BOL U GRUDIMA

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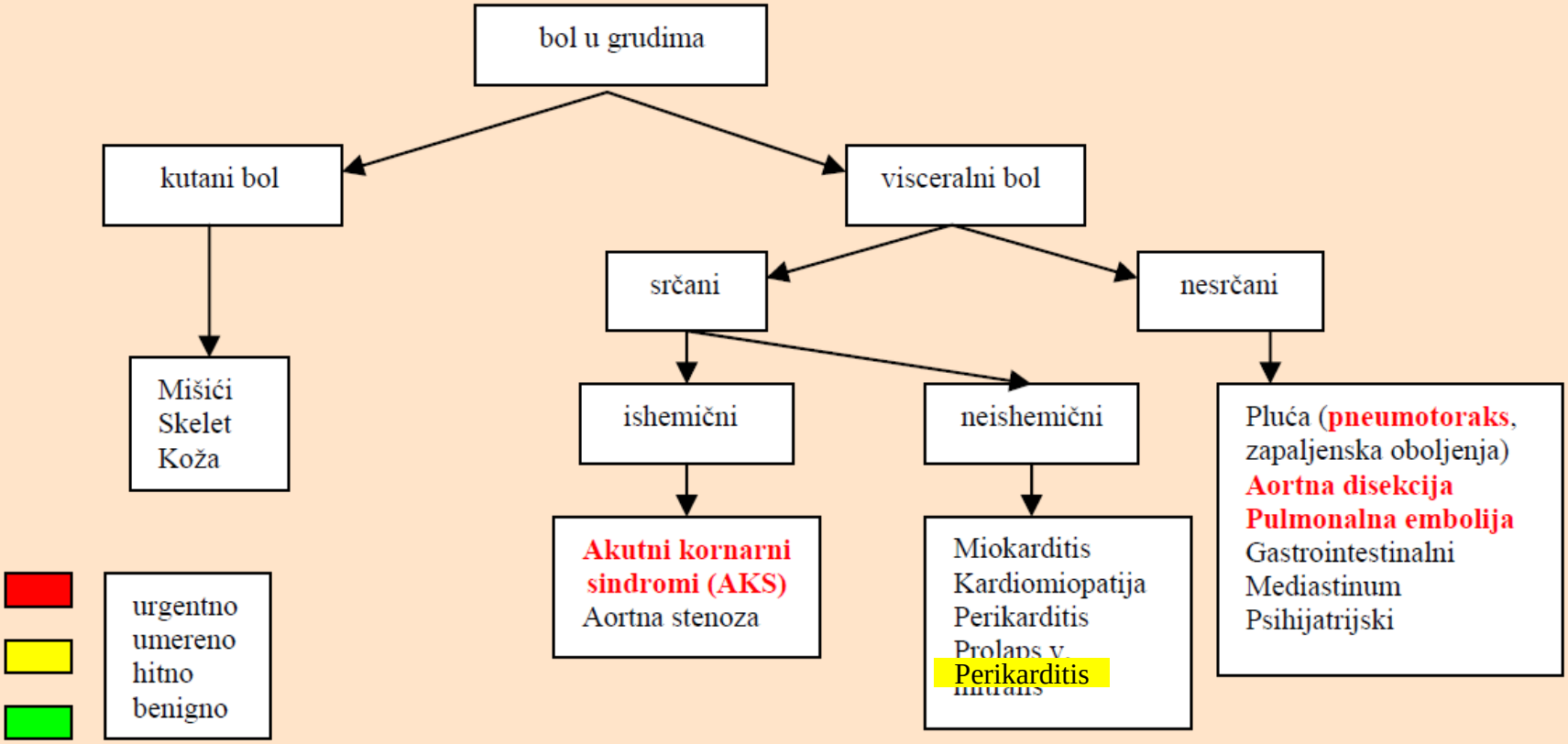
BOL U GRUDIMA

Preventivni, dijagnosticki i terapijski pristup bolesniku sa bolom u grudima

Diferencijalna dijagnoza bola u grudima



PREPORUKE ZA PREVENTIVNI, DIJAGNOSTIČKI I TERAPIJSKI PRISTUP BOLESNIKU SA BOLOM U GRUDIMA. Radna grupa za kardiovaskularne bolesti: Miodrag Ostojić sa saradnicima, 2002.

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ANGINOZNI BOL - AKS

Moguća lokalizacija bola u grudima kod infarkta miokarda

- Bol je obično, ali ne uvijek, jak, (“nepodnošljiv”, ”surov”, “stiskajući”) i može biti praćen mučninom, povraćanjem i preznojavanjem
- Bol najčešće počinje u središnjem dijelu grudnog koša i širi se, ali se može javiti bilo gdje u obilježenom području, uključujući i donju vilicu
- Bol se inicijalno može pojačavati i smanjivati, za razliku od disekcije, kod koje bol naglo nastaje i najjačeg je intenziteta na svom početku
- Potpuni prolazak bola u roku od nekoliko minuta nakon primjene nitrata, čini STEMI malo vjerovatnim

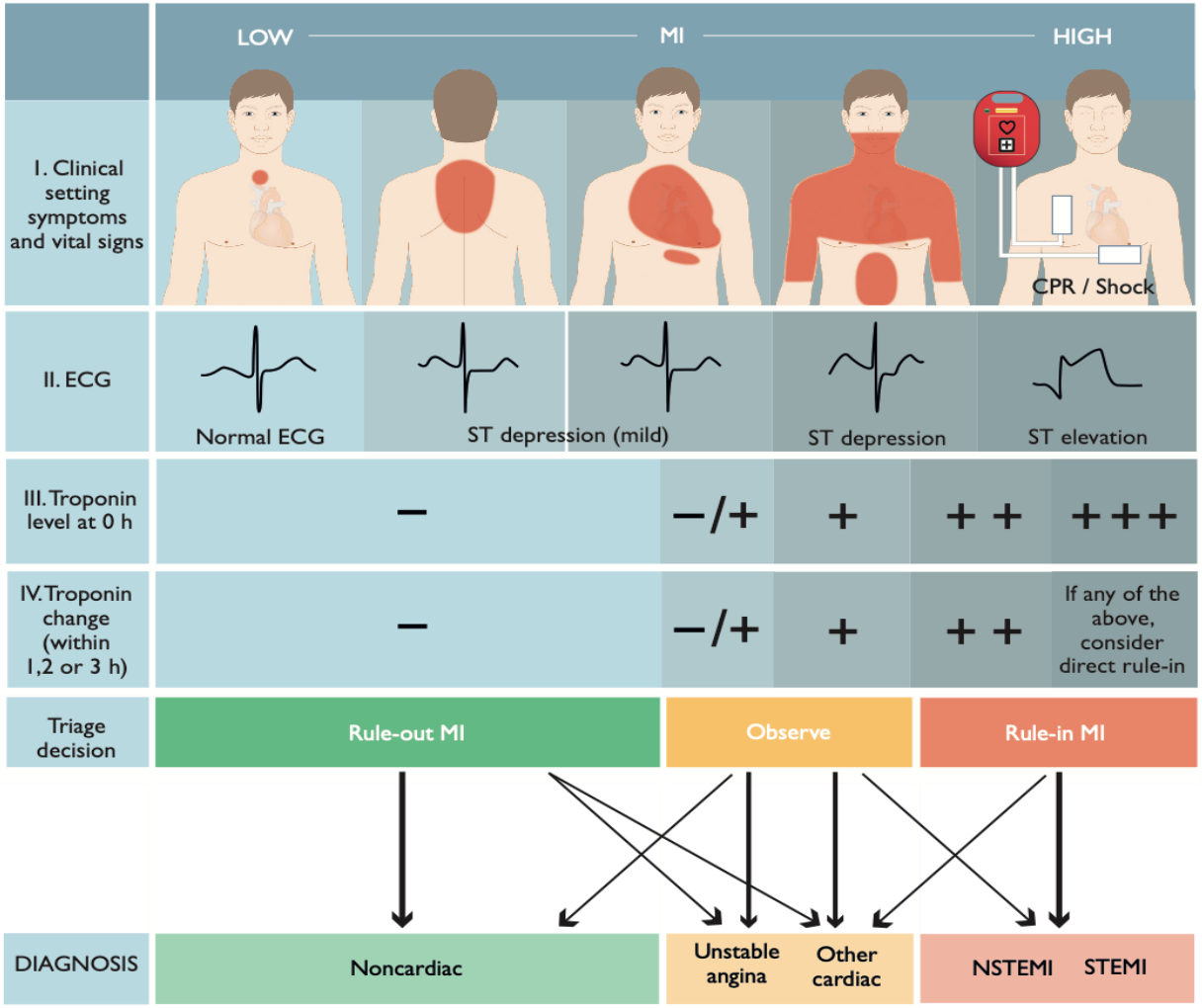

Figure 1
Diagnostic algorithm and triage in acute coronary syndrome.

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persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/eh

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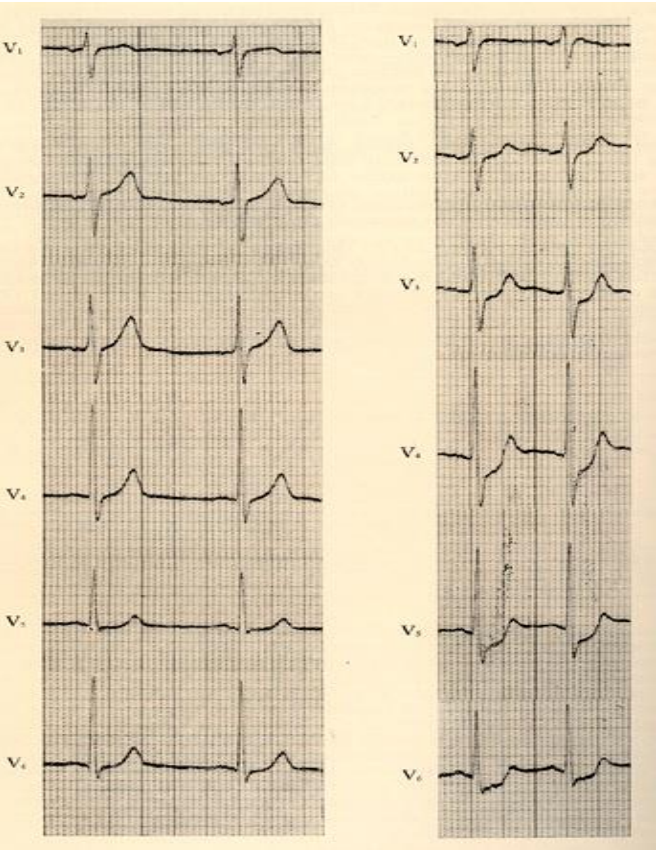
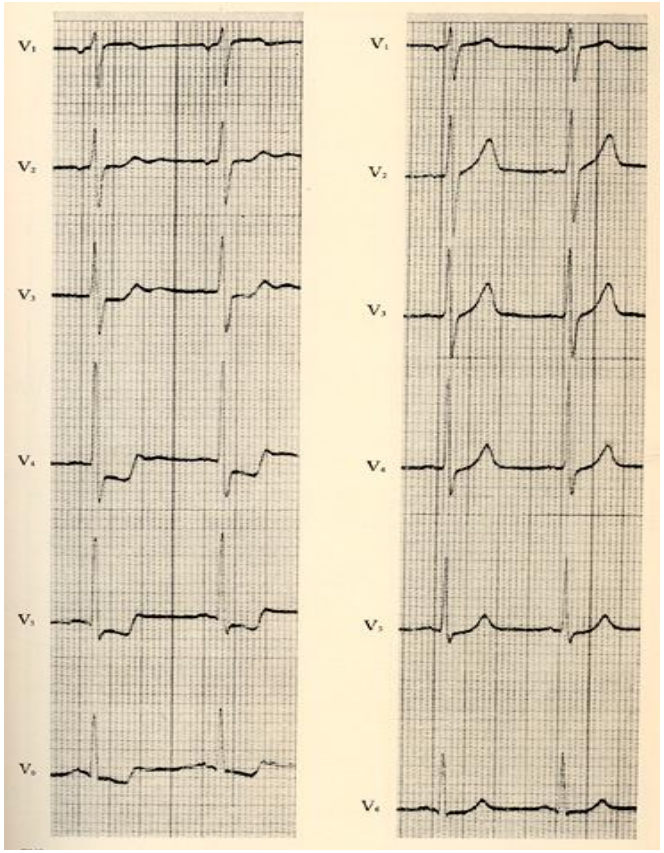
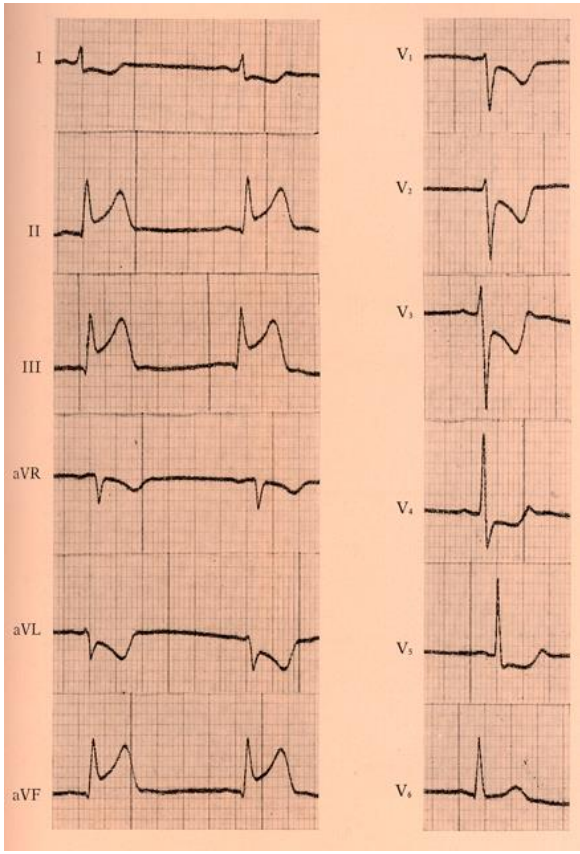
AKS – EKG







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Kliničke implikacije testova za analizu visoko senzitivnog troponina (hs cTn)

Uporedjujući ga sa standardnim troponinom, test za analizu visoko senzitivnog troponina (hs troponin):

- ima veću negativnu prediktivnu vrijednost kod akutnog infarkta miokarda
- smanjuje interval "slijepog troponina", omogućavajući ranije postavljanje dijagnoze akutnog infarkta miokarda
- dovodi do oko 4% apsolutnog i 20% relativnog porasta u otkrivanju tipa 1 infarkta miokarda, a korespondira sa smanjenjem dijagnoze nestabilne angine pektoris
- Udružen je sa dvostrukim porastom u otkrivanju tipa 2 infarkta miokarda

Vrijednosti visoko senzitivnog troponina trebaju se interpretirati kao kvantitativni markeri oštećenja kardiomiocita (npr. veća vrijednost troponina ide u prilog veće vjerovatnoće za dijagnozu infarkta miokarda)

- porast preko 5 puta iznad gornje granice referentne vrijednosti ima visoku pozitivnu prediktivnu vrijednost (>90%) za dijagnozu infarkta miokarda tip 1
- trostruki porast iznad gornje granice referentne vrijednosti ima limitiranu (50-60%) pozitivnu prediktivnu vrijednost i može biti udružen sa širokim spektrom stanja
- Uobičajeno je registrovati cirkulišuće nivoe vrijednosti troponina kod zdravih ljudi

Porast i/ili pad vrijednosti troponina diferencira akutno od hroničnog oštećenja kardiomiocita (što je izraženija promjena vrijednosti, veća je vjerovatnoća za dijagnozu akutnog infarkta miokarda)

Authors/Task Force Members et al. Eur Heart J 2015;eurheartj.ehv320

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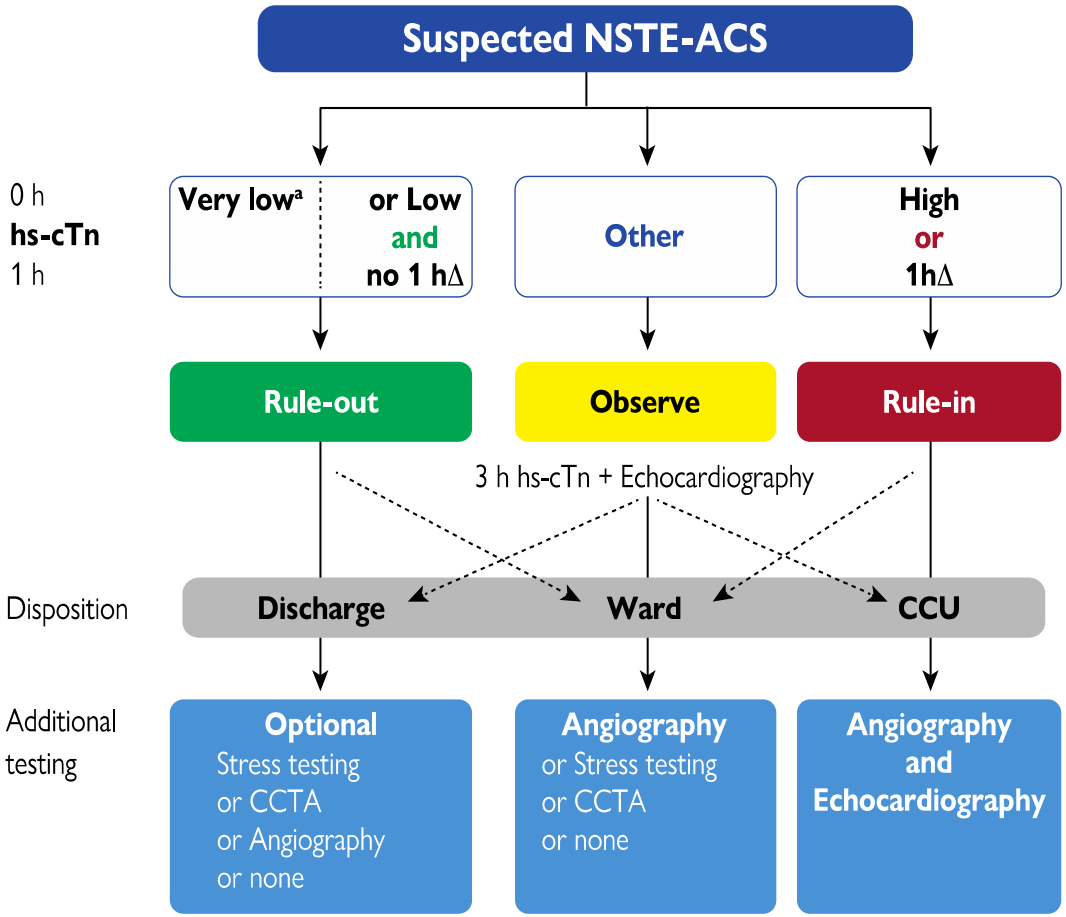

Figure 3 (1)

0 h/1 h rule-out and rule-in algorithm using high-sensitivity cardiac troponin assays in haemodynamically stable patients presenting with suspected non-ST-segment elevation acute coronary syndrome to the emergency department.

[a]Only applicable if CPO >3 h.

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Table 3 Assay specific cut-off levels in ng/l within the 0 h/1 h and 0 h/2 h algorithms (1)

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0 h/1 h algorithm	Very low	Low	No 1h Δ	High	1h Δ
hs-cTn T (Elecsys; Roche)	<5	<12	<3	≥52	≥5
hs-cTn I (Architect; Abbott)	<4	<5	<2	≥64	≥6
hs-cTn I (Centaur; Siemens)	<3	<6	<3	≥120	≥12
hs-cTn I (Access; Beckman Coulter)	<4	<5	<4	≥50	≥15
hs-cTn I (Clarity; Singulex)	<1	<2	<1	≥30	≥6
hs-cTn I (Vitros; Clinical Diagnostics)	<1	<2	<1	≥40	≥4
hs-cTn I (Pathfast; LSI Medience)	<3	<4	<3	≥90	≥20
hs-cTn I (TriageTrue; Quidel)	<4	<5	<3	≥60	≥8

These cut-offs apply irrespective of age and renal function. Optimized cut-offs for patients above 75 years of age and patients with renal dysfunction have been evaluated, but not consistently shown to provide better balance between safety and efficacy as compared to these universal cut-offs. The algorithms for additional assays are in development.
hs-cTn = high-sensitivity cardiac troponin; TBD = to be determined.

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Table 3 Assay specific cut-off levels in ng/l within the 0 h/1 h and 0 h/2 h algorithms (2)

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0 h/2 h algorithm	Very low	Low	No 2h Δ	High	2h Δ
hs-cTn T (Elecsys; Roche)	<5	<14	<4	≥52	≥10
hs-cTn I (Architect; Abbott)	<4	<6	<2	≥64	≥15
hs-cTn I (Centaur; Siemens)	<3	<8	<7	≥120	≥20
hs-cTn I (Access; Beckman Coulter)	<4	<5	<5	≥50	≥20
hs-cTn I (Clarity; Singulex)	<1	Tbd	Tbd	≥30	Tbd
hs-cTn I (Vitros; Clinical Diagnostics)	<1	Tbd	Tbd	≥40	Tbd
hs-cTn I (Pathfast; LSI Medience)	<3	Tbd	Tbd	≥90	Tbd
hs-cTn I (TriageTrue; Quidel)	<4	Tbd	Tbd	≥60	Tbd

These cut-offs apply irrespective of age and renal function. Optimized cut-offs for patients above 75 years of age and patients with renal dysfunction have been evaluated, but not consistently shown to provide better balance between safety and efficacy as compared to these universal cut-offs. The algorithms for additional assays are in development.
hs-cTn = high-sensitivity cardiac troponin; TBD = to be determined.

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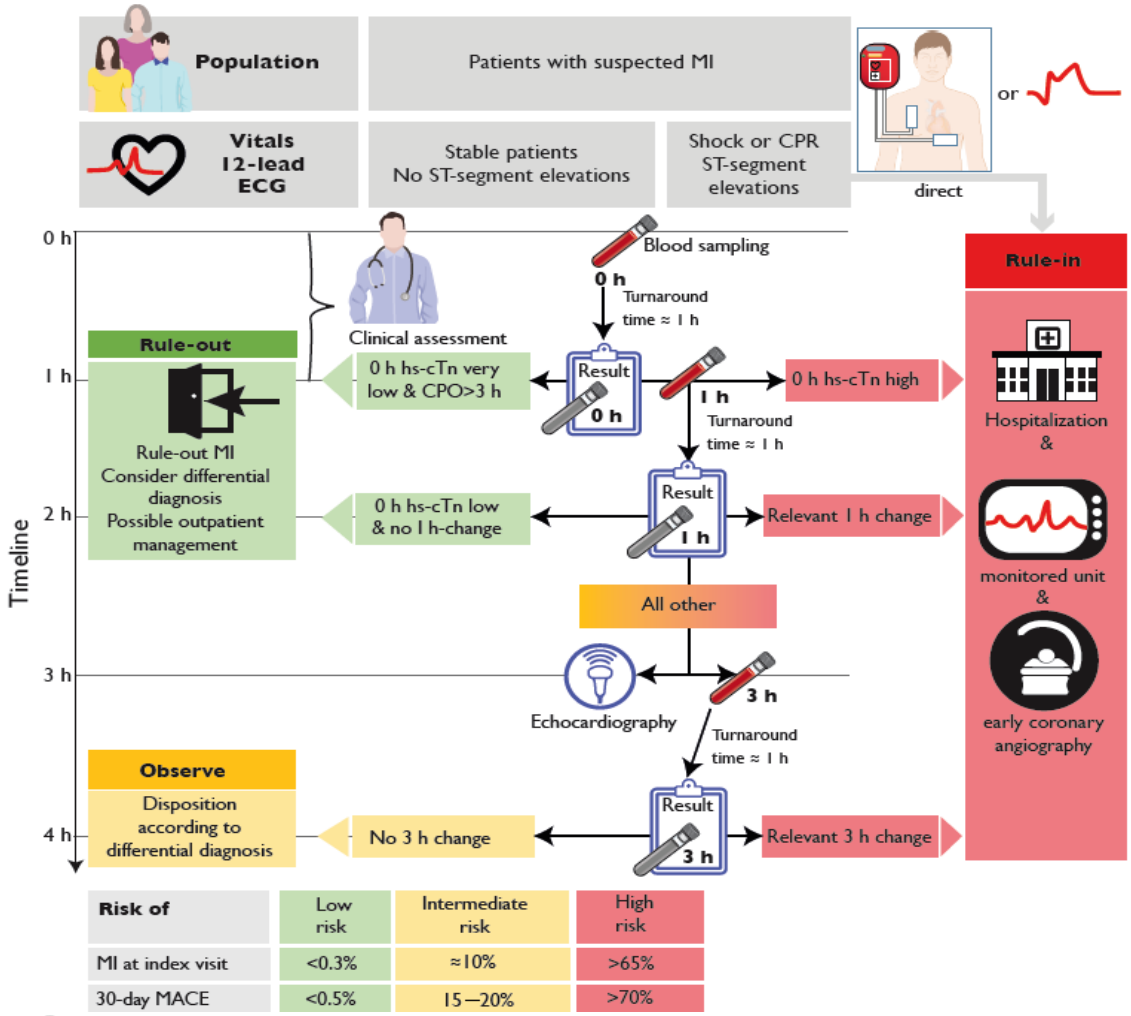

Figure 4 (1) Timing of the blood draws and clinical decisions when using the European Society of Cardiology 0h / 1h algorithm

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Stanja udružena sa porastom vrijednosti troponina (osim akutnog infarkta miokarda tip 1)

- tahiaritmije
- srčana insuficijencija
- hipertenzivna kriza
- kritična stanja (npr. šok, sepsa, opekotine)
- miokarditis, uključujući ekstenziju na miokard endokarditisa ili perikarditisa
- Tako-Tsubo kardiomiopatija
- strukturne srčane bolesti (npr. aortna stenoza)
- disekcija aorte
- embolija pluća, plućna hipertenzija
- bubrežna disfunkcija i udruženo srčano oboljenje
- koronarni spazam
- akutni neurološki dogadjaj (npr. moždani udar ili subarahnoidalna hemoragija)
- kontuzija srca ili kardiološke procedure (ACBG, PCI, ablacija, pejsing, kardioverzija ili endomiokardna biopsija)
- hipotireoza i hipertireoza
- infiltrativne bolesti (npr. amiloidoza, hemohromatoza, sarkoidoza, sklerodermija)
- intoksikacija miokarda ljekovima ili trovanje (npr. doksorubicin, 5-fluorouracil, herceptin, zmijski otrov)
- ekstremni fizički napori
- rabdomioliza

Authors/Task Force Members et al. Eur Heart J 2015;eurheartj.ehv320

TROMBOEMBOLIJA PLUĆA

- Predstavlja kliničko stanje kada trombni embolus spriječi dovod krvi arterijom pulmonalis u jedan dio pluća

- Akutno plućno srce
  - prati porast pritiska u plućnim arterijama
  - uz akutno opterećenje desne komore

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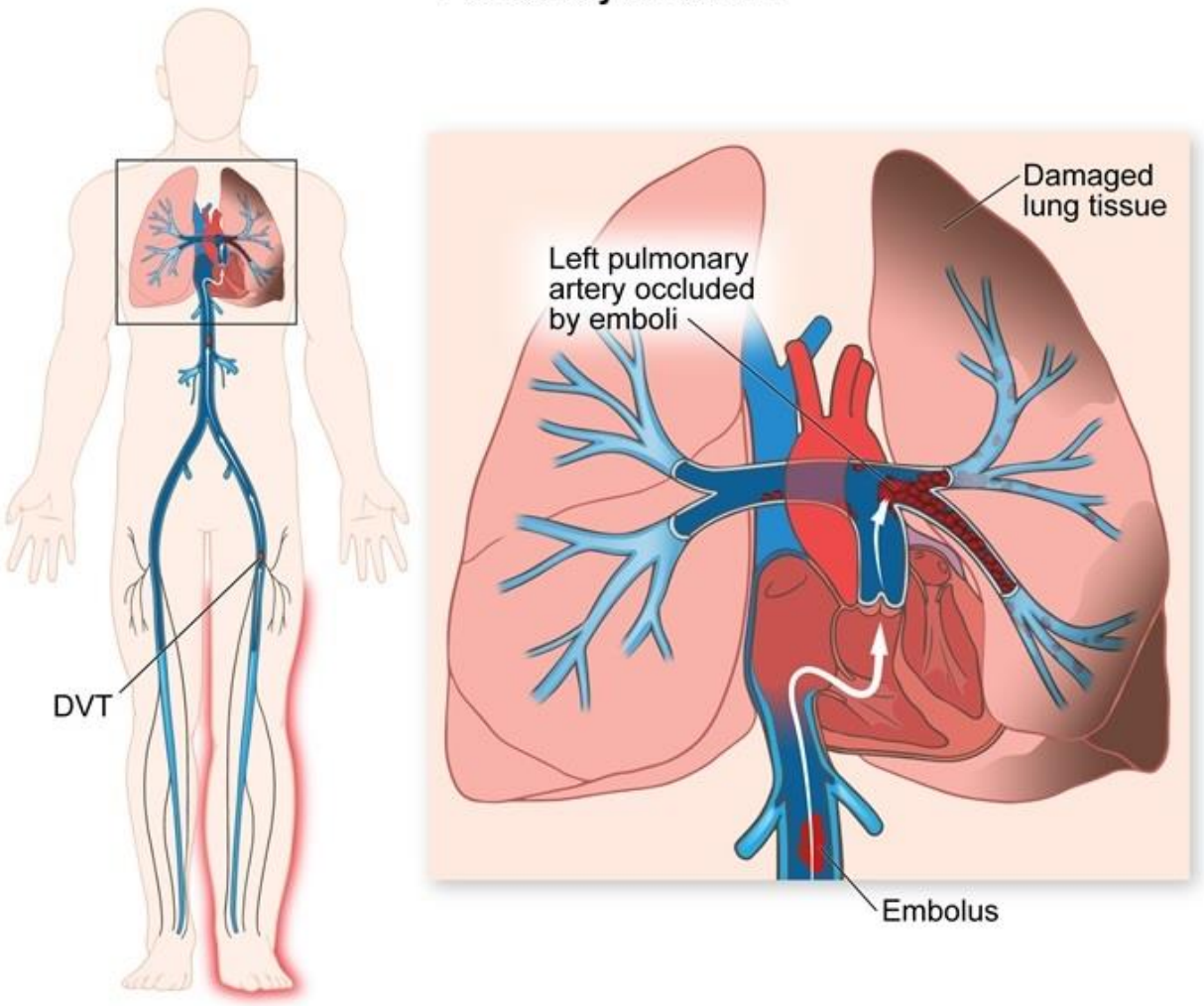
Pulmonary embolism



DVT = deep venous thrombosis

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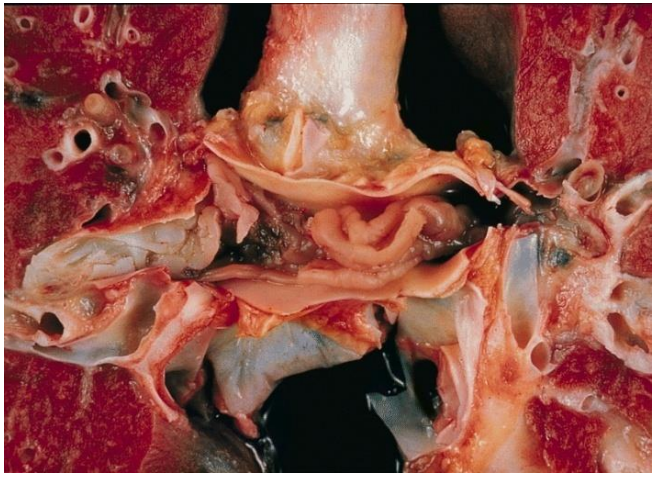
TROMBOEMBOLIJA PLUĆA
Epidemiologija

- **Incidenca plućne embolije je u velikoj mjeri potcijenjena**
- **Smrtnost kod neliječenih 30%**
- **Smrtnost kod liječenih 8%**



- **ETIOLOGIJA:**

95% - tromboze dubokih vena natkoljenice
5% - ugrušci iz desnog srca i ostalih vena

50-70% sa dokazanom PTE ima DVT

nedijagnostifikovana proksimalna DVT embolizira u 40%, a ako se liječi u 5%

Tromboza donjih ekstremiteta u 50% slučajeva je **asimptomatska** - rizik najveći 72 h od tromboze, rizik neznatan nakon 7-10 dana

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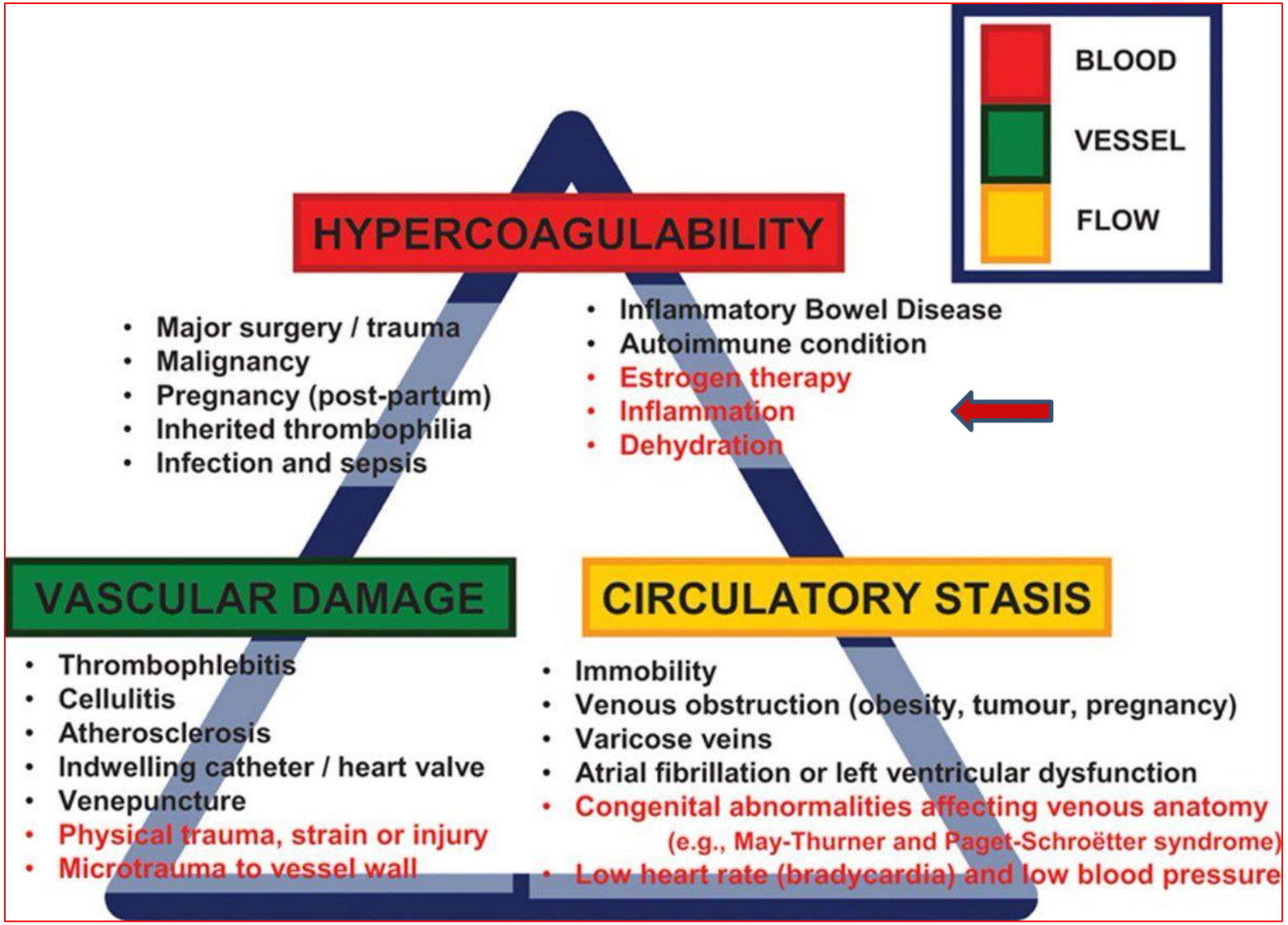

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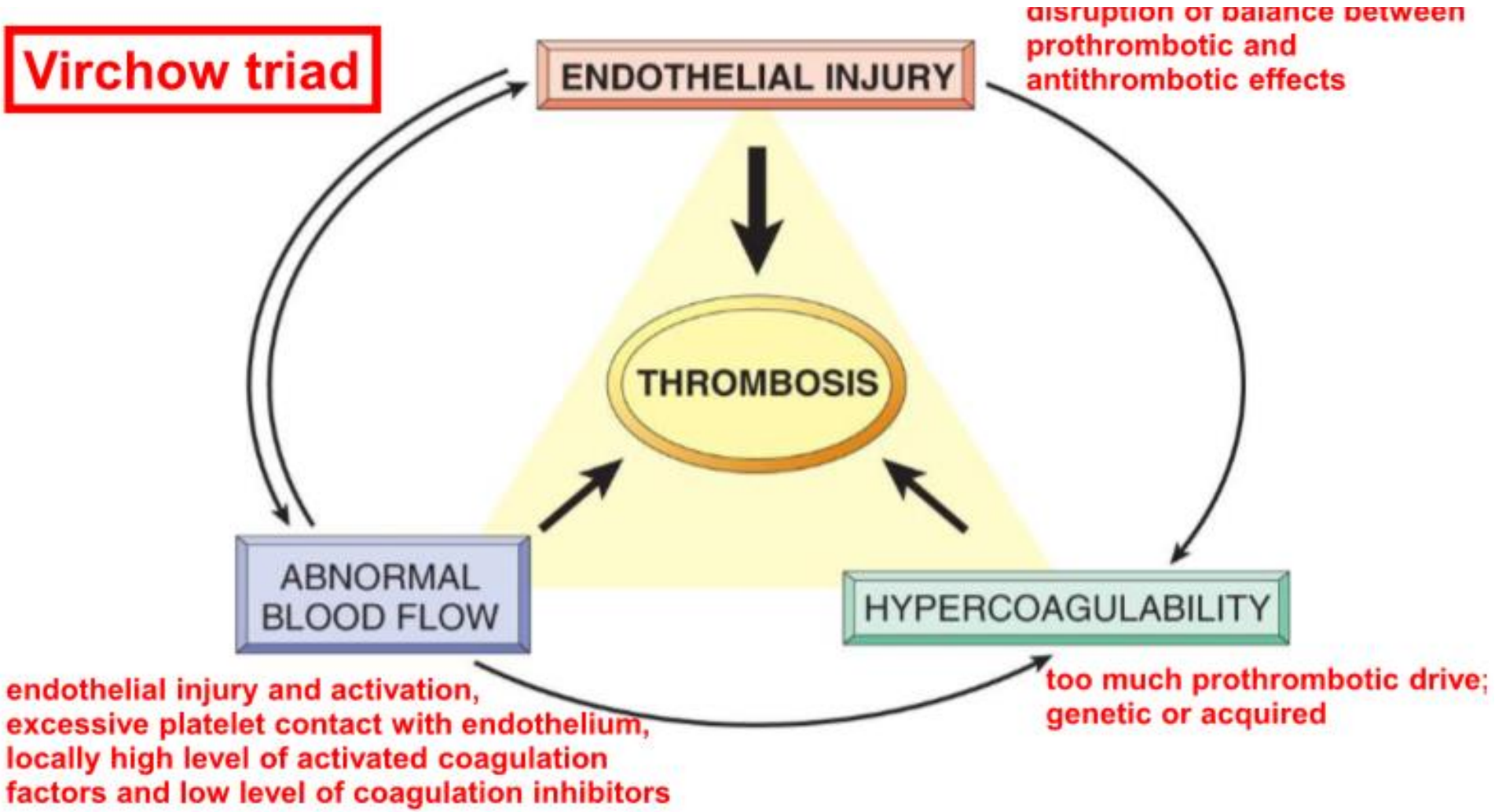

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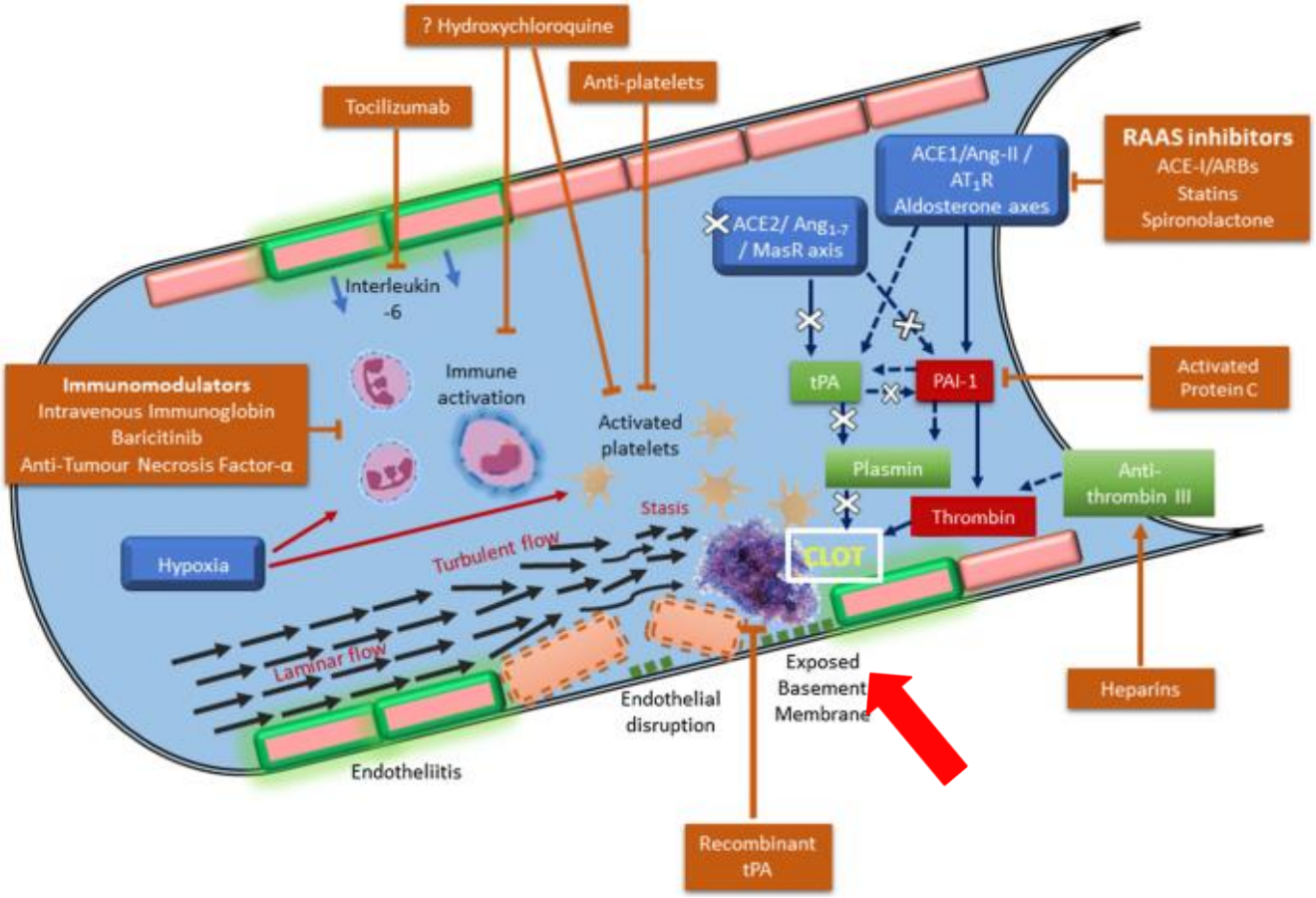
COVID-19



Virchow's triad in the thrombogenesis in COVID-19. Virchow's triad consists of **abnormal vessel wall (endotheliitis**, **endothelial dysfunction** with loss of glycocalyx, endothelial disruption), **abnormal flow** (due to hyper-viscosity, immune activation, high fibrinogen, impaired microcirculation due to hypoxia and turbulent flow due to microthrombi), and **hypercoagulable state** (inhibition of plasminogen system due to unopposed canonical renin-angiotensin pathway, platelet dysfunction, complement activation (not shown), and hyperimmune response)

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TROMBOEMBOLIJA PLUĆA

Patogeneza

- **Djelimična ili potpuna opstrukcija plućne arterijske cirkulacije embolusom**
- **Respiratorne posljedice:** perfuzijsko-ventilacioni poremećaj - stvara se **funkcionalni "mrtvi prostor"** što je praćeno **bronhoalveolarnom konstrikcijom** pogodjenog plućnog segmenta, u mrtvom prostoru se više **ne stvara surfaktant** i nastaje **atelektaza**, ⟶ **hipoksemija**
- **Hemodinamske posljedice:** zavise od masivnosti redukcije krvne mreže: **vazokonstrikcija** - plućna hipertenzija – **akutno plućno srce**, ⟶ **pad minutnog volumena** i **refleksna tahikardija**
- Ishod respiratornih i hemodinamskih posljedica PE zavisi i od prethodnog stanja KV i respiratornog sistema bolesnika

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Figure 1 The spiral of haemodynamic collapse in acute PE

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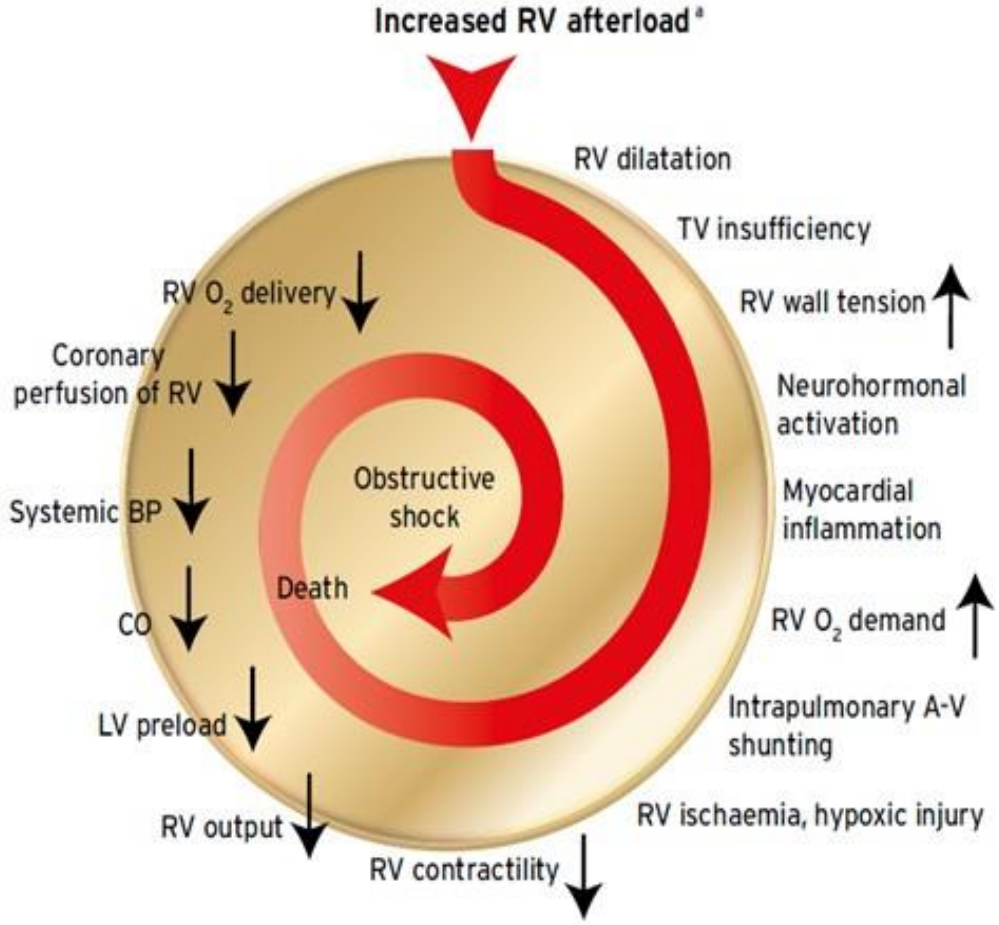

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Simptomi i znaci opisani u potvrđenoj PE

Simptomi	Prosječna prevalenca
Dispnoja	**80%**
Bol u grudima (pleuritični)	52%
Bol u grudima (substernalni)	12%
Kašalj	20%
Sinkopa	19%
Hemoptizije	11%
Znaci	**Prosječna prevalenca**
Tahipnoja (≥ 20/min)	**70%**
Tahikardija (≥ 100/min)	26%
Znaci DVT	15%
Cijanoza	11%
Povišena temperatura>38.5°C	7%

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TROMBOEMBOLIJA PLUĆA - EKG

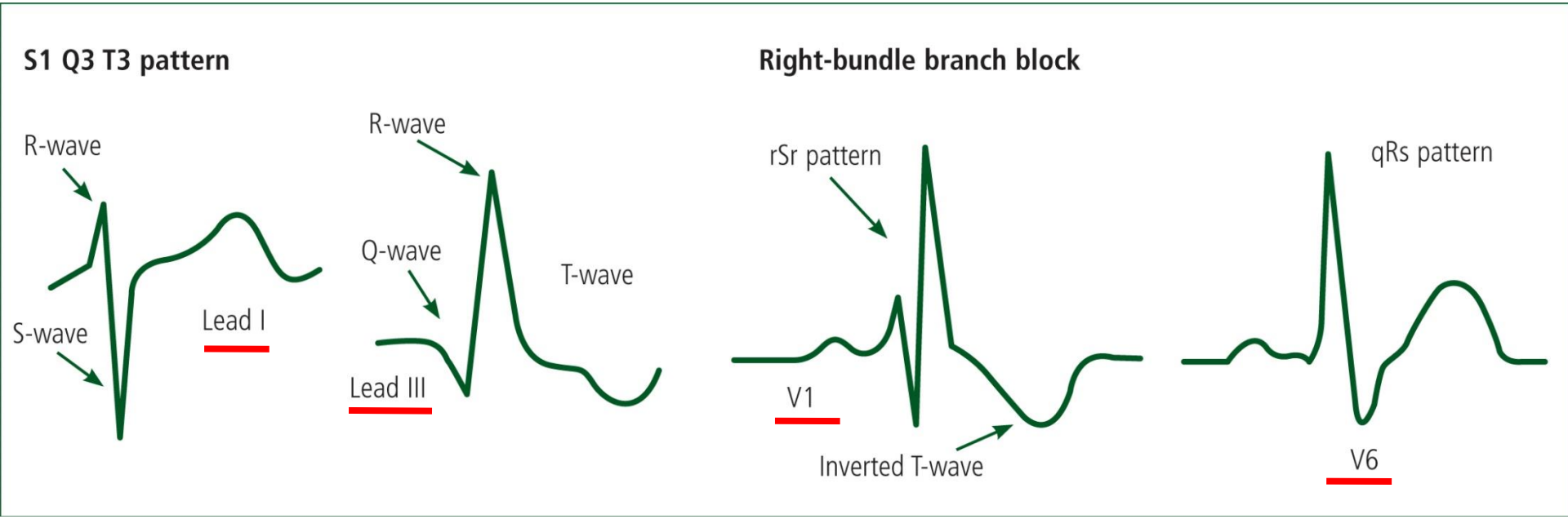

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Table 6 Imaging tests for diagnosis of PE (3)

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	Radiation issues
CTPA	• Radiation effective dose 3–10 mSv • Significant radiation exposure to young female breast tissue
Planar V/Q scan	• Lower radiation than CTPA, effective dose approximately 2 mSv
V/Q SPECT	• Lower radiation than CTPA, effective dose approximately 2 mSv
Pulmonary angiography	• Highest radiation, effective dose 10–20 mSv

CTPA = computed tomography pulmonary angiography; V/Q = ventilation-perfusion; SPECT = single photon emission computed tomography.

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Table 8 Original and simplified PESI (1)

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Parameter	Original version	Simplified version
Age	Age in years	1point (if age >80 years)
Male sex	+10 points	–
Cancer	+30 points	1point
Chronic heart failure	+10 points	1point
Chronic pulmonary disease	+10 points	
Pulse rate ≥110b.p.m.	+20 points	1point
Systolic BP <100mmHg	+30 points	1point

BP = blood pressure; PESI = Pulmonary Embolism Severity Index.

(European Heart Journal 2019 - doi/10.1093/eurheartj/ehz405)

Table 8 Original and simplified PESI (2)

Parameter	Original version	Simplified version
Respiratory rate >30 breaths per min	+20 points	–
Temperature <36 °C	+20 points	–
Altered mental status	+60 points	–
Arterial oxyhaemoglobin saturation <90%	+20 points	1point

PESI = Pulmonary Embolism Severity Index.

Table 8 Original and simplified PESI (3)

	Risk strata	
	Class I: ≤65 points very low 30-day mortality risk (0–1.6%) **Class II: 66–85 points** low mortality risk (1.7–3.5%)	**0 points** = 30-day mortality risk 1.0% (95% CI 0.0–2.1%)
	Class III: 86–105 points moderate mortality risk (3.2–7.1%) **Class IV: 106–125 points** high mortality risk (4.0–11.4%) **Class V: >125 points** very high mortality risk (10.0–24.5%)	**≥1 point(s)** = 30-day mortality risk 10.9% (95% CI 8.5–13.2%)

PESI = Pulmonary Embolism Severity Index.

Table 9 Classification of PE based on early mortality risk

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Early mortality risk		Indicators of risk			
		Haemo-dynamic instability	Clinical parameters of PE severity/ comorbidity: PESI III–V or sPESI ≥1	RV dysfunction on TTE or CTPA	Elevated cardiac troponin levels
High		+	(+)	+	(+)
Interme-diate	Intermediate–high	-	+	+	+
	Intermediate–low	-	+	One (or none) positive	
Low		-	-	-	Assessment optional; if assessed, negative

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CTPA = computed tomography pulmonary angiography; PESI = Pulmonary Embolism Severity Index; TTE = transthoracic echocardiography.

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Preporuke za inicijalni tretman PE visokog rizika	klasa	nivo
Započeti antikoagulantnu terapiju UFH bez odlaganja	I	A
Sistemsku hipotenziju treba korigovati radi progresije slabosti RV i smrti usled PE	I	C
Vazopresivni ljekovi se preporučuju za hipotenzivne pacijente sa PE	I	C
Dobutamin i dopamin se mogu koristiti u pacijenata sa PE sa malim udarnim volumenom i normalnim arterijskim pritiskom	IIa	B
Agresivno opterećenje volumenom se ne preporučuje	III	B
O_2 treba primjeniti u pacijenata sa hipoksemijom	I	C
Trombolitičku terapiju treba koristiti u pacijenata sa PE koji se prezentuju kardiogenim šokom i/ili perzistentnom atrterijskom hipotenzijom	I	A
Hirurška pulmonalna embolektomija je alternativna terapijska opcija u pacijenata sa PE u kojih je tromboliza kontraindikovana ili nije uspjela	I	C
Kateter embolektomija ili fragmentacija tromba kao alternativa hirurškom tretmanu	IIb	C

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Preporuke za inicijalni tretman PE bez visokog rizika	klasa	nivo
Započeti antikoagulantnu terapiju bez odlaganja dok se sprovodi dijagnostički postupak	I	C
Upotreba LMWH ili fondaparina je preporučena za inicijalni tretman većine pacijenata	I	A
U pacijenata sa visokim rizikom od krvarenja i onih sa ozbiljnom bubrežnom disfunkcijom UFH sa aPTT ciljnim opsegom 1,5-2,5 x normalnog nalaza je preporučeni inicijalni tretman	I	C
Inicijalni tretman UFH, LMWH ili fondaparinom treba nastaviti najkraće 5 dana i Može se zamjeniti NOAk-om ili antagonistima K vitamina	I I	A C
Rutinska primjena trombolize se ne preporučuje, ali se može razmotriti u selektovanih pacijenata sa intermedijernim rizikom	IIb	B
Trombolitičku terapiju ne treba primjenjivati u pacijenata niskog rizika	III	B

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Preporuke za dugotrajni tretman PE	klasa	nivo
Za pacijente sa PE sa reverzibilnim faktorom rizika, terapija oralnim antikoagulansima (NOAC prije nego VKA ovisno o KI-ne u trudnoći i laktaciji, ozbiljna HRI, AFL Sy) se preporučuje 3 mjeseca	I	A
Za pacijente sa neprovociranom PE, terapija OAK se preporučuje 3 mjeseca	I	A
Pacijenti sa prvom epizodom neprovocirane PE i malim rizikom od krvarenja, a u kojih se može postići stabilna antikoagulacija, treba razmotriti dugotrajnu oralnu antikoagulantu Th	IIb	B
Za pacijente sa drugom epizodom neprovocirane PE, preporučuje se dugotrajni tretman	I	A
U pacijenata koji su na dugotrajnoj antikoagulantnoj terapiji, periodično je potrebno procjeniti odnos rizik-korist ove th.	I	B
Za pacijente sa PE i karcinomom, LMWH treba razmotriti prvih 3-6 mjeseci, nakon toga OAK ili LMWH treba nastaviti neograničeno ili dok se karcinom ne smatra izliječenim	IIa I	B C
U pacijeata sa PE, doza VKA treba optimizirati da PV-INR bude oko 2,5 (opseg 2-3) u zavisnosti od trajanja tretmana	I	A

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