



ESCMID

ESCMID Postgraduate
Education Course

**Sepsis & Immuno-
comprised Hosts:
Challenges in 2024**

MANAGING INFECTIONS
PROMOTING SCIENCE



A SEPTIC PATIENT WITH ACUTE MYELOID LEUKEMIA (AML)

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Training and Administrative Supervisor

CASE

- 66-year-old Turkish male patient, retired
- He was admitted to the emergency room.
- **Complaints:**
 - Fever
 - Impairment in consciousness, lethargy
- 14 days after receiving the last chemotherapy
- Family history: nothing significant

CASE

➤ **Past medical history:**

- COPD (cigarette 60 pacs-year)
- Hypertension
- Cholecystectomy (2 years ago)
- GIS hemorrhage (1 year ago)
- Myelodysplastic syndrome (MDS)
 - progressed to **Acute Myeloid Leukemia (AML)** one year ago: Azacitidine therapy
- **Recurrent Febrile Neutropenia (FEN) episodes (5x/1 year)**
- **Invasive Pulmonary Aspergillosis**

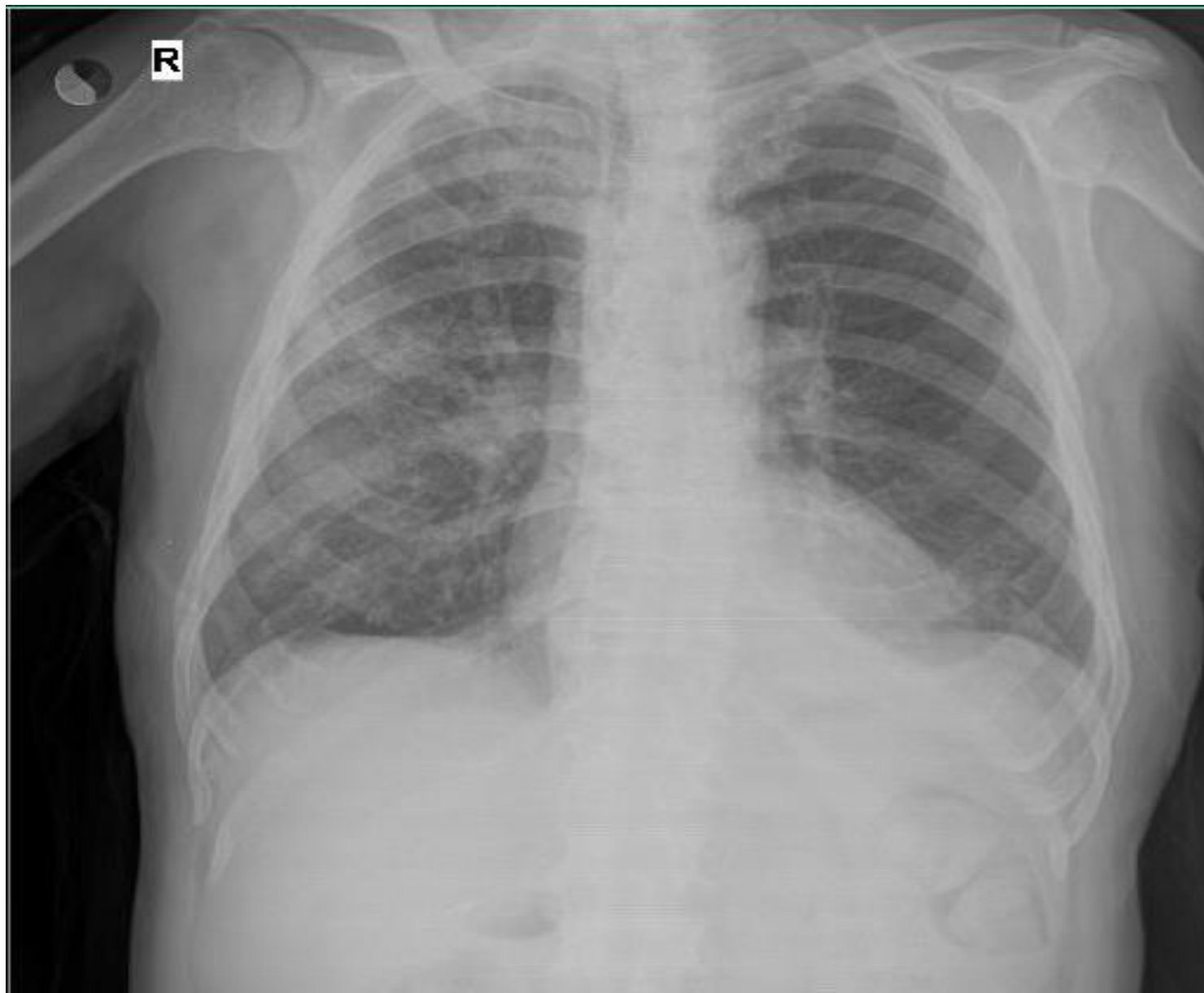
PRIOR HOSPITALISATIONS

Medical Ward	Diagnosis	Dates
Internal Medicine	GIS Hemorrhage, COPD	25.02.2018 - 01.03.2018
Internal Medicine - Hematology	Diagnosis of AML	03.04.2018 - 12.04.2018
Infectious Diseases and Cl. Microb.	AML + FEN	23.04.2018 – 30.05.2018
Infectious Diseases and Cl. Microb.	AML + FEN + Pneumonia	07.06.2018 – 10.08.2018
Infectious Diseases and Cl. Microb.	AML + FEN + <i>Klebsiella pneumoniae</i> bacteremia	04.11.2018 – 15.11.2018
Infectious Diseases and Cl. Microb.	AML + FEN + IPA	06.02.2019 – 18.02.2019
Infectious Diseases and Cl. Microb.	AML + FEN + IPA + CDI	27.02.2019 – 12.03.2019
Intensive Care Unit (ICU)	AML + FEN + SEPSIS – Bloodstream Infection	10.04.2019 – 11.04.2019

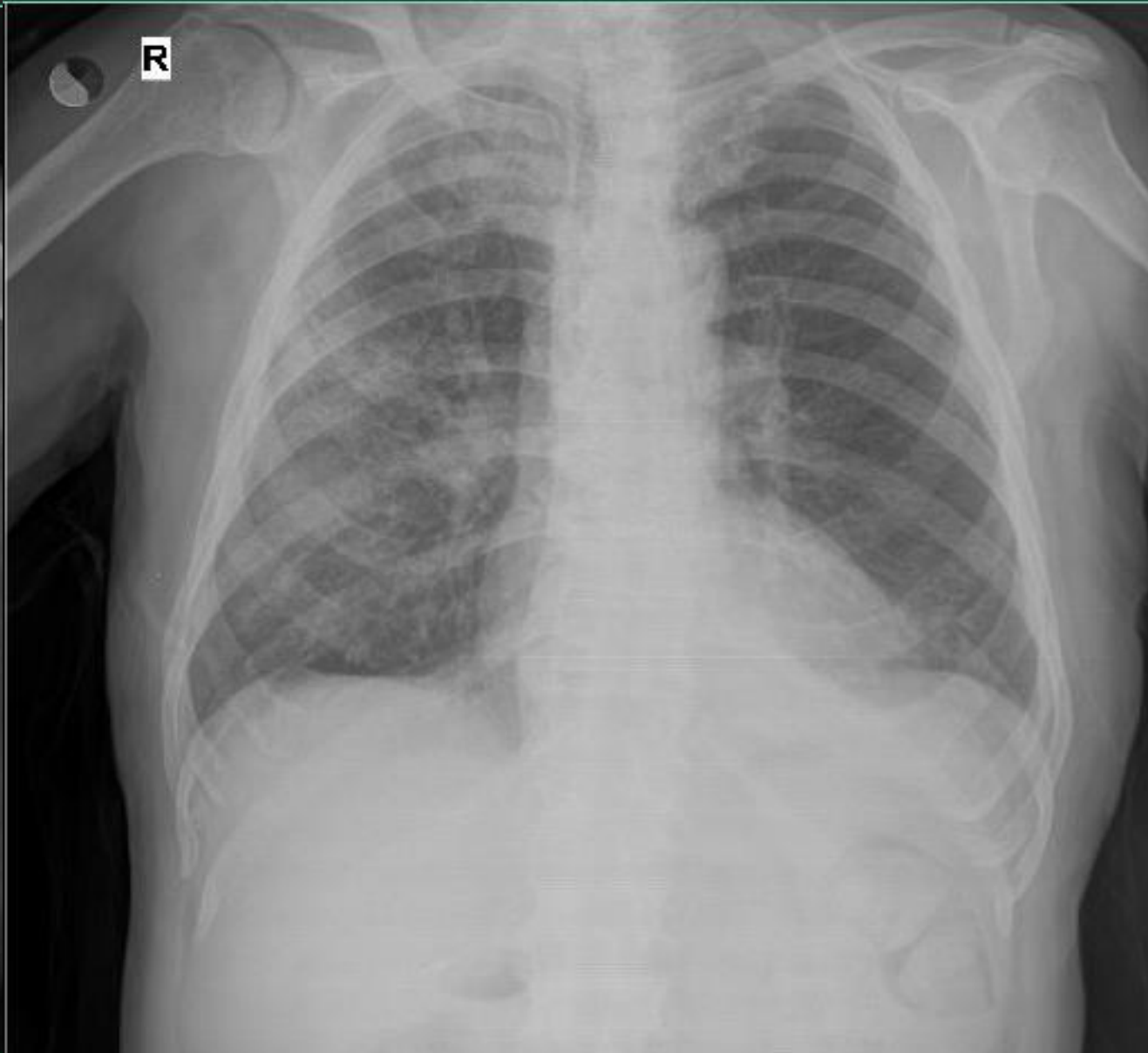
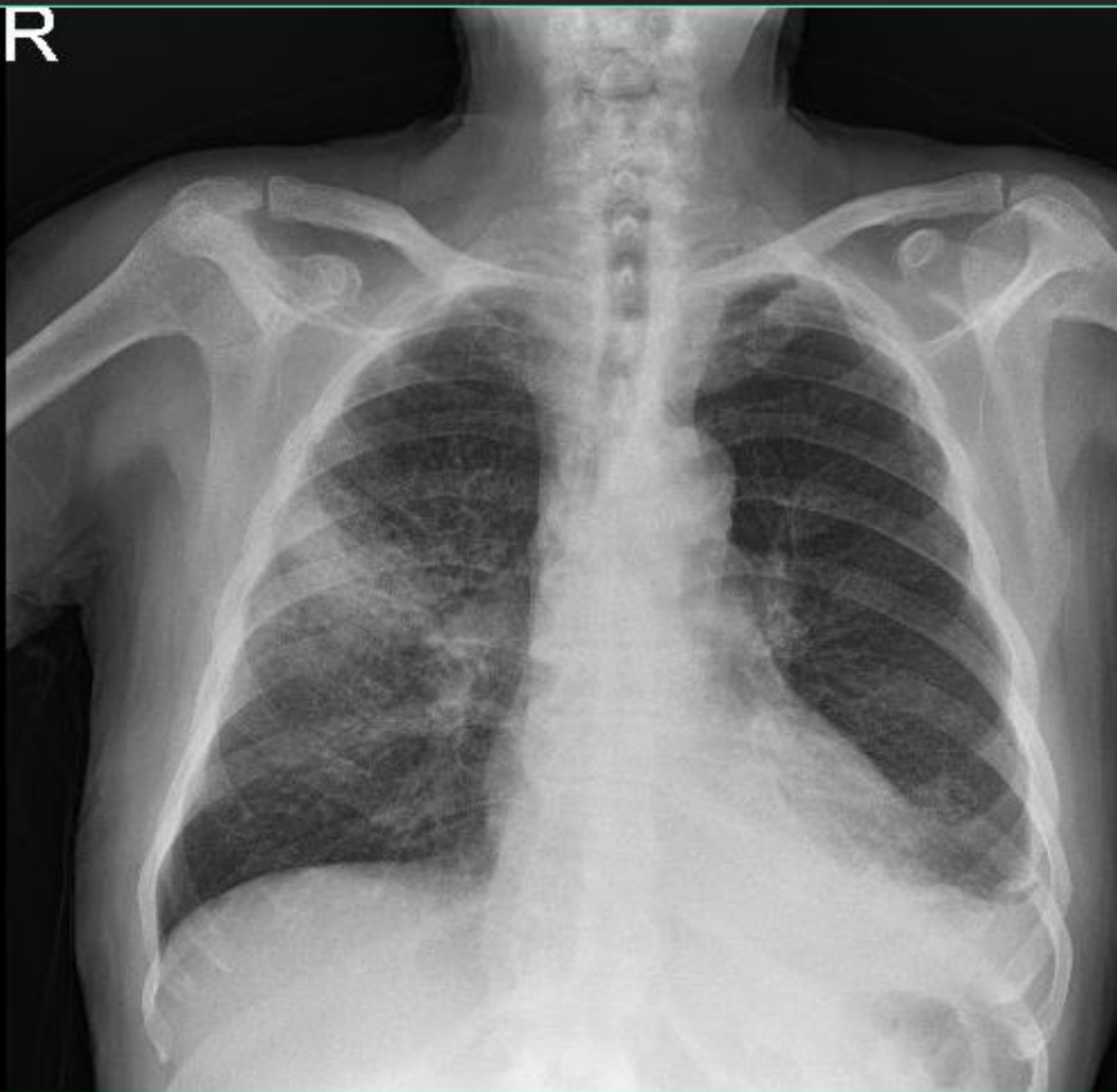
PHYSICAL EXAM

- Temperature: **39.2 ° C** Heart beat: **120/min** BP: **90/50 mmHg (MAP: 63)**
RR:**26/min** , **dyspneic**
- Initial **O₂ saturation** checked by pulse oximetry was **93% in room air.**
- **Altered state of consciousness (GKS:12), somnolent**
- Oropharynx: Normal
- Respiratory System: **Rhonchi bilaterally**
- Cardiovascular system: S1(+), S2(+), **tachycardia**, no murmurs
- Gastrointestinal system: Normal
- Genitourinary system: No costovertebral angle or suprapubic tenderness
- LAP absent. Pretibial edema: -/-

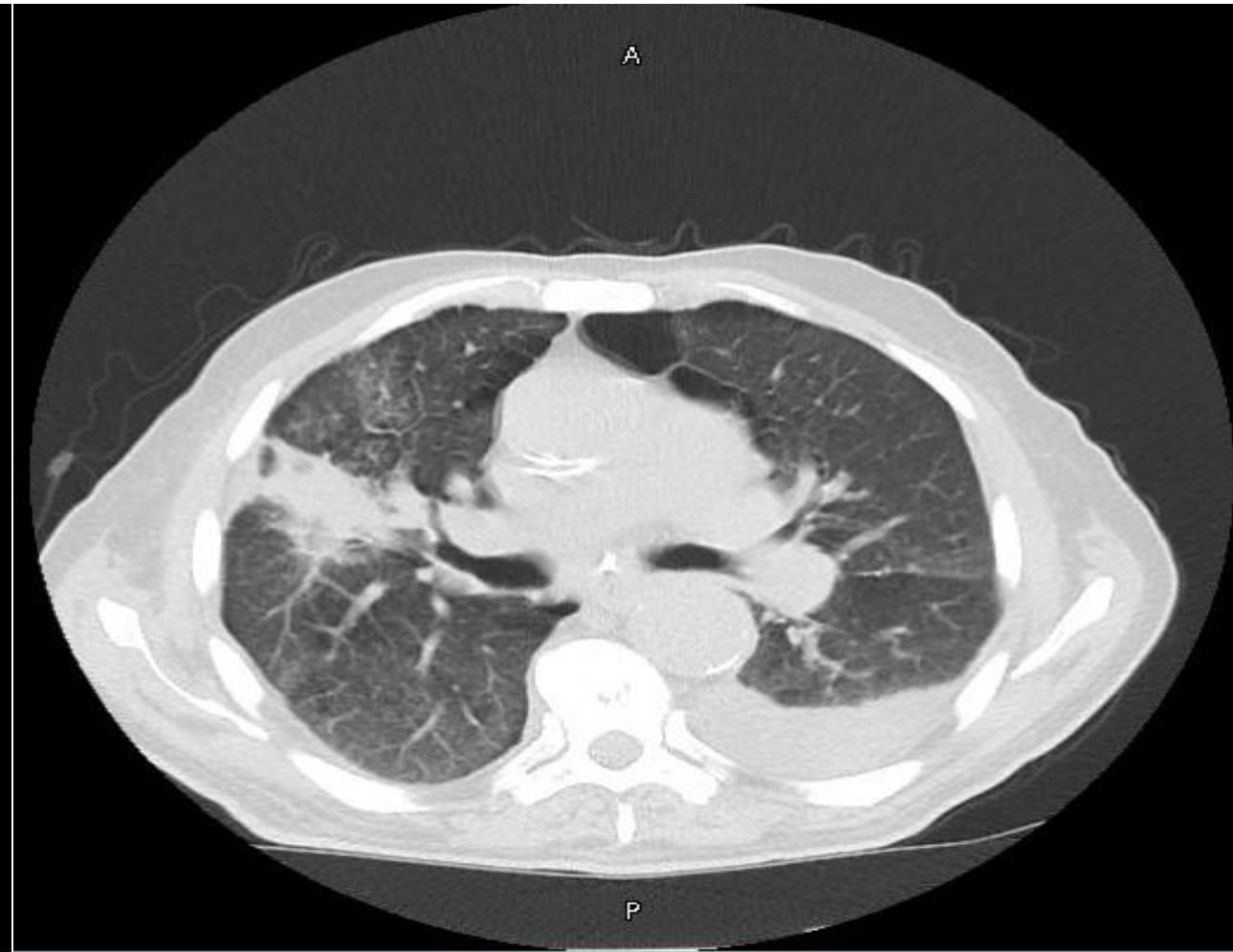
Lung X-Ray (10.04.2019)



Chest X-Ray comparison (27.02.2019 vs 10.04.2019)



THORAX CT Scan (27.03.2019)



Irregular consolidation including air-bronchograms in the right upper lobe, left pleural effusion (3.2 cm), adjacent compression atelectasis, bilateral emphysematous sequelae in upper lobes, reticular density in lower lobes

PREVIOUS IMAGING FINDINGS

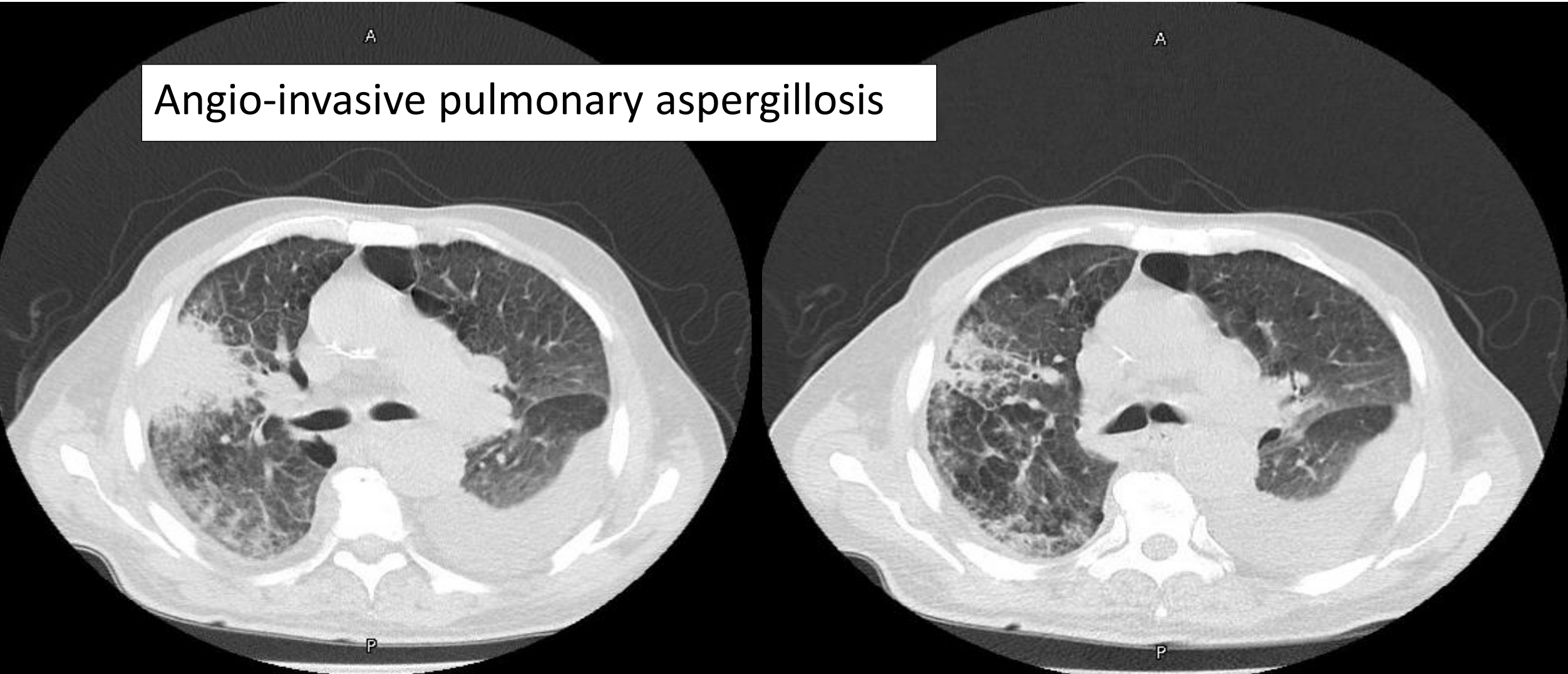
THORAX CT Scan (27.03.2019)



- **Thoracentesis:**
serofibrinous pleural fluid, exudate
- Cultures: sterile
- **Fiberoptic bronchoscopy (FOB):**Non-specific

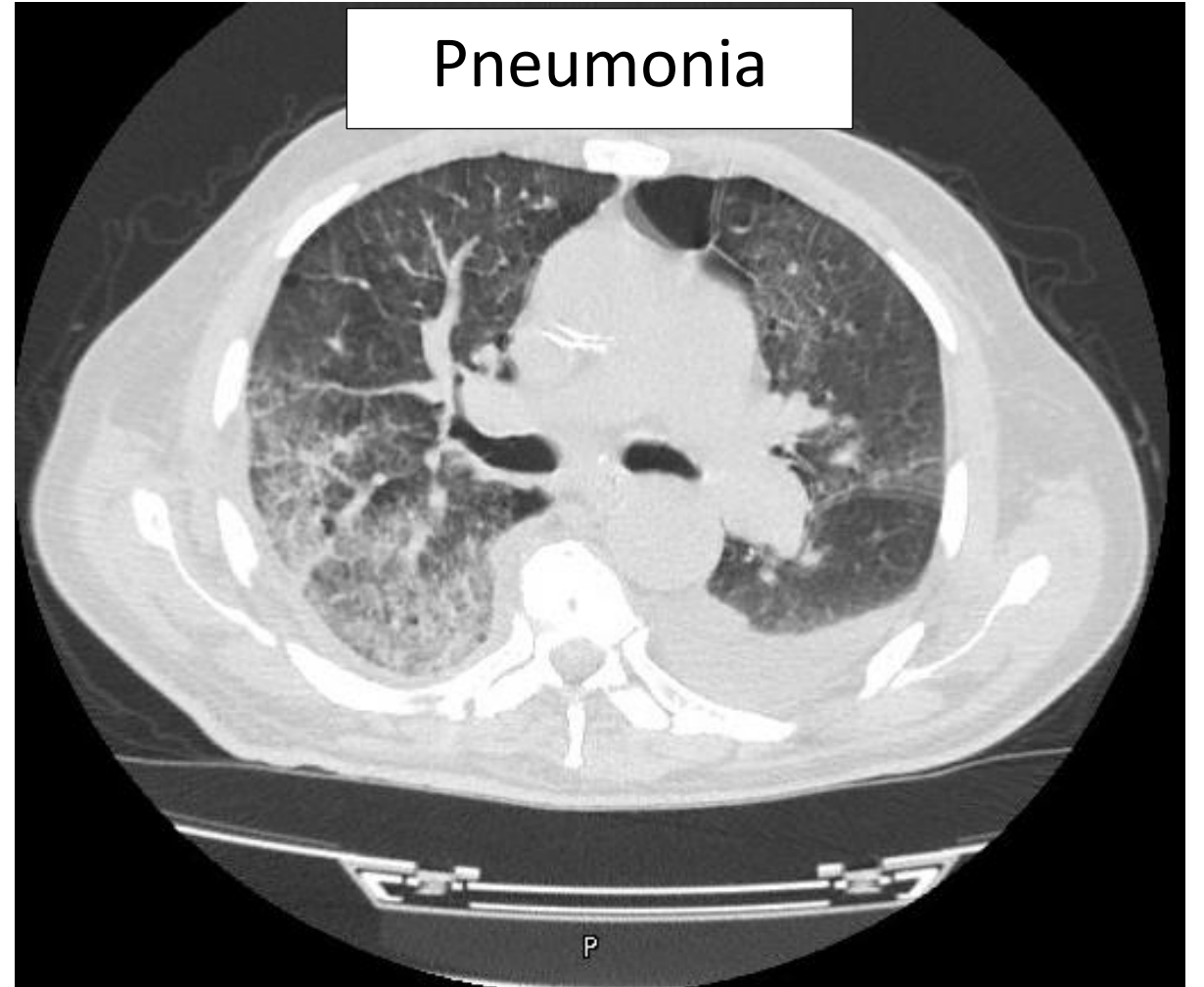
THORAX CT Scan (28.02.2019)

Angio-invasive pulmonary aspergillosis



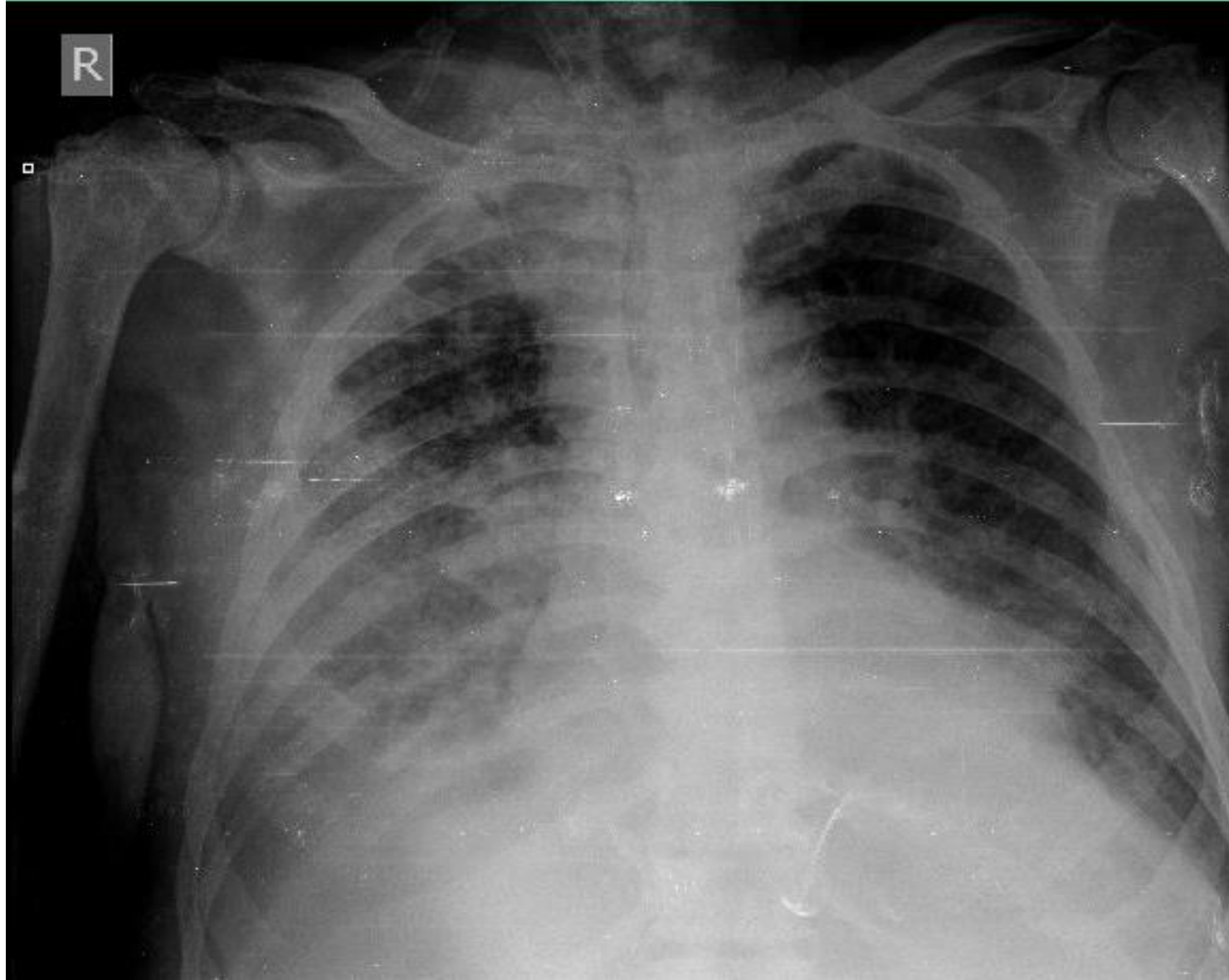
Subpleural nodule in the right lung, pleural effusion predominant on the left (5.5 cm), ground-glass opacities

HRCT (20.06.2018)



- Bilateral non-homogenous ground-glass opacities, pleural effusion

Chest X-Ray (01.07.2018)



HRCT (09.07.2018)



THORAX CT (27.07.2018)



LABORATORY FINDINGS

- **Wbc: 800 /mm³**
- **Neu: 400 /mm³ (% 51)**
- **Lym: 200 /mm³ (% 23)**
- **Hgb: 8.6 g/dl**
- **Hct: 26 %**
- **Plt: 94.000 /mm³**
- Urinalysis: Normal
- **CRP: 360 mg/L (N: 0-5)**
- **Procalcitonin: >100 ng/L**
- **Lactate: 11.3**
- **AST: 55 U/L (0-40)**
- **ALT: 65 U/L (0-41)**
- T.bil/D.bil: 0.94/0.52 mg/dl
- GGT: 66 /L (0-60)
- ALP: 125 U/L
- **LDH: 465 U/L**
- Urea: 75 mg/dl
- **Creatinine: 2.4 mg/dl**
- Na: 144 mmol/L
- **K: 3 mmol/L**
- **INR: 2.79**

11.04.2019

Q-Tümü

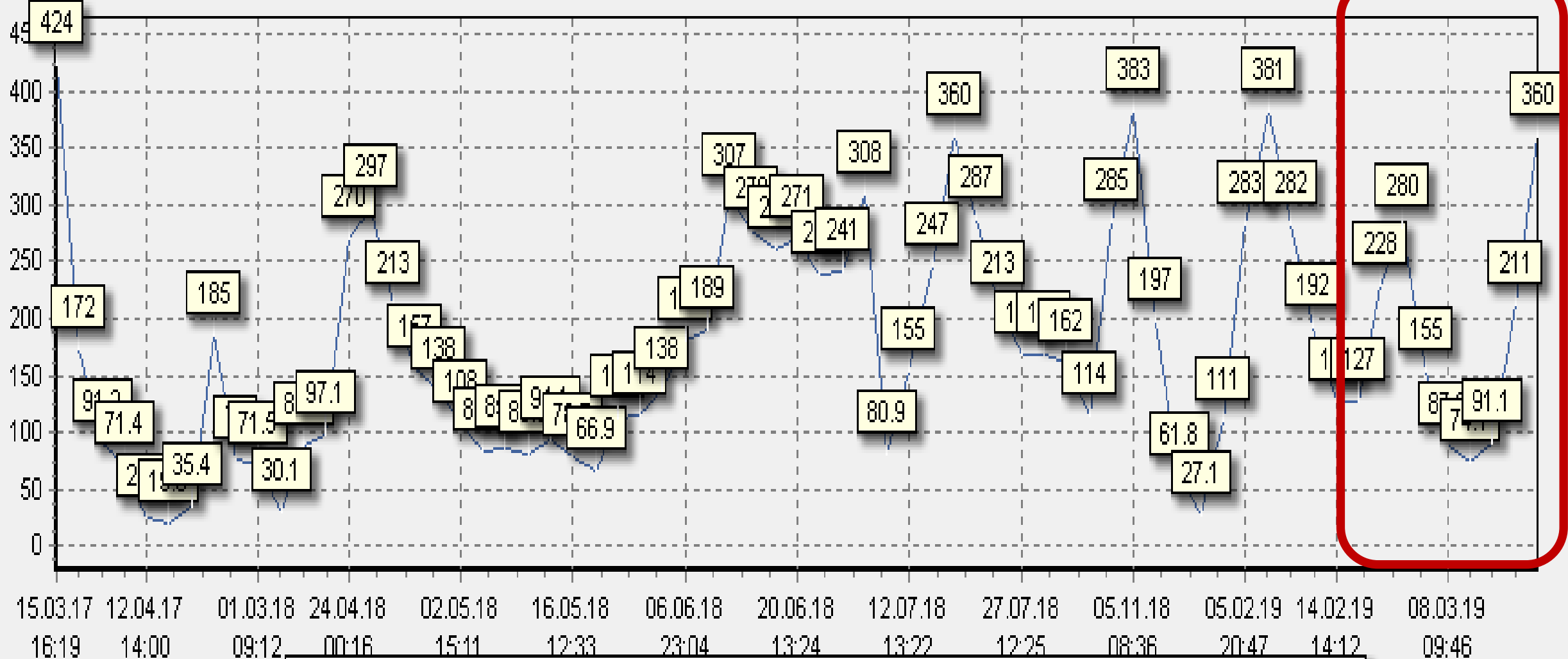
A-AKGZ

Adı	Sonuç	Eski Sonuc1
pH	7.18	7.46 (10.04.19)
pCO2	38.6	31 (10.04.19)
PO2	36.2	57.5 (10.04.19)
Ca++	1.08	1.11 (10.04.19)
tHB	2.8	10 (10.04.19)
Hct	9.1	30.8 (10.04.19)
O2Hb	54.8	88 (10.04.19)
COHb	2.6	3.2 (10.04.19)
HHb	40	6.9 (10.04.19)
MetHB	2.6	1.9 (10.04.19)
BE(ecf)	-12.9	-1.7 (10.04.19)
HCO3-std	13.9	23.3 (10.04.19)
ctCO2(B)	2.2	12.3 (10.04.19)
Lac	11.3	2.1 (10.04.19)
SO2	57.8	92.7 (10.04.19)
Clor	109	107 (10.04.19)

CRP Levels

Toplam Test Sayısı: 67 - Test Sonuç Ortalaması :

5 - Max.Test Sonucu :424



:- Toplam : 67 - Ortalama : 173.07 - Std.Dev : 100.1 - Medyan : 157 - Min : 19.5 - Max : 424

Lactate levels

Değerleri göster

Noktalama yap

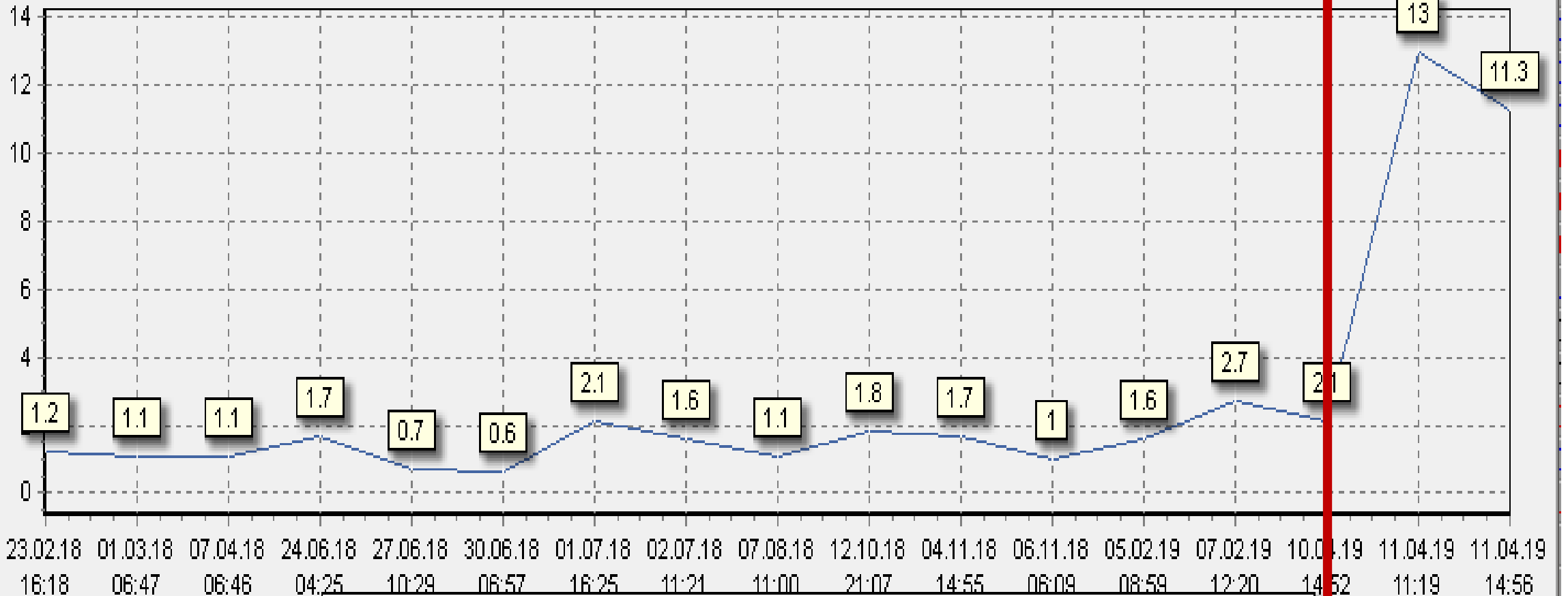
Üç Boyutlu göster

Garfikteki Test Sayısı

17

Süre(ms):0.078

Toplam Test Sayısı: 17 - Test Sonuç Ortalaması : 2.73 - Min.Test Sonucu :0.6 - Max.Test Sonucu :13



:- Toplam : 17 - Ortalama : 2.73 - Std.Dev : 3.49 - Medyan : 1.6 - Min : 0.6 - Max : 13

LABORATORY FINDINGS

- Anti-HCV: Negatif
- HBsAg: Negatif
- Anti-HBs: Pozitif
- Anti-Hbc IgG: Negatif
- Anti- HAV IgM:Negatif
- Anti- HAV IgG: Pozitif

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Mervyn Singer, MD, FRCP; Clifford S. Deutschman, MD, MS; Christopher Warren Seymour, MD, MSc; Manu Shankar-Hari, MSc, MD, FFICM; Djillali Annane, MD, PhD; Michael Bauer, MD; Rinaldo Bellomo, MD; Gordon R. Bernard, MD; Jean-Daniel Chiche, MD, PhD; Craig M. Coopersmith, MD; Richard S. Hotchkiss, MD; Mitchell M. Levy, MD; John C. Marshall, MD; Greg S. Martin, MD, MSc; Steven M. Opal, MD; Gordon D. Rubenfeld, MD, MS; Tom van der Poll, MD, PhD; Jean-Louis Vincent, MD, PhD; Derek C. Angus, MD, MPH

Quick SOFA (qSOFA)

- Respiratory rate $\geq 22/\text{min}$
- Systolic blood pressure $\leq 100 \text{ mmHg}$
- Altered state of consciousness (GKS <13)

3 points !

• ≥ 2 +  unfavorable outcome/mortality !

SOFA Score

Table 1. Sequential [Sepsis-Related] Organ Failure Assessment Score^a

System	Score				
	0	1	2	3	4
Respiration					
Pao ₂ /Fio ₂ , mm Hg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
Coagulation					
Platelets, ×10 ³ /μL	≥150	<150	<100	<50	<20
Liver					
Bilirubin, mg/dL (μmol/L)	<1.2 (20)	1.2-1.9 (20-32)	2.0-5.9 (33-101)	6.0-11.9 (102-204)	>12.0 (204)
Cardiovascular	MAP ≥70 mm Hg	MAP <70 mm Hg	Dopamine <5 or dobutamine (any dose) ^b	Dopamine 5.1-15 or epinephrine ≤0.1 or norepinephrine ≤0.1 ^b	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1 ^b
Central nervous system					
Glasgow Coma Scale score ^c	15	13-14	10-12	6-9	<6
Renal					
Creatinine, mg/dL (μmol/L)	<1.2 (110)	1.2-1.9 (110-170)	2.0-3.4 (171-299)	3.5-4.9 (300-440)	>5.0 (440)
Urine output, mL/d				<500	<200

Abbreviations: Fio₂, fraction of inspired oxygen; MAP, mean arterial pressure; Pao₂, partial pressure of oxygen.

^a Adapted from Vincent et al.²⁷

^b Catecholamine doses are given as μg/kg/min for at least 1 hour.

^c Glasgow Coma Scale scores range from 3-15; higher score indicates better neurological function.

SOFA (Sequential / Sepsis-related Organ Failure Assessment)

Special Communication | CARING FOR THE CRITICALLY ILL PATIENT

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

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SOFA SCORE: 11
(50 % Mortality)

PROGRESS

- He was hospitalized in the **ICU with septic shock and multi-organ dysfunction due to sepsis.**
- Two sets of blood culture and urine culture were performed.
- An **empirical antibiotic treatment** with meropenem (1 g every 8 hours, intravenous) and teicoplanin (2x400 mg initially with 1x400 mg maintenance dose) was initiated intravenously.
- Voriconazole 6 mg/kg IV q12hx 1 day, then 4 mg/kg IV q12h as maintenance dose was added.
- **IV Fluid replacement with ringer lactate and %0.9 NaCl**

PROGRESS

- **Pulmonary Medicine consultation:** Tachypnea, dyspnea, acidosis: COPD acute exacerbation
- Methyl prednisolone 40 mg (1x1), Salbutamol (6x1 inh), Ipratropium bromide (4x1 inh) recommended.
- **Hematology consultation:** Neupogen IM for three days recommended.

PROGRESS

- His clinical condition deteriorated.
- Urine output decreased.
- He was intubated due to respiratory insufficiency.
- He developed acute renal failure with oliguria and severe metabolic acidosis.
- Despite the fluid resuscitation and antimicrobial therapy, his blood pressure was 80/50 mm/Hg after 3 hours (**MAP=60 mm/Hg**).
- **Noradrenaline** was initiated.
- ***Escherichia coli*** was grown in his blood culture and was susceptible to piperacillin/tazobactam and carbapenems.

10.04.2019

Bak.Sonuç Girişi :: Anaerop Kan Kültürü 1 (Perifer)

1-Sonuç 2-Açıklama 3-Mikroskopi 4-Boyama

Materyal 001 Kan

Mat.Alın.Yer

Üreme Oldu Gram Uyumsuz Yalancı Pozitif

Bakı Not

Bakı Snc

Sonuç .Anaerop etken üremedi.

Blood culture results were available after 48-72 hours of hospitalisation

Bakteriler Açıklama Gir Bakteri Ekle Bakteri Değiştir

Bakteri Kodu	Bakteri Adı	Üreme Düzeyi	Üreme Düzeyi
BAK10212	Escherichia coli		

AntiBiyogramlar Ant.Gr.Ekle Ant.Ekle Kısıtla

Alt Grup	Kodu	Adı	Kısa Adı	T.Y.	Sonuç	Yorum	Açıklama	Cihaz So...	Kons.	K.Birim	Zon Çapı	Zon Aralık	Mic Sonuç	C.Mic Sonuç
	5	Amoxicilin/Clavulanic A.	AMC	<input type="checkbox"/>	R	3-Dirençli(R)		R					>=32.0	>=32.0
	10	Sefazolin	CZ	<input checked="" type="checkbox"/>	R	3-Dirençli(R)		R					>=64.0	>=64.0
	13	Sefuroksim	CXM	<input checked="" type="checkbox"/>	R	3-Dirençli(R)		R					>=64.0	>=64.0
	16	Seftriakson	CRO	<input checked="" type="checkbox"/>	R	3-Dirençli(R)		R					>=64.0	>=64.0
	22	Gentamicin	CN	<input checked="" type="checkbox"/>	R	3-Dirençli(R)		R					>=16.0	>=16.0
	25	Amikasin	AN	<input checked="" type="checkbox"/>	S	1-Duyarlı(S)		S					4.0	4.0
	42	Meropenem	MER	<input type="checkbox"/>	S	1-Duyarlı(S)		S					<=0.25	<=0.25
	44	Sefepim	FEP	<input checked="" type="checkbox"/>	R	3-Dirençli(R)		R					8.0	8.0
	46	Piperacilin/Tazobactam	TZP	<input checked="" type="checkbox"/>	S	1-Duyarlı(S)		S					<=4.0	<=4.0
	56	Ertapenem	ETP	<input type="checkbox"/>	S	1-Duyarlı(S)		S					<=0.12	<=0.12
	53	Tigecycline	TGC	<input type="checkbox"/>	S	1-Duyarlı(S)		S					<=0.5	<=0.5
	KMANT15	Siprofloksasin	CIP	<input checked="" type="checkbox"/>	R	3-Dirençli(R)		R					>=4.0	>=4.0

11.04.2019

Q-Tümü	6-BAK	9-SER	A-AKGZ	g-PRZ
Adı	Sonuç	Eski Sonuç1		
▶ CRP	360	211 (10.04.19)		
pH	7.18	7.46 (10.04.19)		
pCO2	34.3	31 (10.04.19)		
PO2	35.4	57.5 (10.04.19)		
Ca++	1.05	1.11 (10.04.19)		
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Hct	28	30.8 (10.04.19)		
O2Hb	52	88 (10.04.19)		
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HHb	44.1	6.9 (10.04.19)		
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Lac	13	2.1 (10.04.19)		
SO2	54.1	92.7 (10.04.19)		
Clor	111	107 (10.04.19)		

- He had a cardiac arrest, therefore **cardiopulmonary resuscitation (CPR)** was started, but he was unresponsive.
- Unfortunately, despite the effective sepsis management, he died after a 24-hour follow-up in the intensive care unit due to sepsis and septic shock.
- Herein, we report a septic patient with Acute Myeloid Leukemia (AML) in order to point out the **poor outcome of sepsis and septic shock** in immunocompromised patients and emphasize the importance of early effective treatment.

SSC Guidelines - 2021 Update

Intensive Care Med

<https://doi.org/10.1007/s00134-021-06506-y>

GUIDELINES

Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021

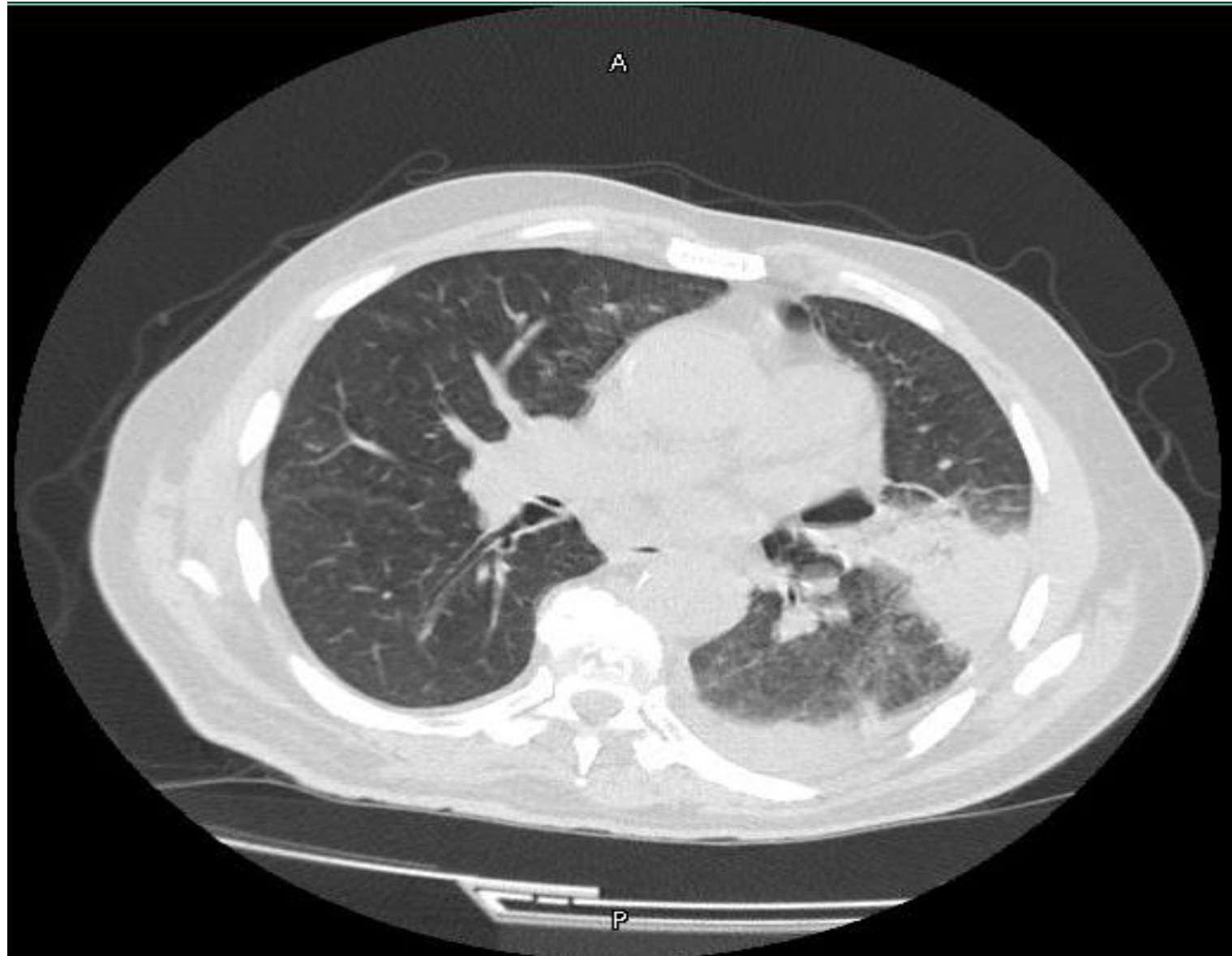


Recommendations from these guidelines cannot replace the clinician's decision-making capability when presented with a unique patient's clinical variables. These guidelines are intended to reflect best practice.

Mervyn Mer⁴⁶, Mark Nunnally⁴⁷, Simon Oczkowski³, Tiffany Osborn⁴⁸, Elizabeth Papathanassoglou⁴⁹, Anders Perner⁵⁰, Michael Puskarich⁵¹, Jason Roberts^{52,53,54,55}, William Schweickert⁵⁶, Maureen Seckel⁵⁷, Jonathan Sevransky⁵, Charles L. Sprung^{58,59}, Tobias Welte⁶⁰, Janice Zimmerman⁶¹ and Mitchell Levy⁶²

THANK YOU

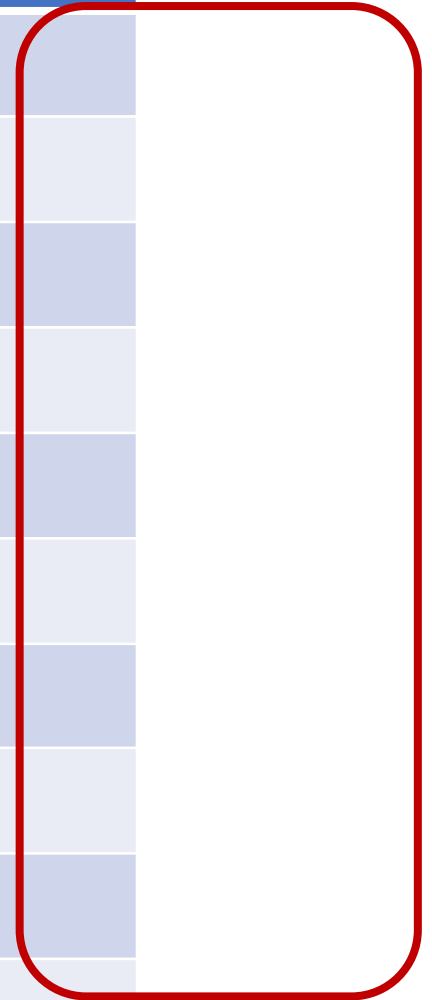
HRCT (26.04.2018)



Day 1

Day 2

	Day 1	Day 2
WBC /uL		
HBG g/dl		
NEU /uL		
LYM /uL		
PLT /uL		
CRP mg/L		
PROC ng/L		
SEDIM mm/saat		



Day 1

Day 2

	Day 1	Day 2
AST U/L		
ALT U/L		
GGT		
ALP U/L		
LDH U/L		
Üre/kreatinin mg/dl		
T.BiL mg/dl		
PT-		
PTT		
INR		

