
بسم الله الرحمن الرحيم

Corona Virus Infection

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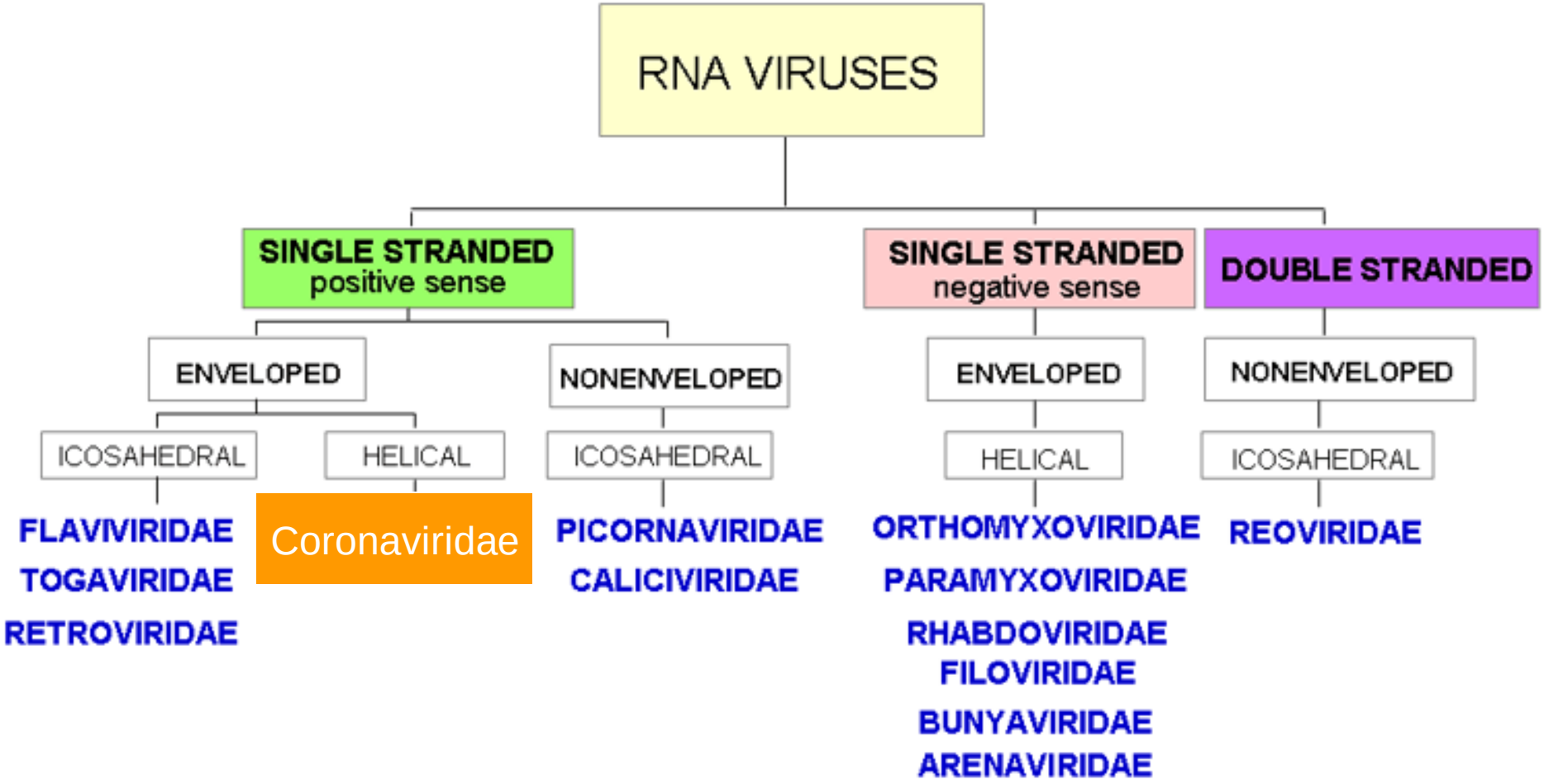


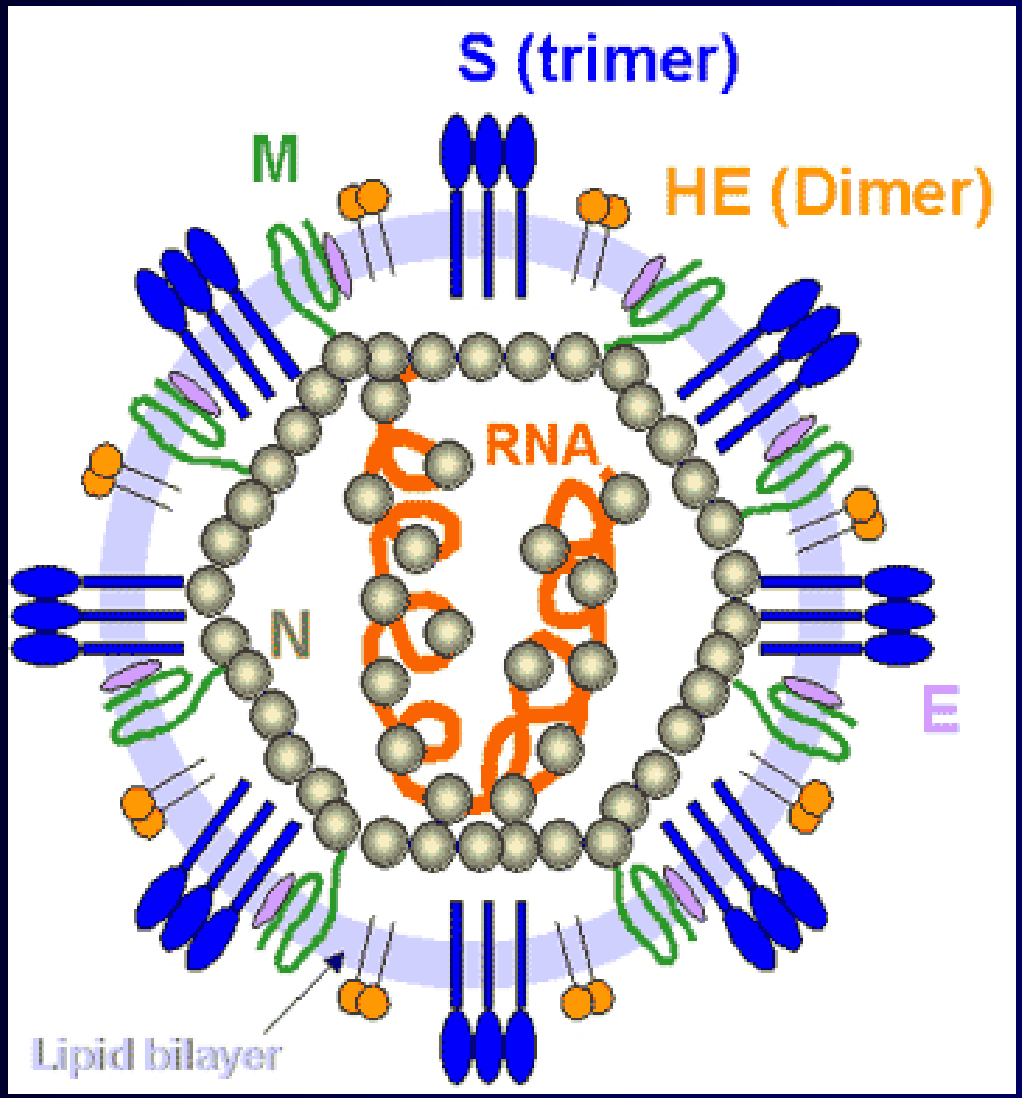
Modified from Volk et al., Essentials of Medical Microbiology, 4th Ed. 1991

CORONAVIRUSES

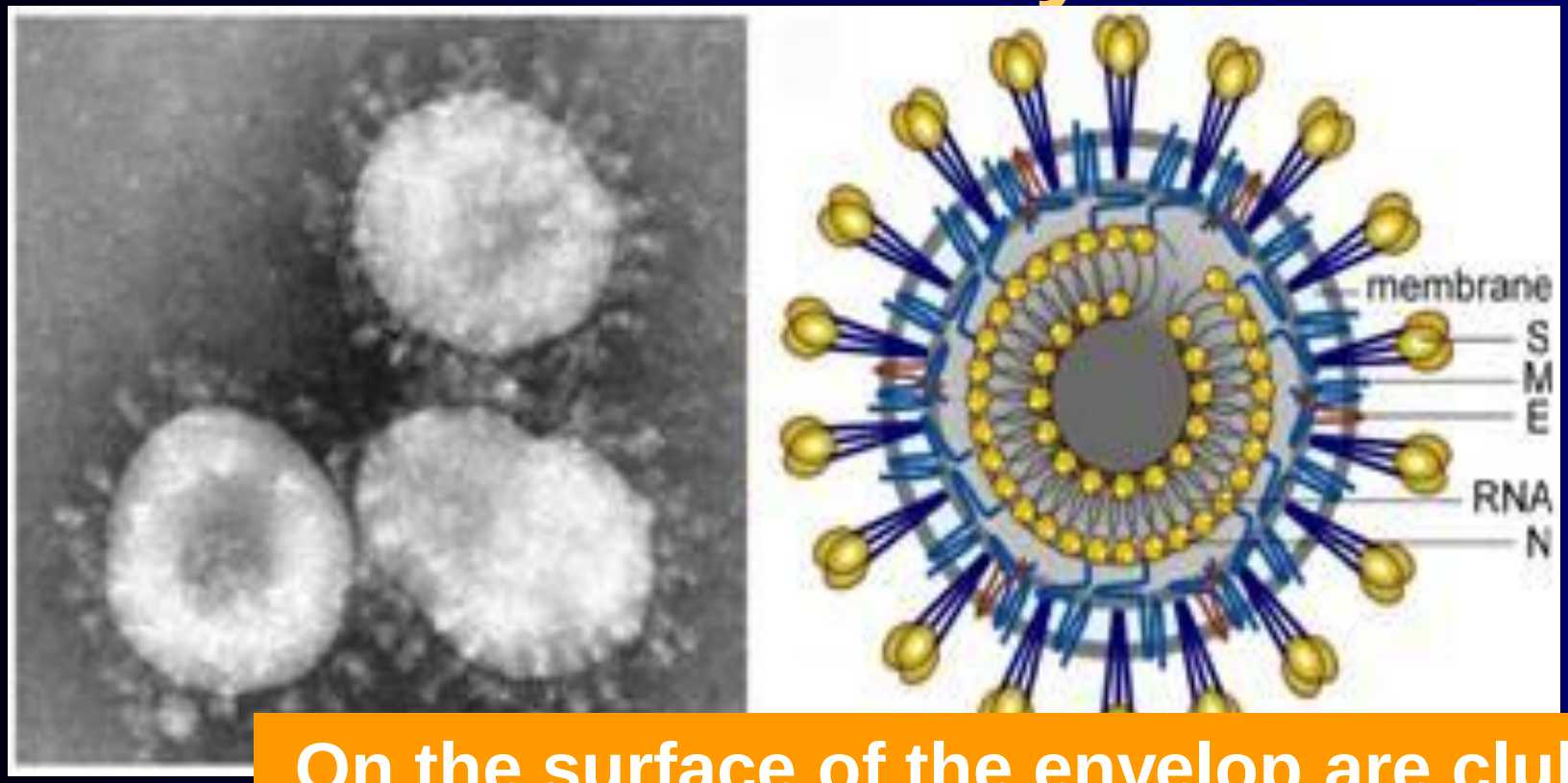
The genome

- SS linear non segmented +ve sense RNA

- the largest among RNA viruses.



A Crown-like Appearance when viewed by EM



On the surface of the envelop are club • shaped projections that resemble a solar corona

What are Corona viruses?

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- Coronaviruses are believed to cause a significant percentage of all common colds in human adults. Coronaviruses cause colds in humans primarily in the winter and early spring season.

- Coronaviruses primarily infect the upper respiratory and gastrointestinal tract of mammals and birds.

What are Corona viruses?

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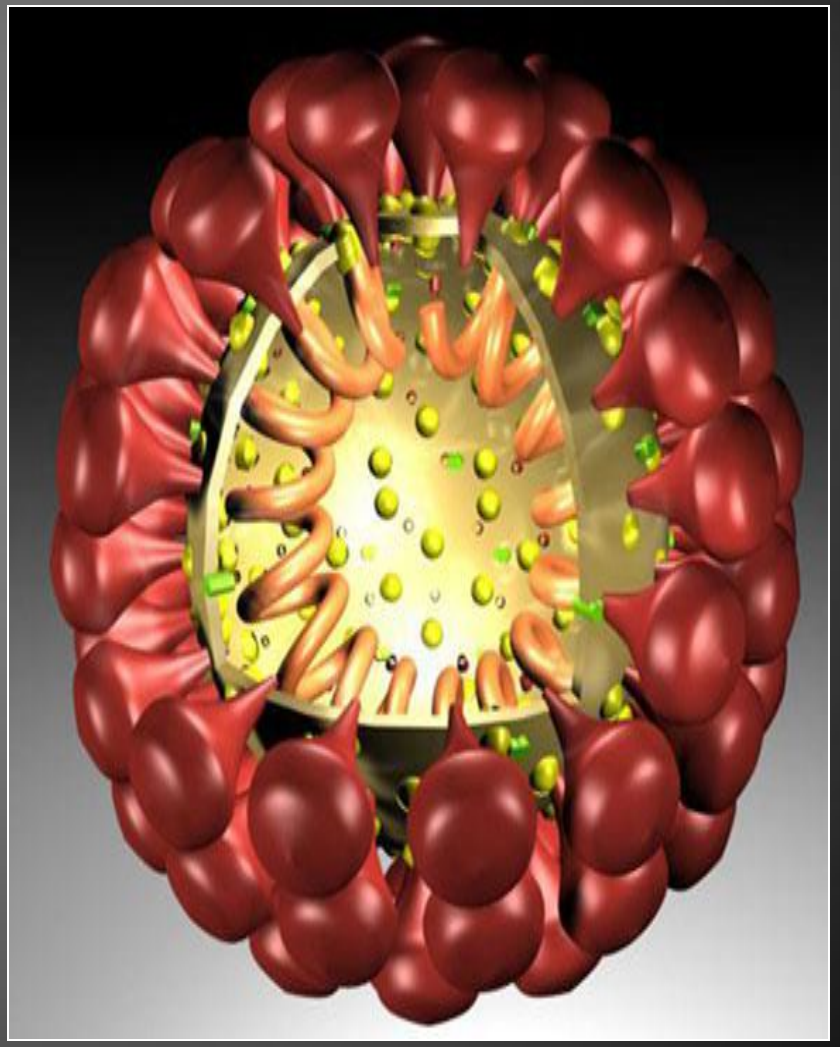
- Four to five different currently known strains of Coronaviruses infect humans. The most publicized human Coronavirus, is SARS.

- A sixth was discovered last year, known as Novel Coronavirus 2012.



SARS Corona Virus

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- This has a unique pathogenesis because it causes both upper and lower respiratory tract infections and can also cause Gastroenteristis.

Recent History

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- In 2003 The SARS epidemic resulted in over 8,000 infections, about 10% of which resulted in death.

One of the enclosed beds designed to contain disease-infected travellers at the border checkpoint in Nanjing, China's eastern Jiangsu Province.

Recent History

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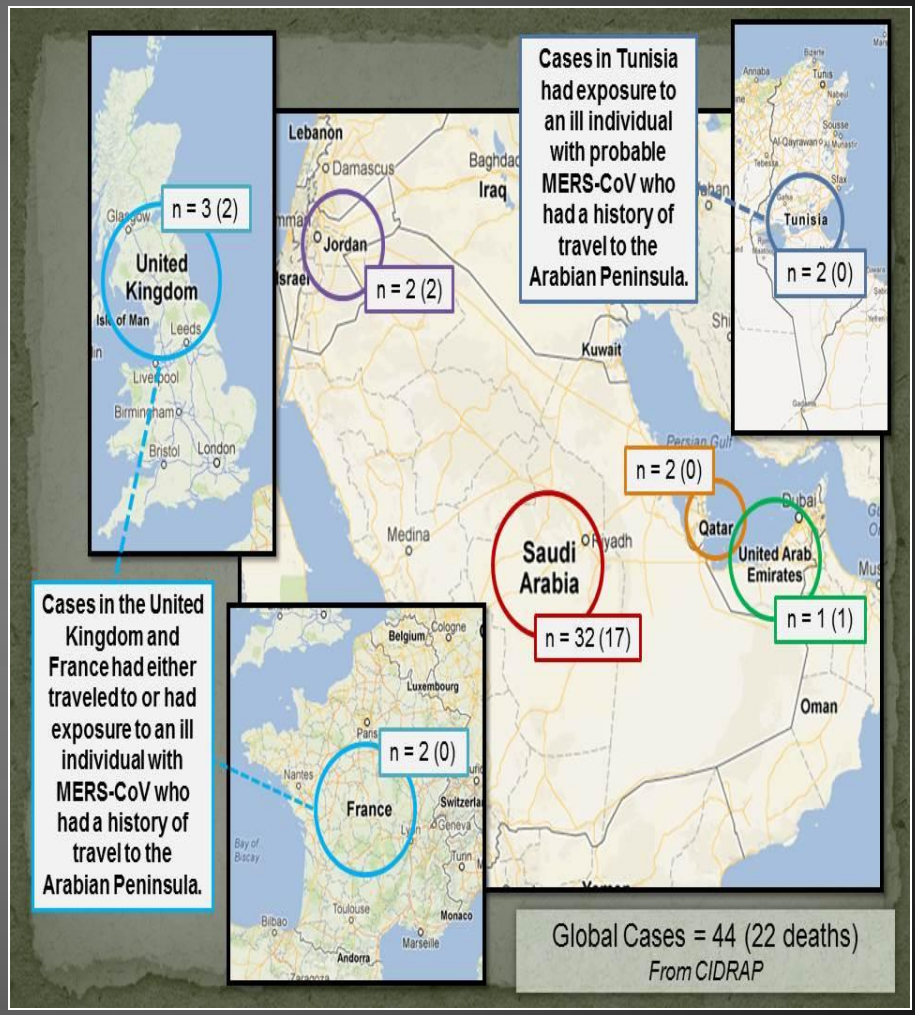
- In September 2012, what is believed to be a sixth new type of coronavirus, tentatively referred to as Novel Coronavirus 2012, being like SARS (but still distinct from it and from the common-cold coronavirus) was discovered in Qatar and Saudi Arabia.



Middle East respiratory syndrome coronavirus (MERS-CoV)

World Health Organisation

University Health Center

- After the deadly Coronavirus outbreak killed 17 out of 33 people who contracted it in Saudi Arabia in the past year, the World Health Organization (WHO) has pledged to further investigate the disease spread before millions of Muslims descend on holy sites in Mecca and Medina during the Hajj pilgrimage season in October.

2013 Concerns

University Health Center

- The Hajj pilgrimage is one of the largest mass gatherings in the world, bringing about 3 million ethnically diverse Muslims to Mecca each year, according to estimates from the Centers for Disease Control and Prevention (CDC).

World Health Organisation

Globally, from September 2012 to date, WHO has been informed of a total of 153 laboratory-confirmed cases of infection with MERS-CoV, including 64 deaths.

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2013 Concerns

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- That creates a perfect opportunity for infectious diseases, especially respiratory tract infections like coronavirus, to spread. Millions of people from all over the world are gathered in tight spaces over the span of several weeks, and they take back any diseases they might have caught when they return home.

How is Novel Coronavirus transmitted?

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- All the clusters of cases seen so far have been transmitted between family members or in a health care setting, the WHO said in an update .

- Human-to-human transmission occurred in at least some of these clusters, however, the exact mode of transmission is unknown.

How is Novel Coronavirus transmitted?

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- That means it's not yet known how humans contract the virus. But, experts say, there has been no evidence of cases beyond the clusters into communities.

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Symptoms

- A person will show the symptoms after a week
- Flu-like symptoms,
- a heavy cough.

Prevention Measures

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- Keep away from someone with a heavy cough.
- Use a tissue to cover the nose/mouth when coughing, sneezing, wiping and blowing noses.
- If a tissue isn't available, cough or sneeze into the inner elbow rather than the hand

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Prevention Measures

- Wash hands with hot water and soap at least six or seven times a day
- Disinfect common surfaces as frequently as possible.
- Wash hands or use a sanitiser when in contact with common surfaces like door handles.

Novel Coronavirus 2012

- Widespread transmission hasn't been seen
- Underlying health conditions may make you more susceptible
- No travel warnings have been issued
- There are no treatments and no vaccine

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Information Provided By:

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Clinical management of severe acute respiratory infections when novel coronavirus is suspected:
What to do and what not to do

Patient under investigation for novel coronavirus infection

A person with an acute respiratory infection, which may include history of fever or measured fever (≥ 38 °C, 100.4 °F) and cough;
AND suspicion of pulmonary parenchymal disease (e.g. pneumonia or ARDS), based on clinical or radiological evidence of consolidation: AND residence in or history of travel to the Arabian Peninsula or neighboring countries within 10 days before onset of illness:
AND not already explained by any other infection or aetiology, including all clinically indicated tests for community-acquired pneumonia according to local management guidelines. It is not necessary to wait for test results for other pathogens before testing for novel coronavirus.

Criteria for clinical diagnosis of Pneumonia

New or progressive radiographic pulmonary infiltrate and 2 of the following (fever, leukocytosis, purulent sputum). In ARDS at least 1 of the 3 preceding symptoms and signs is sufficient.

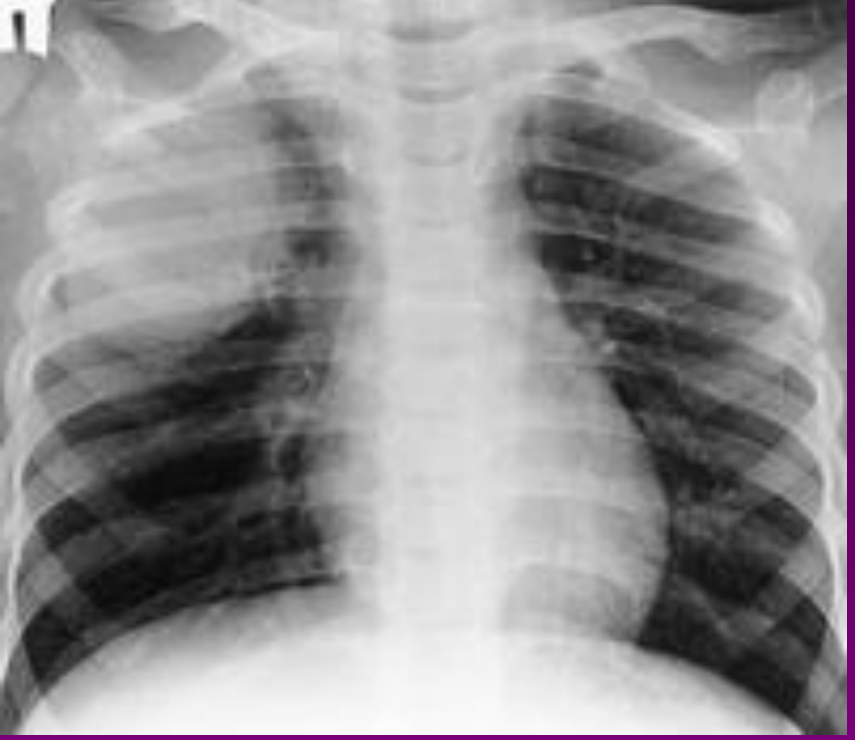
- Exclude conditions that mimic pneumonia.
- Define the severity of Pneumonia

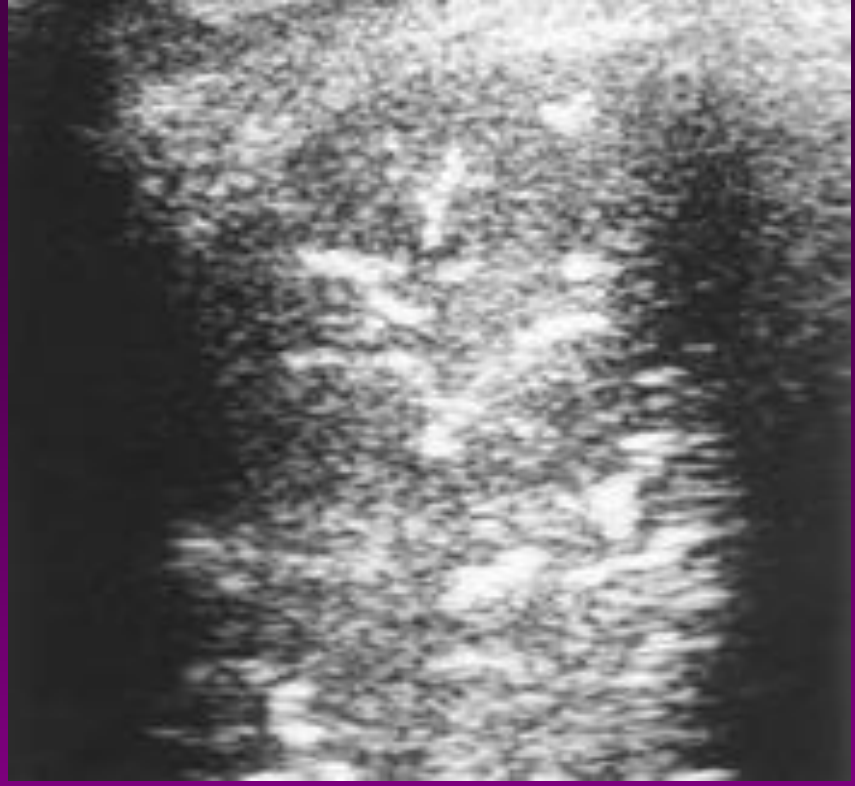
Clinical Pulmonary Infection Score (CPIS)

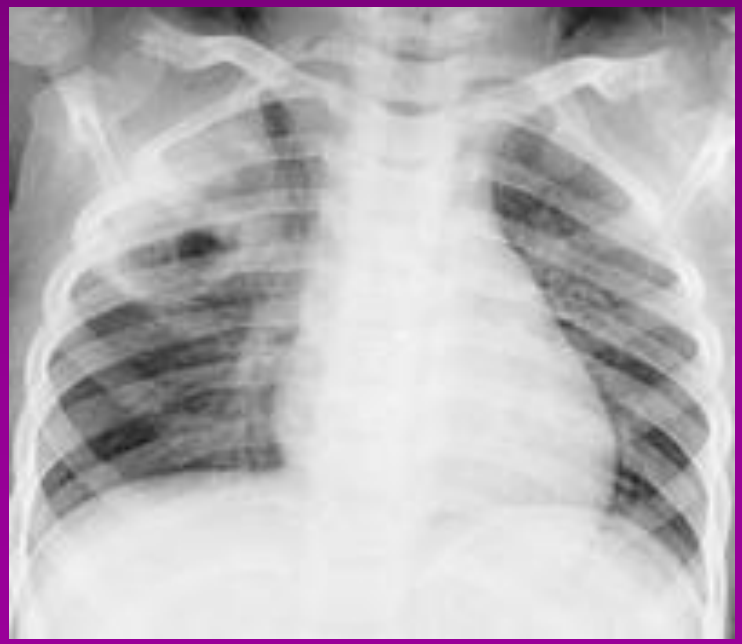
Tracheal secretions	○	Rare	○	Abundant	○	Abundant and purulent
Chest x-ray	○	No infiltrate	○	Diffuse	○	Focal infiltrate
Temp (°C)	○	36.0-38.4	○	38.5-38.9	○	< 36 or > 39
White blood cell count (x 1000/mm^3)	○	4-11	○	< 4 or > 11	○	< 4 or > 11 + band > 0.5
PAO_2/FIO_2 mm Hg	○	> 240 or ARDS			○	< 240 + no ARDS
Microbiology	○	Negative			○	Positive

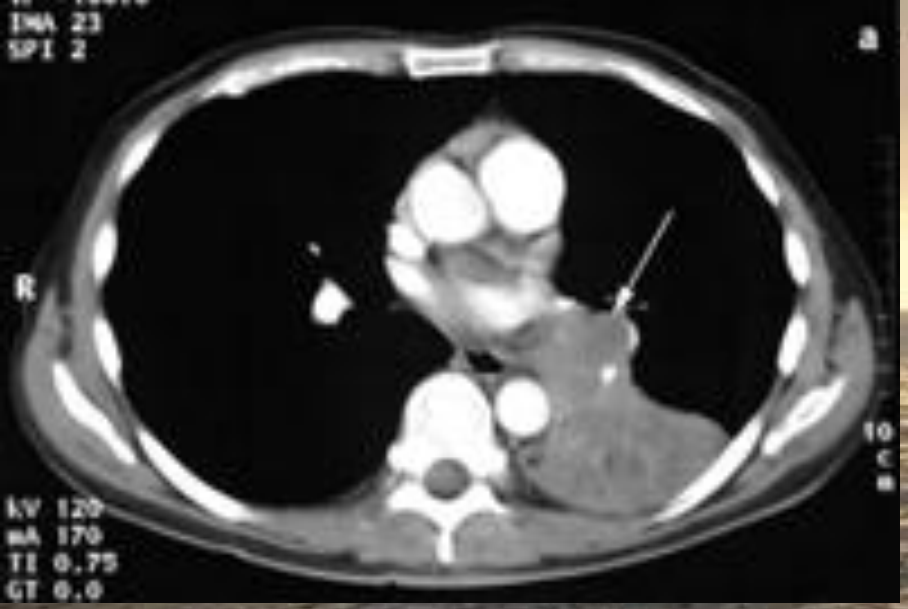
Reseults & Recommendation

Score						
VAP Probability						





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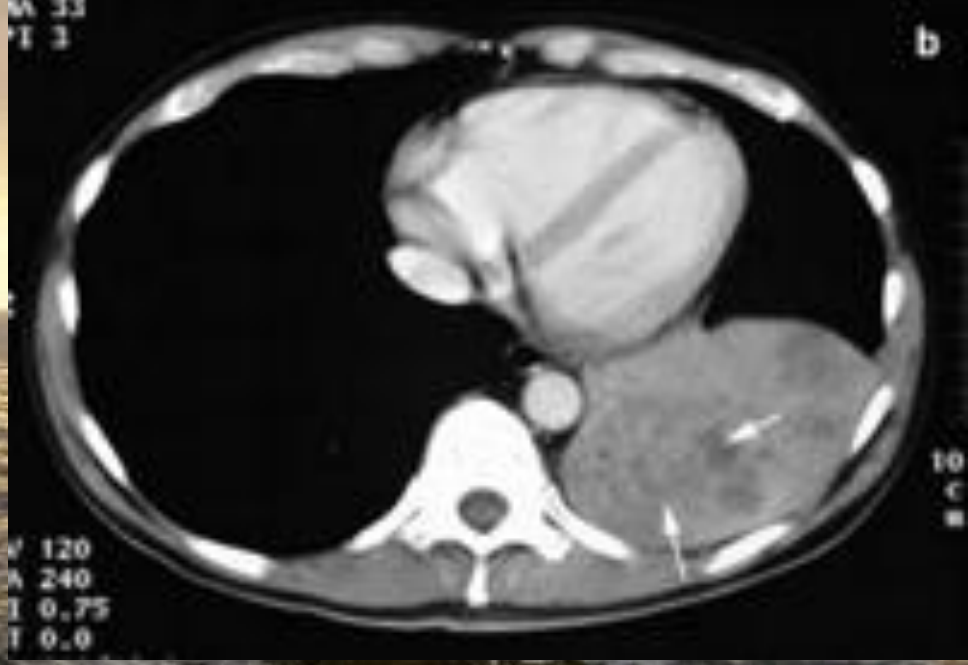
GT 0.0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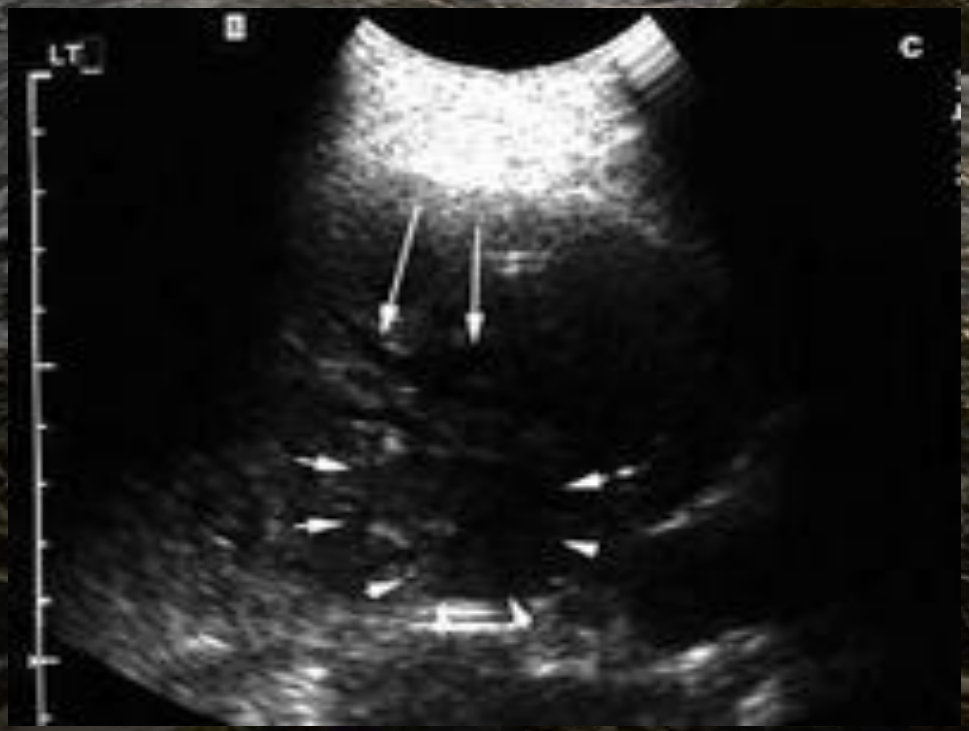
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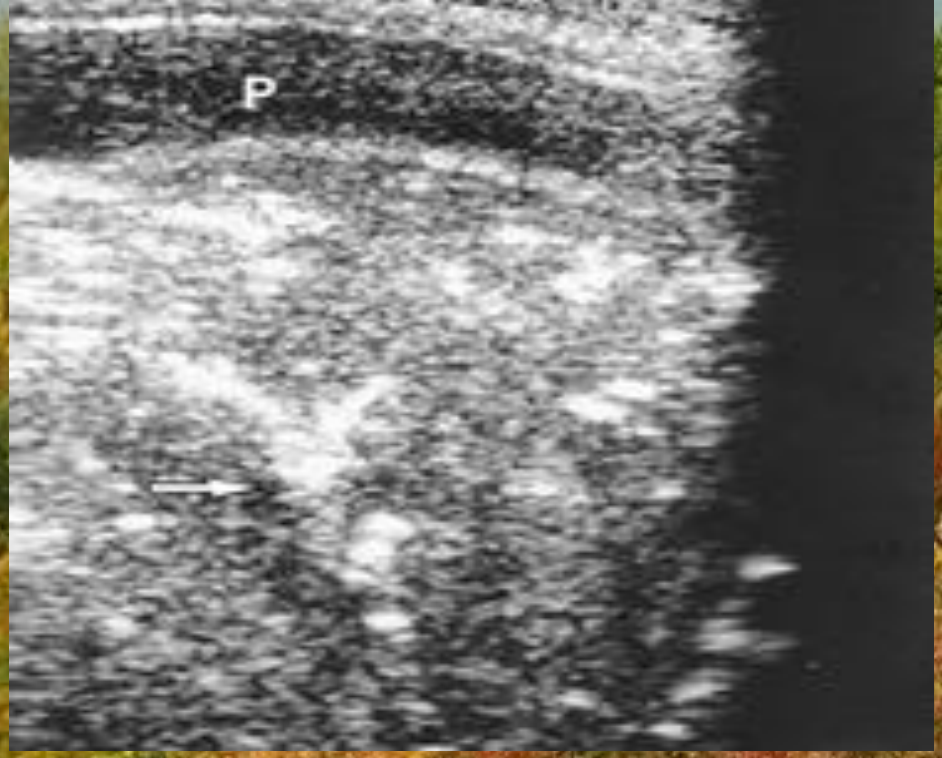
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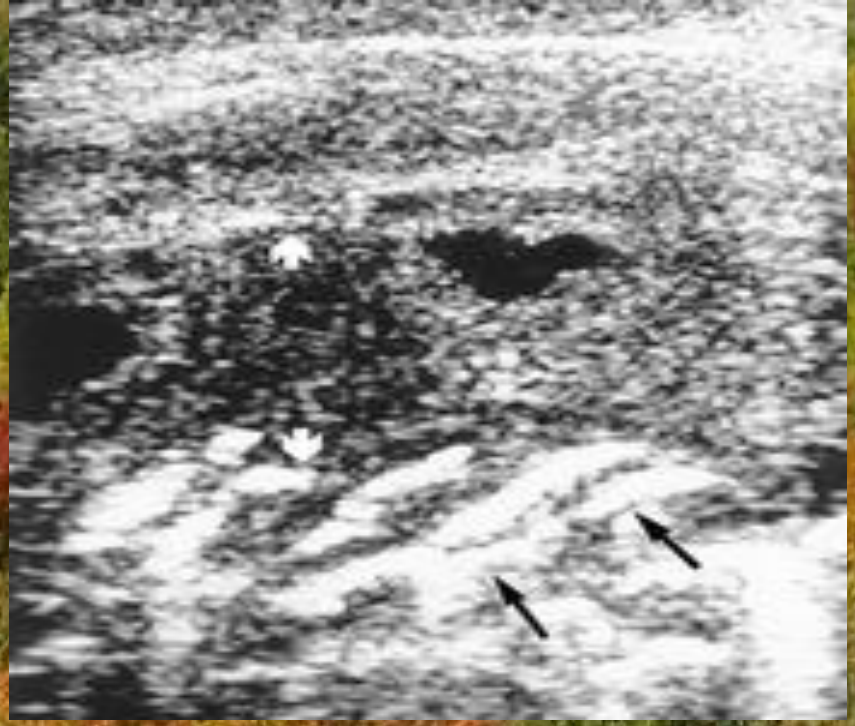
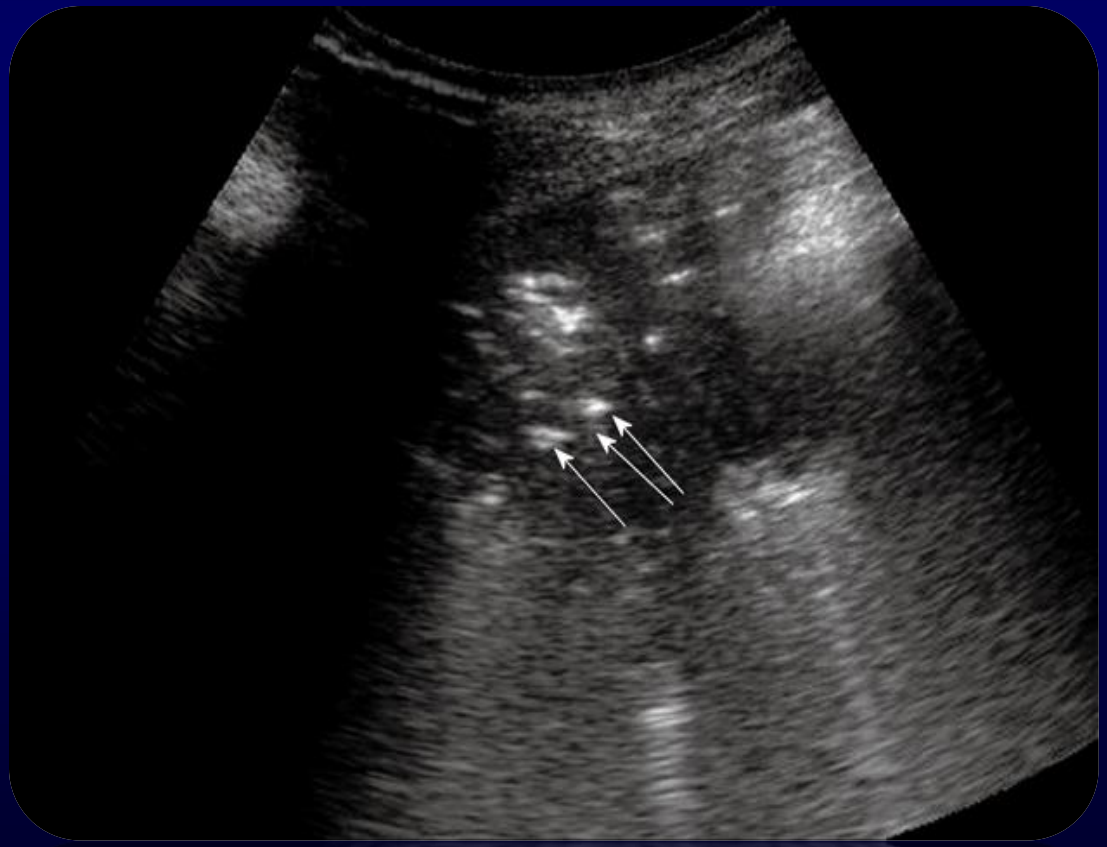
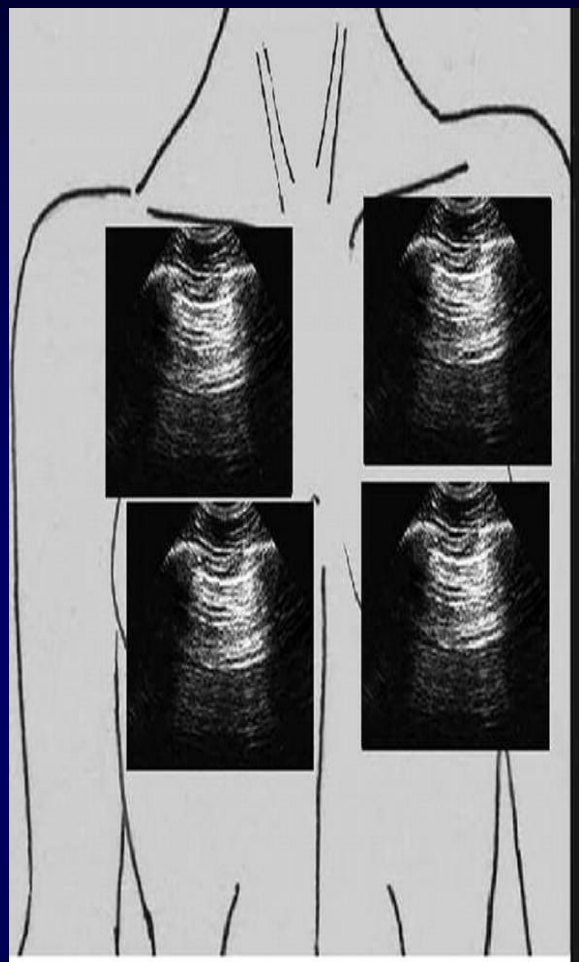



P

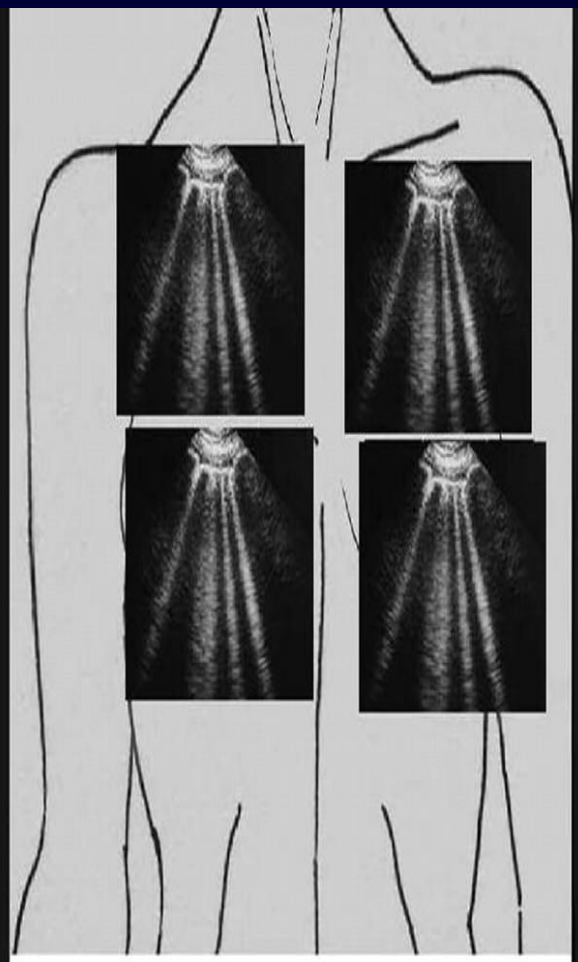
Pneumonia

Posterior intercostal scan shows a hypoechoic consolidated area that contains multiple echogenic lines that represent an air bronchogram.

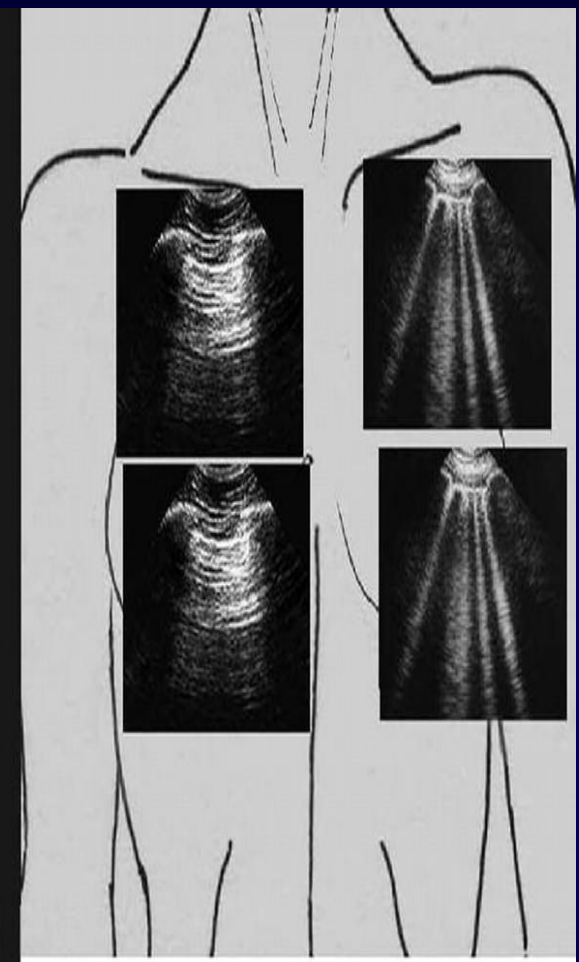




The A profile



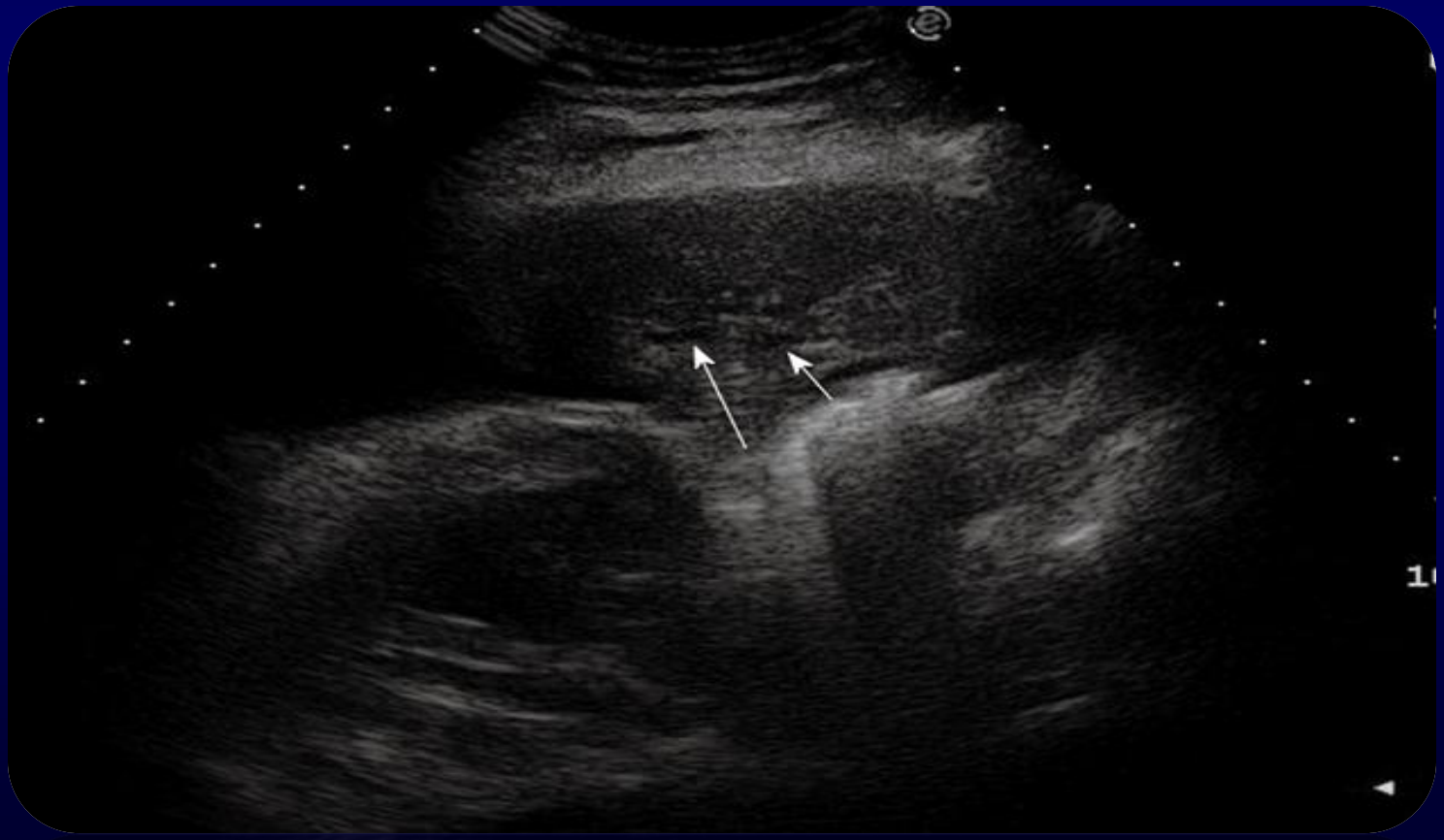
The B profile



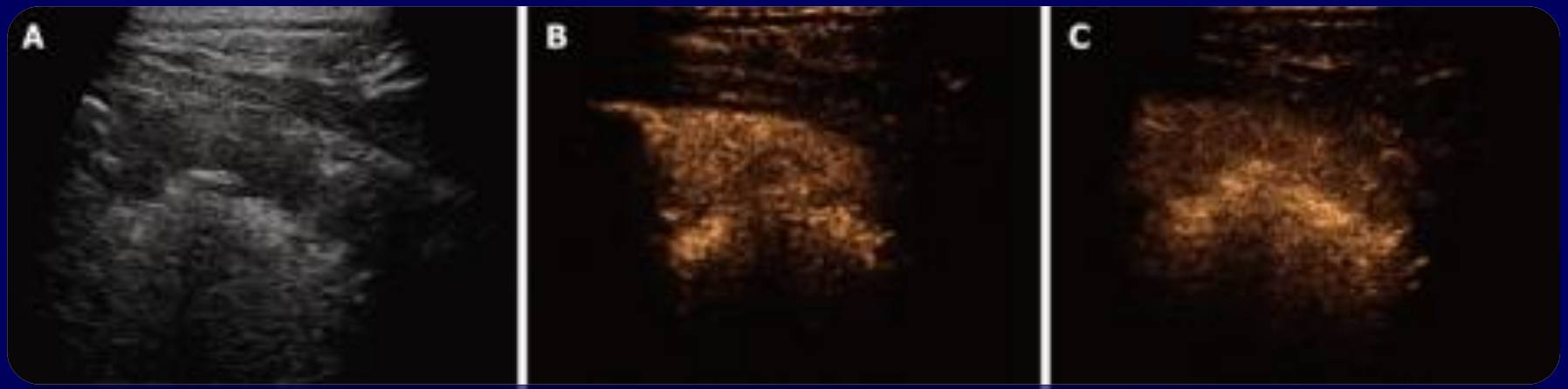
An AB profile

Post-stenotic pneumonia

Posterior intercostal scan shows a hypoechoic consolidated area that contains anechoic, branched tubular structures in the bronchial tree (fluid bronchogram).



Contrast-enhanced ultrasonography of pneumonia



A: Baseline scan shows a hypoechoic consolidated area

B: Seven seconds after iv bolus of contrast agent, the lesion shows marked and homogeneous enhancement

C: The lesion remains substantially unmodified after 90 s.

Severe Pneumonia

Adolescent or adult patient with fever or suspected infection, cough, respiratory rate > 30 breaths/min, severe respiratory distress, oxygen saturation (SpO2) < 90% on room air

ARDS

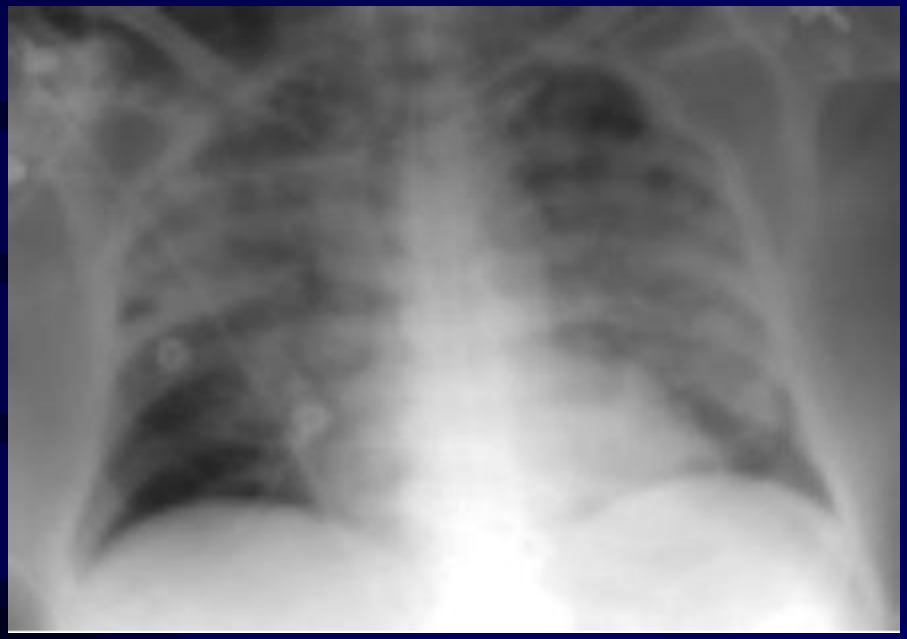
Onset: acute, i.e. within 1 week of known clinical insult or new or worsening respiratory symptoms

Chest imaging (e.g. X-ray or CT scan): bilateral opacities, not fully explained by effusions, lobar/lung collapse or nodules

Origin of pulmonary edema: respiratory failure not fully explained by cardiac failure or fluid overload

Degree of hypoxemia: 200 mm Hg < PaO_2/FiO_2 ≤ 300 mm Hg with PEEP or CPAP ≥ 5 cm H_2O (mild ARDS); 100 mm Hg < PaO_2/FiO_2 ≤ 200 mm Hg with PEEP ≥ 5 cm H_2O (moderate ARDS); PaO_2/FiO_2 ≤ 100 mm Hg with PEEP ≥ 5 cm H_2O (severe ARDS). When PaO_2 is not available, an SpO_2/FiO_2 ratio ≤ 315 suggests ARDS.

ARDS



ARDS

ARDS Severity	PaO٢/FiO *٢	Mortality **
Mild	٣٠٠ – ٢٠٠	%٢٧
Moderate	٢٠٠ – ١٠٠	%٣٢
Severe	١٠٠ >	%٤٥
* on PEEP ٥+; **observed in cohort		

The Berlin definition would include the following:

“Acute lung injury” no longer exists. Under the Berlin definition, patients with PaO2/FiO2 200-300 would now have “mild ARDS.”

Onset of ARDS (diagnosis) must be **acute**, as defined as within 7 days of some defined event, which may be sepsis, pneumonia, or simply a patient’s recognition of worsening respiratory symptoms. (Most cases of ARDS occur within 72 hours of recognition of the presumed trigger.)

Bilateral opacities consistent with pulmonary edema must be present but **may be detected on CT** or chest X-ray.

There is no need to exclude heart failure in the new ARDS definition; patients with high pulmonary capillary wedge pressures, or known congestive heart failure with left atrial hypertension can still have ARDS. The new criterion is that respiratory failure simply be “not fully explained by cardiac failure or fluid overload,” in the physician’s best estimation using available information. An “**objective assessment**“– meaning an**echocardiogram** in most cases — should be performed if there is **no clear risk factor** present like trauma or sepsis.

Sepsis

Documented or suspected infection, with two or more of the following conditions: temperature > 38 °C (100.4 °F) or < 36 °C (96.8 °F), HR > 90/min, RR > 20/min or PaCO2 < 32 mm Hg, white blood cells > 12 000 or < 4000/mm^3 or > 10% immature (band) forms

Severe Sepsis

Sepsis associated with organ dysfunction, hypoperfusion (lactic acidosis) or hypotension. Organ dysfunction may include: oliguria, acute kidney injury, hypoxemia, transaminitis, coagulopathy, thrombocytopenia, altered mental status, ileus or hyperbilirubenia.

Septic Shock

Sepsis-induced hypotension (SBP < 90 mm Hg) despite adequate fluid resuscitation and signs of hypoperfusion.

Standard precautions

Standard precautions include:

hand hygiene and use of personal protective equipment (PPE) to avoid direct contact with patients' blood, body fluids, secretions (including respiratory secretions) and non-intact skin. When providing care in close contact with a patient with respiratory symptoms (e.g. coughing or sneezing), use eye protection, because sprays of secretions may occur. Standard precautions include: prevention of needle-stick or sharps injury; safe waste management; cleaning and disinfection of equipment; and cleaning of the environment.

Droplet precautions

Use a medical mask if working within 1 meter of the patient. Place patients in single rooms, or group together those with the same etiological diagnosis. If an etiological diagnosis is not possible, group patients with similar clinical diagnosis and based on epidemiological risk factors, with a spatial separation of at least 1 meter. Limit patient movement and ensure that patients wear medical masks when outside their rooms.

Aerosol precautions

Ensure that healthcare workers performing aerosol-generating procedures use PPE, including gloves, long-sleeved gowns, eye protection and particulate respirators (N95 or equivalent). Whenever possible, use adequately ventilated single rooms when performing aerosol-generating procedures.

Give supplemental oxygen therapy to patients with SARI

Give oxygen therapy to patients with signs of severe respiratory distress, hypoxaemia (i.e. SpO2 < 90%) or shock. Initiate oxygen therapy at 5 L/min and titrate to SpO2 ≥ 90% in non-pregnant adults and SpO2 ≥ 92–95 % in pregnant patients. Pulse oximeters (*5*), functioning oxygen systems and appropriate oxygen-delivering interfaces should be available in all areas where patients with SARI are cared for.

Collect respiratory and other specimens for laboratory testing

Collect routine clinical specimens (e.g. blood and sputum bacterial cultures) for community-acquired pneumonia, ideally before antimicrobial use. Also collect respiratory specimens from the upper respiratory tract (i.e. nasal, nasopharyngeal and/or throat swab) and lower respiratory tract (i.e. sputum, endotracheal aspirate, bronchoalveolar lavage) for known respiratory viruses (such as influenza A and B, influenza A virus subtypes H1, H3, and H5 in countries with H5N1 viruses circulating among poultry; 5 RSV, parainfluenza viruses, rhinoviruses, adenonviruses, human metapneumoviruses, and non-SARS coronaviruses).

Collect respiratory and other specimens for laboratory testing

Testing should be done by reverse-transcriptase polymerase chain reaction (RT-PCR) if possible. Serial collection of respiratory specimens from multiple sites on multiple days (every 2–3 days) will inform viral shedding; and blood to assess viremia; conjunctival swabs if conjunctivitis is clinically present; urine, stool, and cerebrospinal fluid if lumbar puncture is performed. Contact WHO for information about laboratories that can test for the presence of novel coronavirus.

Collect respiratory and other specimens for laboratory testing

While there are few data to determine the most appropriate specimens for novel coronavirus testing, early experience indicates that lower respiratory specimens are more likely to be positive than upper respiratory specimens

Give empiric antimicrobials to treat suspected pathogens, including community-acquired pathogens

Use conservative fluid management in patients with SARI when there is no evidence of shock

Do not give high-dose systemic corticosteroids or other adjunctive therapies for viral pneumonitis outside the context of clinical trials

Closely monitor patients with SARI for signs of clinical deterioration, such as severe respiratory distress/respiratory failure or tissue hypoperfusion/shock, and apply supportive care interventions

Management of severe respiratory distress, hypoxemia and ARDS

Recognize severe cases, when severe respiratory distress may not be sufficiently treated by oxygen alone, even when administered at high flow rates

Wherever available, and when staff members are trained, mechanical ventilation should be instituted early in patients with increased work of breathing or hypoxemia that persists despite high-flow oxygen therapy

Consider NIV if local expertise is available, when immunosuppression is also present, or in cases of mild ARDS without impaired consciousness or cardiovascular failure

If equipment is available and staff are trained, proceed with endotracheal intubation to deliver invasive mechanical ventilation

Use a lung-protective ventilation strategy (LPV) for patients with ARDS

In patients with severe ARDS, consider adjunctive therapeutics early, especially if failing to reach LPV targets

Management of septic shock

Recognize sepsis-induced shock when patient develops hypotension (SBP < 90 mm Hg) that persists after initial fluid challenge or signs of tissue hypoperfusion (blood lactate concentration > 4 mmol/L) and initiate resuscitation by protocol

Give early and rapid infusion of crystalloid intravenous fluids for septic shock

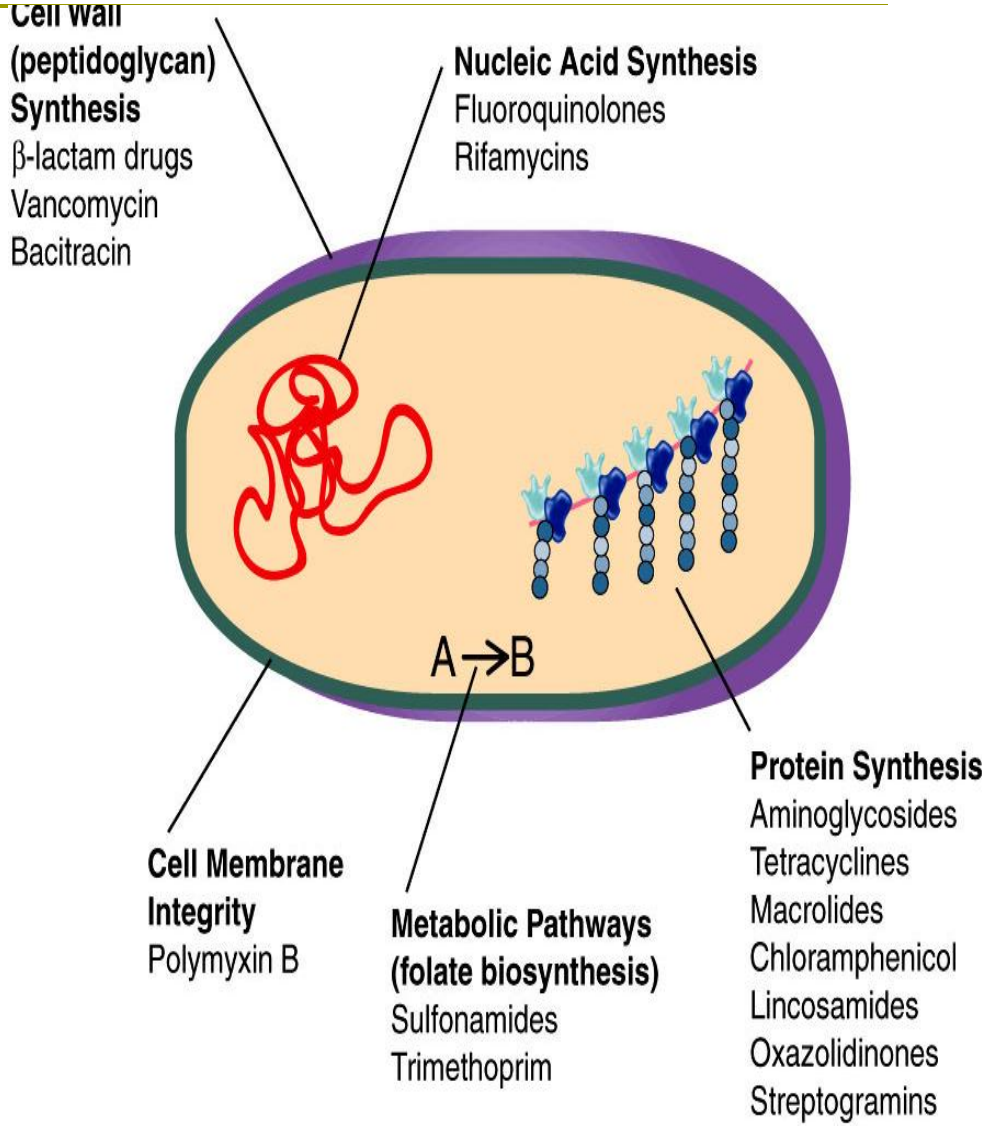
Use vasopressors when shock persists despite liberal fluid resuscitation

Consider administration of intravenous hydrocortisone (up to 200 mg/day) or prednisolone (up to 75 mg/day) to patients with persistent shock who require escalating doses of vasopressors

ANTIMICROBIAL DRUGS

MECHANISMS OF ACTION OF ANTIBACTERIAL DRUGS

- Mechanism of action include:
  - Inhibition of cell wall synthesis
  - Inhibition of protein synthesis
  - Inhibition of nucleic acid synthesis
  - Inhibition of metabolic pathways
  - Interference with cell membrane integrity



EFFECTS OF COMBINATIONS OF DRUGS

- Sometimes the chemotherapeutic effects of two drugs given simultaneously is greater than the effect of either given alone.
- This is called synergism. For example, penicillin and streptomycin in the treatment of bacterial endocarditis. Damage to bacterial cell walls by penicillin makes it easier for streptomycin to enter.

EFFECTS OF COMBINATIONS OF DRUGS

- Other combinations of drugs can be antagonistic.
- For example, the simultaneous use of penicillin and tetracycline is often less effective than when wither drugs is used alone. By stopping the growth of the bacteria, the bacteriostatic drug tetracycline interferes with the action of penicillin, which requires bacterial growth.

EFFECTS OF COMBINATIONS OF DRUGS

- Combinations of antimicrobial drugs should be used only for:
  1. To prevent or minimize the emergence of resistant strains.
  2. To take advantage of the synergistic effect.
  3. To lessen the toxicity of individual drugs.

Empiric monotherapy versus combination therapy

Optimal combination regimens for proven *P aeruginosa* nosocomial pneumonia include (1) piperacillin/tazobactam plus amikacin or (2) meropenem plus levofloxacin, aztreonam, or amikacin.[12]

Avoid using ciprofloxacin, ceftazidime, gentamicin, or imipenem in combination regimens, as combination therapy does not eliminate the resistance potential of these antibiotics.

Empiric monotherapy versus combination therapy

When selecting an aminoglycoside for a combination therapy regimen, amikacin once daily is preferred to gentamicin or tobramycin to avoid resistance problems.

When selecting a quinolone in a combination therapy regimen, use levofloxacin, which has very good anti– *P aeruginosa* activity (equal or better than ciprofloxacin at a dose of 750 mg).

Antibiotic Cycling


THANK YOU