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## SCIENTIFIC EDITORIAL

# How best to train doctors in adult congenital heart disease?



*Quelle formation pour devenir cardiologue congénitaliste de l'adulte ?*

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Advances in medical and surgical care have produced remarkable improvements in the survival of children with congenital heart disease (CHD); around 90% of children with CHD now reach adulthood [1]. The number of adults with CHD now exceeds the number of children with CHD, and is estimated to be > 1–2 million in the USA and 2–3 million in Europe [2,3]. Many of these adult patients develop late cardiac and extracardiac complications [4]. Lapses in care affect patient management, and may occur during the time of transition from a specialized paediatric CHD centre to an adult CHD (ACHD) centre, which is, nevertheless, highly recommended [5] (Fig. 1). In Quebec, Mylotte et al. reported a significant reduction in mortality when patients were referred to specialized ACHD centres (Fig. 2) [6]. In response to the increasing population, ACHD has been recognized as a specialty, and training has been integrated into the cardiovascular fellowship [7] (Fig. 3). However, the number of ACHD specialists is inadequate [5,6]. The European Society of Cardiology (ESC) Working Group on Grown-up Congenital Heart Disease (GUCH) has detailed the staff requirements for a specialized ACHD centre (Table 1) [8]. Only specialized centres can provide cardiac and extracardiac medical and surgical skills, and gather cohorts of patients, to ensure the triple mission of adequate care, research and training.

*Abbreviations:* ACHD, adult congenital heart disease; CHD, congenital heart disease; ESC, European Society of Cardiology; FCPC, French Society of Congenital and Paediatric Cardiology; GUCH, grown-up congenital heart disease.

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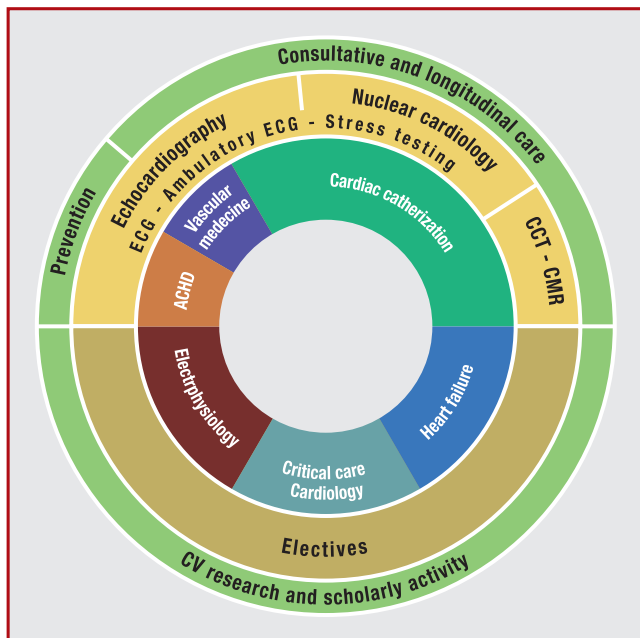
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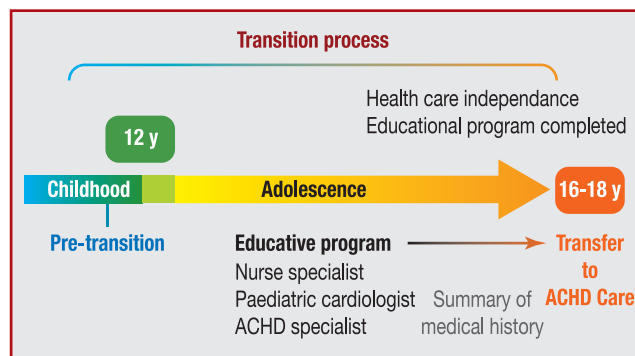
Cardiopathie congénitale ;  
 Cardiopathie congénitale de l'adulte ;  
 Transition des cardiopathies congénitales ;  
 Société internationale des cardiopathies congénitales de l'adulte ;  
 Filiale de cardiologie pédiatrique et congénitale

Training in ACHD varies according to countries and continents. The International Society for Adult Congenital Heart Disease (ISACHD) reported results from a survey of ACHD fellows from 24 different countries [9]. The mean rating for satisfaction with their training in CHD was 3.11/5, and was clearly insufficient (2/5) for training related to advanced imaging modalities (computed tomography and magnetic resonance imaging); 40% of responders defined their training as "stressful". Indeed, training in ACHD involves a wide range of diagnostic and therapeutic methods used in the care of adults with CHD, including direct experience in echocardiography, magnetic resonance imaging, computed tomography, diagnostic catheterization, electrophysiology

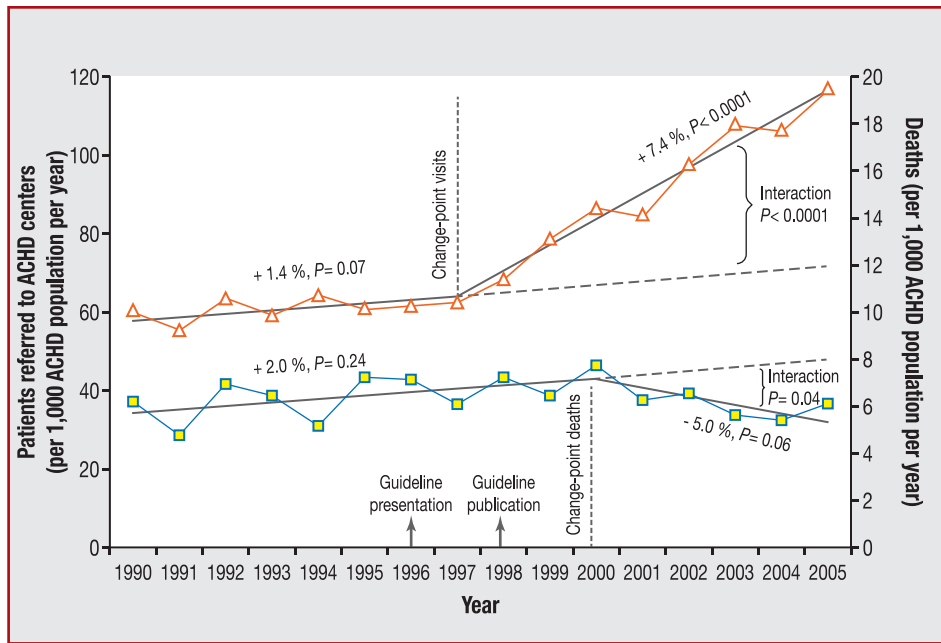
and exercise testing. The American Board of Medical Specialities has recognized ACHD as a separate subspecialty of cardiology, and has issued guidelines for ACHD training [10,11]. This ACHD fellowship training is a 24-month commitment, including full-time clinical training and 6 months of elective clinical or research experience. The trainee should spend 9–12 months on inpatient service and/or ACHD consultative service, 3 months on ACHD imaging (including echocardiography and cardiac magnetic resonance imaging), 2 months on cardiac catheterization and 1 month in the intensive care unit caring for postoperative patients. The ESC Working Group on GUCH also recommends a training period of 24 months, and has quantified the experience required for qualification in ACHD (Table 2) [8]. However, the gaps in knowledge and experience differ between adult and paediatric cardiologists. The American Academy of Pediatrics and the American Heart Association has published recommendations for including CHD training in both paediatric and adult cardiology fellowships [12,13]: trainees with a paediatric cardiology background should spend 2 months taking care of ACHD inpatients, and those with an adult cardiology background should spend 2 months with paediatric CHD patients. Specific knowledge in ACHD must be acquired during training in women's contraception and



**Figure 1.** Timeline for transition from a specialized paediatric congenital heart disease (CHD) centre to an adult CHD (ACHD) centre. The cardiac team should be composed of both paediatric CHD and ACHD specialists [5]. y: years.



**Figure 2.** Time-series analysis illustrating observed specialized adult congenital heart disease (ACHD) centre referral (black line) and ACHD mortality (grey line) [6].



**Figure 3.** Different components of training during the standard cardiovascular fellowship, according to the recommendations of the American College of Cardiology. Elective time for training in adult congenital heart disease (ACHD; orange) is limited [7]. CCT: cardiac computed tomography; CMR: cardiac magnetic resonance imaging; CV: cardiovascular; ECG: electrocardiogram.

pregnancy, participation in sports and exercise, psychosocial aspects and legislative aspects of employment and advocacy [14,15]. It is important for fellows to know when to refer ACHD patients to non-ACHD medical expertise, including the fields of general internal medicine, obstetrics, gynaecology, nephrology, hepatology, haematology and psychiatry. Specific exposure to multidisciplinary teams caring for ACHD should be emphasized.

GUCH working groups have included an evaluation of competency to certify ACHD training [6,13]. Evaluation tools include direct observation by a supervisor,

in-training examinations, case logbooks and reflection and self-assessment. The programme director is responsible for confirming the experience and competence of the fellow. In the USA, certification in ACHD is promulgated by the Accreditation Council for Graduate Medical Education (ACGME). In Europe, the final examination should be organized and undertaken jointly by the national adult and paediatric

**Table 1** Staff requirements for a specialized adult congenital heart disease centre. From the European Society of Cardiology Working Group on Grown-up Congenital Heart Disease [8].

Adult/paediatric cardiologist with GUCH certification	At least 2
GUCH imaging specialist with GUCH certification	At least 2
Congenital invasive cardiologist	At least 2
CHD surgeon	At least 2
Anaesthesiologist with CHD experience and expertise	At least 2
Invasive electrophysiologist with GUCH experience	At least 1
Psychologist	At least 1
Social worker	At least 1
Cardiovascular pathologist	At least 1

CHD: congenital heart disease; GUCH: grown-up congenital heart disease.

**Table 2** Quantification of experience required for qualification in adult congenital heart disease. From the European Society of Cardiology Working Group on Grown-up Congenital Heart Disease [8].

	Number required
Outpatients (majority with great or moderate complexity)	> 400
Inpatients	> 200
Echocardiography in CHD	
TTE performed	> 250
TOE performed	> 50
CMR/CT in CHD	
Interpreted	> 50
Heart catheterization in CHD	
Interpreted	> 30
Catheter intervention in CHD	
Interpreted	> 20
Electrophysiology in CHD	
Participated	> 5

CHD: congenital heart disease; CMR: cardiac magnetic resonance imaging; CT: computed tomography; TOE: transoesophageal echocardiography; TTE: transthoracic echocardiography.

cardiology societies [16,17]. If the national societies agree with European accreditation, a certificate for the subspecialty of GUCH will be awarded by the ESC. In France, reform of the third cycle of medical school is ongoing. The French Society of Congenital and Paediatric Cardiology (FCPC) has proposed the inclusion of complementary training in CHD, named "Formation Spécialisée Transversale" (i.e. Cross-Speciality Training). This 12-month period of Cross-Speciality Training could be integrated with both the paediatrician and adult cardiology fellowships [16–18].

Additional training that conforms to the ESC accreditation will be required to validate the ACHD certificate. The FCPC has estimated that 20–30 medical doctors should be trained in ACHD in France, but there is still a long way to go to achieve that goal. This special issue of *Archives of Cardiovascular Diseases* demonstrates the major challenge in training cardiologists in CHD.

## Disclosure of interest

The author declares that he has no competing interest.

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