Acute Respiratory Failure in Children

Gökhan KALKAN M.D.
Division of Pediatric Critical Care
Gazi University, School of Medicine, Ankara
November 4th, 2015
3rd Italian-Turkish-Iranian Pediatric Congress, Antalya

Disclosure

I have no conflict of interest

Definition

Respiratory distress

Acute

Respiratory

Failure

ARDS

High O_2 consumption
Narrow airways
Limited compensatory mechanisms

Respiratory failure may lead to **cardiac arrest** very quickly

Unrecognized respiratory failure is the leading cause of cardiorespiratory arrest in pediatrics

Question

6 yo

GBS

Extremity weakness

Tachypnea

Weak cough

Which of the following might be the first sign of respiratory failure?

SpO2<95%

Retractions

Increase in CO_2 levels

Classification

PaO_2<60

Hypoxic / Hypercapnic

Classification

Airway obstruction
Decreased compliance
Neuromuscular disease
CNS disease

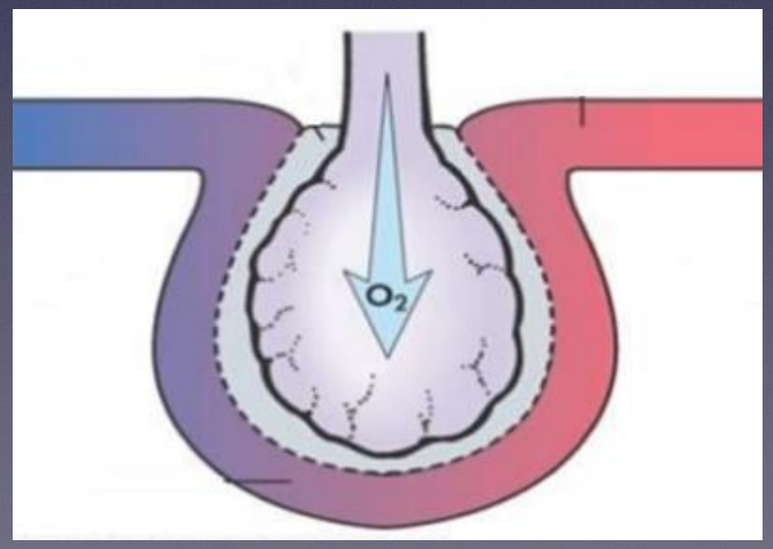
Hypercapnic

Neuromuscular disease
Thoracic deformities

Hypoventilation
V/Q mismatch
Shunt
Diffusion limitation

Hypoxic / Hypercap

Mechanism



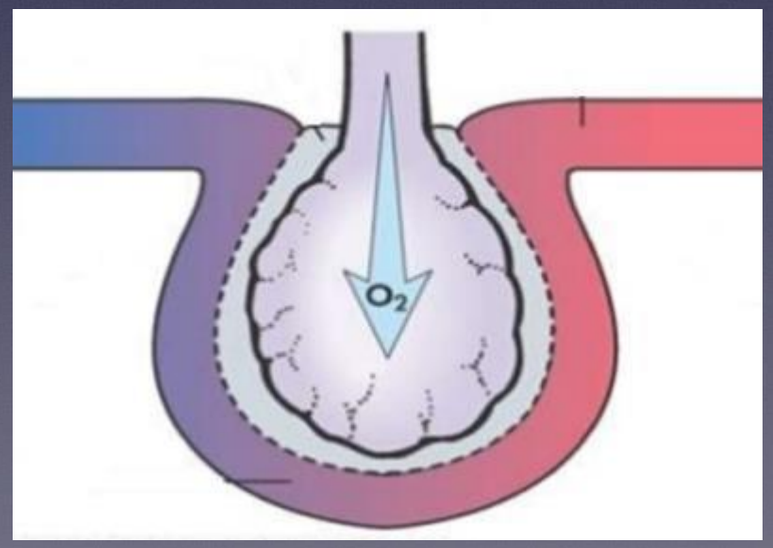
C

Airway diseases
Pulmonary emboli

Hypoventilation
V/Q mismatch
Shunt
Diffusion limitation

Hypoxic / Hypercap c

Mechanism



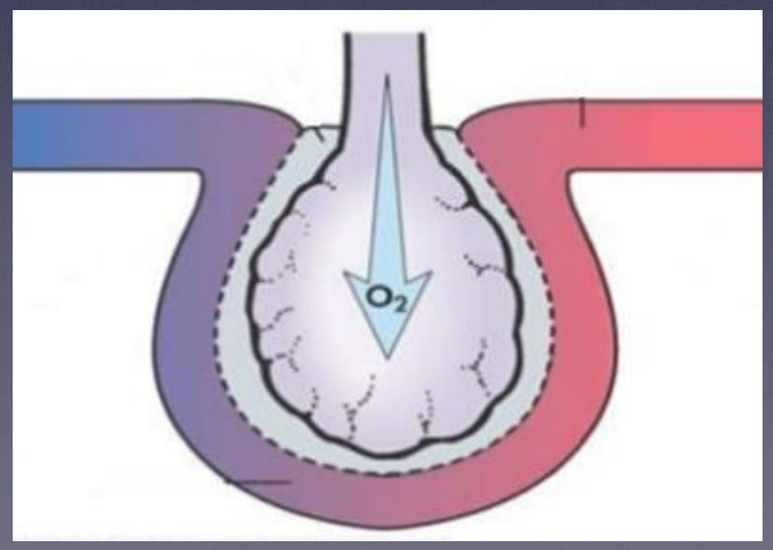
Clas

ARDS
Pneumonia
Pulmonary edema

Hypoventilation
V/Q mismatch
Shunt
Diffusion limitation

Hypoxic / Hypercap

Mechanism



Clinical findings

Tachypnea

Grunting

Nasal flaring

Retractions

Different in patients with NMD

Clinical findings

Retractions	Lungs/ airways
Shallow breathing	Respiratory muscles
Apnea	Central/ peripheric chemoreceptors

4 mo

Fever & nasal congestion for 4 days

Tachypnea

HR: 169/min

SpO_2: 92% at room air

Intercostal & subcostal retractions

Scattered wheezing

XR: increased aeration

Nasopharyngeal swab: RSV +

Increase in respiratory distress in the first day of his hospitalization

RR:86/min, HR: 189/min

Nasal flaring, grunting, ↑ **retractions**

What to do?

Transferred to PICU

Intubated

Increased aeration in XR

Post-intubation ABG: pH: 7.16, PCO_2: 70 mm Hg

How bad is th

Appearance
Color
Mental status
Activity

General

How bad is the patient?

General

How much O_2?

O_2 delivery methods

Nasal cannula 25-40%

Simple O_2 mask 30-65%

O_2 mask with reservoir 50-95%

Nasal cannula

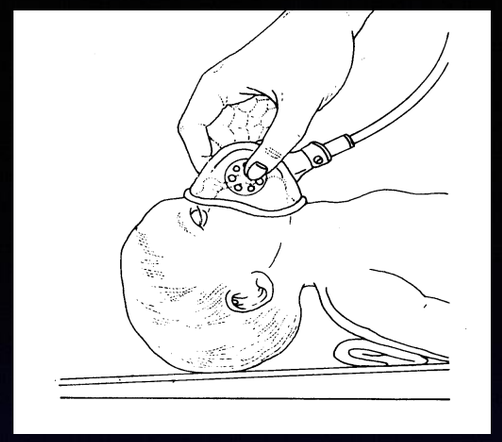
Supports ventilation
Good for CO_2 retention

ntrate the O_2

Pressure

Dry mucosa
Tympanic membrane rupture
O_2 flow should be < 4-5 L/min

O_2 mask



More concentrated O_2

Risk of CO_2 retention

O_2 flow should be > 4-5 L/min

How bad is the patient?

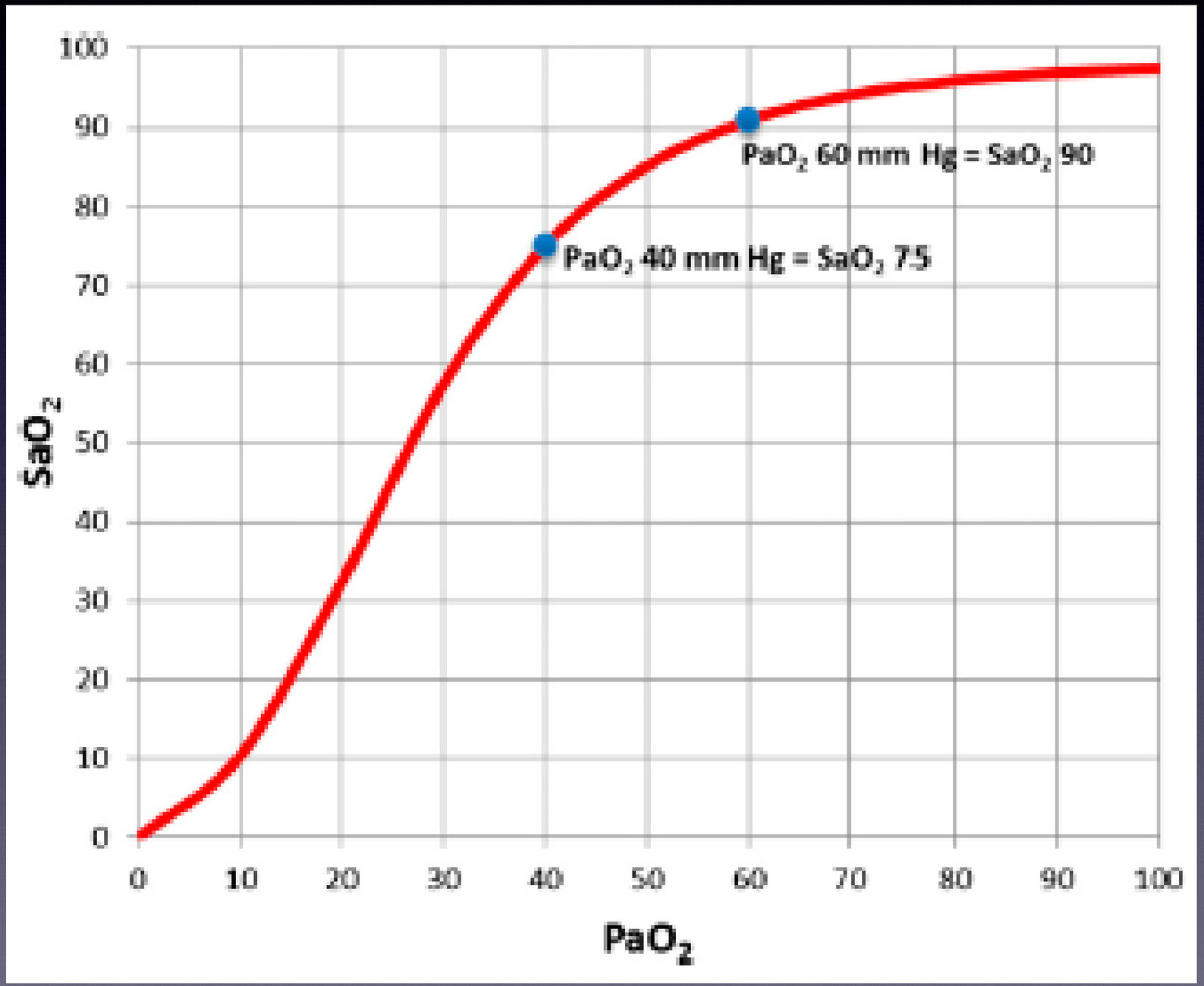
General

How much O_2?

RR

SpO_2

Pulse oxymetry



How bad is the patient?

General
How much O_2?
RR
SpO_2
Retractions
Respiratory sounds
Arterial blood gas

Arterial blood gas

Normal values

Lactate

Vein or artery

Interpretation

Normal values

pH	7.35 - 7.45
$PaCO_2$	35 - 45 mm Hg
PaO_2	70 - 100 mm Hg
SaO_2	93 - 98%
HCO_3^-	22 - 26 mEq/L

12 yo girl

Meningomyelocele, scoliosis & nosocomial pneumonia

Increased tachypnea & retractions

PE:

Subcostal, intercostal, suprasternal retractions

Nasal flaring

Bilateral rales

XR: increased infiltration

pH: 7.35

pCO2: 41 mmHg

pO2: 70 mmHg

(while receiving O_2 via face mask @ 15 lt/min)

HCO3: 22 mmol/l

SaO2: 92%

What to do?

Signs of respiratory failure

Normal ABG

Intubated for impending respiratory failure

ARDS

New findings- 1 week

Imaging- Bilateral opacities

R/O: Heart failure/ fluid overload

Disrupted oxygenation

JAMA. 2012; May 21, 2012

ARDS

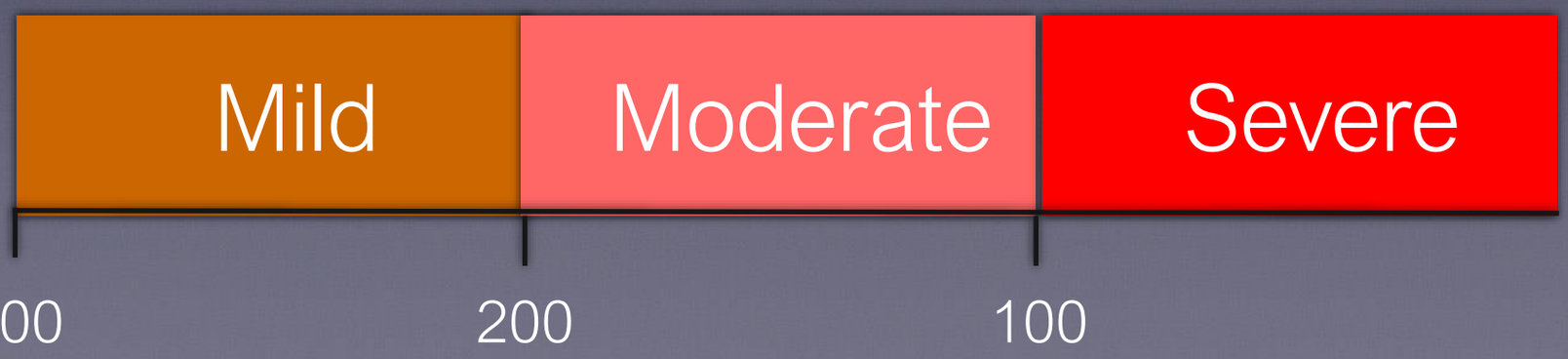
New findings- 1 week

maging- Bilateral opacities

: Heart failure/ fluid overload

PaO_2/FiO_2

Disrupted oxygenation



Hypotonic?

Recurrent pneumonia

CO_2 retention

yo with Down syndrom

acheostomy

May not show much retractions!

d activity and sleepy

RR: 35/min & shallow breathing

ABG @ roo

pH: 7,33

CO2: 62 mm Hg

pO2: 54 mm H

HCO3: 28 mEq/

Hb: 15 g/dl

Chronic CO_2 retention
Her normal $PCO_2 \approx 50$

Chronic hypoxia

After 10

pH: 7,23

CO2: 80 mm Hg

pO2: 118 mm Hg

HCO3: 32 mEq/L

O_2 may be harmful in chronic respiratory failure

Hypoxia stimulates respiratory center

Thank you


GAZİ HASTANESİ
GAZİ HASTANESİ
GAZİ TIP