Heart's Infective Disease's

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Objectives

- Pericarditis
- Myocarditis
- Infective endocarditis
- Take home messages

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ESC GUIDELINES

2015 ESC Guidelines for the diagnosis and management of pericardial diseases

The Task Force for the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology (ESC)

Endorsed by: The European Association for Cardio-Thoracic Surgery (EACTS)

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Pericarditis

- Definition:Inflammation of the pericardial sac.
- Viral
  - Coxsackie virus,echovirus,HIV,herpes (EBV,CMV),adenovirus
- Bacterial
  - **myc.tbc** ,Staph.strep.pneumonia,B hem.strep.,
- Fungal
  - Histop.capsulatum

A. Infectious causes:
Viral (common): Enteroviruses (coxsackieviruses, echoviruses), herpesviruses (EBV, CMV, HHV-6), adenoviruses, parvovirus B19 (possible overlap with aetiologic viral agents of myocarditis).
Bacterial: *Mycobacterium tuberculosis* (common, other bacterial rare). *Coxiella burnetii*, *Borrelia burgdorferi*, rarely: *Pneumococcus* spp, *Meningococcus* spp, *Gonococcus* spp, *Streptococcus* spp, *Staphylococcus* spp, *Haemophilus* spp, *Chlamydia* spp, *Mycoplasma* spp, *Legionella* spp, *Leptospira* spp, *Listeria* spp, *Providencia stuartii*.
Fungal (very rare): *Histoplasma* spp (more likely in immunocompetent patients), *Aspergillus* spp, *Blastomyces* spp, *Candida* spp (more likely in immunocompromised host).
Parasitic (very rare): *Echinococcus* spp, *Toxoplasma* spp

- Malignancy
  - Leukemia,lymphema,meta static,breast and lung carsinoma
- Drugs
  - Procainamid,hydralazin
- Systemic
  - SLE,RA,scleroderma,PAN
- Radiation
- Postmyocardial infarction
- Uremia
- Myxedema

Epidemiology

- % 0.1 to 0.2 hospitalized patients and %5 of patients admitted to the ED nonischemic chest pain
- 27.7 cases 100,000 persons/year.

eb Table 5 Final aetiologic diagnosis in major published unselected series of acute pericarditis

	Permanyer-Miralda *et al.*[129]	Zayas *et al.*[130]	Imazio *et al.*[9]	Reuter *et al.*[77]
Patients *(n)*	231	100	453	233
Years	1977–83	1991–93	1996–2004	1995–2001
Geographic area	Western Europe	Western Europe	Western Europe	Africa
Idiopathic	199 (86.0%)	78 (78.0%)	377 (83.2%)	32 (13.7%)
Specific aetiology	32 (14.0%)	22 (22.0%)	76 (16.8%)	201 (86.3%)
Neoplastic	13 (5.6%)	7 (7.0%)	23 (5.1%)	22 (9.4%)
Tuberculosis	9 (3.9%)	4 (4.0%)	17 (3.8%)	161 (69.5%)
Autoimmune or post-cardiac injury	4 (1.7%)	3 (3.0%)	33 (7.3%)	12 (5.2%)
Purulent	2 (0.9%)	1 (1.0%)	3 (0.7%)	5 (2.1%)

Kvto V,Sipila J,Rautava P.Clinical profie and influences on outcomes in patients hospitalized for acute pericarditis.Circulation 2014;130:1601.

Classification and diagnostic criteria

- Chest pain
- Pericardial friction rub
- New ST elevation,PR depression
- Pericardial effusion(new or worsening)
- Elevation of inflamation markers

Pericarditis	Definition and diagnostic criteria
Acute	Inflammatory pericardial syndrome to be diagnosed with at least 2 of the 4 following criteria: (1) pericarditic chest pain (2) pericardial rubs (3) new widespread ST-elevation or PR depression on ECG (4) pericardial effusion (new or worsening) Additional supporting findings: - Elevation of markers of inflammation (i.e. C-reactive protein, erythrocyte sedimentation rate, and white blood cell count); - Evidence of pericardial inflammation by an imaging technique (CT, CMR).
Incessant	Pericarditis lasting for >4–6 weeks but <3 months without remission.
Recurrent	Recurrence of pericarditis after a documented first episode of acute pericarditis and a symptom-free interval of 4–6 weeks or longer[3].
Chronic	Pericarditis lasting for >3 months.

Viral pericarditis

- Cardiotropic virus
- Cytolitic or cytotoxic effect(enteroviruses)
- T and B cell immune mediated mechanism(herpes viruses)

Recommendations for the diagnosis and therapy of viral pericarditis

Recommendations	Class[a]	Level[b]	Ref.[c]
For the definite[d] diagnosis of viral pericarditis, a comprehensive workup of histological, cytological, immunohistological and molecular investigations in pericardial fluid and peri-/epicardial biopsies should be considered	IIa	C	
Routine viral serology is not recommended, with the possible exception of HIV and HCV	III	C	
Corticosteroid therapy is not recommended in viral pericarditis	III	C	

Bacterial and tuberculosis pericarditis

- Uncommon
- TB pericarditis,devoloping countries
- %4 pericardial disease
- Pericardial effussion,%90,clin.important
- Endemic area
- CHF clinic
- Mortality %17-40

Recommendations for the diagnosis and treatment of tuberculous pericarditis and effusion

Recommendations	Class[a]	Level[b]	Ref.[c]
Diagnostic pericardiocentesis should be considered in all patients with suspected tuberculous pericarditis	IIa	C	
Intrapericardial urokinase may be considered to reduce the risk of constriction in tuberculous effusive pericarditis	IIb	C	
In patients living in non-endemic areas, empiric antituberculosis treatment is not recommended when systematic investigation fails to yield a diagnosis of tuberculous pericarditis	III	C	
In patients living in endemic areas, empiric antituberculosis chemotherapy is recommended for exudative pericardial effusion, after excluding other causes	I	C	
Adjunctive steroids may be considered in HIV-negative cases of TB pericarditis and avoided in HIV-associated TB pericarditis	IIb	C	

Clinical features of pericarditis

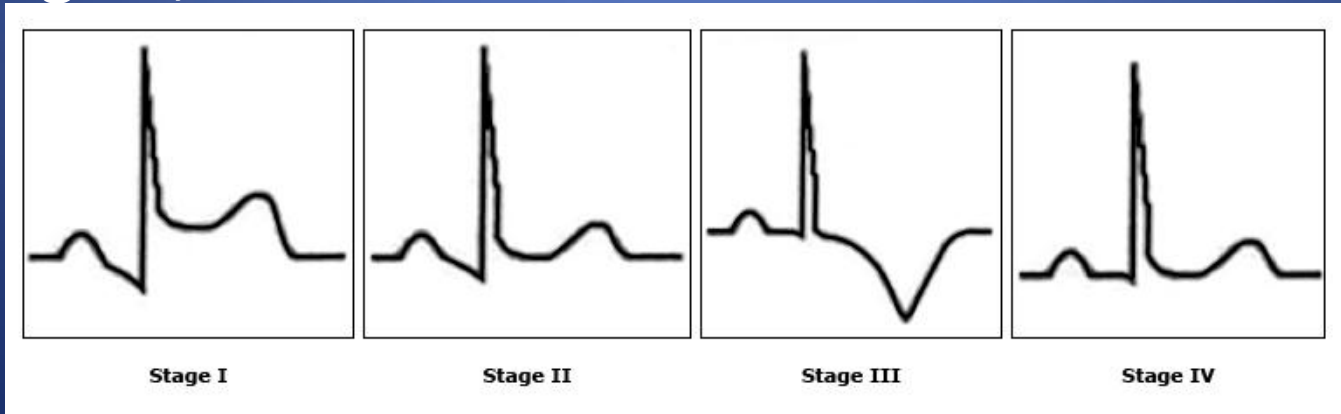
- Nonspecific signs and symptoms.
- **Chest pain** – Typically sharp and pleuritic, improved by sitting up and leaning forward
  - Sudden,gradual onset,radiates to the back,neck, left shoulder,arm,aggravated by inspiraton or movement
  - Referral of pain to the left trapezil ridge
  - Pain is most severe when the patient is supine,relived sits up and lean forward.
  - Fever,dyspnea,dysphagia

Pericardial friction rub

- The presence of a pericardial friction rub on physical examination is highly specific and most common findings .
- Diffucult to hear in noisy ED.
- Friction between the two inflamed layers of the pericardium.
- Lower left sternal border,apex,when the patient sitting and leaning forward,best heard.

ECG on pericarditis

- Four stage
- Stage 1, seen in the first hours to days, diffuse ST elevation (typically concave up) with reciprocal ST depression in leads aVR and V1 .
- Stage 2, the first week,normalization of the ST and PR segments.
- Stage 3, development of diffuse T-wave inversions, ıts duration is not well-documented and likely highly variable.
- Stage 4, normalization of the ECG.

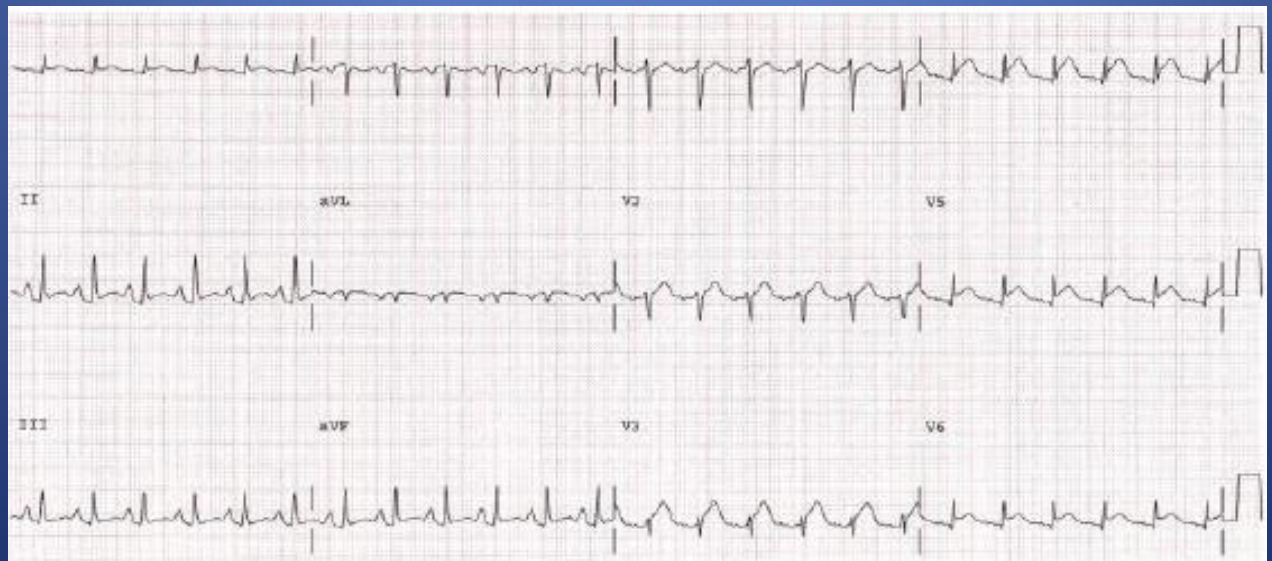


ECG on pericarditis

- Large pericardial volume,low-voltage QRS complex and electrical alternans.
- Serial ECG tracking
- Pericarditis alone does not cause significiant rhythm distubances
- Differentation early repolarization is common problem,%2 healthy young adults.

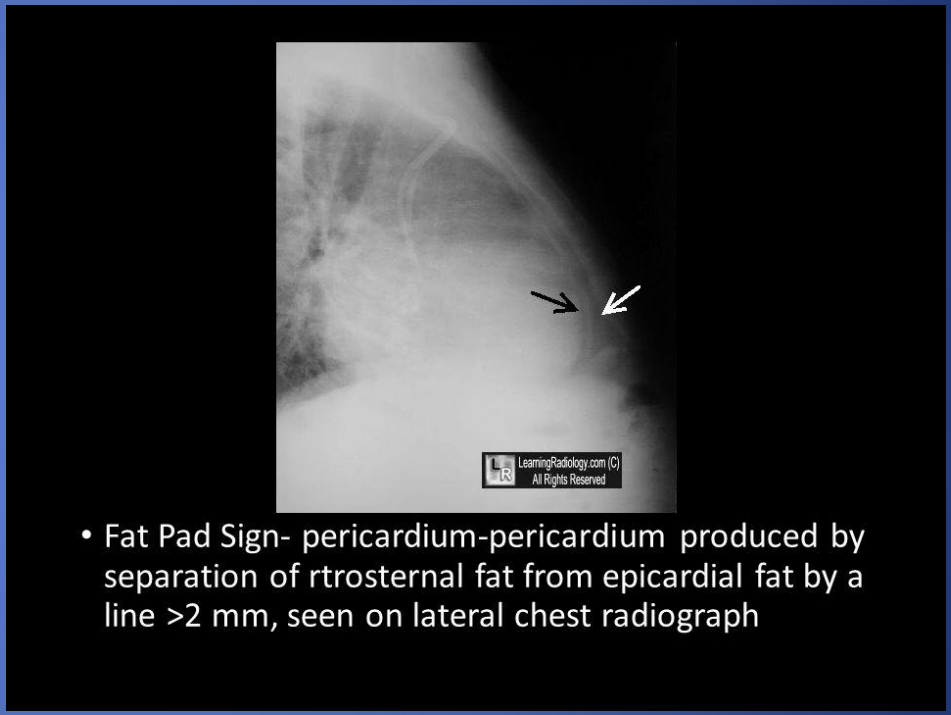
Stage	PR Segment	ST Segment	T Wave
1 (acute)	Depression, especially in II, aVF, and V_4–V_6	Elevation, especially in I, V_5, and V_6; ST amplitude: T-wave amplitude >0.25	—
2	Isoelectric or depressed	Returns to isoelectric line	Amplitude decreases, inversion rare
3	Isoelectric or depressed	Isoelectric	T-wave inversion, especially in I, V_5, and V_6
4	Isoelectric	Isoelectric	Normal

- ST segment/T-wave amplitude ratioin leads V5,V6 or I,differentiate early rep.-pericarditis.
- End of PR segment as a baseline,or 0,milivolt,height of ST segment an T wave same leads,ratio is calculated.
- Ratio of ST segment/T wave is 0,25 and more,acute pericarditis likely.
- Less than 0,25 acute pericarditis unlikely.



Radiographic assesment

- Chest x-ray limited value.
- Cardiac silhoutte
- Cardiac tamponade
- Cardiothoracic ratio
- Comparison past X-ray
- Epicardial fat pad sign,rare,%15,lateral chest x-ray



• Fat Pad Sign- pericardium-pericardium produced by separation of rtrosternal fat from epicardial fat by a line >2 mm, seen on lateral chest radiograph

Echocardiography

- **5.examination method in ED**
- Detection
- Confirmation
- Serial follow up
- Non-invasive
- Bedside

Diagnosis

- **Initial history and physical examination**
- **Initial testing in all suspected cases**:
  - An ECG.
  - Chest radiography.
  - Complete blood count, troponin level, erythrocyte sedimentation rate, and serum C-reactive protein level.
  - Echocardiography, with urgent echocardiography if cardiac tamponade is suspected.
  -
- The 2003 American College of Cardiology/American Heart Association/American Society of Echocardiography (ACC/AHA/ASE)guidelines for the clinical application of echocardiography stated that evidence and/or general agreement supported the use of echocardiography for the evaluation of all patients with suspected pericardial disease.
- 2013 expert consensus statement from the ASE recommends echocardiography for all patients with acute pericarditis .

Recommendations for diagnosis of acute pericarditis

Recommendations	Class[a]	Level[b]	Ref.[c]
ECG is recommended in all patients with suspected acute pericarditis	I	C	
Transthoracic echocardiography is recommended in all patients with suspected acute pericarditis	I	C	
Chest X-ray is recommended in all patients with suspected acute pericarditis	I	C	
Assessment of markers of inflammation (i.e. CRP) and myocardial injury (i.e. CK, troponin) is recommended in patients with suspected acute pericarditis	I	C	

Level	Investigation
1st level (all cases)	Markers of inflammation (i.e. ESR, CRP, white blood cell count). Renal function and liver tests, thyroid function. Markers of myocardial lesion (i.e. troponins, CK). ECG Echocardiography Chest X-ray
2nd level (if 1st level not sufficient for diagnostic purposes)	CT and/or CMR Analysis of pericardial fluid from pericardiocentesis, or surgical drainage, for (I) cardiac tamponade or (II) suspected bacterial, neoplastic pericarditis, or (III) symptomatic moderate to large effusions not responding to conventional anti-inflammatory therapy. Additional testing should be directed to specific aetiologies according to clinical presentation (presence of high risk clinical criteria).

Treatment and disposition

- Depends of cause.
- NSAİD,1-3 week
- Ibuprufen 300-800 mg/6-8 hours
- Colchicine prevent recurrent episodes.
- Antiviral therapy ?
- Hospitalization rare
  - Associated myocarditis
  - İmmunsupression
  - CHF
  - Large effusion

Pericarditis-occult cancer?

Pericarditis as a Marker of Occult Cancer and a Prognostic Factor for Cancer Mortality

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Abstract

Background: Pericarditis may be a serious complication of malignancy. Its significance as a first symptom of occult cancer and as a prognostic factor for cancer survival is unknown.

Methods: Using Danish medical databases, we conducted a nationwide cohort study of all patients with a first-time diagnosis of pericarditis during 1994 to 2013. We excluded patients with previous cancer and followed up the remaining patients for subsequent cancer diagnosis until November 30, 2013. We calculated risks and standardized incidence ratios of cancer for patients with pericarditis compared with the general population. We assessed whether pericarditis predicts cancer survival by the Kaplan-Meier method and Cox regression using a matched comparison cohort of cancer patients without pericarditis.

Results: Among 13 759 patients with acute pericarditis, 1550 subsequently were diagnosed with cancer during follow-up. The overall cancer standardized incidence ratio was 1.5 (95% confidence interval [CI], 1.4–1.5), driven predominantly by increased rates of lung, kidney, and bladder cancer, lymphoma, leukemia, and unspecified metastatic cancer. The <3-month cancer risk among patients with pericarditis was 2.7%, and the standardized incidence ratio was 12.4 (95% CI, 11.2–13.7). The 3- to <12-month standardized incidence ratio of cancer was 1.5 (95% CI, 1.2–1.7), subsequently decreasing to 1.1 (95% CI, 1.0–1.2). Three-month survival after the cancer diagnosis was 80% and 86% among those with and without pericarditis, respectively, and the hazard ratio was 1.5 (95% CI, 1.3–1.8). One-year survival was 65% and 70%, respectively, corresponding to a 3- to <12-month hazard ratio of 1.3 (95% CI, 1.1–1.5).

Conclusions: Pericarditis may be a marker of occult cancer and augurs increased mortality after a cancer diagnosis.

Myocarditis

- Definition: Myocardial inflamation.
- Occasionally with pericarditis,myopericarditis
- Acute period,CHF;cardiogenic shock and death.
- Late period,dilated cardiomyopathy or other cardiomyopathies.
- Incidence is usually estimated 1-10 cases/100,000
- Patients are usually fairly young.
- The median age of 42.

Infective causes

- **Viral** – **Enterovirus, coxsackie B, adenovirus**, influenza, cytomegalovirus, poliomyelitis, Epstein-Barr virus, HIV-1, viral hepatitis, mumps, rubeola, varicella, variola/vaccinia, arbovirus, respiratory syncytial virus, herpes simplex virus, yellow fever virus, rabies, parvovirus
- **Rickettsial** - Scrub typhus, Rocky Mountain spotted fever, Q fever
- **Bacterial** - Diphtheria, tuberculosis, streptococci, meningococci, brucellosis, clostridia, staphylococci, melioidosis, *Mycoplasma pneumoniae*, psittacosis
- **Spirochetal** - Syphilis, leptospirosis/Weil disease, relapsing fever/Borrelia, Lyme disease
- **Fungal** - Candidiasis, aspergillosis, cryptococcosis, histoplasmosis, actinomycosis, blastomycosis, coccidioidomycosis, mucormycosis
- **Protozoal** - Chagas disease, toxoplasmosis, trypanosomiasis, malaria, leishmaniasis, balantidiasis, sarcosporidiosis
- **Helminthic** - Trichinosis, echinococcosis, schistosomiasis, heterophyiasis, cysticercosis, visceral larva migrans, filariasis

Epidemiology

- In developed countries, viral infection is the most cause of myocarditis.
- In the 1980s and 1990s, **enteroviruses (Coxsackie B and others**) were frequently associated with myocarditis and dilated cardiomyopathy.
- Nowadays, **adenovirus, parvovirus B19, hepatitis C, and herpes virus 6,** have emerged as significant pathogens .
- In many developing countries, **rheumatic carditis, Chagas disease**, and HIV are important causes of myocarditis.

Clinical features of myocarditis

- Flu like syndrome of fevers, arthralgias, and malaise or pharyngitis, tonsillitis, or upper respiratory tract infection
- Excessive fatigue
- Exercise intolerance
- Chest pain
- Cardiogenic shock
- Sudden cardiac death
- Respiratory distress/tachypne

Clinical findings

- **Chest pain**
- **Sudden cardiac death**

  Myocarditis may present with unexpected sudden death,VT/VF.

  – **Under age 40,SCD %22(absence of heart disease),30 %11**
  – **Athletes,SCD,%6 myocarditis in autopsy**
- **Arrhythmias**
  – Sinus tachycardia is more frequent ,
  – Ventricular extrasystoles are common.
  – Bradyarrhythmia

ECG on Myocarditis

- ECG,normal or nonspecific abnormalities.
- Nonspecific ST-T changes, single atrial or ventricular ectopic beats, complex ventricular arrhythmias (couplets or nonsustained ventricular tachycardia), or, rarely, atrial tachycardia or atrial fibrillation.
- Sinüs tachicardia
- QRS/QT prolongation
- Diffüse T wave inversion
- Ventriculer aritmi
- AV conduction defects

Cardiac biomarkers

- Cardiac biomarker elevations reflecting myocardial necrosis are seen in **some but not all patients** with myocarditis.
- Serum cardiac troponin levels are obtained to aid in diagnosis of myocarditis.
- Persistent elevations in cardiac enzymes are indicative of ongoing necrosis.

Evaluation

- Chest radiograph
  - The heart size on chest radiograph varies from normal to enlarged
  - Pulmonary vascular congestion (+,-)and pleural effusions
- BNP or NT-proBNP
- Echocardiography
  - Left ventricular dilation,
  - Changes in left ventricular geometry (eg, development of a more spheroid shape)
  - Wall motion abnormalities
  - Coexistent pericardial involvement, silent intracardiac thrombi, and functional mitral or tricuspid regurgitation.

Detailed diagnostic methods

- Cardiovascular magnetic resonance(CMR)
- Radionuclide ventriculography
  - Diagnosis and echocardiography unclear
- Cardiac catheterization

Emergency Department Care

- Standard supportive treatment
- Dysrhythmia with cardiac monitoring
- Sympathomimetic drugs should be avoided, they increase the extent of myocardial necrosis and mortality.
- Beta blockers should be carefull in the acutely decompensating phase of illness.
- Very few patients require ICD placement.

Infective endocarditis

- Definition:Infection of the endocardial surface of the heart , include heart valve(s), mural endocardium, septal area.
- Severe valvular insufficiency, lead to congestive heart failure and myocardial abscesses.
- If untreated, IE is almost inevitably fatal(%15-30 in hospital mortality)
- Native valve IE effects ,mostly left side of heart.(mortality %16-27)
- Incidences ranging from 3 to 10 cases/100 000 people/year.

Epidemiology

- %50 and more cases 60 year and older(developed countries)
- Newer predisposing factors nowadays
- – valve prostheses
  - degenerative valve sclerosis,
  - intravenous drug abuse
  - intracardiac device
  - associated with the increased use of invasive procedures at risk for bacteremia.
- Hemodialysis
- **Infections**
- Cardiac structural abnormality
- Baseline predispotion factors(infection,dental hygiene,HIV etc)
- Mitral valve most affected(Ao,tricuspid,pulmonary valve)

Epidemiology

- IV drug user's %30 staph.aureus
- Mostly coagulaz (+) m.o
- Strept. slow progression
- Blood culture %5 negative.(before ab therapy)
- HACEK group: Haemophilus,Actinobasillus,Cardibacterium,Eikenalla,King ella)
- Prothesis valve endocarditis,skin infection,strep.epidermitis.

Native Valve IE (% of cases)			Intracardiac Device IE (% cases)		
	Nonaddict	IV Drug Addict		Prosthetic Valve IE	Other Devices*
Staphylococcus aureus	28	68	*S. aureus*	23	35
Coagulase-negative *Staphylococcus*	9	3	Coagulase-negative *Staphylococcus*	17	26
Viridans group streptococci	21	10	*Viridans* group streptococci	12	8
Other strepto-cocci	14	3	*Streptococcus bovis*	10	7
Enterococcus species	11	4	*Enterococcus* species	12	6
HACEK	2	0	HACEK	2	1
Fungus	1	1	Fungus	4	1
Polymicrobial	1	3	Polymicrobial	1	0
Others	4	5	Others	7	6
Culture negative	9	3	Culture negative	12	10

Pathophysiology

- Turbulence blood flow
- Endothelial damage
- Drug user's:recurrens of particules,vasospasm
- Non-bacterial trombotic endocarditis(malignancy,SLE-libman-sack End.,hipercoagulability,intracardiac catheters,prothesis valves..)
- Collection of infective agents
- Transient bacteraemia(skin,oropharengeal,GIS,GUS, peridental disease)
- İnvasive m.o,Staph.aureus (mostly agent),direct invasion
- Vegetation and continuously bacteraemia.

Hospital based IE

- Health care-associated IE represents up to 30% cases of IE, justifying aseptic measures during venous catheters manipulation and during any invasive procedures.

- Essential Messages from the 2015 ESC Guidelinesfor the Management of Infective Endocarditis, European Heart Journal 2015; 36: 3075–3123 - doi/10.1093/eurheartj/ehv319

Infection of drug user's IE

- Risk %2-5/year,average age 30
- Mostly tricuspid valve affected
- Right side IE
- Recurrence high(%40)
- Comorbid diseases(HIV,fungal infections)

Prothesis valve IE

- %1-4/year risk after operation,%1 risk every year
- Mechanical and bioprothesis valve:no differance
- Early prothesis valve IE(first 60 day,mortality high,%30-80)
- Late prothesis valve IE(late 60 days,mortality %20-40)

Clinical features of IE

- Fever
- Cardiac findings
- Neurologic manifestations
- Arterial embolization
- Skin findings

Symptoms	%	Signs	%
Fever	80	Fever	90
Chills	40	Heart murmur	85
Weakness	40	New murmur	3–5
Dyspnea	40	Changing murmur	5–10
Anorexia	25	Skin manifestations	18–50
Cough	25	Osler nodes	10–23
Malaise	25	Splinter hemorrhages	15
Skin lesions	20	Petechiae	20–40
Nausea/vomiting	20	Janeway lesions	<10
Headache	20	Splenomegaly	20–57
Stroke	20	Embolic phenomena	>50
Chest pain	15	Septic complications	20
Abdominal pain	15	Mycotic aneurysm	20
Mental status change	10–15	Renal failure	10
Back pain	10	Retinal lesions	2–10

Clinical findings

fever

- First 2 week
- %90,drug user %98
- More than 38(100.4 F)
- Nonspesific symtoms
  - Fever
  - Chill
  - Nausea
  - Vomitting
  - Fatigue
  - Malaise

Cardiak manifestations

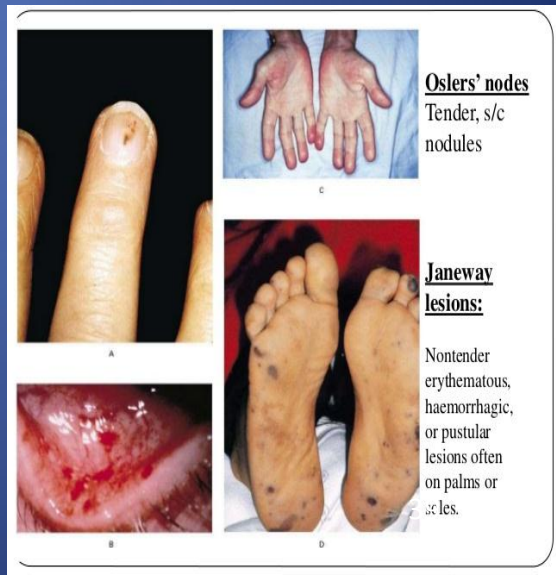
- Congestive Heart Failure
  - %70 more
  - Distorsion or perforation of valvuler leaflet
  - Rupture of chorda tendinea,papiller muscles
  - Perforation of cardiac chamber
- Murmurs
  - %50-85,diffucult to hear in noisy ED
- Valvular abcess
- Heart blocks
- Dysritmia

Neurological manifestations

- %20-40
- Cerebral ischemic events(often multiple areas)
- Embolic stroke,esp.middle cerebral artery(MCA)
- CNS abcess
- Intracranial hemorrhage
- Mycotik aneurysm
- Meningitis
- Seizures

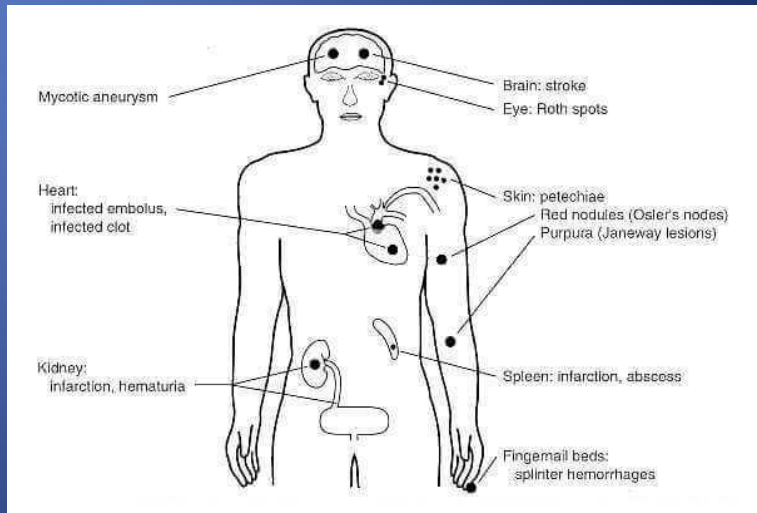
Cutaneous findings

- %5-10,non-spesific,embolic phenomena,vasculitis,bacteremia.
- Petechia,splinter or subungal hemorrhage of finger,toenails.
- Osler node,small tender subcutaneous nodules on the pads of the fingers or toes.
- Janeway lesions,small,hemorrhagic painless plaques on the palms or soles.



Arterial embolization

- Friable vegetation fragments can embolize to **ANY** artery.
- İnfarction or abcess in remote tissues.
- Pulmonary(infarction,pneumonia,empyema,pleural effussion)
- Coronary(AMI,myocarditis)
- Embolic splenic infarct(left upper quadrant abdomial pain radiation to left shoulder)
- Renal embolus,flank pain,hematuria
- Mesenteric arter embolus,abdomianal pain,blood (+) stool
- Embolus to extremities,acute limb ischemia
- Rupture of cerebral mycotik aneurism,ICH
- Retinal artery embolism,acute monoculer blindness



Diagnostic Duke criteria

- The Duke diagnostic criteria, developed by Durack and colleagues, are generally used to make a definitive diagnosis of IE.
- The criteria combine the clinical, microbiologic, pathologic, and echocardiographic characteristics of a specific case·

Major blood culture criteria for IE include the following:

- Two blood cultures positive for organisms typically found in patients with IE
- Blood cultures persistently positive for one of these organisms, from cultures drawn more than 12 hours apart
- Three or more separate blood cultures drawn at least 1 hour apart

Major echocardiographic criteria include the following:

- Echocardiogram positive for IE, documented by an oscillating intracardiac mass on a valve or on supporting structures, in the path of regurgitant jets, or on implanted material, in the absence of an alternative anatomic explanation
- Myocardial abscess
- Development of partial dehiscence of a prosthetic valve
- New-onset valvular regurgitation

Table 13 Definition of infective endocarditis according to the modified Duke criteria (adapted from Li et al[87])

Definite IE
Pathological criteria • Microorganisms demonstrated by culture or on histological examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or • Pathological lesions; vegetation or intracardiac abscess confirmed by histological examination showing active endocarditis **Clinical criteria** • 2 major criteria; or • 1 major criterion and 3 minor criteria; or • 5 minor criteria
Possible IE
• 1 major criterion and 1 minor criterion; or • 3 minor criteria
Rejected IE
• Firm alternate diagnosis; or • Resolution of symptoms suggesting IE with antibiotic therapy for ≤4 days; or • No pathological evidence of IE at surgery or autopsy, with antibiotic therapy for ≤4 days; or • Does not meet criteria for possible IE, as above

Blood cultures

- 3 sets,different sites,at least 10 ml sample,1 h more
- Sometimes additional samples necessary
- No delay for therapy,septick shock,systemic complication.
- Polimeraz chain reaction technics
- Carefull testing

Echocardiography

- Obtain Echo,as soon as possible
  - Two major criteria
  - Cardiac valves and structure
- TTE first,vegetation specificity %98
- Bedside Echo
- Drug user, best result.
- TEE valvular abnormality,prosthetic valves,intracardiac devices,inadequte images,intermediate or high suspicion.

Other diagnostic tests

- **No spesific test in ED**
- Anemia(%70-90),hematuria,elevated ESR(%90),CRP,procalcitonin.
- ECG findings nonspesific.Prolonged PR interval,new LBBB,RBBB+left ant.hemiblock:ao valv to conduction system ,spreading of infection
- Junctional tachicardia,wenkebach block,complete heart block
- Chest X-ray,PE,CHF

Diagnosis-diffucult

- Diagnosis of IE is frequently difficult, particularly in some subgroups (prosthetic valve IE, intracardiac device and blood-culture negative IE)
- The Duke criteria are useful for the classification of IE, but they are of limited value in those subgroups.
- **Echocardiography and blood cultures are the cornerstone of diagnosis** of IE. TTE must be performed first, but both TTE and TEE should ultimately be performed in the majority of cases of suspected or definite IE.
- Persisting high level of clinical suspicion, echocardiography and blood culture should be repeated, and other imaging techniques should be used, either for diagnosis of cardiac involvement (cardiac CT, PET/ CT or leukocytes-labelled SPECT/CT), or for imaging embolic events (cerebral MRI, whole body CT)
- **Endocardit's team decision final.**

Treatment

- İnitial stabilization
- Hemodynamic instability,hypotension,pulmonry edema,altered mental status,acidosis.
- İntraaortic baloon valve counterpulsation unstable mitral valve rupture,ao valve contraindicate.
- Team approach(**cardiology,infectious disease,cardiac surgen**)

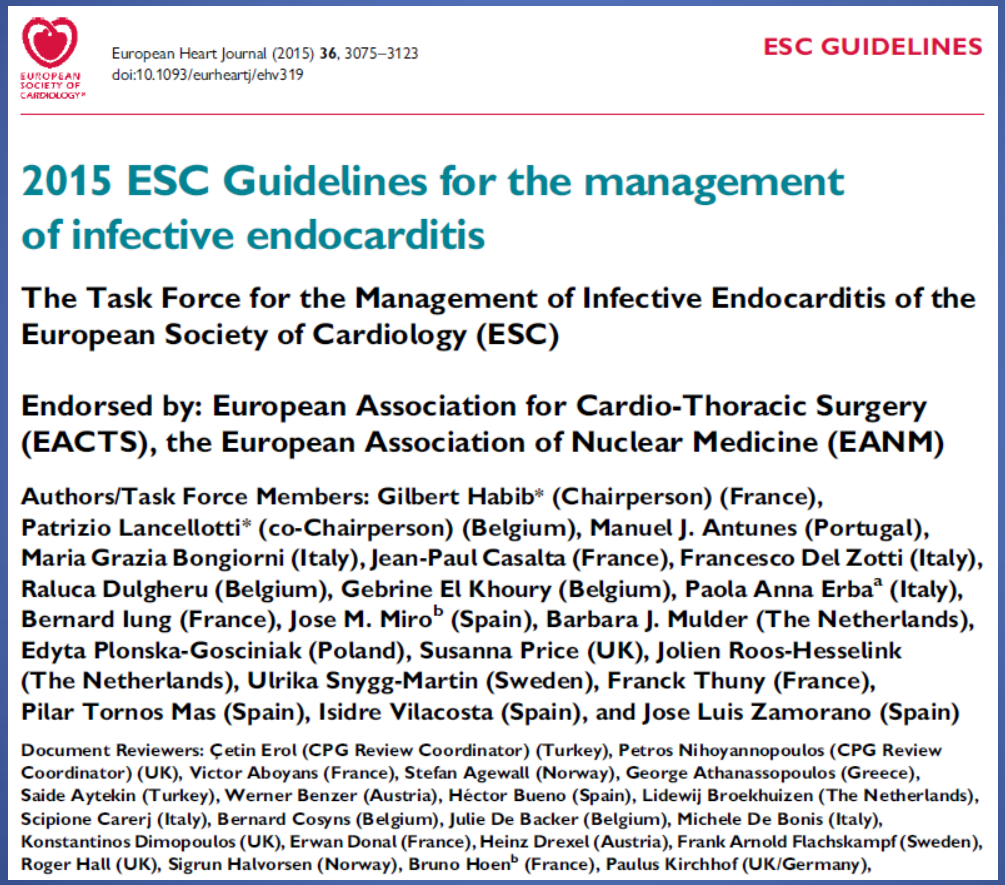
Empiric treatment

- **Native valves**
  - Before cultures
  - **Every patient must be takenAB in ED**
  - Staph.aureus and strep.species must be cover
  - Penisillinase resistant penisillin or a cephalosphorin and **aminoglycoside.**

  The indications and pattern of use of aminoglycosides have changed. They are no long recommended in staphylococcal NVE because their clinical benefits have not been demonstrated but they can increase renal toxicity; and, when they are indicated in other conditions, aminoglycosides should be given in a single daily dose in order to reduce nephrotoxicity.

  - Complicated patients,add vancomycin
- Prosthesis valves
  - Vancomycin,aminoglycoside and rifampin.

Essential messages ESG Guideline's



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ESC GUIDELINES

2015 ESC Guidelines for the management of infective endocarditis

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Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM)

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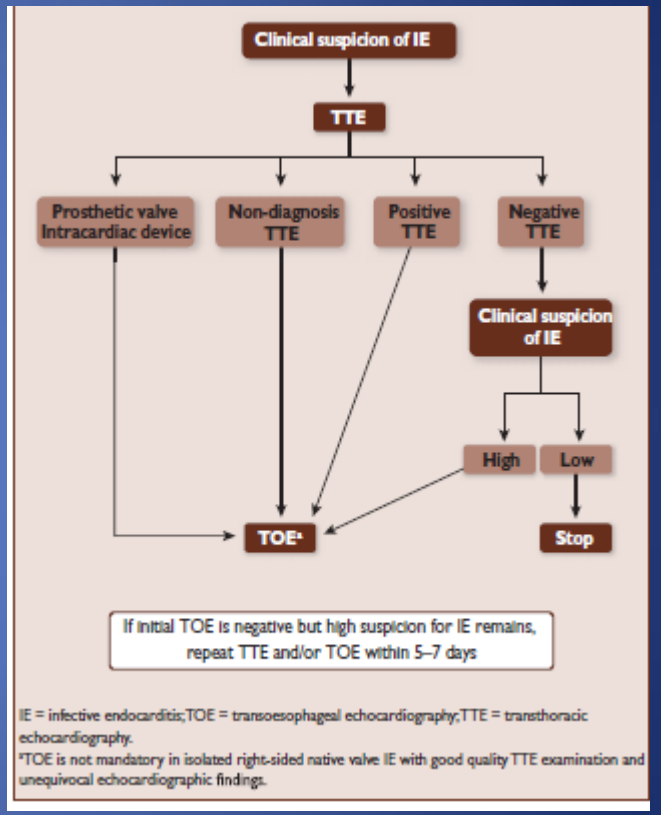
TTE,TEE

Table 10 Role of echocardiography in infective endocarditis

Recommendations	Class[a]	Level[b]	Ref.[c]
A. Diagnosis			
• TTE is recommended as the first-line imaging modality in suspected IE.	I	B	64,65
• TOE is recommended in all patients with clinical suspicion of IE and a negative or non-diagnostic TTE.	I	B	64, 68–71
• TOE is recommended in patients with clinical suspicion of IE, when a prosthetic heart valve or an intracardiac device is present.	I	B	64,71
• Repeat TTE and/or TOE within 5–7 days is recommended in case of initially negative examination when clinical suspicion of IE remains high.	I	C	
• Echocardiography should be considered in *Staphylococcus aureus* bacteraemia.	IIa	B	66,67
• TOE should be considered in patients with suspected IE, even in cases with positive TTE, except in isolated right-sided native valve IE with good quality TTE examination and unequivocal echocardiographic findings.	IIa	C	
B. Follow-up under medical therapy			
• Repeat TTE and/or TOE are recommended as soon as a new complication of IE is suspected (new murmur, embolism, persisting fever, HF, abscess, atrioventricular block).	I	B	64,72
• Repeat TTE and/or TOE should be considered during follow-up of uncomplicated IE, in order to detect new silent complications and monitor vegetation size. The timing and mode (TTE or TOE) of repeat examination depend on the initial findings, type of microorganism, and initial response to therapy.	IIa	B	64,72
C. Intraoperative echocardiography			
• Intraoperative echocardiography is recommended in all cases of IE requiring surgery.	I	B	64,73
D. Following completion of therapy			
• TTE is recommended at completion of antibiotic therapy for evaluation of cardiac and valve morphology and function.	I	C	



IE = infective endocarditis; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.
*TOE is not mandatory in isolated right-sided native valve IE with good quality TTE examination and unequivocal echocardiographic findings.

Endocarditis team and centre

- The presence of an '**Endocarditis Team**' is crucial in IE. This multidisciplinary approach has been shown to significantly reduce the 1-year mortality in infective endocarditis.
- A multidisciplinary approach is mandatory, including **cardiologists, cardiac surgeons, and specialists of infectious diseases.**
- Patients with complicated IE, i.e. endocarditis with HF, abscess, embolic or neurological complication or CHD, should be referred early and managed in a reference centre with immediate surgical facilities.
- Patients with non-complicated IE can be initially managed in a non-reference centre, but with regular communication with the reference centre, consultations with the multidisciplinary 'Endocarditis Team' and, when needed, with external visit to the reference centre

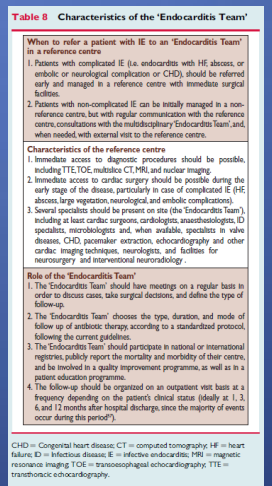


Table 8 Characteristics of the 'Endocarditis Team'

When to refer a patient with IE to an 'Endocarditis Team' in a reference centre

1. Patients with complicated IE (i.e. endocarditis with HF, abscess, or embolic or neurological complication or CHD), should be referred early and managed in a reference centre with immediate surgical facilities.
2. Patients with non-complicated IE can be initially managed in a non-reference centre, but with regular communication with the reference centre, consultations with the multidisciplinary 'Endocarditis Team', and, when needed, with external visit to the reference centre.

Characteristics of the reference centre

1. Immediate access to diagnostic procedures should be possible, including TTE, TOE, multislice CT, MRI, and nuclear imaging.
2. Immediate access to cardiac surgery should be possible during the early stage of the disease, particularly in case of complicated IE (HF, abscess, large vegetation, neurological, and embolic complications).
3. Several specialists should be present on site (the 'Endocarditis Team'), including at least cardiac surgeons, cardiologists, anaesthesiologists, ID specialists, microbiologists and, when available, specialists in valve diseases, CHD, pacemaker extraction, echocardiography and other cardiac imaging techniques, neurologists, and facilities for neurosurgery and interventional neuroradiology.

Role of the 'Endocarditis Team'

1. The 'Endocarditis Team' should have meetings on a regular basis in order to discuss cases, take surgical decisions, and define the type of follow-up.
2. The 'Endocarditis Team' chooses the type, duration, and mode of follow up of antibiotic therapy, according to a standardized protocol, following the current guidelines.
3. The 'Endocarditis Team' should participate in national or international registries, publicly report the mortality and morbidity of their centre, and be involved in a quality improvement programme, as well as in a patient education programme.
4. The follow-up should be organized on an outpatient visit basis at a frequency depending on the patient's clinical status (ideally at 1, 3, 6, and 12 months after hospital discharge, since the majority of events occur during this period").

CHD = Congenital heart disease; CT = computed tomography; HF = heart failure; ID = infectious disease; IE = infective endocarditis; MRI = magnetic resonance imaging; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.

Table 9 Recommendations for referring patients to the reference centre

Recommendations	Class[a]	Level[b]	Ref.[c]
Patients with complicated IE should be evaluated and managed at an early stage in a reference centre, with immediate surgical facilities and the presence of a multidisciplinary 'Endocarditis Team', including an ID specialist, a microbiologist, a cardiologist, imaging specialists, a cardiac surgeon and, if needed, a specialist in CHD	IIa	B	12,56
For patients with uncomplicated IE managed in a non-reference centre, early and regular communication with the reference centre and, when needed, visits to the reference centre should be made	IIa	B	12,56

Endocarditis prophylaxis

- **Prophylaxis is not routinely indicated**
- Lack of scientific evidence for the efficacy of infective endocarditis prophylaxis. **Thus, antibiotic prophylaxis is recommended only for patients with the highest risk of IE undergoing the highest risk dental procedures.**
- **Good oral hygiene and regular dental review are more important than antibiotic prophylaxis to reduce the risk of IE.**
- Aseptic measures are mandatory during venous catheter manipulation and during any invasive procedures in order to reduce the rate of health care-associated IE.
- Tattoo and piercing?

Highest risk conditions for endocarditis

Table 3 **Cardiac conditions at highest risk of infective endocarditis for which prophylaxis should be considered when a high-risk procedure is performed**

Recommendations	Class[a]	Level[b]
Antibiotic prophylaxis should be considered for patients at highest risk for IE: (1) Patients with any prosthetic valve, including a transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair. (2) Patients with a previous episode of IE. (3) Patients with CHD: (a) Any type of cyanotic CHD. (b) Any type of CHD repaired with a prosthetic material, whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains.	IIa	C
Antibiotic prophylaxis is not recommended in other forms of valvular or CHD.	III	C

CHD = congenital heart disease; IE = infective endocarditis.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

- Prosthetic heart valves
- Prosthetic material used for valve repair
- History of previous infective endocarditis
- Unrepaired cyanotic congenital heart disease
- Repaired congenital heart defect with prosthetic material or device
- Repaired congenital heart disease with residual defects
- Cardiac transplant recipients with valve regurgitation due to a structurally abnormal valve

Which procedures for prophylaxis?

Table 5 Recommendations for prophylaxis of infective endocarditis in the highest-risk patients according to the type of at-risk procedure

Recommendations	Class[a]	Level[b]
A. Dental procedures		
• Antibiotic prophylaxis should only be considered for dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa	IIa	C
• Antibiotic prophylaxis is not recommended for local anaesthetic injections in non-infected tissues, treatment of superficial caries, removal of sutures, dental X-rays, placement or adjustment of removable prosthodontic or orthodontic appliances or braces or following the shedding of deciduous teeth or trauma to the lips and oral mucosa	III	C
B. Respiratory tract procedures[c]		
• Antibiotic prophylaxis is not recommended for respiratory tract procedures, including bronchoscopy or laryngoscopy, or transnasal or endotracheal intubation	III	C
C. Gastrointestinal or urogenital procedures or TOE[c]		
• Antibiotic prophylaxis is not recommended for gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery or TOE	III	C
D. Skin and soft tissue procedures[c]		
• Antibiotic prophylaxis is not recommended for any procedure	III	C

Prophylaxis medication

Table 6 Recommended prophylaxis for high-risk dental procedures in high-risk patients

Situation	Antibiotic	Single-dose 30–60 minutes before procedure	
		Adults	Children
No allergy to penicillin or ampicillin	Amoxicillin or ampicillin[a]	2 g orally or i.v.	50 mg/kg orally or i.v.
Allergy to penicillin or ampicillin	Clindamycin	600 mg orally or i.v.	20 mg/kg orally or i.v.

[a]Alternatively, cephalexin 2 g i.v. for adults or 50 mg/kg i.v. for children, cefazolin or ceftriaxone 1 g i.v. for adults or 50 mg/kg i.v. for children.
Cephalosporins should not be used in patients with anaphylaxis, angio-oedema, or urticaria after intake of penicillin or ampicillin due to cross-sensitivity.

Procedure	Patient Characteristics	Antibiotic Agent	Dose
Dental procedures involving manipulation of either gingival tissue or the periapical region of teeth or perforation of the oral mucosa	Able to take oral antibiotics	Amoxicillin	2 grams PO, 30–60 min before procedure
		or	
	Unable to take oral medication	Ampicillin	2 grams IM or IV, 30–60 min before procedure
		or	
		Cefazolin or ceftriaxone	1 gram IM or IV, 30–60 min before procedure
	Allergic to penicillins or ampicillin	Cephalexin	2 grams PO, 30–60 min before procedure
		or	
		Clindamycin	600 milligrams PO, 30–60 min before procedure
		or	
		Azithromycin or clarithromycin	500 milligrams PO, 30–60 min before procedure
	Unable to take oral medication and allergic to penicillins or ampicillin	Cefazolin or ceftriaxone	1 gram IM or IV, 30–60 min before procedure
		or	
		Clindamycin	600 milligrams IM or IV, 30–60 min before procedure
Procedures on infected skin, skin structure, or musculoskeletal tissue	Non–methicillin-resistant strain of *Staphylococcus* or β-hemolytic *Streptococcus* suspected	Dicloxacillin	2 grams PO, 30–60 min before procedure
		or	
		Cephalexin	2 grams PO, 30–60 min before procedure
	Patients unable to tolerate a β-lactam or who are known or suspected to have an infection caused by a methicillin-resistant strain of *Staphylococcus*	Vancomycin	1 gram IV, 30–60 min before procedure
		or	
		Clindamycin	600 milligrams IM or IV, 30–60 min before procedure
Other procedures (respiratory; GI; GU; noninfected dermatologic or musculoskeletal procedures)		Prophylaxis not indicated	

Take home message's

- Bedside echography in ED,mandatory
- Clinical findings non-spesific
- Follow up carefully
- Past medical history
- **Chest pain is not ONLY indicate Acute Coronary Syndrome and deathfull reasons in ED.**

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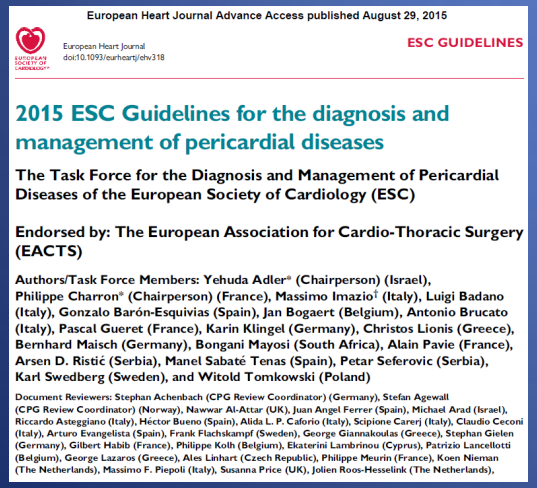

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ESC GUIDELINES

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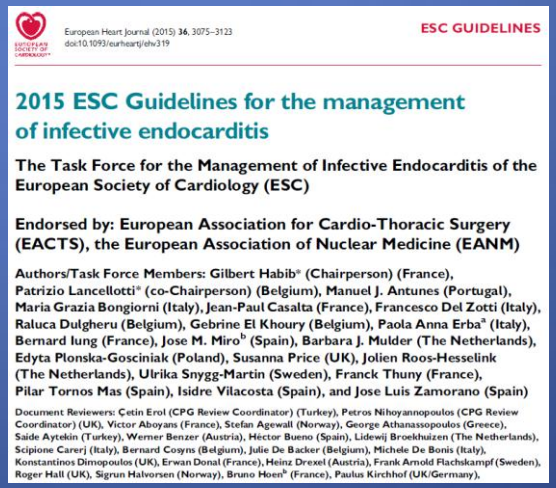

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