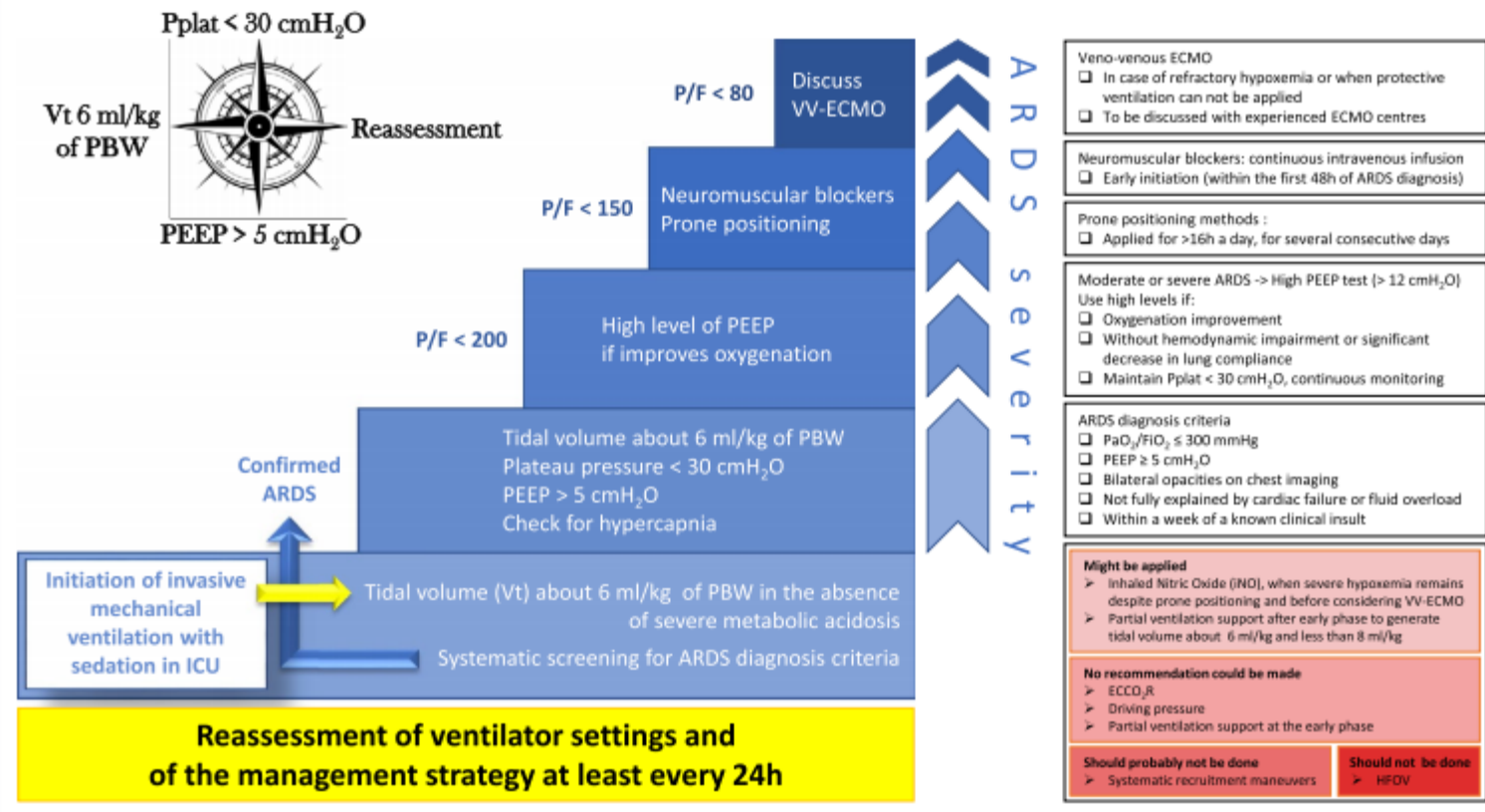


ve  
Acil Klinik  
Ultrasonografi

Betül Evren Gülalp

# Early management of ARDS in 2019



**Fig. 1** Therapeutic algorithm regarding early ARDS management (EXPERT OPINION)

The AECC definition of acute respiratory distress syndrome

Diagnosis	Oxygenation	Timing	Chest radiograph	PCWP
ALI	$\text{PaO}_2/\text{FiO}_2 < 300$ mmHg (regardless of level of PEEP)	Acute	Diffuse, bilateral infiltrates	<18 mmHg
ARDS	$\text{PaO}_2/\text{FiO}_2 < 200$ mmHg (regardless of level of PEEP)	Acute	Diffuse, bilateral infiltrates	<18 mmHg

The Berlin definition of acute respiratory distress syndrome

Diagnosis	Oxygenation <sup>a</sup>	Timing	Chest imaging <sup>b</sup>	Origin of edema
Mild	$200 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 300$ mmHg with PEEP or CPAP $\geq 5$ cmH <sub>2</sub> O <sup>c</sup>	Within 1 week of a known clinical insult or new or worsening respiratory symptoms	Bilateral opacities—not fully explained by effusions, lobar/lung collapse, or nodules	Respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment (e.g., echocardiography) to exclude hydrostatic edema if no risk factor is present
Moderate	$100 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 200$ mmHg with PEEP $\geq 5$ cmH <sub>2</sub> O			
Severe	$\text{PaO}_2/\text{FiO}_2 \leq 100$ mmHg with PEEP $\geq 5$ cmH <sub>2</sub> O			

PCWP pulmonary capillary wedge pressure,  $\text{PaO}_2$  partial pressure for oxygen,  $\text{FiO}_2$  fraction of inspired oxygen, ALI acute lung injury, ARDS acute respiratory distress syndrome, CPAP continuous positive airway pressure, PEEP positive end-expiratory pressure

<sup>a</sup> Chest radiograph or computed tomography scan

<sup>b</sup> If altitude is higher than 1000 m, the correction factor should be calculated as follows:  $[\text{PaO}_2/\text{FiO}_2 \times (\text{barometric pressure}/760)]$

<sup>c</sup> This may be delivered noninvasively in the mild acute respiratory distress syndrome group

Clinical criteria for the diagnosis of ARDS

The Kigali modification of the berlin definition: A  
new epidemiological tool for ARDS?

June 2016

Journal of Thoracic Disease 8(6):E443-E445

- Amerika-Avrupa Konsensus Konferansı 1994’de ARDS tanı kriterini yayınladı.
- Bu yolla, oksijenizasyon açığını değerlendirmek standard solunum desteğini içermemektedir. Villar 2012

# Hospital Incidence and Outcomes of the Acute Respiratory Distress Syndrome Using the Kigali Modification of the Berlin Definition

Elisabeth D. Riviello<sup>1,2</sup>, Willy Kiviri<sup>3</sup>, Theogene Twagirumugabe<sup>3</sup>, Ariel Mueller<sup>4</sup>, Valerie M. Banner-Goodspeed<sup>4</sup>, Laurent Officer<sup>4</sup>, Victor Novack<sup>5</sup>, Marguerite Mutumwinka<sup>6</sup>, Daniel S. Talmor<sup>4</sup>, and Robert A. Fowler<sup>7</sup>

- Akut Solunumsal Sıkıntısı Sendromu (=The acute respiratory distress syndrome=ARDS)
- Sık ve letaldir.
- ARDS'nin hastanede mortalite riski %50'dir.
- ARDS hastalarının ortalama yaşı 37, en sık neden enfeksiyon bulunmuştur.
- Berlin kriterleriyle, sınırlı koşullarda hiç birine ARDS tanısı koyulamayacaktı.

# ARDS

- 2. Akut hipoksi ve iki taraflı akciğer enfiltrasyonları
- Akciğer ya da akciğer –dışı nedenlerle gelişir (Enfeksiyon, travma, cerrahi, inme,..),
- Orta-ağır ARDS tüm yoğun bakım yatışlarının % 1.6 to 7.7, tüm solutulan hastaların % 8 to 19.7’u.

- Berlin kriterleri güçlü ve tekrarlanabilir.
- Kaynak ve koşulları sınırlı durum ve alanlarda ise Berlin tanımı ile ARDS belirlenemez.



# Kigali Deęişiklięi/Uyarlaması ile

- Tanı için PEEP'e gereksinim yoktur,
- Oksijenizasyon kesimi  $SpO_2 / FIO_2 \leq 350$ , (Rice,2007)
- Hipoksi kesim  $SpO_2 / FIO_2 \leq 315$  ( $SpO_2 < 97$ )  
( $FIO_2 = 0.2110.033$ [oxygen flow in liters/minute])
- Akcięer Ultrasonu ile iki taraflı beyaz alanların varlıęı  
(Lichtenstein)
- Akcięer düz filminden çok daha doęru ve belirleyici

- Sayın Lichtenstein ve Meziere'in bilime kazandırdığı ve kanıtladığı üzere;
- Akciğer ultrasonu;
- Yarı-yatar pozisyondaki hastaya, eğri prob ile,
- Her bir akciğerde 6 alanda; 2 anterior, 2 lateral, 2 posterolateral uygulanmıştır

	Berlin Criteria	Challenges in Resource Poor Settings	Kigali Modification of the Berlin Criteria
Timing	Within 1 wk of a known clinical insult or new or worsening respiratory symptoms	None	Within 1 wk of a known clinical insult or worsening respiratory symptoms
PaO <sub>2</sub> /F <sub>I</sub> O <sub>2</sub>	PaO <sub>2</sub> /F <sub>I</sub> O <sub>2</sub> ≤300	Scarcity of arterial blood gas diagnostics	SpO <sub>2</sub> /F <sub>I</sub> O <sub>2</sub> ≤315
PEEP	Minimum 5 cm H <sub>2</sub> O PEEP required by invasive mechanical ventilation (noninvasive acceptable for mild ARDS)	Scarcity of mechanical ventilators	No PEEP requirement, consistent with definition
Imaging	Bilateral opacities not fully explained by effusions, lobar/lung collapse, or nodules by chest radiograph or CT	Scarcity of chest radiography resources	Bilateral opacities not fully explained by effusions, lobar/lung collapse, or nodules by chest radiograph or ultrasound
Edema	Respiratory failure not fully explained by cardiac failure or fluid overload (need objective assessment, such as echocardiography, to exclude hydrostatic edema if no risk factor present)	None	Respiratory failure not fully explained by cardiac failure or fluid overload (need objective assessment, such as echocardiography, to exclude hydrostatic edema if no risk factor present)

*of abbreviations:* AECC = American-European Consensus Conference; ARDS = acute respiratory distress syndrome; CT = computed tomography; PEEP = positive end-expiratory pressure; SpO<sub>2</sub> = oxygen saturation as measured by pulse oximetry.

## Lichtenstein 2004

- ARDS
- Tomografi ile karşılaştırıldığında;
- Alveolar-interstitial Sendrom
- % 95 ultrason, % 72 pa akciğer x-ray
- Alveolar konsolidasyon % 97% ultrason ile
- % 75 x-ray ile izlenebilmiştir

# **Chest sonography: a useful tool to differentiate acute cardiogenic pulmonary edema from acute respiratory distress syndrome**

Roberto Copetti\*<sup>1</sup>, Gino Soldati<sup>2</sup> and Paolo Copetti<sup>1</sup>

Address: <sup>1</sup>Emergency Department S. Antonio Abate General Hospital, Tolmezzo, Italy and <sup>2</sup>Emergency Department Valle del Serchio General Hospital, Lucca, Italy

Email: Roberto Copetti\* - [robcopet@tin.it](mailto:robcopet@tin.it); Gino Soldati - [g.soldati@usl2.toscana.it](mailto:g.soldati@usl2.toscana.it); Paolo Copetti - [paolo.cop@libero.it](mailto:paolo.cop@libero.it)

sensitivity and specificity of each ultrasonographic sign in the two groups.

SONOGRAPHIC SIGNS	SENSITIVITY		SPECIFICITY	
	ALI/ARDS	APE	ALI/ARDS	APE
AIS	100%	100%	0%	0%
Pleural line abnormalities	100%	25%	45%	0%
Reduction or absence of lung sliding	100%	0%	100%	0%
"Spared areas"	100%	0%	100%	0%
Consolidations	83.3%	0%	100%	0%
Pleural effusion	66.6%	95%	5%	33.3%
"Lung pulse"	50%	0%	100%	50%

<b>Sonografi Bulguları</b>	<b>Duyarlılık (%)</b>		<b>Özgüllük (%)</b>	
	<b>AAH/ARDS</b>	<b>APÖ</b>	<b>AAH/ARDS</b>	<b>APÖ</b>
<b>Alveoler-interstisyel Sendrom</b>	<b>100</b>	<b>100</b>	<b>0</b>	<b>0</b>
<b>Plevral çizgi anormallikleri</b>	<b>100</b>	<b>25</b>	<b>45</b>	<b>0</b>
<b>Akciğer kayma hareketinin azalması ya da olmaması</b>	<b>100</b>	<b>0</b>	<b>100</b>	<b>0</b>
<b>Korunmuş alanlar</b>	<b>100</b>	<b>0</b>	<b>100</b>	<b>0</b>
<b>Konsolidasyon</b>	<b>83.3</b>	<b>0</b>	<b>100</b>	<b>0</b>
<b>Plevral efüzyon</b>	<b>66.6</b>	<b>95</b>	<b>5</b>	<b>33.3</b>
<b>Akciğer atımı</b>	<b>50</b>	<b>0</b>	<b>100</b>	<b>50</b>

# Copetti,2008

- AAH/ARDS'de alveolar kapiller membran bütünlüğü bozulmuştur
- Erken, diffüz, heterojen alveoler
- In ALI/ARDS the integrity of the alveolar capillary membrane
- is compromised, and this causes an early, diffuse,
- heterogeneous alveolar flooding which ranges in severity
- from "ground glass" appearance to lung consolidation.



# Table of Contents



**01**

## About the Disease

Here you could describe the topic of the section

**02**

## Diagnosis

Here you could describe the topic of the section

**03**

## Recommendations

Here you could describe the topic of the section

# Introduction

Mercury is the closest planet to the Sun and the smallest one in the Solar System

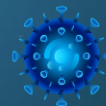




# About the Disease

You can enter a subtitle here  
if you need it

# About the Disease



## Mercury

Mercury is the closest planet to the Sun



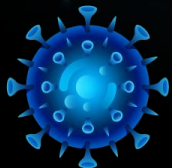
## Venus

Venus is the second planet from the Sun



## Saturn

Saturn is the ringed one. It's a gas giant



# About the Disease

## Venus

Venus is the second planet from the Sun

## Mercury

Mercury is the closest planet to the Sun

## Saturn

Saturn is the ringed one. It's a gas giant



# Concepts and Typology

## Type A

Despite being red, Mars is a cold place

Mercury is the closest planet to the Sun

## Type B

Jupiter is the biggest planet of them all

Venus is the second planet from the Sun

## Gestational

Saturn is a gas giant and has several rings

Neptune is the farthest planet from the Sun

# Pathology

## Mercury

Mercury is the closest planet to the Sun

01

02

## Saturn

Saturn is a gas giant and has several rings

03

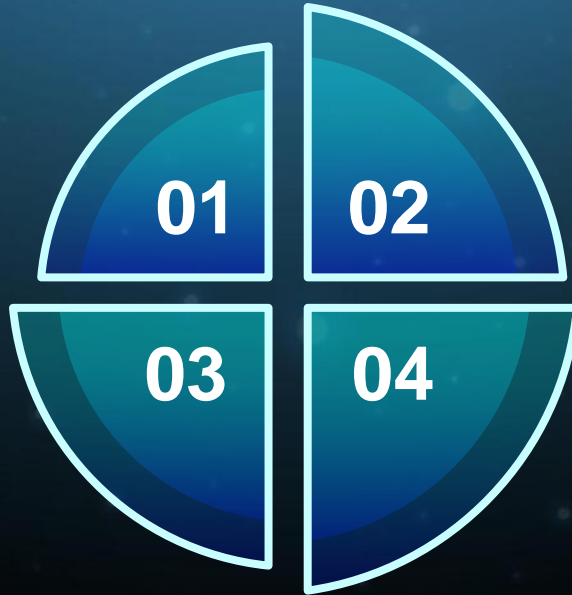
04

## Neptune

Neptune is the farthest planet from the Sun

## Mars

Despite being red, Mars is a cold place



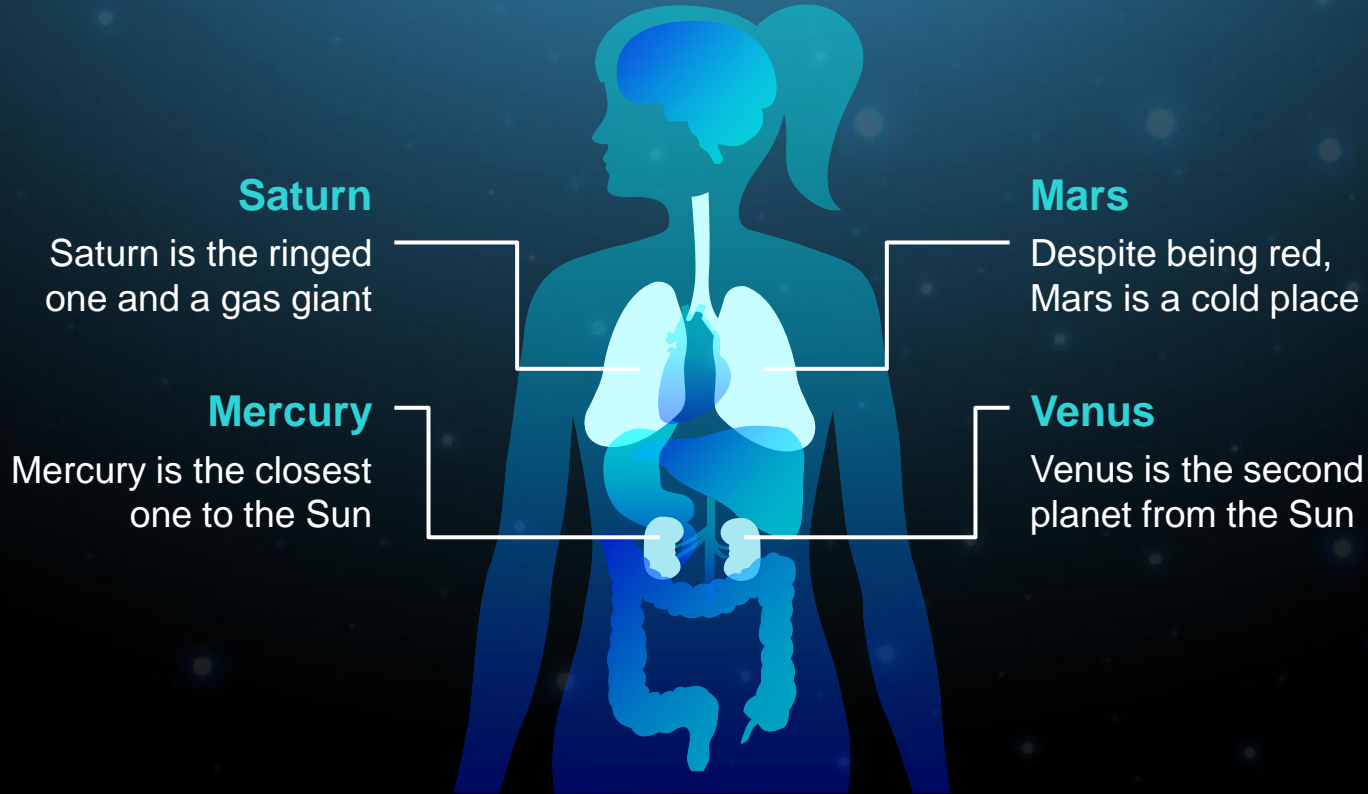


**4,498,300,000**

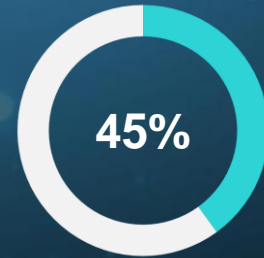
Big numbers catch your audience's attention



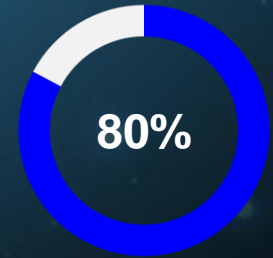
# Symptoms of the Disease



# Risks Factors



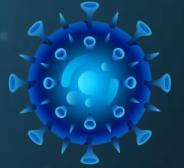
**Venus**  
Venus is the  
second planet



**Saturn**  
Saturn is the  
ringed one

To modify this graph, click on it, follow the link, change the data and paste the resulting graph here

# Key Numbers



**333,000.00**

earths is the sun's mass

**24h 37m 23s**

is Jupiter's rotation period

**386,000 km**

is the distance to the Moon





“This is a quote, words full of wisdom that someone important said and can make the reader get inspired.”

—Someone Famous

# Diagnosis



## Mercury

Mercury is the smallest planet



## Jupiter

Jupiter is the biggest planet



## Neptune

Neptune is the farthest planet



## Mars

Mars is actually a cold place



## Venus

Venus is the second planet



## Saturn

Saturn is the ringed one

# Prevention

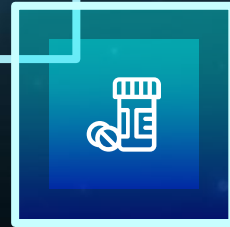
## Mercury

Mercury is the closest planet to the Sun



## Neptune

Neptune is the farthest planet from the Sun



## Saturn

Saturn is a gas giant and has several rings

## Mars

Despite being red, Mars is a cold place



# Whoa!

This could be the part of the presentation where  
you can introduce yourself, write your email...

# Treatment

## Mercury

Mercury is the smallest planet

01

## Jupiter

Jupiter is the biggest planet

03

## Mars

Mars is actually a cold place

02

## Venus

Venus is the second planet

04



# Recommendations

## Don'ts

- Here you can describe what the patient shouldn't do
- Here you can describe what the patient shouldn't do
- Here you can describe what the patient shouldn't do

## Dos

- Here you can describe what the patient should do
- Here you can describe what the patient should do
- Here you can describe what the patient should do

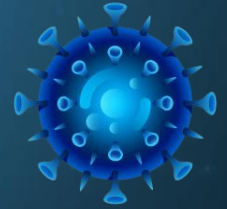
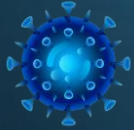
# Prevalence



**Neptune**

Neptune is the  
farthest planet  
from the Sun

# Conclusions



## Mars

It's a cold place. The planet is full of iron oxide dust

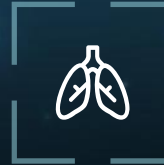


## Saturn

Saturn is composed mostly of hydrogen and helium

## Mercury

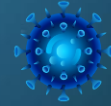
Mercury is the smallest one in the Solar System



## Venus

Venus is the second planet from the Sun

# Our Team



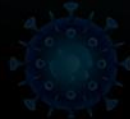
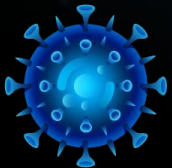
**Jane Smith**

Neptune is the  
farthest planet

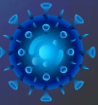
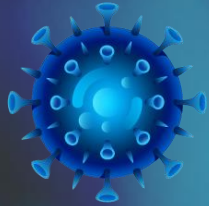


**John James**

Saturn is the  
ringed one







**A Picture Is Worth a Thousand  
Words**



# Infographics

## Jupiter

Jupiter is the biggest planet

## Neptune

Neptune is the farthest planet

## Mercury

Mercury is the smallest planet

## Saturn

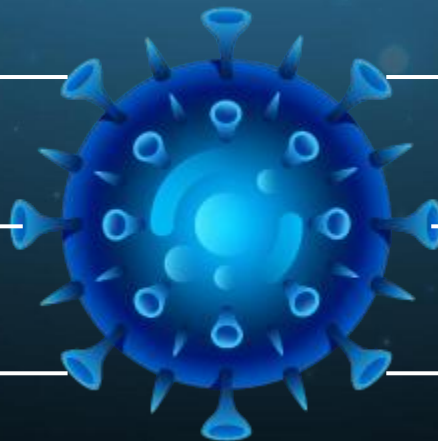
Saturn is the ringed one

## Mars

Mars is actually a cold place

## Venus

Venus is the second planet



# The Slide Title Goes Here!

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Lists like this one:

- They're simple
- You can organize your ideas clearly
- You'll never forget to buy milk!

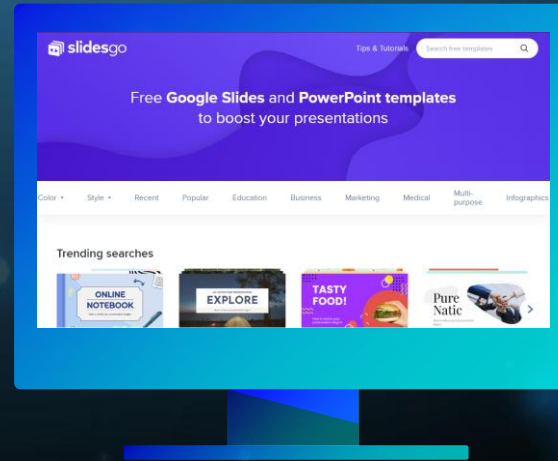
And the most important thing: the audience won't miss  
the point of your presentation





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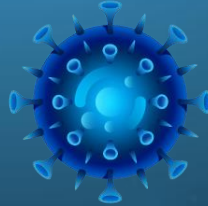
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Do you have any questions?

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# Alternative Resources

- High angle female and male nurse
- Close-up of a female doctor in blue uniform examining the x-ray
- Coronavirus outbreak in blue shades
- Vaccine concept with syringe

# Resources

## Photos

- Detail of an x-ray of lungs
- Doctors watching x-ray
- Nurses verifying clipboard
- High angle male nurse with stethoscope
- Smiley female nurse

## Vectors

- Coronavirus concept with lungs and infection
- Appointment booking with calendar and desk computer

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Pana



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Bro



Rafiki

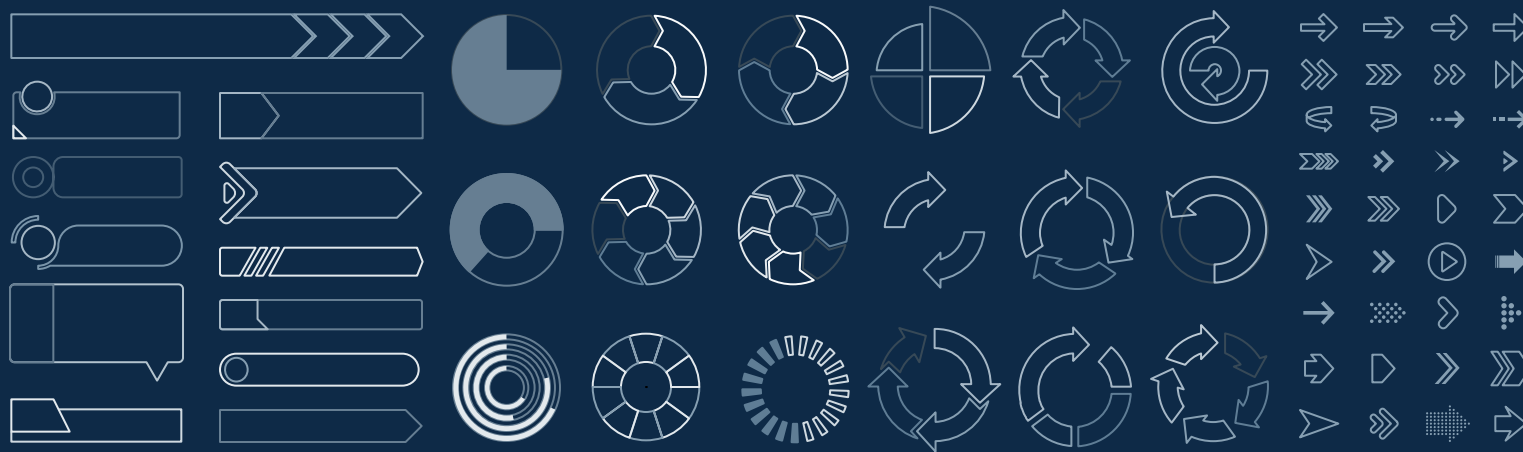


Cuate

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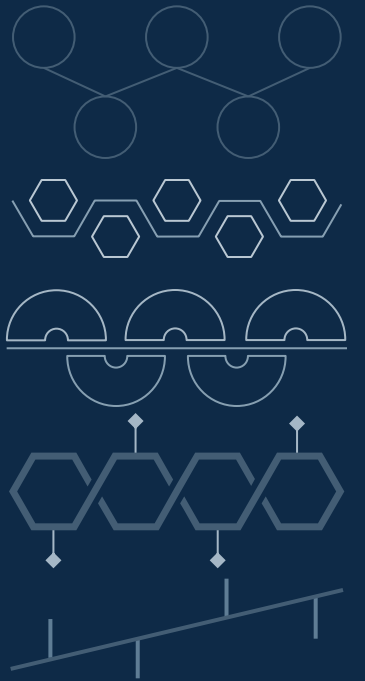
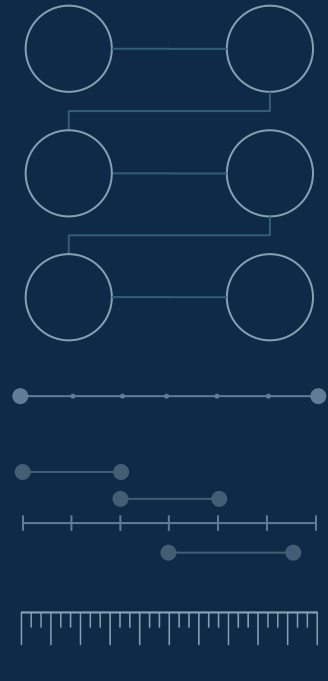
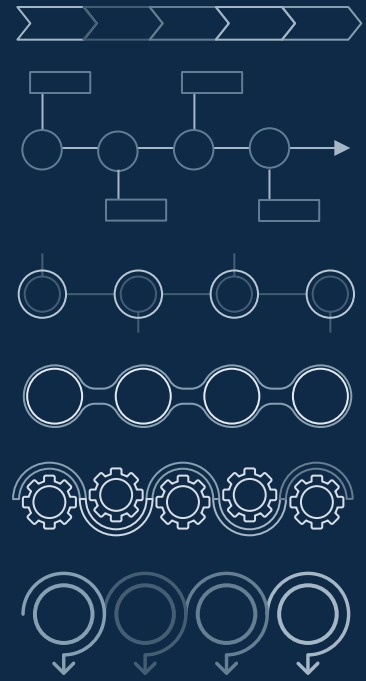
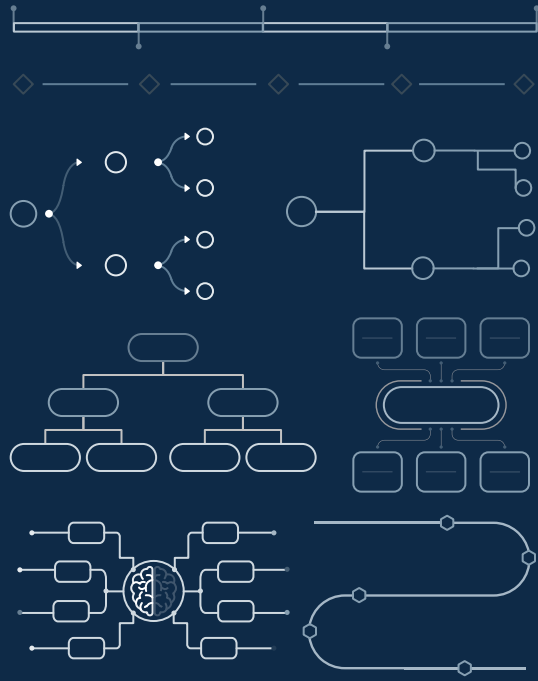
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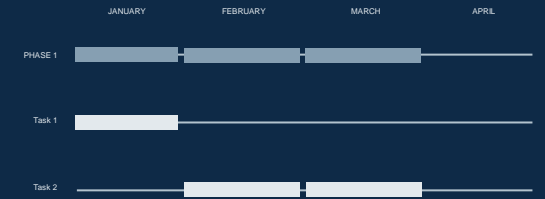
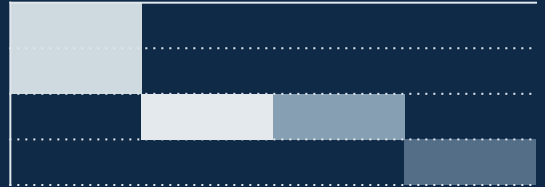
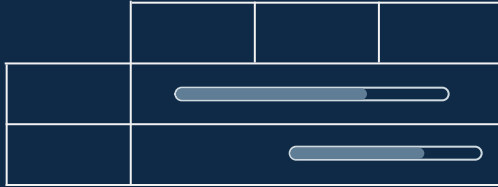
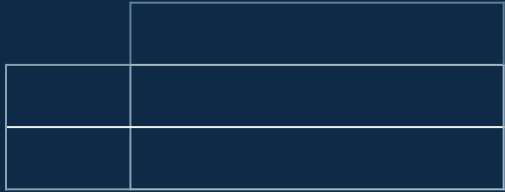
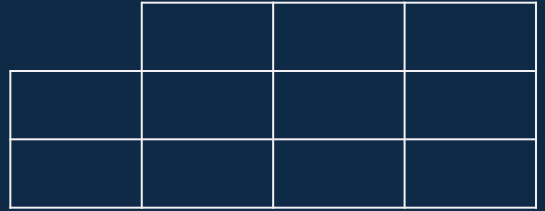
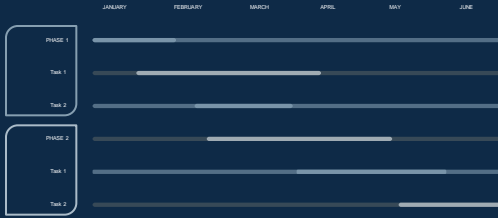
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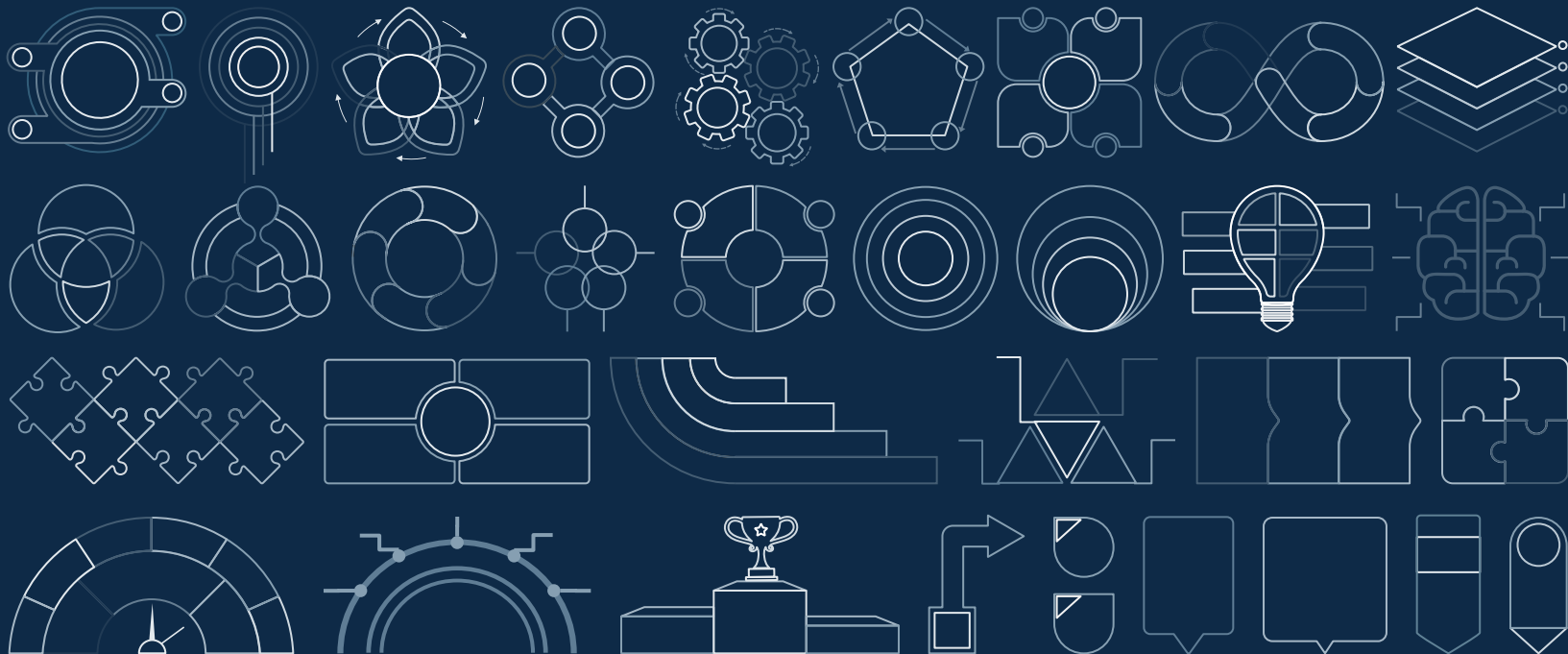


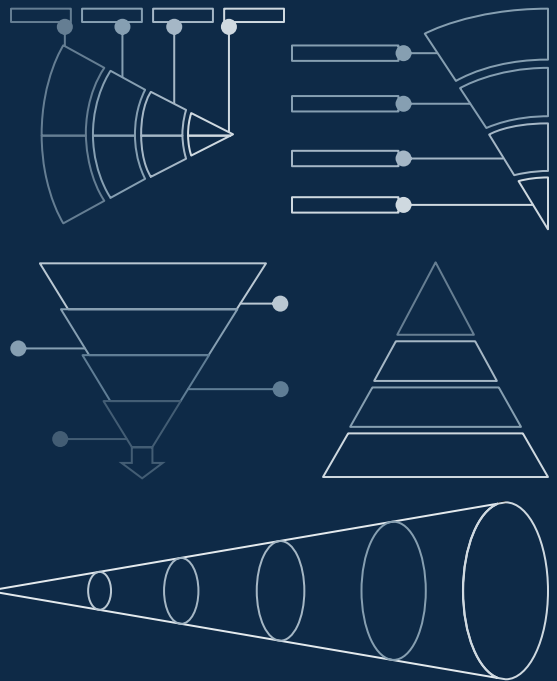
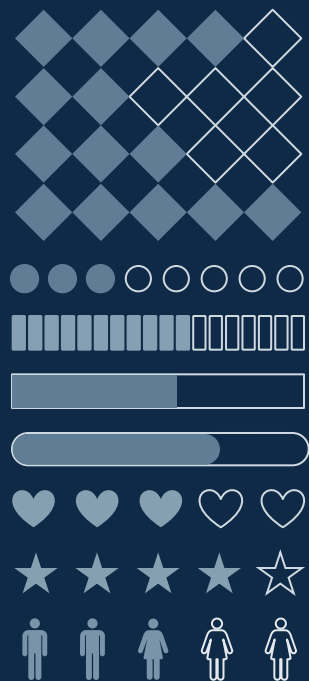
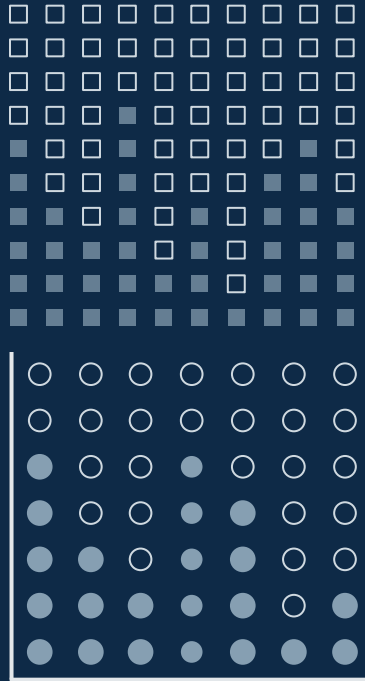




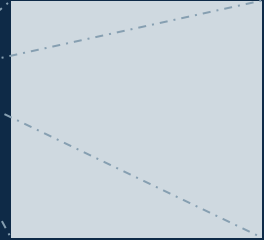
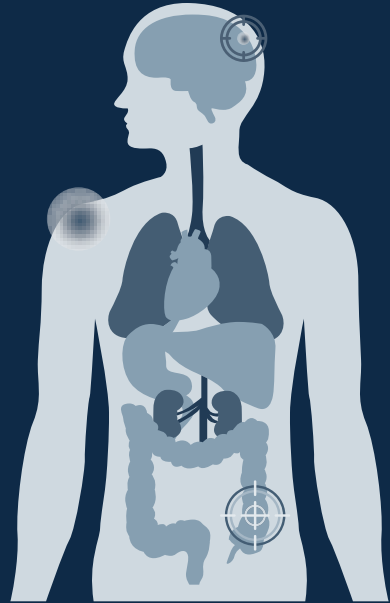


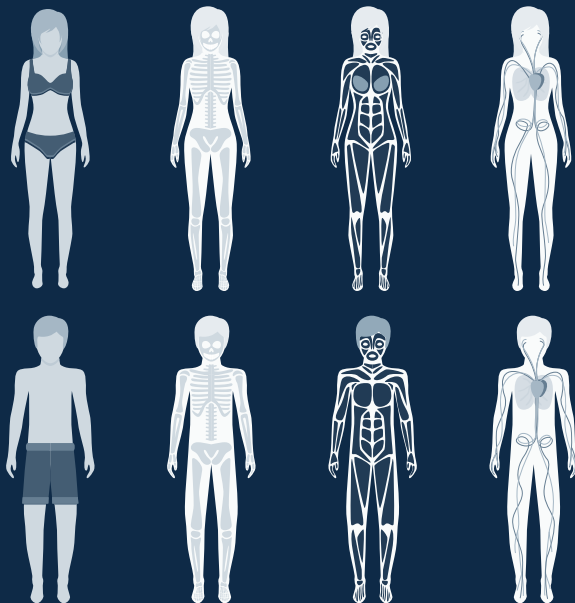
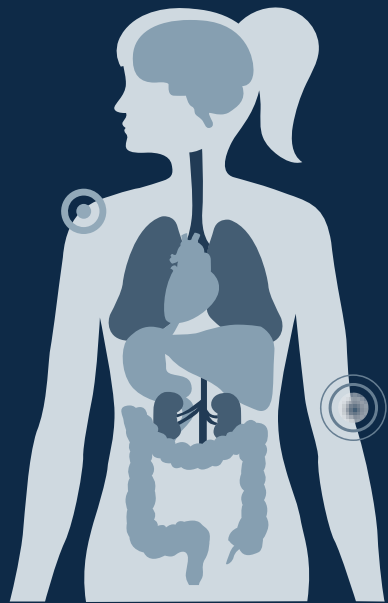






# Medical Infographics







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## Medical Icons



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## Teamwork Icons







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Comparison of the  $SpO_2/FiO_2$  Ratio and the  $Pao_2/FiO_2$  Ratio in Patients With Acute Lung Injury or Acute Respiratory Distress Syndrome

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Formal guidelines: management of acute respiratory distress syndrome

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