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Original Article

Training of residents and fellows: The Mayo Clinic experience*

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"THE OATH OF HIPPOCRATES STATES THE FOLLOWing:To hold him who has taught me this art as equal to my parents and to live my life in partnership with him, and if he is in need of money to give him a share of mine, and to regard his offspring as equal to my brothers in male lineage and to teach them this art – if they desire to learn it – without fee and covenant; to give a share of precepts and oral instruction and all the other learning to my sons and to the sons of him who has instructed me and to pupils who have signed the covenant and have taken an oath according to the medical law, but no one else".

Physicians, particularly those in an academic setting, have an obligation to teach those who follow them. At the Mayo Clinic, we have had a highly successful training programme in paediatric cardiology for many years. Our trainees uniformly pass the board examination for subspecialty training in paediatric cardiology and secure very good jobs.

Our curriculum (Table 1) for the 2 years of clinical training is quite standard. The 12 months of research can be quite variable. Some trainees interspace research months throughout their 3 years of training, whereas other students take the 12 months in a block, particularly if they are doing basic research. All of our fellows are expected to publish at least one first author, peer-reviewed paper. Most fellows in the programme publish three to five peer-reviewed papers, and some fellows have published in excess of 10 manuscripts during the 3 years of training.

An issue that has changed over the years is the concept of "after hours" research. Some trainees in the modern era believe that their clinical research should be carried out only during "working hours". We try to emphasise that there is no reason that clinical research cannot be carried out at other times.

We believe that there are several keys to developing and maintaining a successful fellowship programme. Most important is to hire smart, motivated fellows. It is important to foster a milieu of inquisitiveness and to identify clinical problems that need further research. These provide projects for fellows that will result in publications. In order for this to occur, one has to have faculty members who are inquisitive and who have a successful record of publication.

It is important to have financial resources available to support both clinical and basic research; one must have the availability of statistical support to assist the trainees with the analysis of data. It is critical to have faculty with excellent editing skills. It is also important to have rapid turnaround time when a fellow submits a draft of a manuscript to a faculty member.

An integral part of our training programme is a weekly board review conference. Fellows are asked to write three to four questions each in the format of board examination questions. These questions are then discussed at a formal meeting usually on Wednesday evenings. These questions have been edited and incorporated into a book that is used at the Mayo

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Table 1. Paediatric cardiology curriculum.

Inpatient Service	6 months
Outpatient/outreach	1/2 month
Cardiac catheterisation	7 months
Echocardiography	5 months
Exercise	1/2 month
Cardiac Intensive care	1 month
Adult congenital	1 month
Paediatric electrophysiology	2 months
Cardiac path/MRI	1 month
Research	12 months
Total	36 months

Clinic Pediatric Cardiology Board Review Course held every other year (Fig 1).

It is important to have a well-developed schedule of didactic lectures. These are summarised in Table 2. On Mondays, there are ECG conferences and review of hospitalised cases and upcoming operations for the week. On Tuesday mornings, Medical/Surgical Case Conferences are held. At this conference, fellows present one or two interesting cases and is attended by all cardiology and cardiothoracic surgical trainees and staff. On Wednesdays, imaging conferences, angiography/physiology conferences, Internal Medicine Grand Rounds, and Board Review

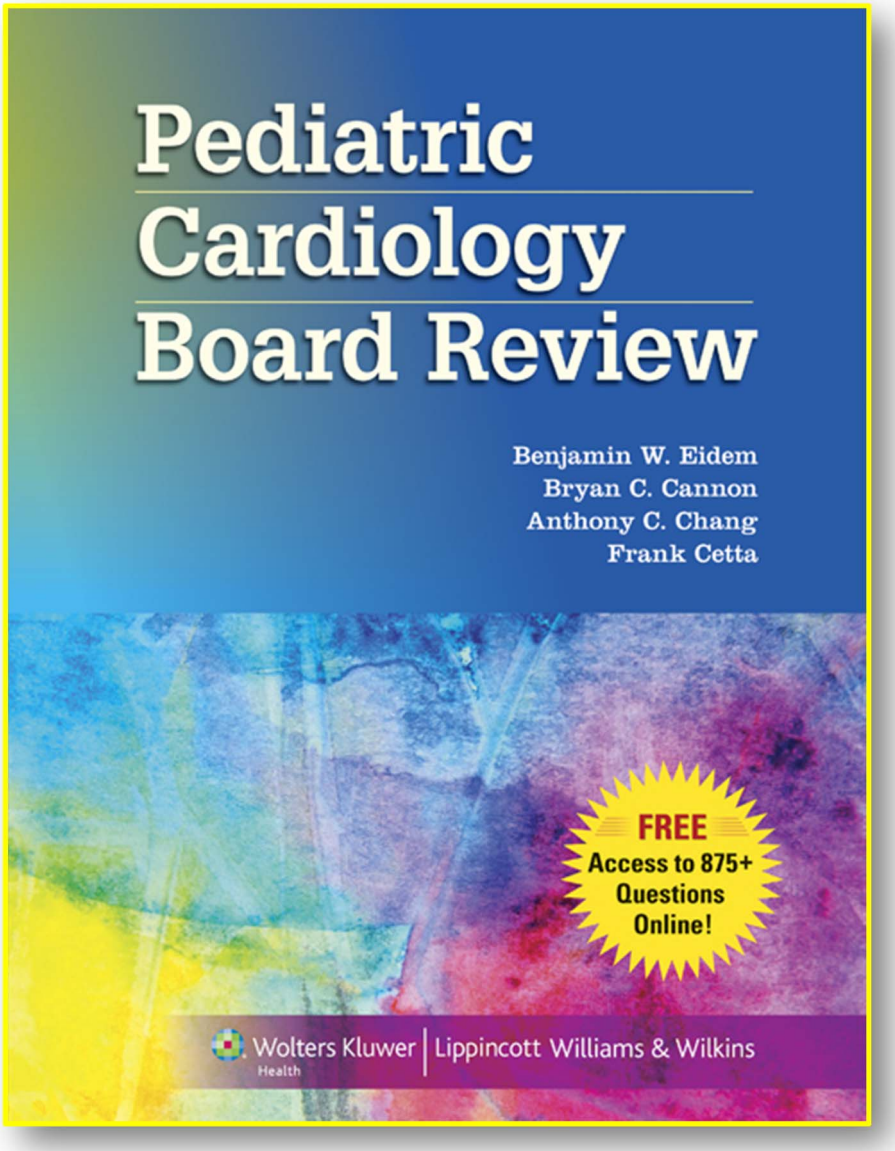

Figure 1.
Pediatric Cardiology Board Review textbook, Eidem, B, Cannon, B., Chang, A., and Cetta, F, editors.

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Table 2. Training of residents and fellows conferences.

Monday	ECG Conference
	Review of hospital cases and preview of upcoming operations
Tuesday	Medical-Surgical Case Conference
Wednesday	Imaging Conference
	Angiography or Cardiac Physiology Conference
	Board Review Conference
	Internal Medicine Grand Rounds
Thursday	Core Curriculum Conference
Friday	Paediatric Grand Rounds
	Echo Case Conference/Exerscise Conference

Table 3. General pediatric resident cardiology training goals.

1. Understand and demonstrate technical proficiency in performing an appropriate cardiovascular physical examination, blood pressure measurements, and echocardiographies
2. Understand how to evaluate and manage common presenting symptom complexes related to the cardiovascular system
3. Understand how to distinguish normal from abnormal cardiovascular signs and symptoms
4. Understand how to diagnose and manage common conditions that generally do not require referral
5. Understand how to recognise, provide initial management for, and refer cardiovascular conditions in children, which generally require referral
6. Understand key principles related to the use of cardiovascular drugs
7. Understand the paediatrician's role in the prevention of morbidity from cardiovascular disease
8. Define the indications for prophylaxis of subacute bacterial endocarditis, and describe the appropriate antibiotic treatment regimens for prophylaxis
9. Demonstrate knowledge of appropriate antibiotic treatment regimens for prophylaxis of rheumatic fever
10. Recognise cardiac conditions, which warrant influenza immunisation, chemoprophylaxis, and/or antiviral treatment for respiratory viruses (influenza, RSV)
11. Recognise the paediatrician's role in the development of heart-healthy lifestyles including diet, exercise, and prevention of tobacco addiction
12. Describe the screening, evaluation, and treatment strategies for hypercholesterolaemia
13. Describe the treatment strategies for tobacco addiction
14. Describe the screening, evaluation, and treatment strategies for hypertension

Conferences are held. On Thursdays, core curriculum conferences are held. During a 24-month period, at such conferences, all important aspects of paediatric cardiology are discussed. These lectures are given by fellows and staff. On Fridays, echocardiography, case/exercise physiology conferences, and Paediatric Grand Rounds are held.

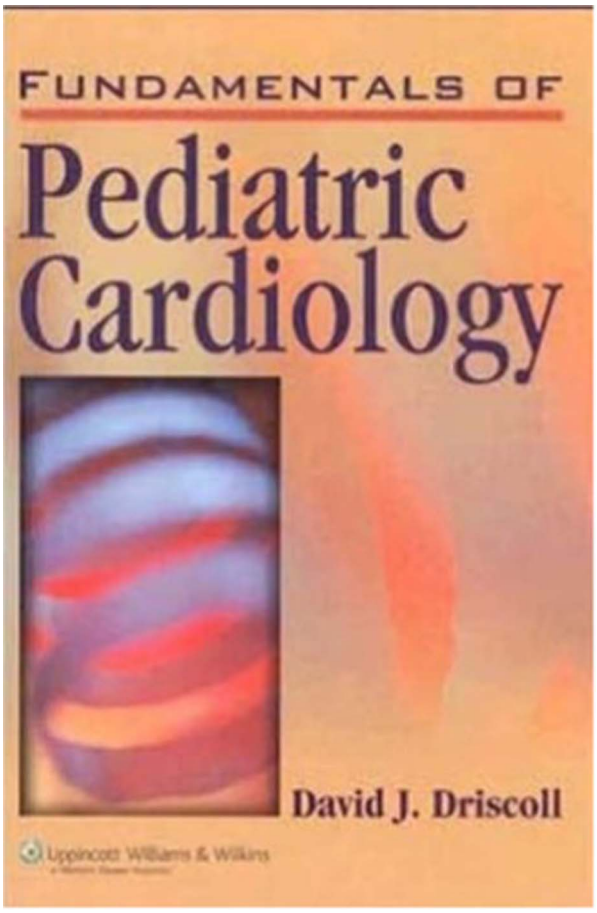

Figure 2.
Fundamentals of Pediatric Cardiology textbook, Driscoll, D author.

From a standpoint of a General Pediatric Residency rotation, the goals of the rotation are clearly outlined (Table 3) and each resident is provided a complimentary copy of the book *Fundamentals of Pediatric Cardiology* (Fig 2). In general, the general paediatric resident rotation is a 2–4-week rotation. The residents accompany the cardiology staff on hospital rounds in the morning and they see outpatients in the afternoon. We administer a computer-generated pre-test when they begin the rotations and a post-test when they complete the rotations. This is a 25-question test. The average post-test score of 81.6% is statistically significantly better than the average pre-test score of 71.7%.

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