Adult Congenital Heart Disease (ACHD): What Every Provider Should Know

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Adult Congenital Heart Program
Oregon Health and Science University

No disclosures
## Congenital Heart Disease

<table>
<thead>
<tr>
<th>Simple Shunts</th>
<th>Complex/Cyanotic Lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial septal defect</td>
<td>Tetralogy of Fallot</td>
</tr>
<tr>
<td>Ventricular septal defect</td>
<td>Pulmonary Atresia</td>
</tr>
<tr>
<td>Patent ductus arteriosus</td>
<td>Truncus arteriosus</td>
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<tr>
<td>Atrioventricular septal defect</td>
<td>Transposition of the great arteries</td>
</tr>
<tr>
<td>Anomalous pulmonary vein</td>
<td>Eisenmenger syndrome</td>
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<td></td>
<td>Single ventricle heart</td>
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<table>
<thead>
<tr>
<th>Left-sided problems</th>
<th>Coronary artery anomalies</th>
</tr>
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<tbody>
<tr>
<td>Bicuspid valve</td>
<td>Anomalous origin</td>
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<tr>
<td>Coarctation</td>
<td>Coronary from pulmonary artery</td>
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<tr>
<td>Sub-aortic stenosis</td>
<td>Coronary fistulae</td>
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<td>Cor-triatriatum</td>
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<table>
<thead>
<tr>
<th>Right-sided problems</th>
<th>Aortopathy</th>
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<tbody>
<tr>
<td>Congenital pulmonic stenosis</td>
<td>Marfans</td>
</tr>
<tr>
<td>Ebstein Anomaly</td>
<td>Turners</td>
</tr>
</tbody>
</table>
Adults with Congenital Heart Disease (ACHD)

1944
Adults with Congenital Heart Disease (ACHD)

Shunts

1944
Adults with Congenital Heart Disease (ACHD)

1954

Shunts
Adults with Congenital Heart Disease (ACHD)

1954

- Shunts
- Cardiopulmonary bypass

Adults with Congenital Heart Disease (ACHD)

1957

Shunts
Cardiopulmonary bypass
Mustard/Senning

Adults with Congenital Heart Disease (ACHD)

1957

Shunts

Cardiopulmonary bypass

Mustard/Senning

Adults with Congenital Heart Disease (ACHD)

1971

Shunts
Cardiopulmonary bypass
Mustard/Senning
Single Ventricle
Hypoplastic LV
Adults with Congenital Heart Disease (ACHD)

1971

- Shunts
- Cardiopulmonary bypass
- Mustard/Senning
- Single Ventricle
- Hypoplastic LV

Evolution of Surgical Successes

- **1950**  
  - **Shunts**

- **1960**  
  - **Cardiopulmonary bypass**

- **1970**  
  - **Mustard/Senning**

- **1980**  
  - **Single Ventricle**

- **1990**  
  - **Hypoplastic LV**

- **2000**  
  - **90% SURVIVAL**

- **2010**  
  - **10% SURVIVAL**

Adults with Congenital Heart Disease (ACHD)
Adults = Children with CHD

Marelli A, Circulation. 2007;115:163-172
Adults with Congenital Heart Disease (ACHD)

Adults = Children with CHD

Individuals with moderate/severe congenital heart disease

Marelli A, Circulation. 2007;115:163-172
Prevalence of ACHD

Oregon Population  3,421,399
Prevalence of ACHD

Oregon Population 3,421,399

Congenital Heart Disease 27,371

Adults with CHD 13,685
A Typical Story

“Blue Baby”

Born in 1964 in California
Diagnosed with tetralogy of Fallot
Surgery performed in 1968 (15th case)
A Typical Story

“Blue Baby”

Born in 1964 in California
Diagnosed with tetralogy of Fallot
Surgery performed in 1968 (15th case)
Good recovery post op, pink
No problems thereafter
 Played high school sports
Career in manufacturing

SUCCESS!!!!
A Typical Story

Now 44 years old

- Gradual decline of function for years
- Occasional palpitations and chest pain

One evening at home felt “chest fluttering”
Became disoriented, lightheaded, then passed out.
A Typical Story
“We predict that in the next two decades an increasing fraction of medical resources will be directed toward the residua and sequelae of cardiac surgical procedures [in children].”

Roberts NK, Med Care. 1980 Sep;18(9):930-9
STATE-OF-THE-ART PAPER

The Adult With Congenital Heart Disease

Born to Be Bad?

Carole A. Warnes, MD, MRCP, FACC

Rochester, Minnesota
ACC/AHA 2008 Guidelines for the Management of Adults With Congenital Heart Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Develop Guidelines on the Management of Adults With Congenital Heart Disease)

Developed in Collaboration With the American Society of Echocardiography, Heart Rhythm Society, International Society for Adult Congenital Heart Disease, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons

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Where Are These Patients?

Birth     5 10 15 20 25 30 35 40

Pediatric Care

Adult Care
Children and Adults With Congenital Heart Disease Lost to Follow-Up
Who and When?

Andrew S. Mackie, MD, SM; Raluca Ionescu-Ittu, MSc; Judith Therrien, MD; Louise Pilote, MD, MPH, PhD; Michal Abrahamowicz, PhD; Ariane J. Marelli, MD

**Background**—Many patients with congenital heart disease (CHD) require lifelong care. However, the duration of cardiology follow-up in children and adults with CHD is unknown. We sought to determine the proportion of children and young adults with CHD receiving outpatient cardiology care and to identify predictors of lack of follow-up.

**Methods and Results**—The study population consisted of individuals born in 1983 and alive at age 22 years who were diagnosed with CHD in Quebec, Canada, before 6 years of age (n=643). Patients and outpatient visits were identified with the use of the provincial physician’s claims database. Three age groups were examined for the presence of outpatient cardiology follow-up: 6 to 12, 13 to 17, and 18 to 22 years. CHD lesions were classified as severe (n=84; 13%), simple shunts (n=390; 61%), and “other” lesions (n=169; 26%). Failure to receive cardiology follow-up after the 6th, 13th, and 18th birthday occurred in 28%, 47%, and 61%, respectively. Among those with severe lesions, only 79% were seen after the 18th birthday. However, the majority of subjects visited primary care physicians in all age groups, and 93% remained in contact with the healthcare system into early adulthood. Predictors of lack of cardiology follow-up in adulthood included male sex, a nonsevere lesion, and a history of follow-up outside a university hospital setting.

**Conclusions**—Lack of cardiology follow-up begins during childhood, even among those with severe lesions. This occurs despite patients being in contact with other healthcare providers. Improved communication with primary care physicians may reduce the proportion of patients lost to cardiac follow-up. (*Circulation. 2009;120:302-309.*)

**Key Words:** adults, congenital heart disease, continuity of care, pediatrics
# Why are these patients not being seen?

<table>
<thead>
<tr>
<th>Patient Obstacles:</th>
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<tbody>
<tr>
<td>Patient assumes “cure”</td>
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<tr>
<td>Poor communication from parents or pediatrician</td>
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<tr>
<td>Loss of previous health records</td>
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<tr>
<td>Gradual symptom onset</td>
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<tr>
<td>Lack of health insurance</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Physician Obstacles:</th>
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<tbody>
<tr>
<td>Physician assumes “cure”</td>
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<tr>
<td>Uninformed about specific potential problems</td>
</tr>
<tr>
<td>No prior records available</td>
</tr>
<tr>
<td>No reported symptoms</td>
</tr>
<tr>
<td>Symptoms ascribed to more common causes</td>
</tr>
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</table>
Health Care Utilization

Quebec Study:

22,000 adults with congenital heart disease

Health encounters over a 4 year period (1996 – 2000)

Health Care Utilization

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51% were hospitalized (2.5 x general population)

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51% were hospitalized (2.5 x general population)

68% were seen in emergency departments

Health Care Utilization

Quebec Study:

22,000 adults with congenital heart disease

Health encounters over a 4 year period (1996 – 2000)

51% were hospitalized (2.5 x general population)
68% were seen in emergency departments
87% of outpatient visits were to non-cardiologists

Health Care Utilization

European Multicenter Study

62% of ED visits required non-cardiology services:

- Surgery
- Internal Medicine
- Neurology
- Ophthalmology
- ENT
- Gynecology
- Psychiatry
- Dermatology
- Orthopedics

Kaemmerer H, 2007
Health Care Utilization

Portland Population of ACHD patients (age 37±18 years):
    Frequency of coded diagnoses over 3 year period:
        34%  Cardiac problems

Weiss and Broberg, 2011
Health Care Utilization

Portland Population of ACHD patients (age 37±18 years):

Frequency of coded diagnoses over 3 year period:

34% Cardiac problems

67% Non-Cardiac problems:

8% Gastroenterology
7% Endocrine
7% Pulmonary
7% Orthopedics
7% Obstetrics/Gynecology
5% Psychology
7% Hematology & Oncology
3% Neurology
3% Infectious Disease
3% Dermatology
7% Surgery including sub-specialties

Weiss and Broberg, 2011
The Non-Cardiology Encounter

Why is recognizing ACHD potentially important

- Complaints or problems may be secondary to congenital defect
The Non-Cardiology Encounter

Why is recognizing ACHD potentially important

- Complaints or problems may be secondary to congenital defect
- Treatment options can be impacted by the congenital defect
The Non-Cardiology Encounter

Why is recognizing ACHD potentially important

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- Treatment options can be impacted by the congenital defect
- Provides a chance to review patients cardiac status
Adults with Congenital Heart Disease (ACHD)

The Non-Cardiology Encounter

Why is recognizing ACHD potentially important

- Complaints or problems may be secondary to congenital defect
- Treatment options can be impacted by the congenital defect
- Provides a chance to review patients cardiac status
- Provides a chance to get patient plugged back in to specialty care when necessary
Adults with Congenital Heart Disease (ACHD)
Case 1

36 year old woman had a “hole in my heart” as a kid. Surgery at age 3, doesn’t know details.

No problems since that time
Followed by local cardiologist for murmur
Mild pulmonary stenosis on echo
Asymptomatic, walks several miles a day
Case 1

36 year old woman had a “hole in my heart” as a kid
Case 1

36 year old woman had a “hole in my heart” as a kid
Presented with sudden diaphoresis and light headedness
36 year old woman had a “hole in my heart” as a kid
Case 1

Tetralogy of Fallot
Case 1

Tetralogy of Fallot

- PS
- vsd
- RV
- LV
- RVH
Case 1: Tetralogy of Fallot

Can be completely asymptomatic
Case 1: Tetralogy of Fallot
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Case 1: Tetralogy of Fallot

Pulmonary valve stenosis
Case 1: Tetralogy of Fallot

Pulmonary valve regurgitation
Case 1

36 year old woman had a “hole in my heart” as a kid

Severe pulmonary valve regurgitation
Severely enlarged right ventricle
Case 1

36 year old woman had a “hole in my heart” as a kid

Patient underwent surgery to replace the pulmonary valve. Implanted Cardioverter-Defibrillator

1 year later
  Reduction of RV volume but not back to normal levels
  Continues to be asymptomatic
Case 2

33 year old with prior coarctation repair
Surgical correction at one month of age
Several corrective surgeries from complications related to his initial repair.
Case 2

33 year old with prior coarctation repair
Surgical correction at one month of age
Several corrective surgeries from complications related to his initial repair.

Extensive story of his first 6 months of life well-documented
Patient very knowledgeable of the details
Had regular follow up
Adults with Congenital Heart Disease (ACHD)

Case 2
Case 2

33 year old with prior coarctation repair

Presents to local ED with violent hematemesis/hemoptysis
“"I splattered the bathroom wall with blood.""
Case 2

33 year old with prior coarctation repair

Presents to local ED with violent hematemesis/hemoptysis
“I splattered the bathroom wall with blood.”

Work-up showed stable vital signs
Told it was probably epistaxis
Discharged
Case 2

33 year old with prior coarctation repair

Presents to local ED with violent hematemesis/hemoptysis
“I splattered the bathroom wall with blood.”

Work-up showed stable vital signs
Told it was probably epistaxis
Discharged

D-Dimer results positive; called back from parking lot
Case 2

33 year old with prior coarctation repair
CT scan to exclude pulmonary embolism
Case 2

33 year old with prior coarctation repair
Life flight to referral center
Emergent covered stent deployment in the OR
Case 3

27 year old man with a ventricular septal defect. Aortic valve insufficiency related to the defect. Surgery at age 12, closed defect, repaired valve. Small residual VSD thereafter
Case 3

27 year old man with a ventricular septal defect. Aortic valve insufficiency related to the defect. Surgery at age 12, closed defect, repaired valve. Small residual VSD thereafter.

URI like symptoms (fever, myalgias, nonproductive cough) Given Azithromycin for bronchitis Symptoms improved Febrile one week later Repeat course of antibiotics
Case 3

27 year old man with a ventricular septal defect.

Repeated recurrent infection
  Multiple courses of various antibiotics
  Always symptom relief 1 day after starting antibiotics

Had seen dentist a few weeks ago but only for a loose filling
Took prophylactic antibiotics beforehand
Case 3

27 year old man with a ventricular septal defect.

Laboratory Evaluation

- WBC 7,000/l
- Hemoglobin 16 g/dl
- Hematocrit 48%
- Platelets 209 /ml
- Creatinine 1.3 mg/dl
- ESR 1 mm/hr
- Urinalysis normal
Adults with Congenital Heart Disease (ACHD)

Case 3
Case 3

27 year old man with a ventricular septal defect.

All antibiotics stopped
One week later patient developed fever
Blood cultures grew *Streptococcus viridans*

Treated with penicillin and gentamycin for 2 weeks IV
Gentamycin stopped

No further fever, negative surveillance cultures thereafter.
Adults with Congenital Heart Disease (ACHD)
Case 4

41 year old with prior “Mustard” surgery
Remembers something about the ventricles being twisted
No surgery since then, generally healthy
Case 4

41 year old with prior “Mustard” surgery
Remembers something about the ventricles being twisted
No surgery since then, generally healthy

Gradually becoming more “out of shape”
Has gained 10 lbs in three months
### Case 4: Transposition of the Great Arteries

Two Distinct Subtypes

<table>
<thead>
<tr>
<th></th>
<th>D-TGA</th>
<th>L-TGA</th>
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<tbody>
<tr>
<td>“Complete Transposition”</td>
<td>&quot;Complete Transposition”</td>
<td>“Congenitally-corrected Transposition”</td>
</tr>
<tr>
<td>“Mustard” or “Senning”</td>
<td>“Mustard” or “Senning”</td>
<td>“Ventricular Inversion”</td>
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<tr>
<td>Atrioventricular concordance</td>
<td>Atrioventricular concordance</td>
<td>Atrioventricular discordance</td>
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<tr>
<td>Ventriculoarterial discordance</td>
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Case 4: Transposition of the Great Arteries

Atrial Switch Palliation ("Mustard" or "Senning")
 Adults with Congenital Heart Disease (ACHD)

Case 4: Transposition of the Great Arteries

Atrial Switch Palliation ("Mustard" or "Senning")
Case 4: Transposition of the Great Arteries

Atrial Switch Palliation ("Mustard" or "Senning")
Case 4: Transposition of the Great Arteries

Atrial Switch Palliation ("Mustard" or "Senning")

Common long-term problems:
- Obstruction of the venous pathways
- Atrial arrhythmia
- Tricuspid valve ("mitral") regurgitation
- Heart failure from systolic dysfunction
Case 4

41 year old with prior “Mustard” surgery
Severe systemic right ventricular failure
Case 4

41 year old with prior “Mustard” surgery

Refractory heart failure
Several admissions
Worsening exercise capacity
Referred for transplantation
Workup for listing began
Case 4

41 year old with prior “Mustard” surgery
Screening CT scan before heart transplant
Case 4

41 year old with prior “Mustard” surgery

Renal Cell Carcinoma
  Successful L nephrectomy
  No extension of tumor
Case 4

41 year old with prior “Mustard” surgery

Renal Cell Carcinoma
   Successful L nephrectomy
   No extension of tumor
   Not a transplant candidate
   Continued to have worsening heart failure
   Eventually ventricular assist device placed
Cancer in Congenital Heart Disease?

Frequent radiation exposure in childhood
Long-term consequences uncertain
Frequency of cancer still not known
Adults with Congenital Heart Disease (ACHD)
Case 5

25 year old woman

Born with complicated congenital heart disease

“I was fixed at the Mayo Clinic.”
Case 5

25 year old woman
   Born with complicated congenital heart disease
   “I was fixed at the Mayo Clinic.”

Asymptomatic
Recently married
Tried to conceive
Referred to fertility clinic
No obstetrical abnormalities found
IVF planned
Case 5

25 year old woman
- Born with complicated congenital heart disease
- “I was fixed at the Mayo Clinic.”

Asymptomatic
Recently married
Tried to conceive
Referred to fertility clinic
No obstetrical abnormalities found
IVF planned

Had a syncopal event after several months
Case 5
Adults with Congenital Heart Disease (ACHD)

Case 5

Double Outlet Right Ventricle
Case 5

Rastelli Repair
Case 5

Subaortic Stenosis (tissue in conduit)
Case 5  Outcome

25 year old woman

Born with complicated congenital heart disease

“I was fixed at the Mayo Clinic.”

Surgery done to revise the baffle and remove stenosis.
Case 5   Outcome

25 year old woman

Born with complicated congenital heart disease
“I was fixed at the Mayo Clinic.”

Surgery done to revise the baffle and remove stenosis.

6 months later had no problems conceiving
Monitored carefully throughout pregnancy
Successful delivery of a baby boy
Case 5

Study of pre-pregnancy counseling

<table>
<thead>
<tr>
<th>Advice Received</th>
<th>Preferred Recommendation</th>
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<tbody>
<tr>
<td>Pregnancy SAFE</td>
<td>Pregnancy SAFE 80</td>
</tr>
<tr>
<td>Pregnancy UNSAFE</td>
<td>Pregnancy UNSAFE 9</td>
</tr>
</tbody>
</table>

30% of women given wrong advice!

Kovacs, AH, JACC 2008 52(7):577-8
<table>
<thead>
<tr>
<th>Frequent types of uninformed advice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pregnancy/contraception?</strong></td>
</tr>
<tr>
<td>Safe for most, with guidance</td>
</tr>
<tr>
<td><strong>Safety of air travel?</strong></td>
</tr>
<tr>
<td>Generally safe for all</td>
</tr>
<tr>
<td><strong>Exercise?</strong></td>
</tr>
<tr>
<td>Strongly encouraged for most</td>
</tr>
<tr>
<td><strong>Prophylactic Antibiotics?</strong></td>
</tr>
<tr>
<td>Generally no, but YES for cyanotics, prosthetic valves, or residual shunt by prosthesis</td>
</tr>
</tbody>
</table>
Adults with Congenital Heart Disease (ACHD)
Case 6

26 year old woman with a single ventricle
Case 6

26 year old woman with a single ventricle
Fontan palliation at age 8
Case 6

Fluid dynamics
Case 6

26 year old woman with single ventricle/Fontan

One evening began experiencing persistent palpitations

Next morning

Hemiparesis and aphasia

Found to have embolic stroke to MCA.

Urgent thrombus retrieval and direct thrombolysis
Case 6

Electrocardiogram: Atrial arrhythmia
Case 6

Left atrial appendage thrombus
Case 6

Large thrombus in “right atrium”
Case 6

26 year old woman with single ventricle/Fontan

Considerations

- Atrial fibrillation no doubt contributed to thrombosis
- Large RA, should require thrombectomy
- Mortality 18% (75% if hemodynamically significant)
- Cannot cardiovert given existing thrombi
Case 7

26 year old woman with single ventricle
Case 7

26 year old woman with single ventricle

Age 5: Fontan operation
Case 7

26 year old woman with single ventricle

Age 5: Fontan operation
Age 14: Atrial arrhythmia
Case 7

26 year old woman with single ventricle

Age 5: Fontan operation
Age 14: Atrial arrhythmia
Age 15: Reoperation (Fontan revision)
Case 7

26 year old woman with single ventricle

Age 5:  Fontan operation
Age 14:  Atrial arrhythmia
Age 15:  Reoperation (Fontan revision)
Age 20:  Recurrent atrial arrhythmia
  Several cardioversions
  Several medications tried
  Several ablation attempts
Case 7

26 year old woman with single ventricle

Age 5:  Fontan operation
Age 14:  Atrial arrhythmia
Age 15:  Reoperation (Fontan revision)
Age 20:  Recurrent atrial arrhythmia
  Several cardioversions
  Several medications tried
  Several ablation attempts
Age 23:  Worsening cyanosis
  Coil embolization of collateral arteries
Case 7

26 year old woman with single ventricle
Age 25: Acute Cholecystitis
  Laparoscopic cholecystectomy
  Attention to excessive intraperitoneal pressure
  Careful management of ventilation
  Extubated quickly
Uneventful post-op recovery and discharge
Case 7

26 year old woman with single ventricle
Age 25: Acute Cholecystitis
3 months later
Worsening ascites
Abdominal Pain
Spontaneous bacterial peritonitis
Case 7

26 year old woman with single ventricle

Liver congestion
Early cirrhosis
Coagulopathy
Case 7

26 year old woman with single ventricle

Several hospitalizations over a few months
Unable to continue working
Friends stopped visiting her
Boyfriend wanted to “start seeing other people”
Moved back in with parents
Depression, poor compliance with medications
Now awaiting transplantation
# Single Ventricle: Overall Complications

<table>
<thead>
<tr>
<th>Cardiac Complications</th>
<th>Non-Cardiac Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrhythmia</td>
<td>Hepatic congestion/cirrhosis</td>
</tr>
<tr>
<td>Thromboembolism</td>
<td>Protein-losing enteropathy</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>Psychosocial issues</td>
</tr>
<tr>
<td>Venous obstruction</td>
<td>Venous stasis</td>
</tr>
<tr>
<td>Ventricular Failure</td>
<td>Renal dysfunction</td>
</tr>
</tbody>
</table>

*Long-term Complications are the Rule!*
Adults with Congenital Heart Disease (ACHD)
32 year old woman

Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

Pacemaker for decades with several revisions
Atrial fibrillation
Moderate ventricular dysfunction
Mild renal insufficiency
Trying to raise her 12 year old son
Case 8
Case 8

32 year old woman

Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

Outpatient visit:

Generally slowing down
Mild gastrointestinal pain
No new findings of cardiovascular disease
Case 8

32 year old woman
Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

Outpatient visit:
Generally slowing down
Mild gastrointestinal pain
No new findings of cardiovascular disease
Depressed appearance
Confessed to feeling down
Case 8

32 year old woman
   Congenitally corrected transposition of the great arteries
   Ventricular septal defect closed with surgery in childhood

That Evening:
Case 8

32 year old woman
Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

That Evening:
Cardiac arrest
Case 8

32 year old woman

Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

That Evening:

Cardiac arrest
9 minutes of CPR.
Medics found her in PEA
Resuscitated with epinephrine
Initial BP 50/30
Case 8

32 year old woman

- Congenitally corrected transposition of the great arteries
- Ventricular septal defect closed with surgery in childhood

Difficult post-resuscitation

- Sepsis
- Multiorgan failure, CVVH for ATN
- Neurologically responsive but not fully recovered
Adults with Congenital Heart Disease (ACHD)

Case 8

32 year old woman
Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

Two weeks post arrest
Disseminated candidiasis
Bowel perforation
Case 8

32 year old woman
Congenitally corrected transposition of the great arteries
Ventricular septal defect closed with surgery in childhood

Two weeks post arrest
Disseminated candidiasis
Bowel perforation
Died
Adults with Congenital Heart Disease (ACHD)
What Every Provider Should Know

ACHD patients are common
Prior surgery almost never means “cure.”
Many patients are receiving uninformed care or no care
Many have multisystem manifestations
ALL Providers should be aware of common pitfalls:
  Don’t ignore subtle but progressive problems
  Treat arrhythmias aggressively
  Avoid uninformed or unnecessary imaging
  Avoid uninformed advice
  Seek consultation
Adults with Congenital Heart Disease (ACHD)
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Thank You

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