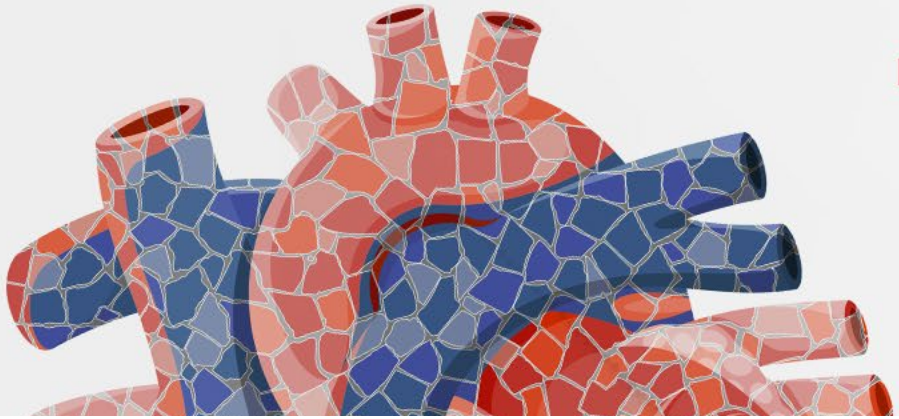

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How to develop and improve endocarditis teams?

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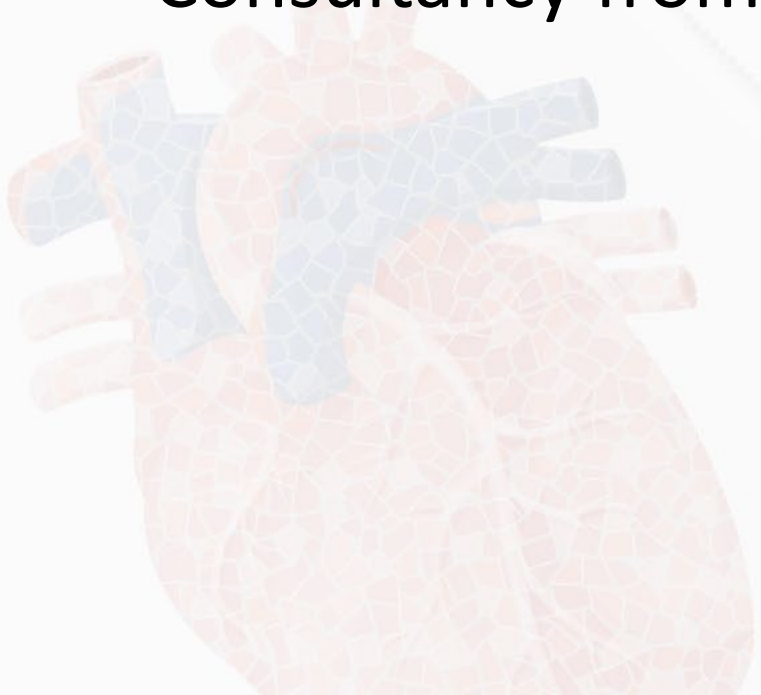
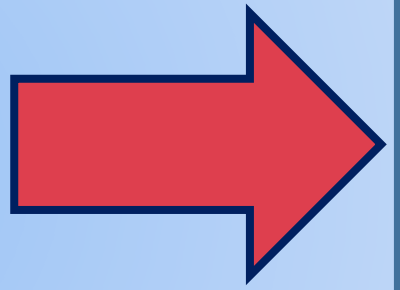


Why is important to set an Endocarditis Team?

- **Goals:**
  - Increase awareness
  - Accurate diagnosis
  - Appropriate treatment:
    - Antibiotic therapy
    - Surgical treatment
  - Follow-up of patients
    - Outpatient parenteral/oral antibiotic therapy
    - Rehabilitation
    - Treatment of comorbidities



Improved prognosis

Increasing awareness

- Highly variable clinical presentation

ESC-EORP EURO-ENDO registry

	Total (n =3116)	Prosthesis+Repair (n = 939)	Native (n =1764)	PM/ICD (n = 308)
Fever	**77.7%**	**77.3%**	**78.9%**	**72.3%**
Cough	17.0%	13.1%	20.1%	12.8%
Dizziness	10.8%	9.9%	11.4%	8.8%
Cerebrovascular accident	6.8%	7.3%	7.2%	2.4%
Syncope	2.6%	2.6%	2.8%	2.4%
Cardiac murmur	**64.5%**	**65.6%**	**70.8%**	31.5%
Congestive heart failure	**27.2%**	**27.1%**	**27.7%**	**28.9%**
Cardiogenic shock	2.3%	1.4%	2.7%	2.6%
Septic shock	6.6%	6.3%	7.1%	5.5%
Oslers nodes	1.9%	1.1%	2.6%	0.6%
Janeway lesions	3.5%	1.9%	4.9%	0.6%
Roth spots	1.4%	0.4%	2.1%	0.3%

European Heart Journal (2019) 40, 3222–3233

Increasing awareness

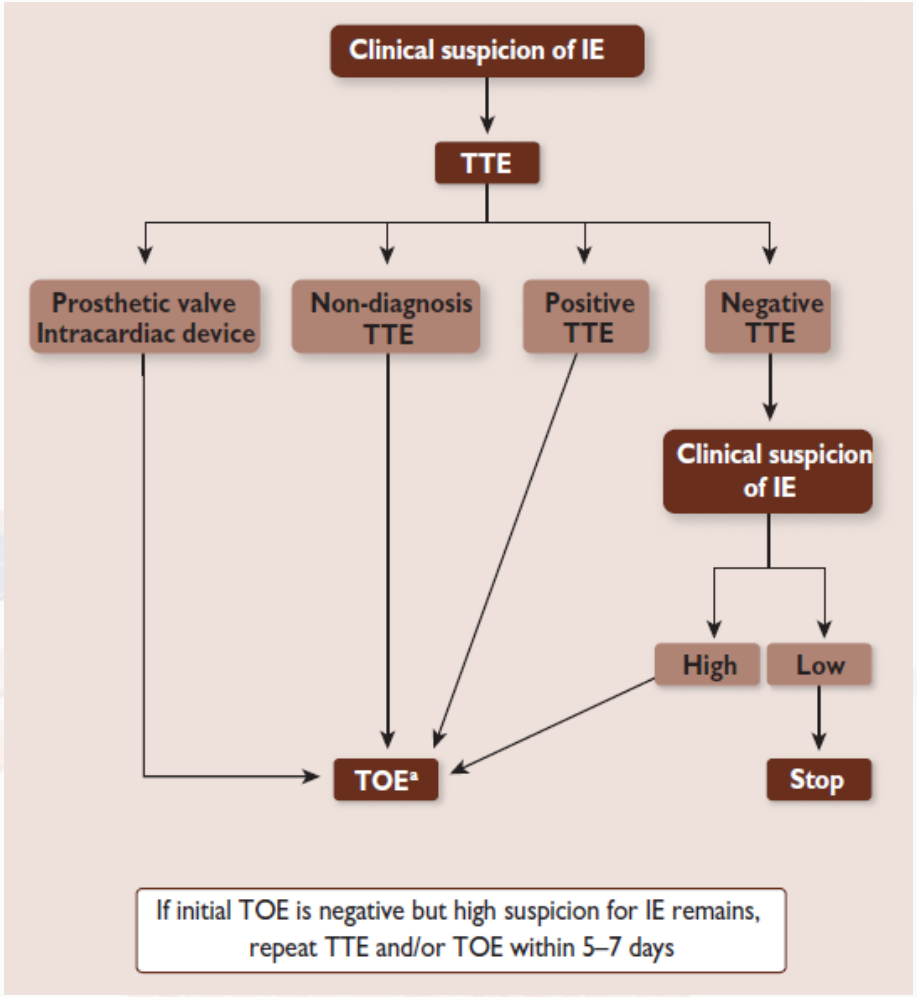
- Highly variable clinical presentation

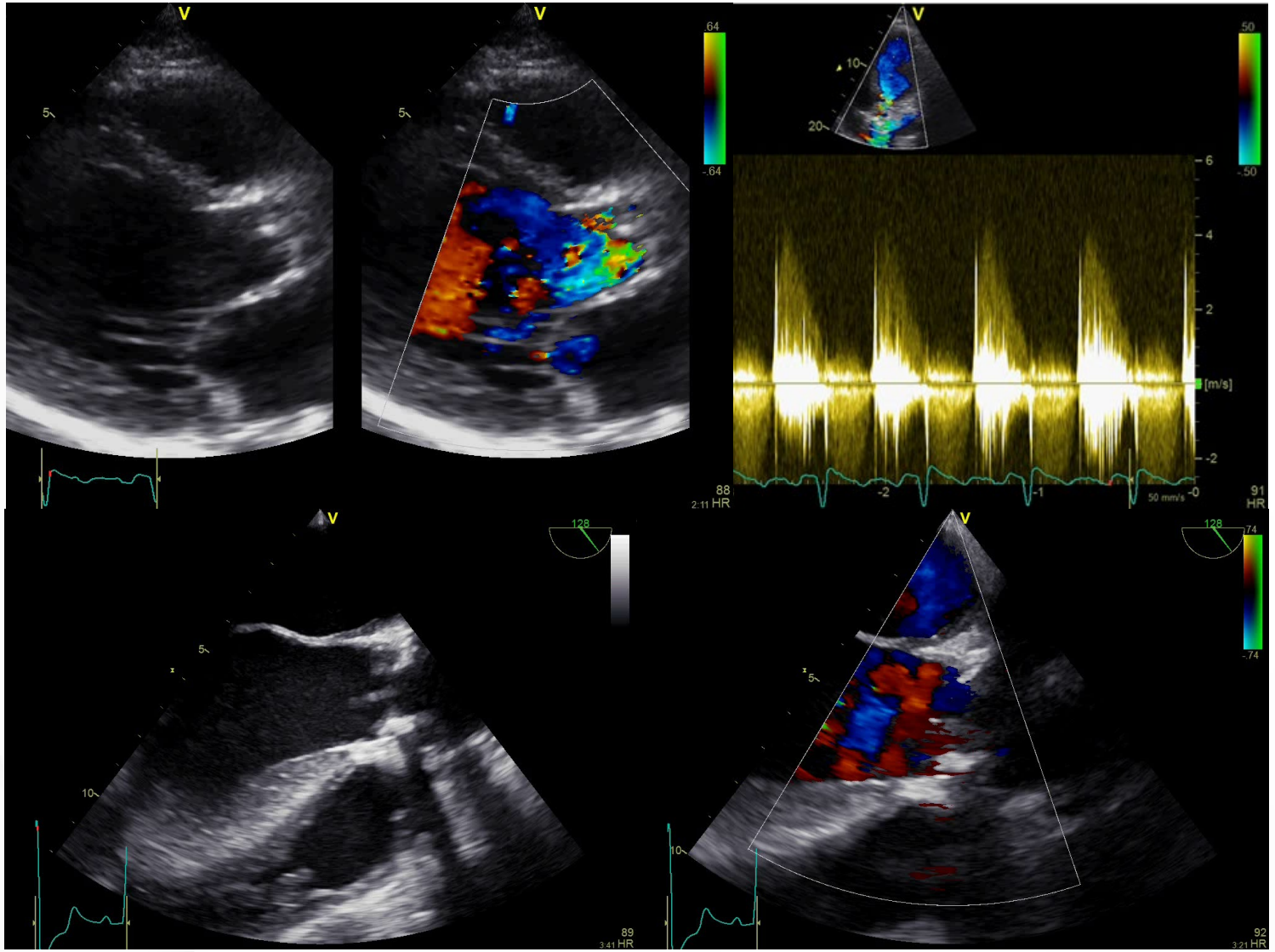
ESC-EORP
EURO-ENDO
registry

	Total (n =3116)	Prosthesis+Repair (n = 939)	Native (n =1764)	PM/ICD (n = 308)
Complications on admission				
Abscess	11.6%	13.8%	11.5%	7.8%
Spondylitis	5.4%	4.5%	5.8%	4.5%
Embolic events	25.3%	21.4%	30.1%	11.7%
Pulmonary	24.7%	9.5%	27.5%	**75.0%**
Cerebral	**44.4%**	**51.2%**	**43.3%**	16.7%
Splenic	**22.3%**	**25.9%**	**22.0%**	5.6%
Coronary	2.8%	2.0%	3.2%	2.8%
Renal	9.6%	7.5%	11.1%	2.8%
Hepatic	2.2%	1.5%	2.4%	0.0%
Peripheral	11.7%	12.4%	12.2%	2.8%
Hemorrhagic Stroke	2.2%	1.7%	2.7%	0.6%

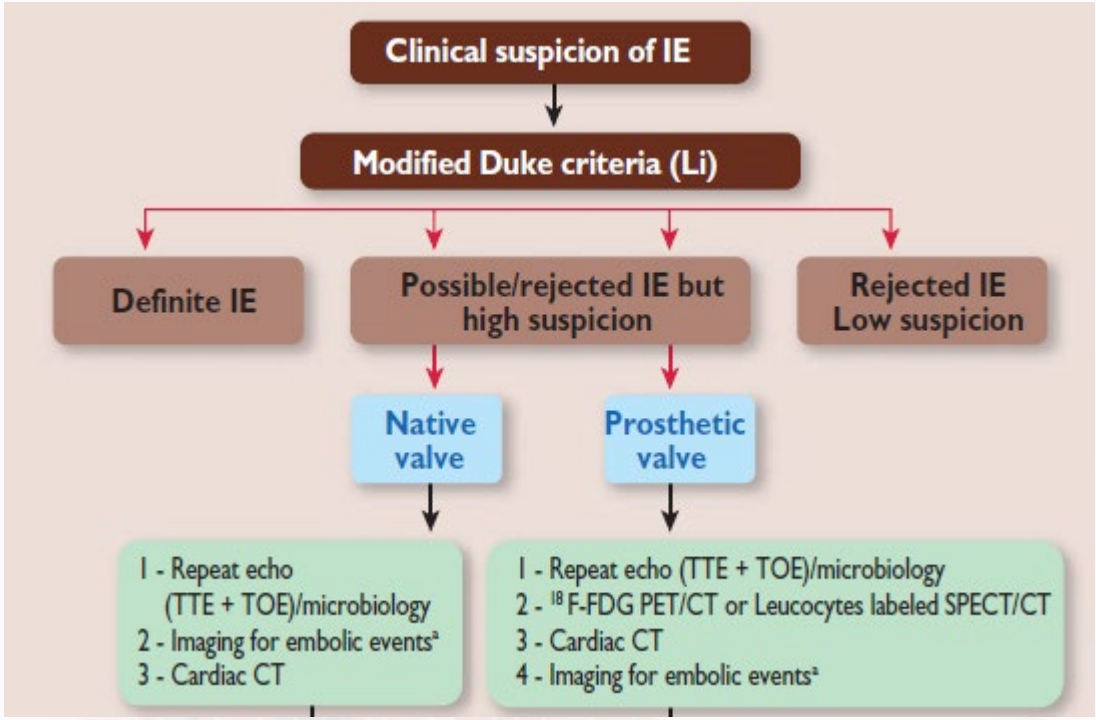
European Heart Journal (2019) 40, 3222–3233

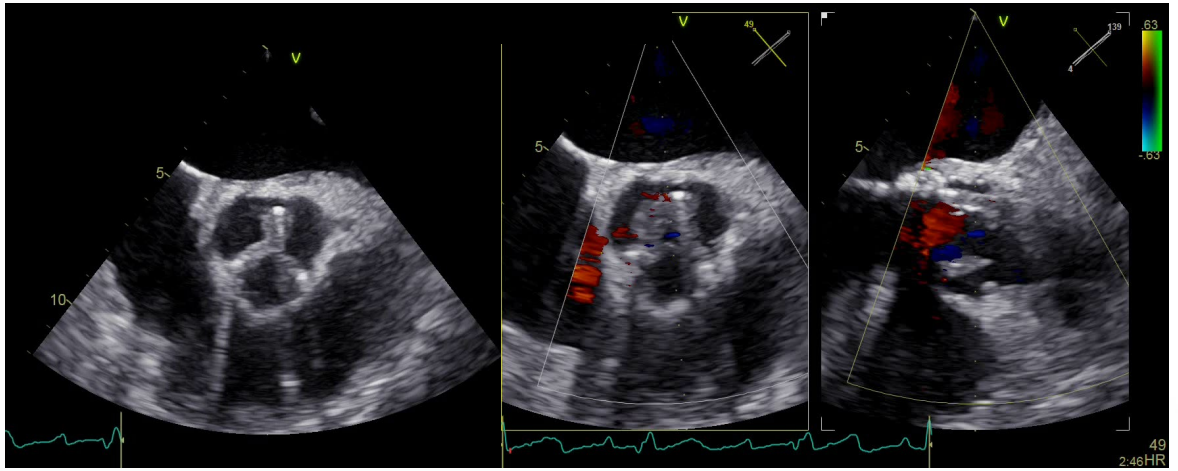
Accurate diagnosis

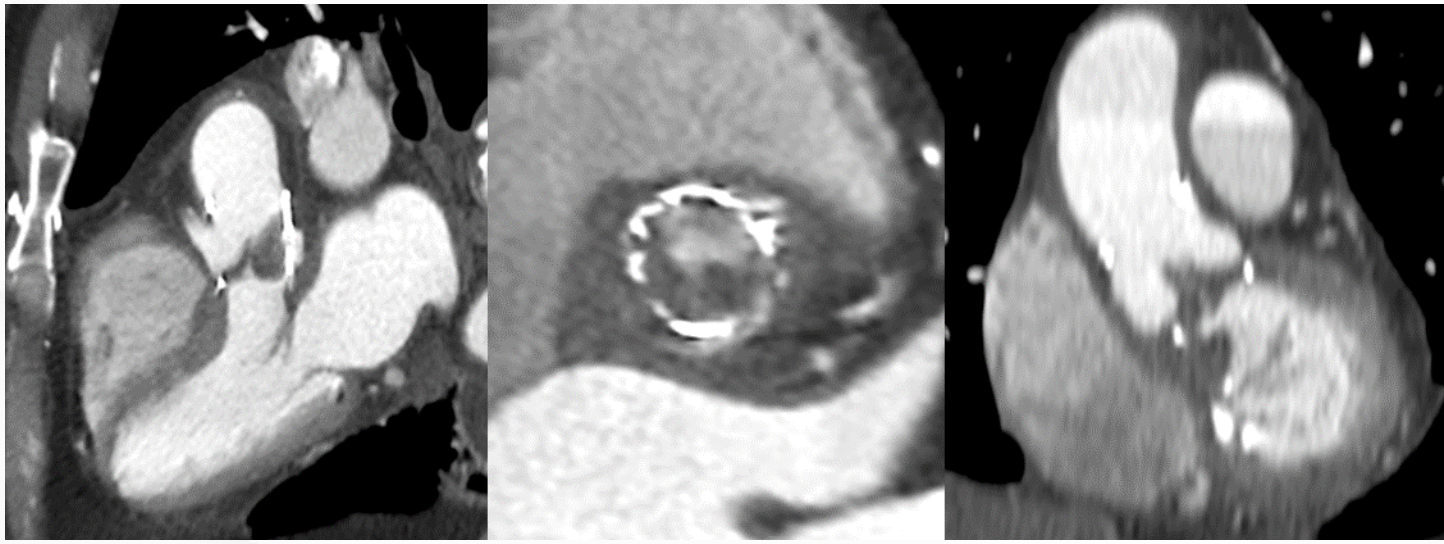




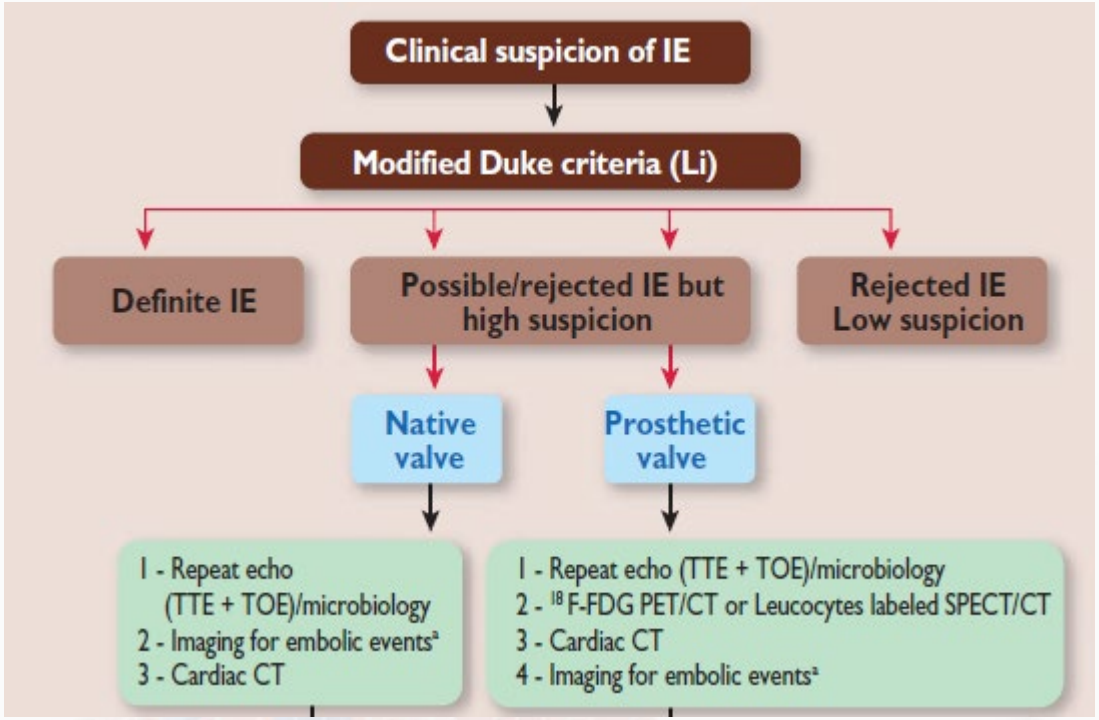
Accurate diagnosis

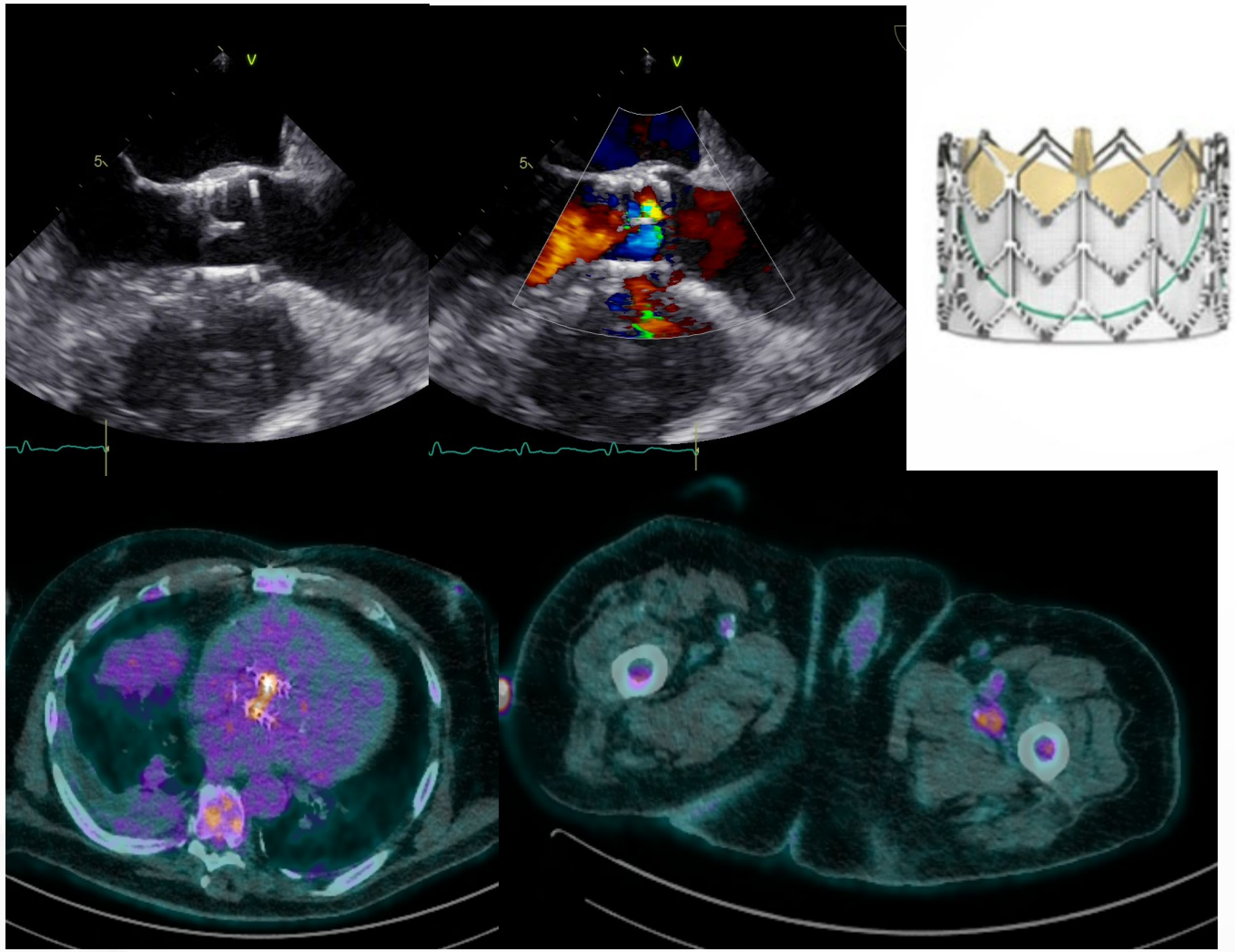






Accurate diagnosis





ESC 2015 modified criteria for diagnosis of IE:

Major criteria
1. Blood cultures positive for IE a. Typical microorganisms consistent with IE from 2 separate blood cultures: • *Viridans streptococci, Streptococcus gallolyticus (Streptococcus bovis), HACEK group, Staphylococcus aureus*; or • Community-acquired enterococci, in the absence of a primary focus; or b. Microorganisms consistent with IE from persistently positive blood cultures: • ≥2 positive blood cultures of blood samples drawn >12 h apart; or • All of 3 or a majority of ≥4 separate cultures of blood (with first and last samples drawn ≥1 h apart); or c. Single positive blood culture for *Coxiella burnetii* or phase I IgG antibody titre >1:800
2. Imaging positive for IE a. Echocardiogram positive for IE: • Vegetation • Abscess, pseudoaneurysm, intracardiac fistula • Valvular perforation or aneurysm • New partial dehiscence of prosthetic valve b. Abnormal activity around the site of prosthetic valve implantation detected by ^{18}F-FDG PET/CT (only if the prosthesis was implanted for >3 months) or radiolabelled leukocytes SPECT/CT. c. Definite paravalvular lesions by cardiac CT.

European Heart Journal (2015);36:3075-3123 - doi:10.1093/eurheartj/ehv319

ESC 2015 modified criteria for diagnosis of IE:

Minor criteria
1. Predisposition such as predisposing heart condition, or injection drug use.
2. Fever defined as temperature >38°C.
3. Vascular phenomena **(including those detected only by imaging)**: major arterial emboli, septic pulmonary infarcts, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway's lesions.
4. Immunological phenomena: glomerulonephritis, Osler's nodes, Roth's spots, and rheumatoid factor.
5. Microbiological evidence: positive blood culture but does not meet a major criterion as noted above or serological evidence of active infection with organism consistent with IE.

European Heart Journal (2015);36:3075-3123 - doi:10.1093/eurheartj/ehv319

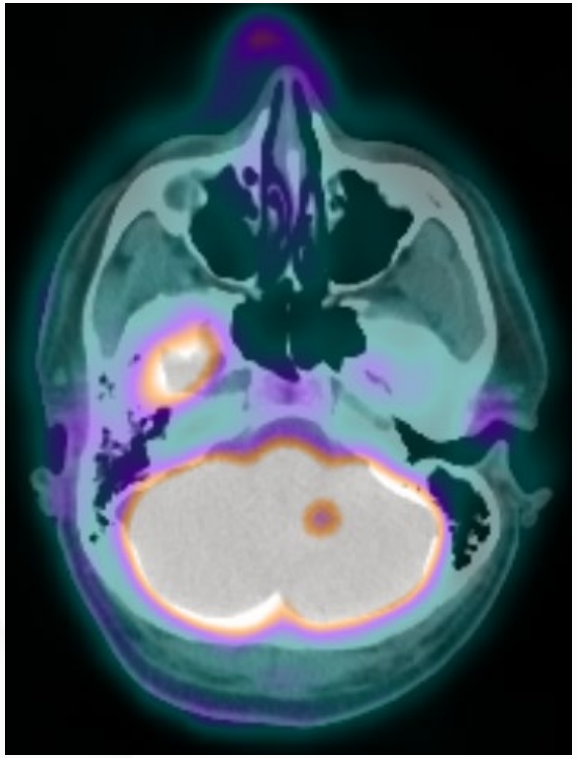
Appropriate treatment:

- Antibiotic ☞ as soon as possible
- Surgical ☞ timing:
  - Emergent = within 24h
  - Urgent = within a few days
  - Elective = 1-2 weeks

Indications and timing of surgery

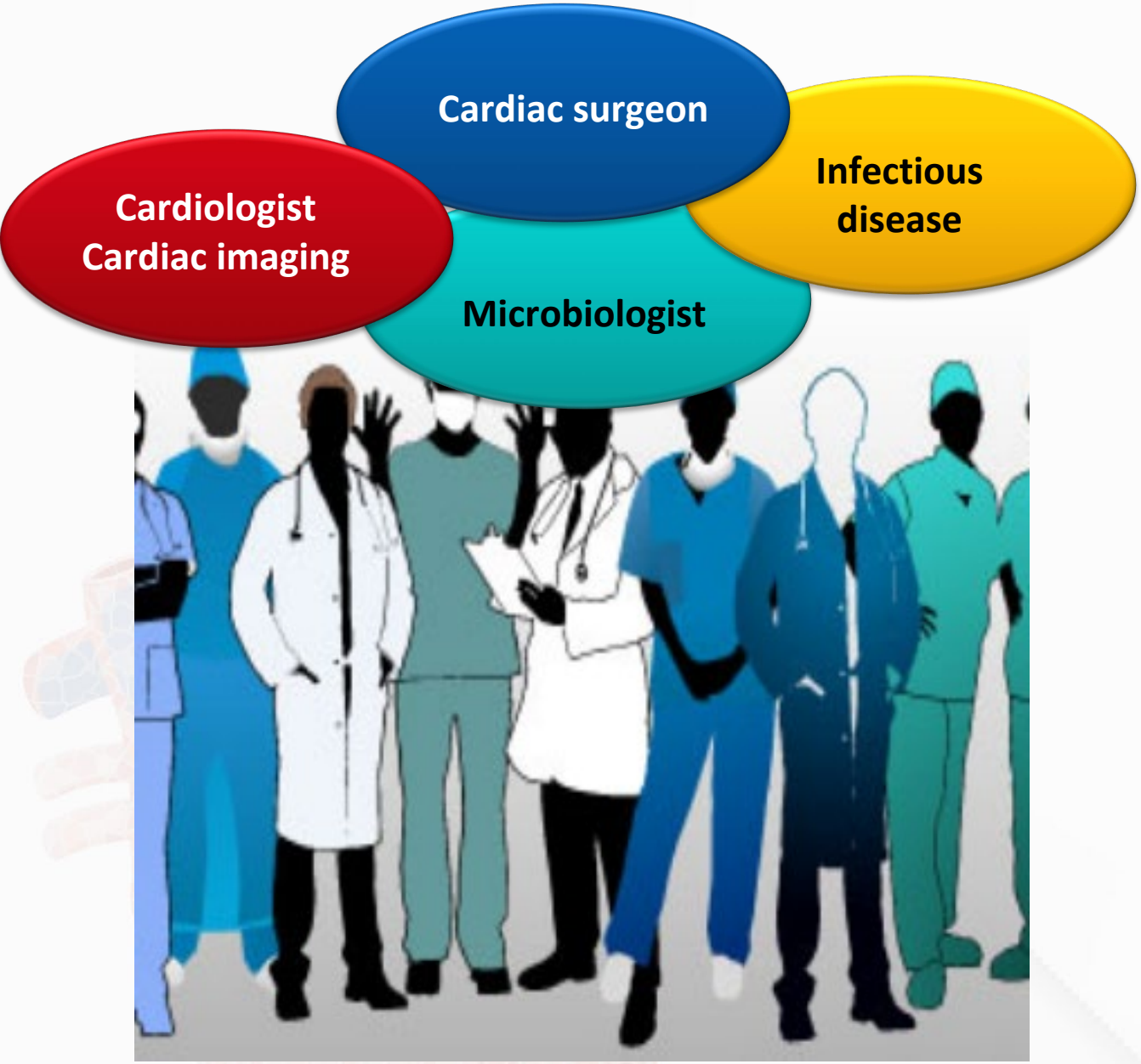
Indications for surgery	Timing	Class	Level
1. Heart Failure			
Aortic or mitral NVE or PVE with severe acute regurgitation, obstruction or fistula causing refractory pulmonary oedema or cardiogenic shock.	Emergency	I	B
Aortic or mitral NVE or PVE with severe regurgitation or obstruction causing symptoms of HF or echocardiographic signs of poor haemodynamic tolerance.	Urgent	I	B
2. Uncontrolled infection			
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation).	Urgent	I	B
Infection caused by fungi or multiresistant organisms.	Urgent/elective	I	C
Persisting positive blood cultures despite appropriate antibiotic therapy and adequate control of septic metastatic foci.	Urgent	IIa	B
PVE caused by staphylococci or non-HACEK Gram negative bacteria.	Urgent/elective	IIa	C
3. Prevention of embolism			
Aortic or mitral NVE or PVE with persistent vegetations >10 mm after one or more embolic episode despite appropriate antibiotic therapy.	Urgent	I	B
Aortic or mitral NVE with vegetations >10 mm, associated with severe valve stenosis or regurgitation, and low operative risk.	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated very large vegetations (>30 mm).	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated large vegetations (>15 mm) and no other indication for surgery.	Urgent	IIb	C

Recommendations	Class[a]	Level[b]
After a silent embolism or transient ischaemic attack, cardiac surgery, if indicated, is recommended without delay	I	B
Neurosurgery or endovascular therapy is recommended for very large, enlarging or ruptured intracranial infectious aneurysms	I	C
Following intracranial haemorrhage, surgery should generally be postponed for ≥1 month	IIa	B
After a stroke, surgery indicated for HF, uncontrolled infection, abscess, or persistent high embolic risk should be considered without any delay as long as coma is absent and the presence of cerebral haemorrhage has been excluded by cranial CT or MRI	IIa	B
Intracranial infectious aneurysms should be looked for in patients with IE and neurological symptoms. CT or MR angiography should be considered for diagnosis. If non-invasive techniques are negative and the suspicion of intracranial aneurysm remains, conventional angiography should be considered	IIa	B



Other complications:

- Splenic embolisms
- Conduction abnormalities needing pacemaker
- Spondylitis
- Abceses



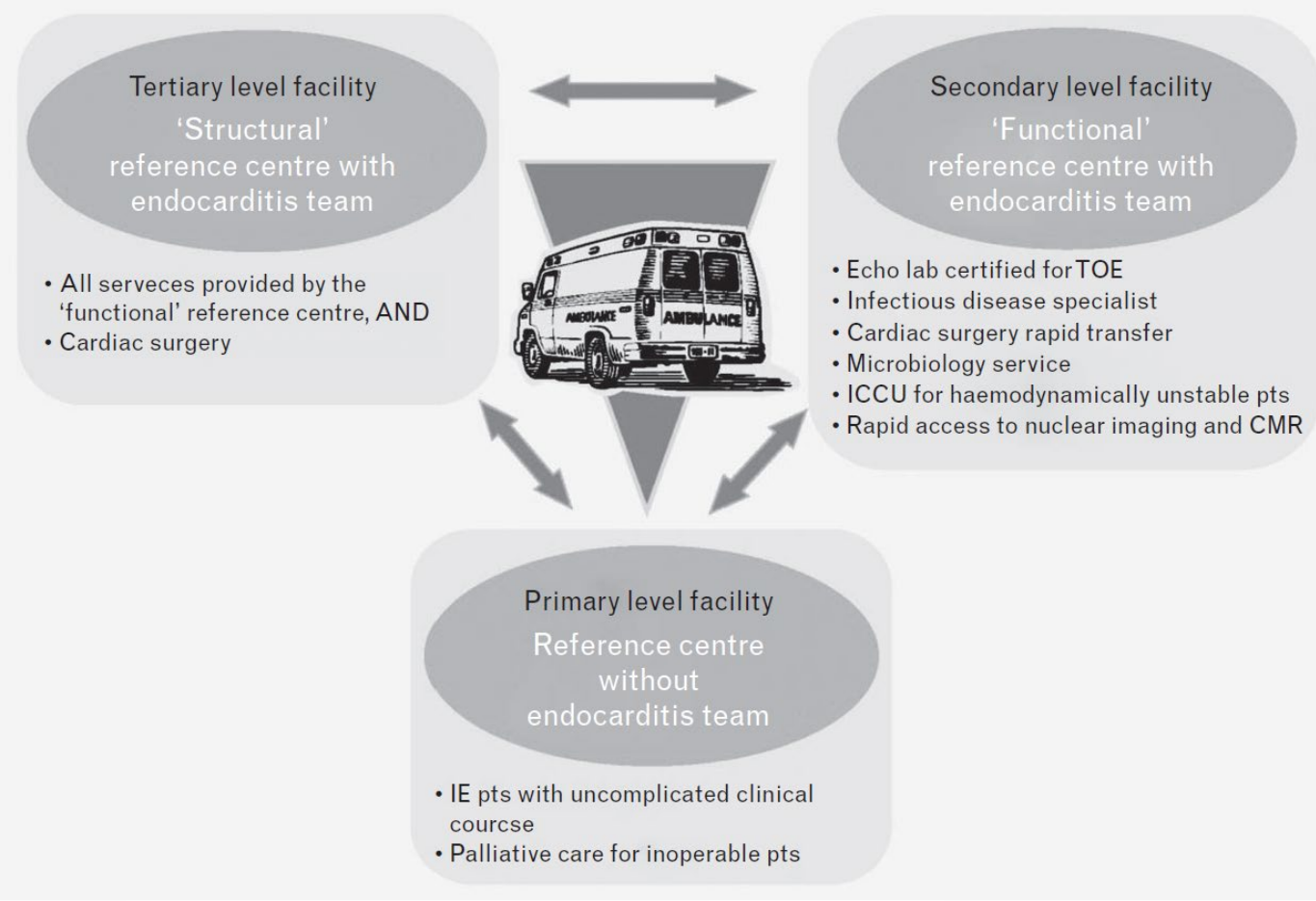
- Additional specialities involved:
  - Neurologists/neurosurgeons
  - Neurointerventional radiology
  - Geriatricians
  - Allied professionals
  - Radiologists/Nuclear medicine
  - Anesthesiologists
  - Intensive care unit specialists….

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.

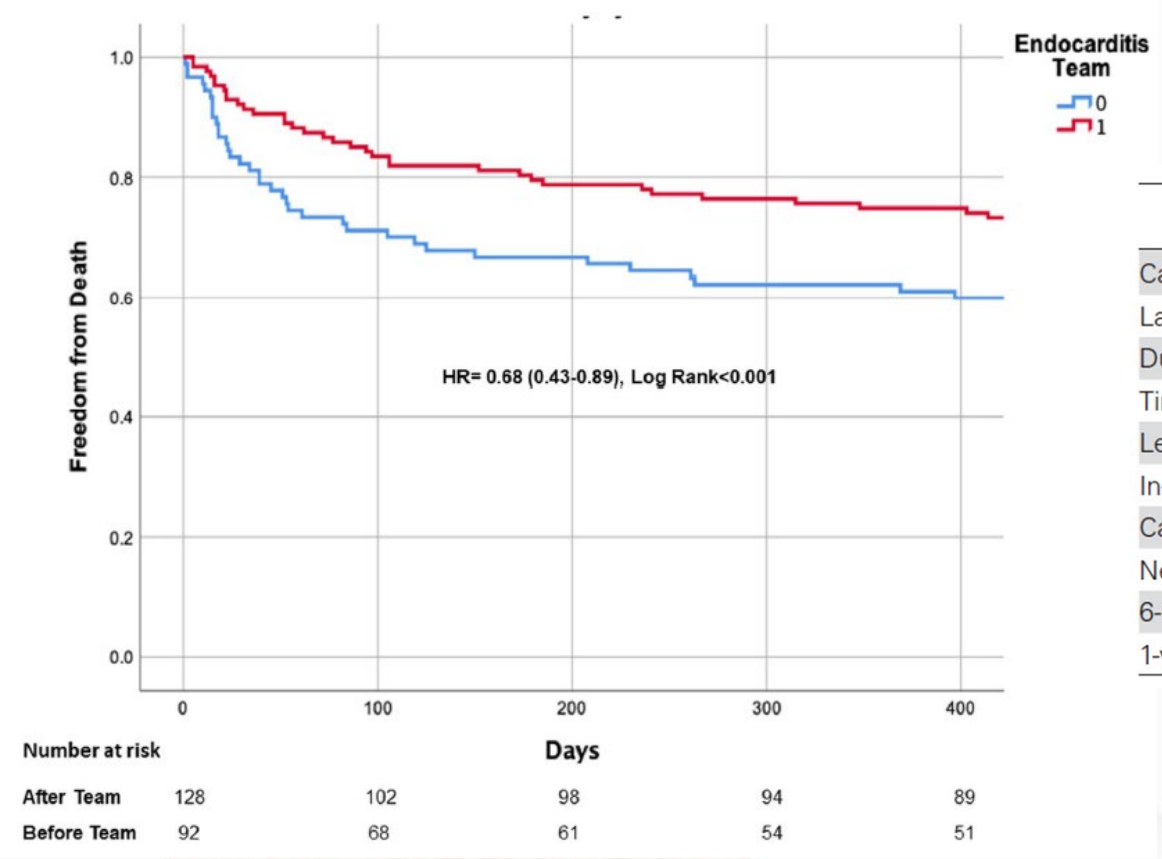
Characteristics of the reference centre

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 .



Cecchi et al J Cardiovasc Med 2019, 20:414–4

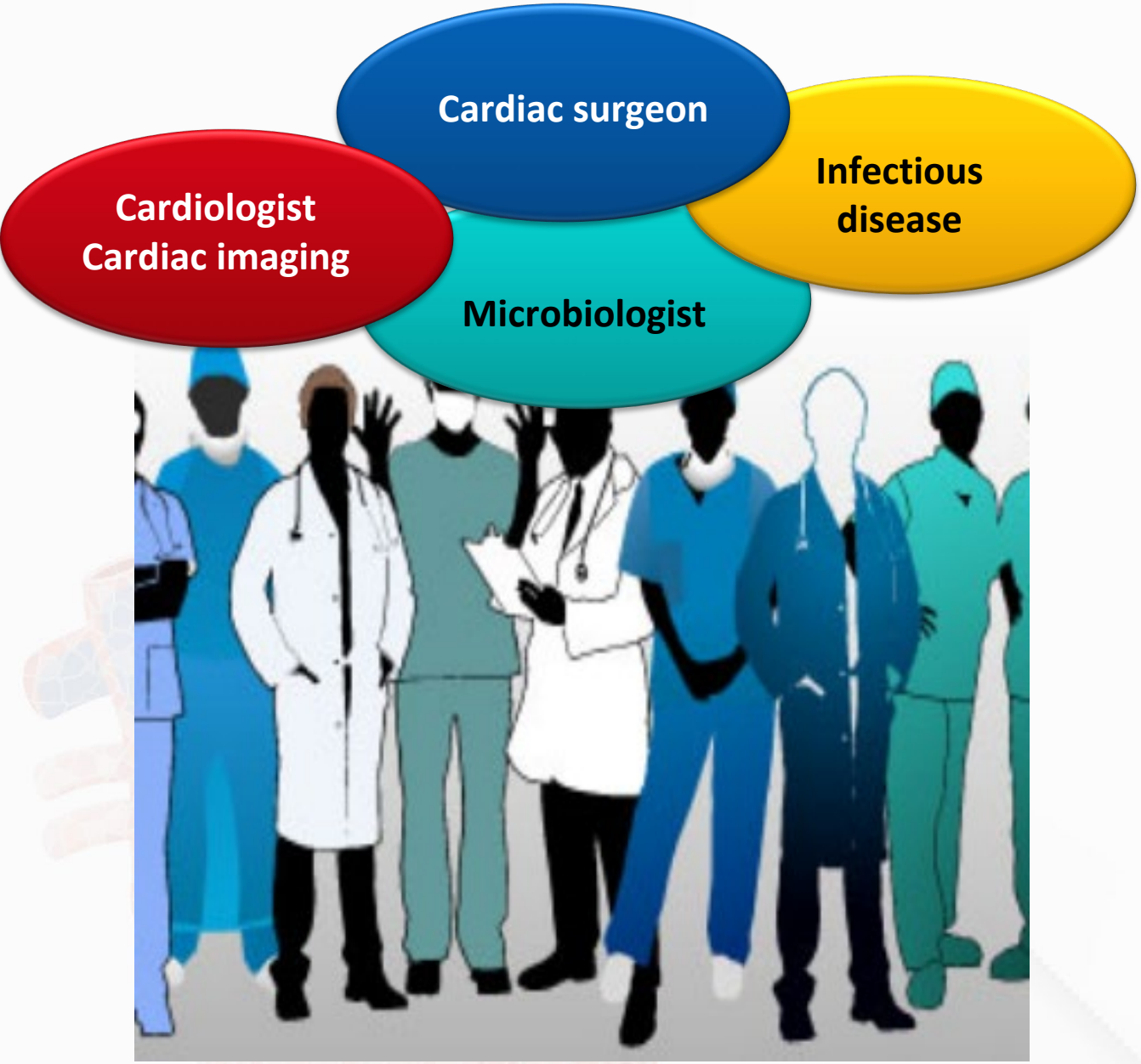
Evidence on the effects of Endocarditis Team



	Pre-ET (n = 316)	Post-ET (n = 75)	*P*	OR (95% CI)
Cardiac surgery	151 (47.8)	34 (45.3)	.70	0.91 (0.53–1.55)
Late surgery	12 (3.8)	2 (2.7)	1	0.69 (0.07–3.22)
Duration of antibiotic therapy, d	55.2 ± 22.5	47.2 ± 11.9	<.001	
Time to surgery, d	16.4 ± 15.0	10.3 ± 7.5	.049	
Length of in-hospital stay, d	40.6 ± 22.0	31.9 ± 19.5	<.01	
In-hospital mortality	64 (20.3)	11 (14.7)	.27	0.68 (0.30–1.39)
Cardiac sequelae[a]	44 (17.7)	6 (9.8)	.14	0.51 (0.17–1.29)
Neurological sequelae[a]	26 (10.4)	2 (3.3)	.09	0.30 (0.03–1.25)
6-mo mortality	67 (21.2)	12 (16.0)	.31	0.71 (0.33–1.42)
1-y mortality	74 (23.4)	12 (16.0)	.16	0.62 (0.29–1.25)

Ruch et al DOI: 10.1093/ofid/ofz308

Elad et al Infection 2021 https://doi.org/10.1007/s15010-021-01636-3

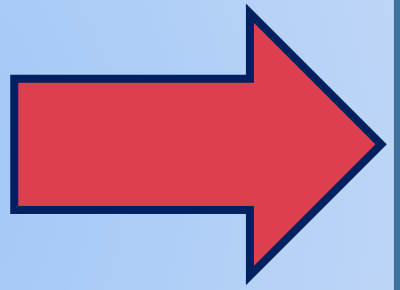


At follow-up:

- Additional specialities involved:
  - Allied professionals:
    - Psychologists
    - Nurses for OPAT
  - Physiotherapists
  - Rehabilitation programs
  - Nutrition

Why is important to set an Endocarditis Team?

- **Goals:**
  - Increase awareness
  - Accurate diagnosis
  - Appropriate treatment:
    - Antibiotic therapy
    - Surgical treatment
  - Follow-up of patients
    - Outpatient parenteral/oral antibiotic therapy
    - Rehabilitation
    - Treatment of comorbidities



Improved prognosis


Thank you!