

An Infant with Rapid breathing

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Please Use the Slide Show view to benefit from step wise animation of the case presentation and to have a chance to think in the case

The chief complaint inquiry

 A 2 month old female infant is brought to the clinic. The mother tells you that she noted rapid breathing

What else do you need to know?

- When did it start
- Is it continuous or episodic
- How severe is it (was the rate counted?, is it affecting feeding)
- Is it worsening with time
- When does the baby becomes tachypneic, diurnal variations, postural variations, aggravating factors such as feeding and crying)
- How is it relieved

The chief complaint Story

The mother says she had noticed the rapid breathing for the last month, but it is getting worse gradually. It comes in episodes, and more more frequently this week (progressive). She does not know how to count the respiratory rate, but in the last week she noticed that the baby cannot complete her feeding because of rapid breathing. The episodes happen following feeding, and after she cries, and resolve spontaneously after several minutes and when she sleeps

How would you proceed with history taking?.....

HPI inquiry

Think about the other important questions that you need to ask

Hint:

Make a short list of possible etiologies

• Example of your short list of etiologies:

- Chronic or recurrent respiratory pathology
- Cardiac failure
- Gastro esophageal reflux
- Progressive Anemia

 Click next for examples of inquiries about associated symptoms

The Associated symptoms

Respiratory symptoms inquiry Cough **Difficulty of Breathing** Noisy breathing (wheeze, stridor, grunting) **Upper respiratory** symptoms Cyanosis

Cardiac symptoms inquiry Cold extremities Diaphoresis **Easily fatigued** Edema **Decreased urine output** Poor weight gain (difficulty of breathing and cyanosis.. Also respiratory symptoms)

Inquiry about GER and Anemia Vomiting **Regurgitation and** aspiration Poor weight gain Progressive pallor, hemolytic anemia symptoms

The HPI Story

The mother says that the baby has <u>no cough</u>, but her breathing is labored after feeding, there is occasional <u>noisy breathing</u> but the mother cannot describe it. There are no upper respiratory symptoms, and <u>no cyanosis</u>.

The extremities were not cold, but the infant <u>sweats a lot</u>, and gets fatigued and <u>breathless during feeding</u>, and her <u>urine</u> is becoming more concentrated and <u>less in amount</u>, no edema was noted. She gained <u>300 grams</u> in the last month.

There was no vomiting or spitting up, no chocking. She did note pale extremities recently, but with no jaundice.

How does the story help you in differential diagnosis?

- GERD is not likely due to absence of symptoms
- Heart failure is more likely
- Respiratory pathology is still a possibility, although less likely
- Anemia is still a possibility

• How would you proceed with history taking?

The other important parts of history

Inquiry	Importance
Prenatal history: asking about exposure to infections (TORCH), or medications or radiation. Maternal illnesses like diabetes.	Congenital malformation (CHD)
Natal and postnatal history: Gestational age , NICU admission, need for respiratory support, birth weight	Chronic lung disease
Nutritional history: type of milk, amount, frequency, etc.	Assess caloric intake to check for etiology of poor weight gain Iron deficiency anemia
Family history: siblings or close relatives with CHD (heart surgery in childhood, early deaths) Family history of hereditary anemias (hemolysis, splenectomy)	Genetic susceptibility

The rest of the Story

The mother says she had a normal pregnancy with no illnesses in the first trimester. She is not diabetic, and received no medications.

The mother says that the baby was born by CS at 38 weeks gestation with a birth weight of 3.2 kg, discharged home at 48 hours, with no NICU admission.

The baby is breast feeding, the mother believes she has enough milk, and the baby used to take enough except more recently when she becomes fatigued during the feed. No additional supplements are given.

There is no family history of congenital malformation, and no early deaths, or cardiac surgeries. No family history of anemias.

What is the importance of the physical examination?

Think of the physical examination, how would every step help you to:

- 1) Confirm your suspicion of heart failure
- 2) Rule out the presence of other possibilities
- 3) Determine the severity of the patient's condition
- 4) Help you determine the etiology of heart failure

Proceed for guidance

Vital signs

Sign	Importance
Respiratory rate	Quantitative assessment of the chief complaint. Know the normal value in this age Tachypnea is a non specific sign of: respiratory distress, respiratory infections, heart failure (pulmonary edema, congestion), metabolic acidosis, anemia etc.
Heart rate	Know the normal value in this age Tachycardia is a non specific sign of many conditions, but in this scenario: Heart failure, Respiratory infections and distress, Anemia (compensatory) Severe bradycardia (Rare) may indicate the presence of bradyarrhythmia as a cause of heart failure (e.g. complete heart block)
Blood pressure	Know how to find out the normal value in this age Elevated blood pressure may indicate the cause of heart failure in this infant (e.g. coarctation (not Rare presentation), secondary hypertension due to renal disorders (Rare presentation)) Low blood pressure indicates shock (severity of the condition)
Temperature	Fever indicates infectious process (e.g. respiratory infection) Decreased peripheral temperature indicates poor perfusion (sign of HF)
Pulse oximetry	Low oxygenation indicates problem of gas exchange (pulmonary cause), or Shunts (cardiac cause)

General exam and Growth parameters

Sign	Importance
Weight	Documentation of poor weight gain, know how to use growth chart
Height	Know how to use growth chart
Head circumference	Know how to use growth chart Microcephaly may be present in some syndromes (e.g. Down syndrome). Syndromes may be associated with CHD
Dysmorphism	Features of dysmorphism may indicate syndromes Look up common syndromes and congenital heart disease Down syndrome: AV canal Di George syndrome: Truncus arteriosus, Tetralogy of Fallot Noonan Syndrome, William Syndrome, Turner Syndrome
General appearance	Color: Pallor/ Cyanosis (pallor indicates anemia, or decreased perfusion), Cyanosis indicates detectable or visible hypoxemia (presence of visible amount of de-oxy hemoglobin) Signs of respiratory distress (retractions, flaring, grunting)

Systematic exam

	Sign	Importance
Respiratory System	Signs of respiratory distress : Retractions, Nasal flaring, Grunting	Indicates increased respiratory effort, points to respiratory disease, or HF
	Check for added sounds on auscultation (crepitations, wheezing)	Crepitation indicates presence of alveolar fluid (infection, heart failure)
Cardiovascular system	Peripheral exam: Capillary refill, peripheral and central pulses, edema	Prolonged capillary refill and poor peripheral pulses indicate poor perfusion, HF. Edema indicate increased preload
	Signs of cardiomegaly (displacement of apical impulse) Hepatomegally	Indicates increased preload, congestion
	Auscultation: looking for abnormal sounds and murmurs	Help determine the etiology of heart failure if present
Rest of systematic exam	Complete the exam, Abdominal, Neurological, and Developmental	Checking for associations

Physical examination findings

- Vital signs: RR 65, HR 165, BP 90/55 in right arm, Temp 37.2, Oxygen saturation 96%. Warm extremities.
- Growth: Wt 3.8 Kg, Height 58 cm, HC 39 cm
- Not dysmorphic
- Pink
- Has nasal flaring and intercostal retractions. No grunting.

Check vital signs normal values and growth parameters on growth chart

Examples for guidance

Hear	t Rate			Respira	tory Rate
Normal Heart Rate by Age (beats/minute) Reference: PALS Guidelines, 2015			Normal Respiratory Rate by Age (breaths/minute)		
Age	Awake	Sleeping		Age Reference: PALS Guidelines, 2015	6 Guidelines, 2015
	Rate	Rate	11		Normal Respiratory
Neonate (<28 d)	100-205	90-160	11		Kate
Infant (1 mo-1 y)	100-190	90-160	111	Infants (<1 y)	30-53
Toddler (1-2 y)	98-140	80-120		Toddler (1-2 y)	22-37
Preschool (3-5 y)	80-120	65-100		Preschool (3-5 y)	20-28
School-age (6-11 y)	75-118	58-90	1	School-age (6-11 y)	18-25
Adolescent (12-15 y)	60-100	50-90]	Adolescent (12-15 y)	12-20
Blood Pressure					
Normal Blood Pressure by Age (mm Hg)					
A.c.o.	Svetolic	Proceuro		Diastolic Pressure	Systelic Hypotension
$\frac{Age}{Birth(12 h < 1000 a)}$	Systone		⊢	16-26	
Birth(12 h, <1000 g)		9-59	⊢	10-30	<40-50
Birth (12 h, 3 kg)	6	0-76	-	31-45	<50
Neonate (96 h)	6	7-84	⊢	35-53	<60
Infant (1-12 mo)	72	2-104		37-56	<70
Toddler (1-2 y)	86	-106		42-63	<70 + (age in years x 2)
Preschooler (3-5 y)	89	-112		46-72	<70 + (age in years x 2)
School-age (6-9 y)	97	-115		57-76	<70 + (age in years x 2)
Preadolescent (10-11 y)	102	2-120		61-80	<90
Adolescent (12-15 y)	11(0-131		64-83	<90

Growth charts





SAFER-HEALTHIER-PEOPLE

the National Center for Chronic Disease Prevention and Health Promotion (2000). http://www.edc.gov/growthefanta

Relevant systemic exam findings

- The baby had <u>intercostal retraction</u>, no grunting or other added noisy breathing, no flaring.
- Respiratory auscultation showed clear breath sounds, no crepitations
- Peripheral pulses were normal, capillary refill time was 2 seconds. No peripheral edema, <u>liver was palpable 4 cm</u> below costal margin.
- Cardiac pulsations were prominent with <u>RV heave</u>.
- Cardiac auscultation showed normal s1 s2, with s3 audible. There was a soft 2/6 holosystolic murmur at the left sternal border.
- Rest of abdominal exam, neurological exam, and developmental assessment were normal.

What is your impression

Based on the history of physical findings, the clinical scenario is consistent with

HEART FAILURE

Respiratory symptoms are explained by pulmonary congestion Tachycardia is explained by compensatory mechanisms Liver enlargement is explained by systemic congestion

What would you expect in a chest radiograph of this patient?



Radiograph of this patient, what are the findings that support the presentation?

Cardiomegaly (Congestions) Increased pulmonary vascular markings (hazy lung fields)

Think about the possible etiologies HF in this patient! (Two month old at presentation)

CHD with increased pulmonary blood flow

- VSD (holosystolic murmur)
- PDA (machinery murmur, wide pulse pressure)
- AV canal defect (Down syndrome)

• Truncus arteriosus (mild desaturation, possible ejection click, wide pulse pressure)

CHD with systemic flow obstruction

- Aortic stenosis (click, radiation to the neck)
- Coarctation of aorta (high blood pressure, poor femoral pulses)

Poor myocardial contractility

• Dilated cardiomyopathy (family history)

• Myocarditis (hx of viral infection)

HF due to dysrrhythmia

- SVT (HR >220)
- Bradycardia (complete heart block), congenital CHB presents earlier

These are some examples of causes of heart failure in a two month old The most common is CHD with increased pulmonary blood flow You diagnosed this infant with HF secondary to a large VSD. What are the lines of management?

Nutritional support	Increase caloric intake (fortified formulas, more frequent feeds, NG feeding if needed)
	Diuretic (furosemide): decrease the congestion, improves respiratory distress
Medications	Afterload reduction (captopril): decrease the amount of left to right shunting
	Inotrope (digoxin): rarely needed, helps if systolic function is depressed
	Surgical paliation (Pulmonary artery constriction by a hand for tempor

Surgery

Surgical paliation (Pulmonary artery constriction by a band for temporary relief of symptoms if correction cannot be done) Surgical repair (VSD closure) is the definitive therapy

END