

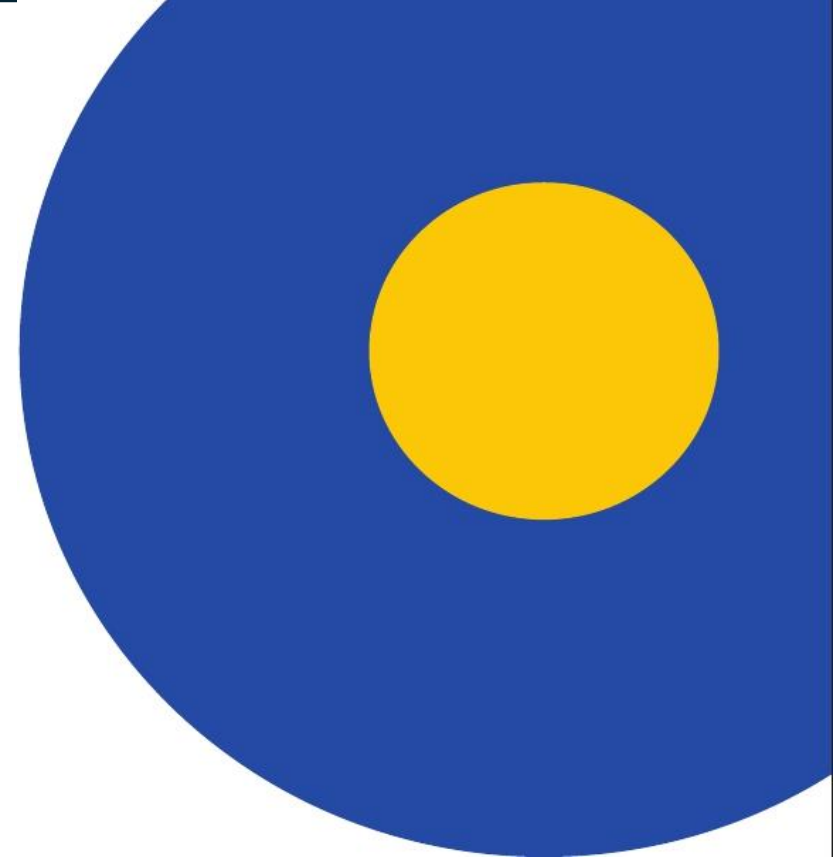
# Heart Failure – Part 2

According to 2023 ESC guidelines

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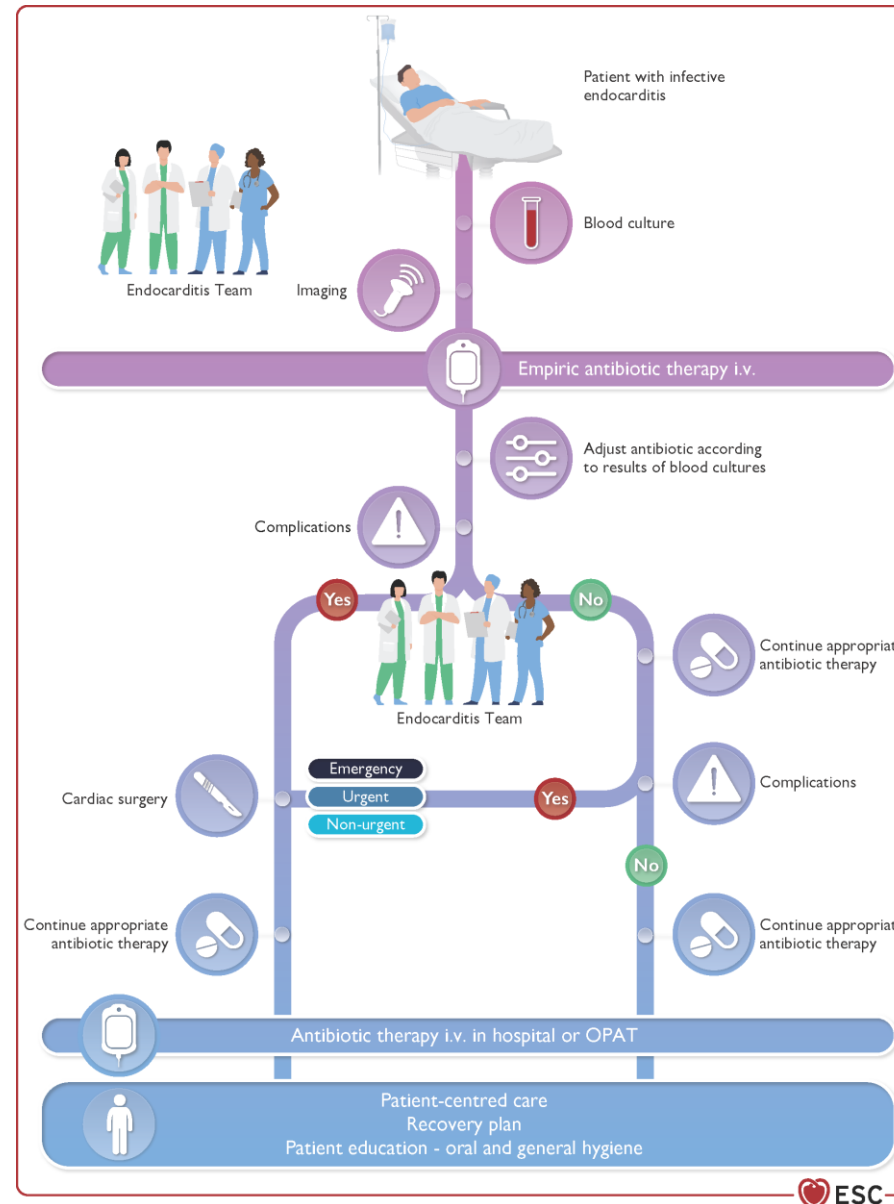
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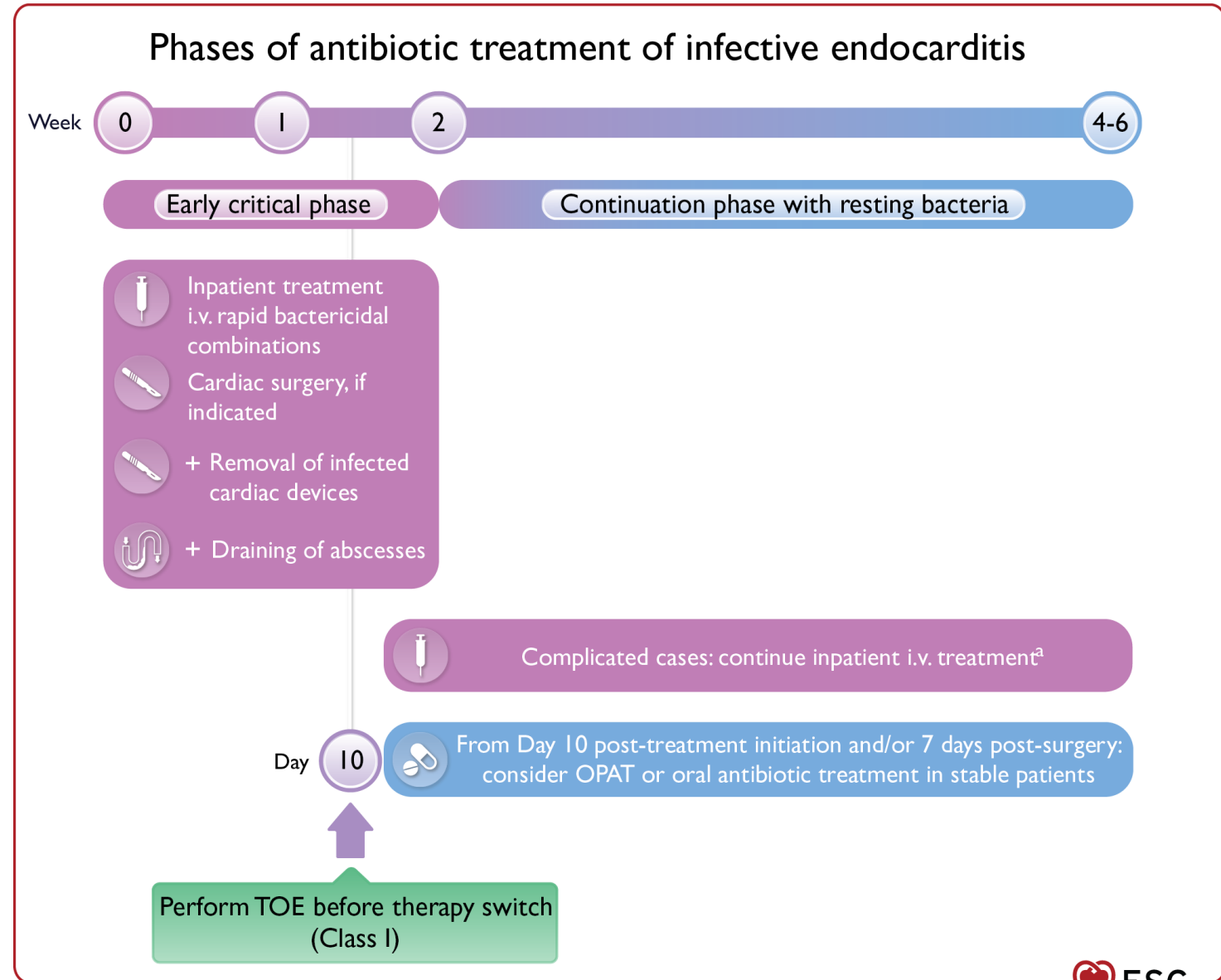
# Figure 1

## Management of patients with infective endocarditis



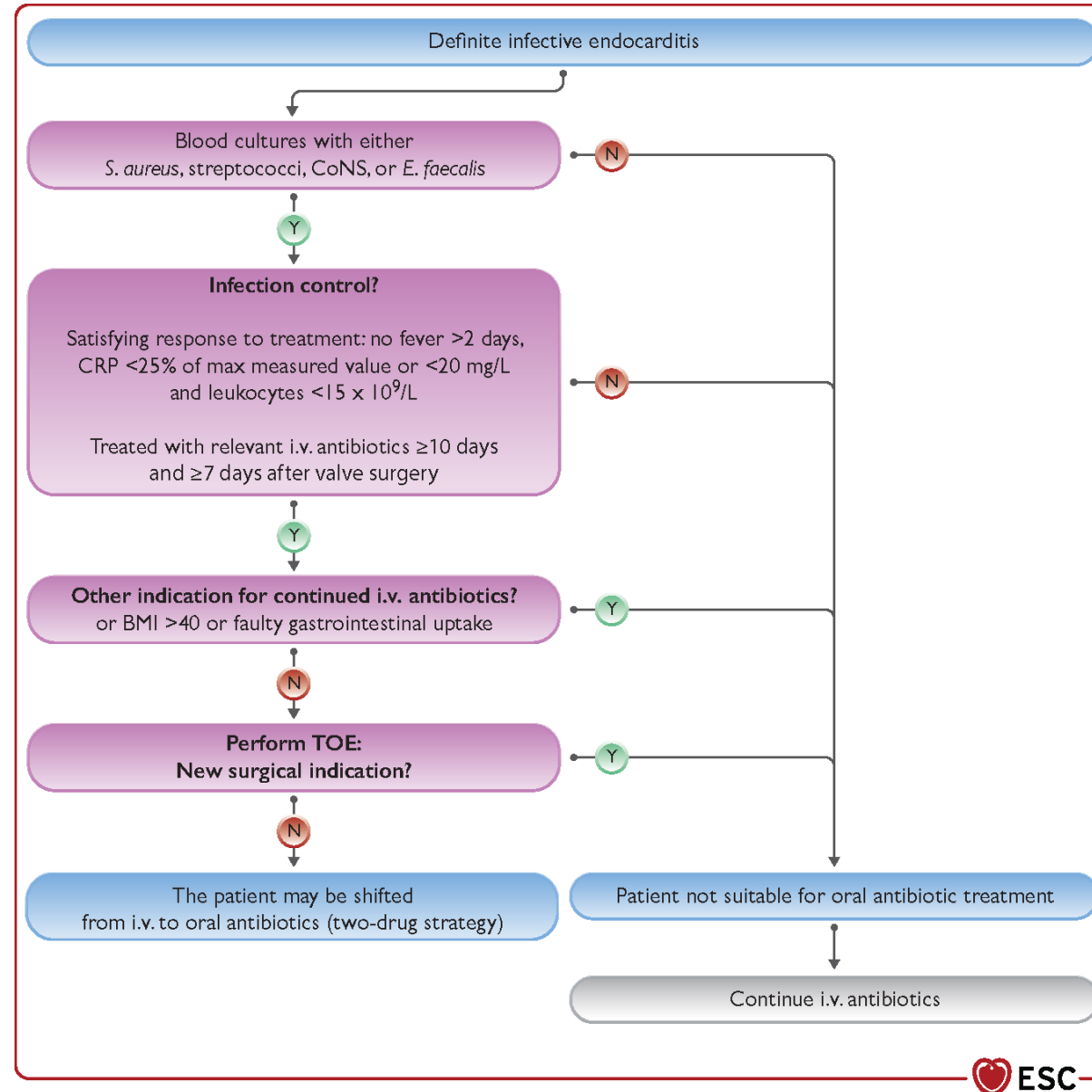
## Figure 8

### Phases of antibiotic treatment for infective endocarditis in relation to outpatient parenteral antibiotic therapy and partial oral endocarditis treatment



## Figure 9

### Flowchart to assess clinical stability based on the Partial Oral Treatment of Endocarditis trial

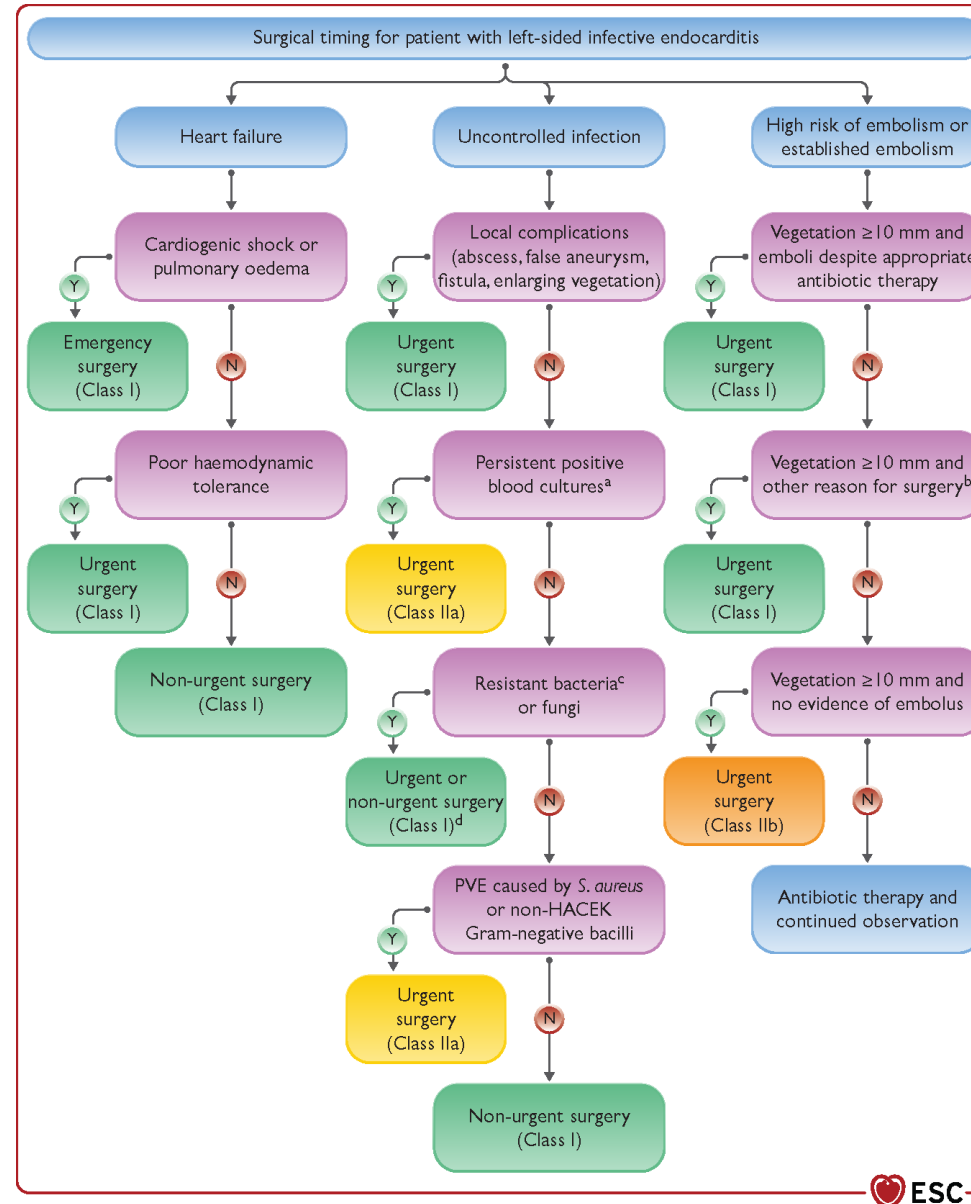


# Recommendations for outpatient antibiotic treatment of infective endocarditis

Recommendations	Class	Level
Outpatient parenteral or oral antibiotic treatment should be considered in patients with left-sided IE caused by <i>Streptococcus</i> spp., <i>E. faecalis</i> , <i>S. aureus</i> , or CoNS who were receiving appropriate i.v. antibiotic treatment for at least 10 days (or at least 7 days after cardiac surgery), are clinically stable, and who do not show signs of abscess formation or valve abnormalities requiring surgery on TOE.	IIa	A
Outpatient parenteral antibiotic treatment is not recommended in patients with IE caused by highly difficult-to-treat microorganisms, liver cirrhosis (Child-Pugh B or C), severe cerebral nervous system emboli, untreated large extracardiac abscesses, heart valve complications, or other severe conditions requiring surgery, severe post-surgical complications, and PWID-related IE.	III	C

# Figure 10

## Proposed surgical timing for infective endocarditis



# Recommendations for the main indications of surgery in infective endocarditis (native valve endocarditis and prosthetic valve endocarditis) (1)

Recommendations	Class	Level
<b><i>(i) Heart failure</i></b>		
Emergency surgery is recommended in aortic or mitral NVE or PVE with severe acute regurgitation, obstruction, or fistula causing refractory pulmonary oedema or cardiogenic shock.	I	B
Urgent surgery is recommended in aortic or mitral NVE or PVE with severe acute regurgitation or obstruction causing symptoms of HF or echocardiographic signs of poor haemodynamic tolerance.	I	B

## Recommendations for the main indications of surgery in infective endocarditis (native valve endocarditis and prosthetic valve endocarditis) (2)

Recommendations	Class	Level
<b><i>(ii) Uncontrolled infection</i></b>		
Urgent surgery is recommended in locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation, prosthetic dehiscence, new AVB).	I	B
Urgent or non-urgent surgery is recommended in IE caused by fungi or multiresistant organisms according to the haemodynamic condition of the patient.	I	C
Urgent surgery should be considered in IE with persistently positive blood cultures >1 week or persistent sepsis despite appropriate antibiotic therapy and adequate control of metastatic foci.	IIa	B
Urgent surgery should be considered in PVE caused by <i>S. aureus</i> or non-HACEK Gram-negative bacteria.	IIa	C



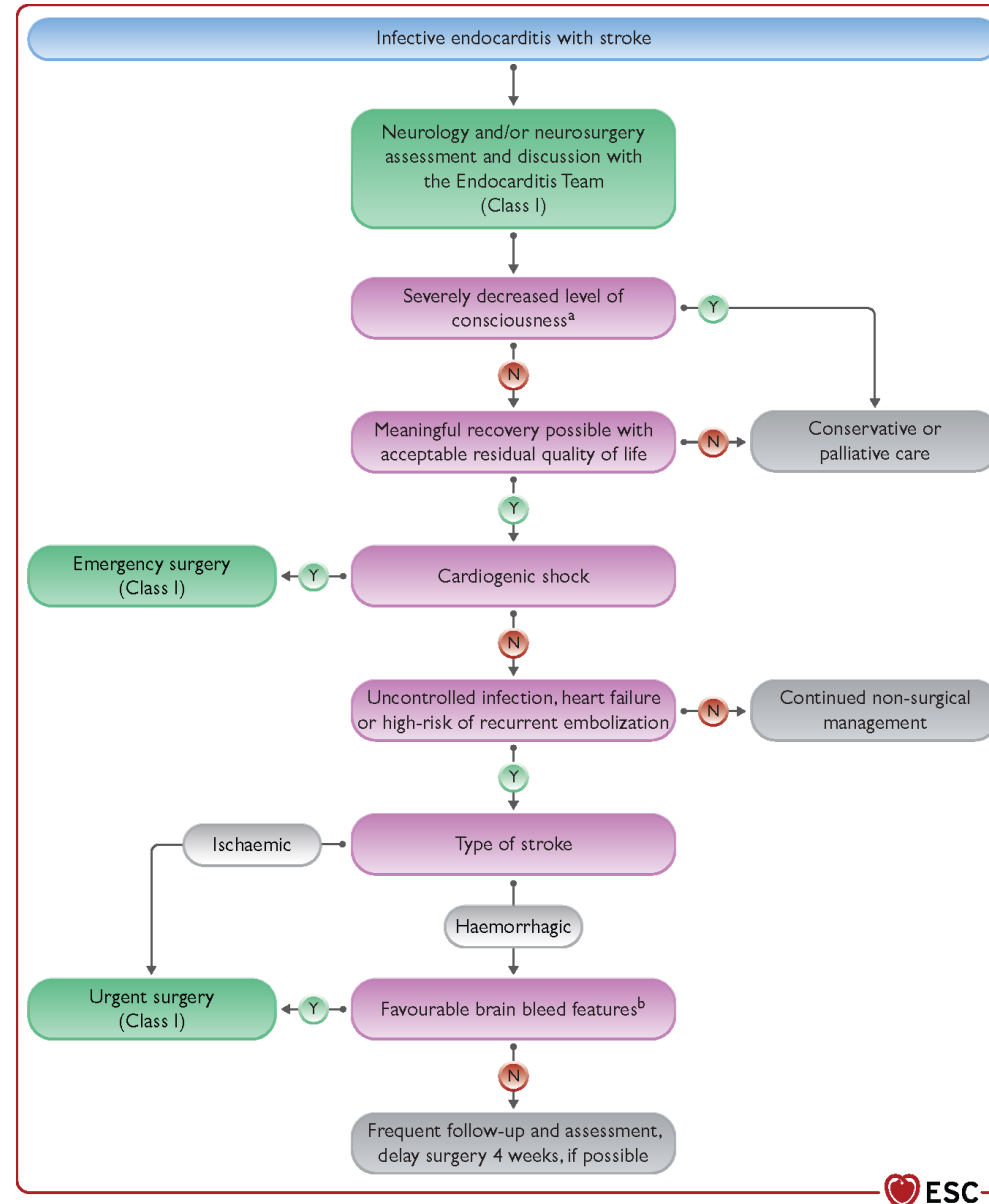
## Recommendations for the main indications of surgery in infective endocarditis (native valve endocarditis and prosthetic valve endocarditis) (3)

Recommendations	Class	Level
<b><i>(iii) Prevention of embolism</i></b>		
Urgent surgery is recommended in aortic or mitral NVE or PVE with persistent vegetations $\geq 10$ mm after one or more embolic episodes despite appropriate antibiotic therapy.	I	B
Urgent surgery is recommended in IE with vegetation $\geq 10$ mm and other indications for surgery.	I	C
Urgent surgery may be considered in aortic or mitral IE with vegetation $\geq 10$ mm and without severe valve dysfunction or without clinical evidence of embolism and low surgical risk.	IIb	B

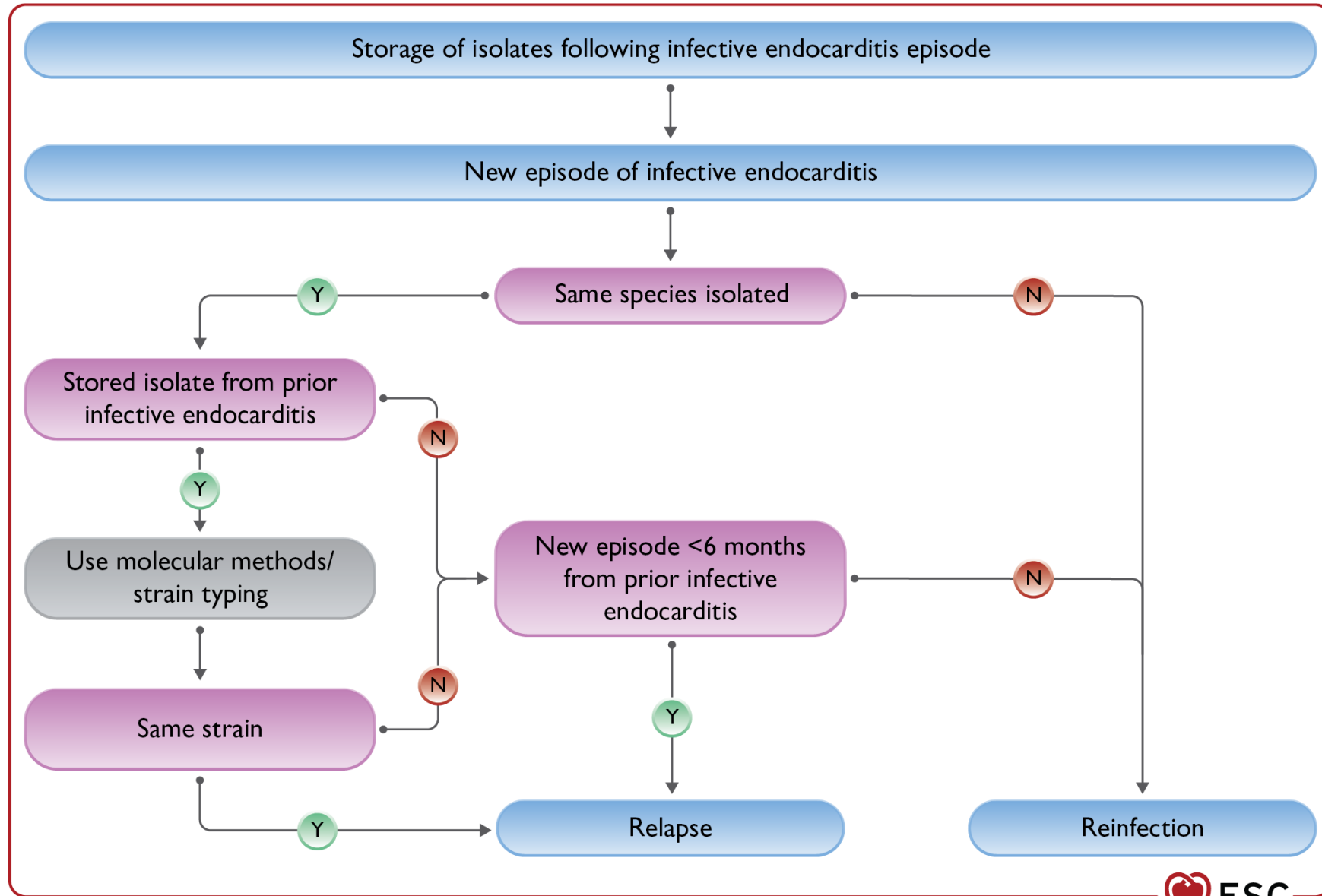
# Recommendations for the treatment of neurological complications of infective endocarditis

Recommendations	Class	Level
Brain CT or MRA is recommended in patients with IE and suspected infective cerebral aneurysms.	I	B
Neurosurgery or endovascular therapy is recommended for large aneurysms, those with continuous growth despite optimal antibiotic therapy, and ruptured intracranial infective cerebral aneurysms.	I	C
If non-invasive techniques are negative and the suspicion of infective aneurysm remains, invasive angiography should be considered.	IIa	B
In embolic stroke, mechanical thrombectomy may be considered if the expertise is available in a timely manner.	IIb	C
Thrombolytic therapy is not recommended in embolic stroke due to IE.	III	C

**Figure 11**  
**Surgery for infective endocarditis following stroke**



**Figure 12**  
**Algorithm**  
**differentiating**  
**relapse from**  
**reinfection**



# Recommendations for post-discharge follow-up

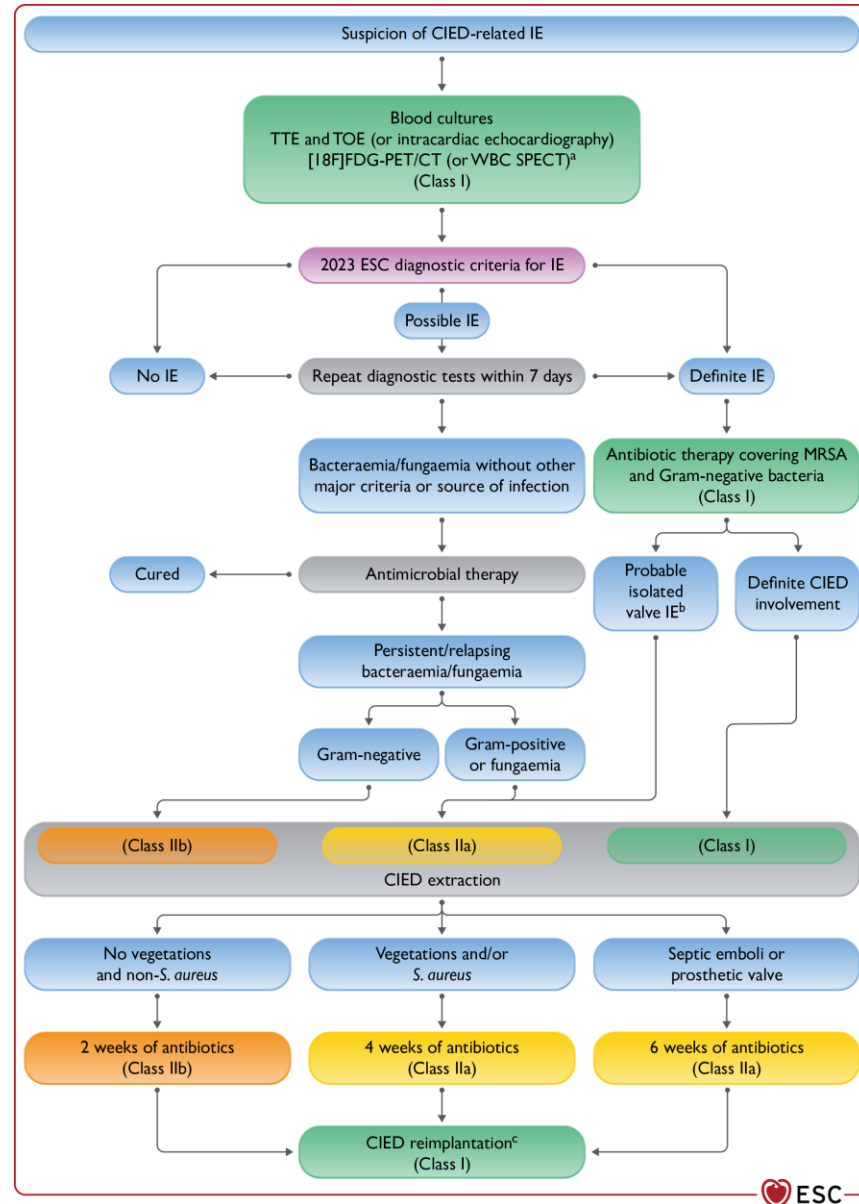
Recommendations	Class	Level
Patient education on the risk of recurrence and preventive measures, with emphasis on dental health, and based on the individual risk profile, is recommended during follow-up.	I	C
Addiction treatment for patients following PWID-related IE is recommended.	I	C
Cardiac rehabilitation including physical exercise training should be considered in clinically stable patients based on an individual assessment.	IIa	C
Psychosocial support may be considered to be integrated in follow-up care, including screening for anxiety and depression, and referral to relevant psychological treatment.	IIb	C

# Recommendations for prosthetic valve endocarditis

Recommendation	Class	Level
Surgery is recommended for early PVE (within 6 months of valve surgery) with new valve replacement and complete debridement.	I	C

# Figure 13

## Management of cardiovascular implanted electronic device-related infective endocarditis



# Recommendations for cardiovascular implanted electronic device-related infective endocarditis (1)

Recommendations	Class	Level
Antibiotic prophylaxis covering <i>S. aureus</i> is recommended for CIED implantation.	I	A
TTE and TOE are both recommended in case of suspected CIED-related IE to identify vegetations.	I	B
Complete system extraction without delay is recommended in patients with definite CIED-related IE under initial empirical antibiotic therapy.	I	B
Obtaining at least three sets of blood cultures is recommended before prompt initiation of empirical antibiotic therapy for CIED infection, covering methicillin-resistant staphylococci and Gram-negative bacteria.	I	C
If CIED reimplantation is indicated after extraction for CIED-related IE, it is recommended to be performed at a site distant from the previous generator, as late as possible, once signs and symptoms of infection have abated and until blood cultures are negative for at least 72 h in the absence of vegetations, and negative for at least 2 weeks if vegetations were visualized.	I	C



# Recommendations for cardiovascular implanted electronic device-related infective endocarditis (2)

Recommendations (continued)	Class	Level
Complete CIED extraction should be considered in case of valvular IE, even without definite lead involvement, taking into account the identified pathogen and requirement for valve surgery.	<b>IIa</b>	<b>C</b>
In cases of possible CIED-related IE with occult Gram-positive bacteraemia or fungaemia, complete system removal should be considered in case bacteraemia/fungaemia persists after a course of antimicrobial therapy.	<b>IIa</b>	<b>C</b>
Extension of antibiotic treatment of CIED-related endocarditis to (4–6) weeks following device extraction should be considered in the presence of septic emboli or prosthetic valves.	<b>IIa</b>	<b>C</b>
Use of an antibiotic envelope may be considered in select high-risk patients undergoing CIED reimplantation to reduce risk of infection.	<b>IIb</b>	<b>B</b>

# Recommendations for cardiovascular implanted electronic device-related infective endocarditis (3)

Recommendations (continued)	Class	Level
In cases of possible CIED-related IE with occult Gram-negative bacteraemia, complete system removal may be considered in case of persistent/relapsing bacteraemia after a course of antimicrobial therapy.	<b>IIb</b>	<b>C</b>
In non- <i>S. aureus</i> CIED-related endocarditis without valve involvement or lead vegetations, and if follow-up blood cultures are negative without septic emboli, 2 weeks of antibiotic treatment may be considered following device extraction.	<b>IIb</b>	<b>C</b>
Removal of CIED after a single positive blood culture, with no other clinical evidence of infection, is not recommended.	<b>III</b>	<b>C</b>

# Recommendations for the surgical treatment of right-sided infective endocarditis (1)

Recommendations	Class	Level
Surgery is recommended in patients with right-sided IE who are receiving appropriate antibiotic therapy for the following scenarios:		
Right ventricular dysfunction secondary to acute severe tricuspid regurgitation non-responsive to diuretics.	I	B
Persistent vegetation with respiratory insufficiency requiring ventilatory support after recurrent pulmonary emboli.	I	B
Large residual tricuspid vegetations (>20 mm) after recurrent septic pulmonary emboli.	I	C
Patients with simultaneous involvement of left-heart structures.	I	C

# Recommendations for the surgical treatment of right-sided infective endocarditis (2)

Recommendations (continued)	Class	Level
Surgery is recommended in patients with right-sided IE who are receiving appropriate antibiotic therapy for the following scenarios: (continued)		
Tricuspid valve repair should be considered instead of valve replacement, when possible.	<b>Ila</b>	<b>B</b>
Surgery should be considered in patients with right-sided IE who are receiving appropriate antibiotic therapy and present persistent bacteraemia/sepsis after at least 1 week of appropriate antibiotic therapy.	<b>Ila</b>	<b>C</b>
Prophylactic placement of an epicardial pacing lead should be considered at the time of tricuspid valve surgical procedures.	<b>Ila</b>	<b>C</b>
Debulking of right intra-atrial septic masses by aspiration may be considered in selected patients who are high risk for surgery.	<b>IIb</b>	<b>C</b>

# Recommendations for the use of antithrombotic therapy in infective endocarditis

Recommendations	Class	Level
Interruption of antiplatelet or anticoagulant therapy is recommended in the presence of major bleeding (including intracranial haemorrhage).	I	C
In patients with intracranial haemorrhage and a mechanical valve, reinitiating unfractionated heparin should be considered as soon as possible following multidisciplinary discussion.	IIa	C
In the absence of stroke, replacement of oral anticoagulant therapy by unfractionated heparin under close monitoring should be considered in cases where indication for surgery is likely (eg. <i>S. aureus</i> IE).	IIa	C
Thrombolytic therapy is not recommended in patients with IE.	III	C

## Figure 14

### Concept of patient-centred care in infective endocarditis

