouraged within the SCFHS training framework. Participation in charitable surgical missions and humanitarian outreach initiatives provides trainees with the opportunity to deliver highly specialized cardiac care to children with congenital heart disease in regions where such services are limited or unavailable. These activities reflect the humanitarian and ethical responsibilities of physicians to serve all members of society and to contribute actively to global health equity.

Engagement in charity missions—particularly through national initiatives such as **KSrelief (King Salman Humanitarian Aid and Relief Center)**—provides opportunities to deliver specialized congenital cardiac care to children in underserved regions locally and internationally. Such experiences exemplify the values of compassion, service, and social responsibility that define the medical profession.

Through involvement in humanitarian cardiac surgery programs, trainees enhance their clinical expertise and decision-making by managing complex cardiac conditions in resource-constrained environments. Such experiences cultivate adaptability, creativity, and resilience, while reinforcing patient safety, teamwork, and sound ethical judgment. Working within diverse and multidisciplinary teams during these missions develops essential competencies in communication, collaboration, and leadership, which are integral to the CanMEDS roles and the SCFHS competency framework.

Moreover, these activities foster professional maturity by exposing trainees to varied healthcare systems, cultural settings, and public health challenges. They provide meaningful opportunities for advocacy, mentorship, and sustainable capacity building through the education and training of local healthcare professionals. Participation in humanitarian work reinforces the roles of the Health Advocate, Professional, and Collaborator, encouraging trainees to embody compassion, integrity, and cultural humility in all aspects of their practice.

The SCFHS encourages trainees to participate in accredited humanitarian missions as part of their training portfolio, recognizing that such experiences enrich clinical competence, broaden perspectives, and instill a lifelong commitment to service and excellence in congenital cardiac surgery.

17.5.1 Learning Objectives

By the end of participation in a recognized humanitarian or charity mission, the trainee should be able to:

- **Demonstrate** the ability to provide safe and effective congenital cardiac surgical care in resource-limited settings.
- **Apply** sound clinical judgment and adaptability when managing patients with limited diagnostic and therapeutic resources.
- **Collaborate** effectively within multicultural and multidisciplinary teams to optimize patient care and outcomes.
- **Exhibit** professionalism, cultural sensitivity, and ethical responsibility in all patient and team interactions.
- **Contribute** to capacity building by sharing knowledge and skills with local healthcare professionals.



- **Reflect on** personal and professional growth, identifying lessons learned and areas for further development related to global health and humanitarian practice.

17.5.2 Suggested Assessment Methods

- **Mini-CEX:** Evaluation of clinical performance and professionalism during patient care activities.
- **CBD:** Assessment of decision-making, adaptability, and ethical reasoning in humanitarian contexts.
- **Reflective Report or Portfolio Entry:** Trainee documentation of experiences, challenges, and learning outcomes from the mission.
- **Direct Supervisor Feedback:** Evaluation from mission leaders or supervising consultants on teamwork, leadership, and professional conduct.

17.5.3 Protected Time for Volunteering, Charity, and Humanitarian Activity

The SCFHS recognizes the educational and professional value of participation in accredited volunteering, charity, and humanitarian activities, including those organized through KSrelief (King Salman Humanitarian Aid and Relief Center) and similar recognized bodies. Trainees may be granted protected time to participate in such missions, subject to approval by the program director and in accordance with SCFHS policies.

Protected time is intended to ensure that trainees can engage meaningfully in humanitarian service without compromising their clinical training requirements or examination eligibility. Participation should be documented in the trainee's portfolio and logbook and must be verified by the supervising consultant or mission coordinator.

The **maximum allowable protected time** for volunteering and humanitarian activities is **up to 16 calendar days per training year, divided into two blocks (7-8 days per block)**. This period may be counted as part of academic leave, provided the activity aligns with the program's educational objectives and contributes to the development of core competencies within the SCFHS framework.

15.5.4 Surgical Cases During the Volunteering, Charity, and Humanitarian Activity

All surgical cases in which the fellow participated during these blocks may be counted toward fulfilling the logbook requirements, provided that each case is signed off by the consultant surgeon overseeing the charity mission.

17.6 Appendix F (Provide Detailed Appendices for Selected Educational Activities, e.g., Universal Topics, Simulation, Etc.)

The following is for illustrative purposes only. Additional details of cases/logs, frequency, levels, and years must be clearly outlined and aligned with the mapping.

17.6.1 Simulation Using High-Fidelity 3D-Printed Congenital Cardiac Models

Simulation-based training using high-fidelity 3D-printed congenital heart models is an integral component of the congenital cardiac surgery training program under the SCFHS framework. This educational modality provides a safe and controlled environment for trainees to practice complex surgical procedures, understand detailed cardiac anatomy, and refine operative judgment without patient risk. Such simulation experiences bridge the gap



between theoretical knowledge and operative performance, promoting competence, confidence, and patient safety.

An example of the use of 3D-printed models in congenital cardiac surgery training is well demonstrated by the SickKids Hospital in Toronto, Canada through their Bootcamp in collaboration with the University of Toronto 3DHeartLab (<https://www.3dheartlab.com/about>).

17.6.1.1 Learning objectives

By the end of the simulation activity, the trainee should be able to:

1. **Demonstrate** detailed understanding of congenital cardiac anatomy using 3D-printed models representing various pathologies (e.g., TOF, TGA, AVSD, VSD).
2. **Apply** surgical principles to perform key operative steps such as exposure, patch reconstruction, and suturing within anatomically accurate models.
3. **Develop** and justify an operative strategy appropriate for the simulated defect, demonstrating clinical reasoning and technical planning.
4. **Collaborate** effectively with the surgical team, demonstrating clear intraoperative communication, leadership, and teamwork.
5. **Reflect** on technical performance, identify areas for improvement, and incorporate structured feedback into ongoing skill development.
6. **Recognize** the role of simulation in improving technical proficiency, decision-making, and overall patient safety in congenital cardiac surgery.

Relevant CanMEDS roles

- **Medical Expert:** Demonstrates technical skill and anatomical understanding through realistic operative simulation.

- **Collaborator:** Works effectively within a multidisciplinary simulated operating room environment.
- **Scholar:** Engages in reflective learning and integrates feedback for continuous improvement.
- **Professional:** Practices ethically and safely within a structured educational setting.

17.4.1.4 Assessment methods

- **DOPS:** Structured evaluation of technical performance and adherence to operative principles.
- **Checklist-Based Assessment:** Objective scoring of procedural steps and surgical precision.
- **Mini-CEX:** Assessment of communication, teamwork, and decision-making within the simulated environment.
- **Video Review and Reflective Report:** Trainee reflection on performance and learning outcomes following simulation.
- **Faculty Feedback Session:** Immediate debrief focusing on strengths, areas for development, and strategies for improvement.

1. Example for simulation table derived from the EM roadmap:

(All the following sessions are 4 hours long with a 1:5 instructor-to-learner ratio.)

Theme	Learners	Objectives	Simulation Modality/ Challenges
Communication/ Patient Advocacy	All Levels	- Demonstrate appropriate communication skills to address medical errors - Apply correct steps for medical error disclosure to colleague/staff/team member - Demonstrate leadership skills in dealing with complications in an emergency situation - Demonstrate appropriate communication skills to address conflict - Apply the correct steps in the escalation conflict - Debrief team member/ staff regarding conflict event - Apply correct steps in obtaining consent in a timely manner - Demonstrate appropriate communication skills in taking consent - Differentiate among the types of consent (implied, expressed, informed) - Demonstrate appropriate communication skills to address medical errors - Apply correct steps for medical error disclosure to colleague/staff/team member - Demonstrate leadership skills in dealing with complications in an emergency situation	High-Fidelity Simulation (Commercial), Standardized Patients

Theme	Learners	Objectives	Simulation Modality/ Challenges
Resuscitation	All Levels	- Be able to deal with cardiac arrest after cardiac surgery and perform resuscitation for each cause accordingly - Recognize cardiac tamponade and how to deal with it - Recognize the indications and contraindications for emergency sternotomy - Perform central venous access - Prepare the treating team and equipment for resuscitative thoracotomy - Perform resuscitative thoracotomy - Prepare the treating team and equipment for extracorporeal membrane oxygenation - Perform Veno-venous access for extracorporeal membrane oxygenation - Perform Veno-arterial access for extracorporeal membrane oxygenation - Select appropriate mode and parameters of extracorporeal membrane oxygenation - Call for help early - Demonstrate adequate CRM skills (e.g., communication, leadership/ followership, role clarity, situational awareness, shared mental model)	High-Fidelity Simulation (Commercial) Need Model for Thoracotomy

Theme	Learners	Objectives	Simulation Modality/ Challenges
Surgical Skills	All levels	- Perform Extended Focused Assessment with Sonography (E-FAST) - Identify anatomical landmarks for lines insertion and vascular cutdown - Perform U/S guided insertion of a chest tube, central line and other lines - Perform vascular cutdown to expose several vessels (such as femoral, tibial, radial, ulnar, brachial, axillary and neck vessels) - Highlight potential complications of each procedure and how to manage them - Perform basic endovascular procedures to be familiar with dealing with wires, dilators and vascular sheaths	High-Fidelity Simulation, Animal labs, Task Trainers (commercial and locally made)

17.7 Appendix G

17.7.1 References:

17.7.1.1 In APA

1. Beal, M. D., Kinnear, J., Anderson, C. R., Martin, T. D., Wamboldt, R., & Hooper, L. (2017). The effectiveness of medical simulation in teaching medical students critical care medicine: a systematic review and meta-analysis. *Simulation in Healthcare*, 12(2), 104–116.
2. Cook, D. A., Erwin, P. J., & Triola, M. M. (2010). Computerized virtual patients in health professions education: a systematic review and meta-analysis. *Academic Medicine*, 85(10), 1589–1602.
3. Cook, D. A., Hatala, R., Brydges, R., Zendejas, B., Szostek, J. H., Wang, A. T., ... & Hamstra, S. J. (2011). Technology-enhanced simulation for health professions education: a systematic review and meta-analysis. *JAMA*, 306(9), 978–988.
4. Lynagh, M., Burton, R., & Sanson-Fisher, R. (2007). A systematic review of medical skills laboratory training: where to from here? *Medical Education*, 41(9), 879–887.
5. McGaghie WC, Issenberg SB, Petrusa ER, Scalese RJ. A critical review of simulation-based medical education research: 2003–2009. *Med Educ*. 2010;44(1):50-63.
6. So, H. Y., Chen, P. P., Wong, G. K. C., & Chan, T. T. N. (2019). Simulation in medical education. *Journal of the Royal College of Physicians of Edinburgh*, 49(1), 52–57.



