

# Addendum bij de 2022 ESC guidelines on non-cardiac surgery



NEDERLANDSE VRENINGING VOOR CARDIOLOGIE & NEDERLANDSE VERENIGING VOOR ANESTHESIOLOGIE

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# ADDENDUM BIJ DE 2022 ESC GUIDELINES ON NON-CARDIAC SURGERY

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# Inleiding

Dit ESC addendum behoort bij de 2022 ESC guidelines non cardiac surgery. Met het opstellen van dit addendum is deze ESC richtlijn door NVVC en de NVA gecontroleerd voor de Nederlandse praktijk.

In dit document worden de aanbevelingen uit de ESC richtlijn beschreven die niet overgenomen kunnen worden voor de Nederlandse praktijk. De overige aanbevelingen in de ESC guidelines, die niet hieronder benoemd worden, zijn toepasbaar in de Nederlandse praktijk en worden door de NVA en NVVC onderschreven.

Voor het controleren van de ESC richtlijn voor de Nederlandse praktijk is de verkorte endorsement procedure gevolgd. Deze is te vinden op de [NVVC website](#).

Op verzoek van de Commissie Kwaliteit van de NVVC en de NVA hebben de onderstaande leden zich verdiept in de ESC Richtlijn: Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery 2022. Omdat er voor deze richtlijn geen werkgroep bestaat door wie deze richtlijn zou worden beoordeeld hebben cardiologen uit verschillende soorten klinieken zich hierin verdiept. De insteek is geweest om de onderbouwing van de verschillende aanbevelingen kritisch te bekijken, de praktische toepasbaarheid en de gevolgen voor de cardiologische en anesthesiologische praktijkvoering te beoordelen. De eerste opvallende bevinding was dat veel aanbevelingen een Class I, Level of evidence C classificatie hebben gekregen. Dit terwijl er meestal geen wetenschappelijke onderbouwing is in de vorm van gerandomiseerd onderzoek met uitkomsten die zo'n stellig advies onderbouwen; tevens voldoet de wetenschappelijke methodologie niet aan de eisen van de European Society of Anaesthesiology and Intensive Care. Tevens zagen wij dat strikte naleving van de adviezen kan leiden tot een enorme toename van cardiologisch consulten en laboratorium bepalingen zonder dat duidelijk is welke vraag moet worden beantwoord en hoe dit consult kan leiden tot verlaging van het cardiale risico tijdens en na de operatie. Daarnaast zijn de aanbevelingen waar vigerende Nederlandse richtlijnen bestaan verwijderd en wordt hier verwezen naar de richtlijndatabase en/of richtlijnen van andere Europese verenigingen.

De NVA heeft de aanbevelingen voor perioperatieve monitoring en anesthesie (tabel 33) kritisch bekeken en aangepast waar nodig. In meerdere sessies hebben wij ons verdiept in de aanbevelingen en stellen aanpassingen voor waarvan wij denken dat die recht doen aan de beschikbare kennis op dit gebied en passend en uitvoerbaar zijn in alle klinieken in Nederland.

## Auteurs NVVC:

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## Aanbevelingen aangepast voor de Nederlandse situatie

Tabel 1 ESC guidelines (Geen aanpassingen, compleet over genomen uit ESC guidelines)

Recommendations for selection of surgical approach and impact on risk	Class	Level
Endovascular or video-assisted procedures should be considered for patients with high CV risk undergoing vascular or pulmonary surgery.	IIb	B

Tabel 2 ESC guidelines (Geen aanpassingen)

Recommendations for all patients scheduled for non-cardiac surgery	Class	Level
In all patients scheduled for NCS, an accurate history and clinical examination are recommended.	I	C
It is recommended to perform a pre-operative risk assessment, ideally at the same time as the NCS is proposed.	I	B
If time allows, it is recommended to optimize guideline-recommended treatment of CVD and CV risk factors before NCS	I	C

Tabel 3 Aangepast aan de Nederlandse praktijk

Recommendations for patients ages 65 years without signs, symptoms or history of cardiovascular disease	Class	Level
In patients with a first-degree family history of genetic cardiomyopathy and an abnormal ECG, it is recommended to perform an ECG and TTE before high-risk NCS, regardless of age and symptoms	IIa	C
In patients aged 45–65 years without signs, symptoms, or history of CVD, ECG and biomarkers may be considered before high-risk NCS	IIb	C

Tabel 4 Aangepast aan de Nederlandse praktijk

Recommendations for pre-operative assessment in patients with previously unknown murmur, angina, dyspnoea, or peripheral oedema	Class	Level
In patients with a newly detected murmur and symptoms or signs of CVD, TTE should be considered before intermediate and high risk NCS.	IIa	C
In patients with a newly detected murmur suggesting clinically significant pathology, TTE is recommended before high-risk NCS.	I	C
In patients with a newly detected murmur, but without other signs or symptoms of CVD, TTE may be considered before high-risk NCS.	IIb	C
If a patient scheduled for elective NCS has chest pain or other symptoms suggestive of undetected CAD, further diagnostic work-up before NCS is recommended.	I	C
If a patient in need of acute NCS also has chest pain or other symptoms suggestive of undetected CAD, a multidisciplinary assessment approach is recommended to choose the treatment with lowest total risk for the patient.	I	C
In patients with dyspnoea and/or peripheral oedema, an ECG and an NT-proBNP/BNP test is indicated before NCS, unless there is a certain non-cardiac explanation.	I	C
In patients with dyspnoea and/or peripheral oedema and elevated NT-proBNP/BNP, TTE is recommended before NCS.	I	C

Tabel 5 ESC guidelines (Geen aanpassingen)

Recommendations for patient information	Class	Level
It is recommended to give patients individualized instructions for pre-operative and post-operative changes in medication, in verbal and written formats with clear and concise directions.	I	C

It should be considered to set up a structured information list (e.g. a check list to help with common issues) for patients with CVD or at high risk of CV complications scheduled for NCS.	<b>Ila</b>	<b>C</b>
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Tabel 6 ESC guidelines (Geen aanpassingen)

<b>Recommendations for pre-operative assessment of frailty and functional capacity</b>	<b>Class</b>	<b>Level</b>
In patients aged $\geq 70$ years and scheduled to undergo intermediate- or high-risk NCS, frailty screening should be considered using a validated screening tool.	<b>Ila</b>	<b>B</b>
Adjusting risk assessments according to self-reported ability to climb two flights of stairs should be considered in patients referred for intermediate- or high-risk NCS.	<b>Ila</b>	<b>B</b>

Tabel 7 Aangepast aan de Nederlandse praktijk

<b>7.1 Recommendations for pre-operative risk assessment—electrocardiography</b>	<b>Class</b>	<b>Level</b>
In patients who have known CVD or CV risk factors (including age $\geq 65$ years), or symptoms or signs suggestive of CVD it is recommended to obtain a pre-operative 12-lead ECG before intermediate- and high-risk NCS.	<b>I</b>	<b>C</b>
In low-risk patients undergoing low- and intermediate-risk NCS, it is not recommended to routinely obtain pre-operative ECG.	<b>III</b>	<b>B</b>
<b>7.2 Recommendations for pre-operative risk assessment— preoperative (stand-alone) cardiac troponins</b>	<b>Class</b>	<b>Level</b>
Routine measurement of preoperative cardiac troponins may be used to help evaluate the risk of some adverse outcomes prior to non-cardiac surgery	<b>Ilb</b>	<b>C</b>
The routine addition of preoperative cardiac troponins to clinical risk scores for the prediction of postoperative events should is not recommend outside the context of clinical research	<b>III</b>	<b>C</b>
The use of preoperative cardiac troponin-enhanced management to improve outcomes is not recommend outside the context of clinical research	<b>3</b>	<b>C</b>
<b>7.3 Recommendations for peri-operative risk assessment— combined pre- and postoperative cardiac troponins</b>	<b>Class</b>	<b>Level</b>
Routine and combined measurement of pre- and postoperative cardiac troponins may be used to help evaluate the risk of some adverse outcomes after non-cardiac sur	<b>Ilb</b>	<b>B</b>
Routine combined pre- and postoperative measurement of cardiac troponins in addition to clinical risk scores may be considered for the prediction of some postoperative events.	<b>Ilb</b>	<b>C</b>
Use of preoperative cardiac troponin-enhanced management to improve outcomes is not recommended outside the context of clinical research	<b>3</b>	<b>C</b>
Combined pre- and postoperative cardiac troponin-enhanced management may be implemented in non-cardiac surgery patients to improve outcome in a clinical research framework	<b>Ilb</b>	<b>C</b>
<b>7.4 Recommendations for peri-operative risk assessment—postoperative cardiac troponins</b>	<b>Class</b>	<b>Level</b>
Routine measurement postoperative cardiac troponins may be used to evaluate the risk of adverse outcomes after non-cardiac surgery. The higher the concentration, the higher the risk of 30-day mortality	<b>Ilb</b>	<b>B</b>
Routine measurement of postoperative cardiac troponins may be used for the prediction of some postoperative outcomes, in particular 30-day all-cause mortality	<b>Ilb</b>	<b>C</b>
Routine measurement of postoperative cardiac troponins within a biomarker-enhanced management program to improve outcome is not recommended outside the context of clinical research	<b>III</b>	<b>C</b>
<b>7.5 Recommendations for pre-operative risk assessment— preoperative (stand-alone) B-type natriuretic peptides</b>	<b>Class</b>	<b>Level</b>
Routine measurement of preoperative B-type natriuretic peptides may be used to help evaluate the risk of some adverse outcomes in non-cardiac surgery	<b>IIB</b>	<b>B</b>

Addition of preoperative B-type natriuretic peptides to clinical risk scores might be used to improve the prediction of some postoperative events, in particular 30-day major adverse cardiac event	<b>IIb</b>	<b>C</b>
Use of preoperative BNP/NT-proBNP-enhanced management to improve outcomes is not recommended outside the context of clinical research.	<b>III</b>	<b>C</b>
<b>7.6 Recommendations for peri-operative risk assessment—postoperative B-type natriuretic peptides</b>	<b>Class</b>	<b>Level</b>
Routine measurement of postoperative BNP / NT-proBNP to help evaluate the risk of adverse outcomes is not recommended outside the context of clinical research.	<b>III</b>	<b>C</b>
The routine addition of BNP / NT-proBNP to clinical risk scores to improve the prediction of postoperative events is not recommended outside the context of clinical research..	<b>III</b>	<b>C</b>
The use of postoperative BNP / NT-proBNP-enhanced management to improve outcomes is not recommended outside the context of clinical research..	<b>III</b>	<b>C</b>

Tabel 8 Aangepast aan de Nederlandse praktijk

<b>Recommendations for transthoracic echocardiography</b>	<b>Class</b>	<b>Level</b>
TTE should be considered in patients with poor functional capacity and/or high NT-proBNP/BNP, or if murmurs are detected before high-risk NCS, in order to undertake risk-reduction strategies.	<b>IIa</b>	<b>B</b>
TTE should be considered in patients with suspected new CVD or unexplained signs or symptoms before high-risk NCS	<b>IIa</b>	<b>B</b>
TTE may be considered in patients with poor functional capacity, abnormal ECG, high NT-proBNP/BNP and $\geq 1$ clinical risk factor before intermediate-risk NCS.	<b>IIb</b>	<b>B</b>
To avoid delaying surgery, a FOCUS exam performed by trained specialists may be considered as an alternative to TTE for pre-operative triage.	<b>IIb</b>	<b>B</b>
Routine pre-operative evaluation of LV function is not recommended	<b>III</b>	<b>C</b>

Tabel 9 Aangepast aan de Nederlandse praktijk

<b>Recommendations for stress imaging</b>	<b>Class</b>	<b>Level</b>
Stress imaging may be considered before high-risk elective NCS in patients with poor functional capacity AND high likelihood of CAD or high clinical risk or known CAD.	<b>IIb</b>	<b>B</b>
Stress imaging is not recommended before high-risk NCS in asymptomatic patients with poor functional capacity and previous PCI or CABG	<b>III</b>	<b>C</b>
Stress imaging may be considered before intermediate-risk NCS when ischaemia is of concern in patients with clinical risk factors and poor functional capacity	<b>IIb</b>	<b>B</b>
Stress imaging is not recommended routinely before NCS	<b>III</b>	<b>C</b>

Tabel 10 Aangepast aan de Nederlandse praktijk

<b>Recommendations for coronary angiography</b>	<b>Class</b>	<b>Level</b>
It is recommended to use the same indications for ICA and revascularization pre-operatively as in the non-surgical setting	<b>I</b>	<b>C</b>
CCTA may be considered to rule out CAD in patients with suspected CCS or biomarker-negative NSTEMI-ACS in case of low-to-intermediate clinical likelihood of CAD, or in patients unsuitable for non-invasive functional testing undergoing non-urgent, intermediate-, and high-risk NCS.	<b>IIb</b>	<b>C</b>
Pre-operative ICA may be considered in stable CCS patients undergoing elective surgical CEA	<b>IIb</b>	<b>B</b>
Routine pre-operative ICA is not recommended in stable CCS patients undergoing low- or intermediate-risk NCS	<b>III</b>	<b>C</b>

Tabel 11 ESC guidelines (Geen aanpassingen)

Recommendations for lifestyle and cardiovascular risk factors	Class	Level
Smoking cessation .4 weeks before NCS is recommended to reduce post-operative complications and mortality.	I	B
Control of CV risk factors—including blood pressure, dyslipidaemia, and diabetes—is recommended before NCS.	I	B

Tabel 12 ESC guidelines (Geen aanpassingen)

Recommendations for pharmacological treatment	Class	Level
In patients with an indication for statins, it should be considered to initiate statins peri-operatively.	IIa	C
Pre-operative initiation of beta-blockers in advance of high-risk NCS may be considered in patients who have two or more clinical risk factors in order to reduce the incidence of peri-operative myocardial infarction.	IIb	A
Pre-operative initiation of beta-blocker in advance of NCS may be considered in patients who have known CAD or myocardial ischaemia	IIb	B
Routine initiation of beta-blocker peri-operatively is not recommended.	III	A
Peri-operative continuation of beta-blockers is recommended in patients currently receiving this medication.	I	B
In patients already on statins, it is recommended to continue statins during the peri-operative period.	I	B
In patients with stable HF, peri-operative continuation of RAAS inhibitors may be considered.	IIb	C
In patients without HF, withholding RAAS inhibitors on the day of NCS should be considered to prevent peri-operative hypotension	IIa	B
For patients on diuretics to treat hypertension, transient discontinuation of diuretics on the day of NCS should be considered.	IIa	B
It should be considered to interrupt SGLT-2 inhibitor therapy for at least 3 days (i.e. 2 days pre-procedure, and the day of procedure) before intermediate- and high-risk NCS.	IIa	C

Tabel 13 ESC guidelines (Geen aanpassingen)

Recommendations for use of antiplatelet therapy in patients undergoing noncardiac surgery	Class	Level
It is recommended to delay elective NCS until 6 months after elective PCI and 12 months after an ACS.	I	A
After elective PCI, it is recommended to delay time-sensitive NCS until a minimum of 1 month of DAPT treatment has been given.	I	B
In patients with a recent PCI scheduled for NCS, it is recommended that management of antiplatelet therapy is discussed between the surgeon, anaesthesiologist, and cardiologist.	I	C
In high-risk patients with a recent PCI (e.g. STEMI patients or high-risk NSTEMI-ACS patients), a DAPT duration of at least 3 months should be considered before time-sensitive NCS.	IIa	C
In patients with a previous PCI, it is recommended to continue aspirin peri-operatively if the bleeding risk allows.	I	B
If interruption of P2Y12 inhibitor is indicated, it is recommended to withhold ticagrelor for 3–5 days, clopidogrel for 5 days, and prasugrel for 7 days prior to NCS.	I	B
In For patients undergoing high bleeding risk surgery (e.g. intracranial, spinal neurosurgery, or vitreoretinal eye surgery), it is recommended to interrupt aspirin for at least 7 days pre-operatively	I	C

In patients without a history of PCI, interruption of aspirin at least 3 days before NCS may be considered if the bleeding risk outweighs the ischaemic risk, to reduce the risk of bleeding.	<b>IIb</b>	<b>B</b>
If antiplatelet therapy has been interrupted before a surgical procedure, it is recommended to restart therapy as soon as possible (within 48 h) post-surgery, according to interdisciplinary risk assessment.	<b>I</b>	<b>C</b>

Tabel 14 Aangepast aan Nederlandse praktijk

Recommendations for interruption and resumption of anticoagulants in patients undergoing non-cardiac surgery	Class	Level
Volg richtlijndatabase Antitrombotisch beleid		

Tabel 15 Aangepast aan Nederlandse praktijk

Recommendations for thromboprophylaxis	Class	Level
Volg richtlijndatabase Antitrombotisch beleid		

Tabel 16 ESC guidelines (Geen aanpassingen)

Recommendations for intra- and post-operative complications associated with anaemia	Class	Level
It is recommended to measure haemoglobin pre-operatively in patients scheduled for intermediate- to high-risk NCS.	<b>I</b>	<b>B</b>
It is recommended to treat anaemia in advance of NCS, in order to reduce the need for RBC transfusion during NCS.	<b>I</b>	<b>A</b>
The use of an algorithm to diagnose and treat anaemic patients before NCS should be considered.	<b>IIa</b>	<b>C</b>

Tabel 17 Aangepast aan Nederlandse praktijk

Recommendations for intra- and post-operative complications associated with blood loss	Class	Level
In patients undergoing surgery with expected blood loss of $\geq 500$ mL, use of washed cell salvage should be considered in patients. When the use of cell salvage is proposed in surgery for malignancy or infection, an explanation should be given to the patient of the potential risks and benefits	<b>IIa</b>	<b>A</b>
It is recommended to use point-of-care diagnostics for guidance of blood component therapy, when available.	<b>I</b>	<b>A</b>
Volg richtlijn Bloedtransfusiebeleid, module Medicamenteuze methoden om perioperatief bloedverlies te verminderen		
Use of closed-loop arterial blood sampling systems should be considered to avoid blood loss.	<b>IIa</b>	<b>B</b>
Application of meticulous haemostasis should be considered a routine procedure.	<b>IIa</b>	<b>B</b>

Tabel 18 ESC guidelines (Geen aanpassingen)

Recommendations for intra- and post-operative complications associated with allogeneic blood transfusion	Class	Level
A feedback/monitoring programme or clinical decision support system should be considered to be assessed before blood transfusion.	<b>IIa</b>	<b>B</b>
Before allogeneic blood transfusion, it should be considered to obtain an extensive consent about risks associated with transfusion.	<b>IIa</b>	<b>C</b>



Tabel 19 ESC guidelines (Geen aanpassingen)

<b>Recommendations for the timing of non-cardiac surgery and revascularization in patients with known coronary artery disease</b>	<b>Class</b>	<b>Level</b>
If PCI is indicated before NCS, the use of new-generation DES is recommended over BMS and balloon angioplasty	<b>I</b>	<b>A</b>
Pre-operative evaluation of patients with an indication for PCI by an expert team (surgeon and cardiologist) should be considered before elective NCS.	<b>Ila</b>	<b>C</b>
Myocardial revascularization before high-risk elective NCS may be considered, depending on the amount of ischaemic myocardium, refractory symptoms, and findings at coronary angiography (as in the case of left main disease).	<b>Ilb</b>	<b>B</b>
Routine myocardial revascularization before low and intermediate-risk NCS in patients with CCS is not recommended.	<b>III</b>	<b>B</b>
If NCS can safely be postponed (e.g. at least 3 months), it is recommended that patients with ACS being scheduled for NCS undergo diagnostic and therapeutic interventions as recommended for ACS patients in general.	<b>I</b>	<b>A</b>
In the unlikely combination of a life-threatening clinical condition requiring urgent NCS, and NSTEMI-ACS with an indication for revascularization, the priorities for surgery on a case-by-case basis should be considered by the expert team	<b>Ila</b>	<b>C</b>

Tabel 20 Aangepast aan de Nederlandse situatie

<b>Recommendations for management of heart failure in patients undergoing non-cardiac surgery</b>	<b>Class</b>	<b>Level</b>
In patients with known HF scheduled for high-risk NCS, it is recommended to assess clinical status and NT-proBNP/BNP levels.	<b>I</b>	<b>B</b>
In patients with known HF scheduled for high-risk NCS with a change in clinical status a new echocardiography should be considered.	<b>Ila</b>	<b>B</b>
It is recommended that patients with HF undergoing NCS receive optimal medical treatment according to current ESC guidelines.	<b>I</b>	<b>A</b>
In patients with HF undergoing NCS, it is recommended to regularly assess volume status and signs of organ perfusion	<b>I</b>	<b>C</b>
A multidisciplinary team including VAD specialists is recommended for peri-operative management of patients with HF receiving mechanical circulatory support	<b>I</b>	<b>C</b>

Tabel 21 Aangepast aan de Nederlandse situatie

<b>Recommendations for management of valvular heart disease in patients undergoing non-cardiac surgery</b>	<b>Class</b>	<b>Level</b>
Clinical and echocardiographic evaluation (if not recently performed) should be considered in all patients with known or suspected VHD who are scheduled for elective high-risk NCS.	<b>Ila</b>	<b>C</b>
AVR (SAVR or TAVI) is recommended in symptomatic patients with severe AS who are scheduled for elective intermediate- or high-risk NCS.	<b>I</b>	<b>C</b>
In asymptomatic patients with severe AS who are scheduled for elective high-risk NCS, AVR (SAVR or TAVI) should be considered after Heart Team discussion	<b>Ila</b>	<b>C</b>
In patients with severe symptomatic AS in need of time-sensitive NCS or in whom the TAVI and SAVR are unfeasible, BAV may be considered before NCS as a bridge to definitive aortic valve repair.	<b>Ilb</b>	<b>C</b>
In patients with symptomatic severe AR or asymptomatic severe AR and LVESD $\geq 50$ mm or LVESD (LVESD/BSA) $\geq 25$ mm/m <sup>2</sup> (in patients with small body size) or resting LVEF $\leq 50\%$ , valve surgery ) should be considered prior to elective intermediate- or high-risk NCS	<b>Ila</b>	<b>C</b>

In patients with moderate-to-severe rheumatic MS and symptoms or SPAP $\geq 50$ mmHg, valve intervention (PMC or surgery) should be considered before elective intermediate- or high-risk NCS.	<b>IIa</b>	<b>C</b>
In patients with symptomatic severe primary MR or asymptomatic severe primary MR with LV dysfunction (LVESD $\geq 40$ mm and/or LVEF $\leq 60\%$ ), valve intervention (surgical or transcatheter) should be considered prior to intermediate- or high-risk NCS, if time allows.	<b>IIa</b>	<b>C</b>
In patients with severe secondary MR who remain symptomatic despite guideline-directed medical therapy (including CRT if indicated), valve intervention (transcatheter or surgical) should be considered before NCS, in eligible patients with an acceptable procedural risk.	<b>IIa</b>	<b>C</b>

Tabel 22 Aangepast aan de Nederlandse praktijk

<b>Recommendations for management of known or newly diagnosed arrhythmias</b>	<b>Class</b>	<b>Level</b>
In patients with SVT controlled by medication, it is recommended that AADs are continued during the peri-operative period.	<b>I</b>	<b>C</b>
Ablation may be considered in symptomatic patients with recurrent or persistent SVT, despite treatment, prior to high-risk, non-urgent NCS	<b>IIb</b>	<b>B</b>
In AF patients with acute or worsening haemodynamic instability undergoing NCS, emergency electrical cardioversion is recommended	<b>I</b>	<b>B</b>
In AF patients with haemodynamic instability, amiodarone may be considered for acute control of heart rate	<b>IIb</b>	<b>B</b>
In patients with symptomatic, monomorphic, sustained VT associated with myocardial scar, recurring despite optimal medical therapy, ablation of arrhythmia ) should be considered before elective NCS	<b>IIa</b>	<b>B</b>
It is not recommended to initiate treatment of asymptomatic PVC during NCS	<b>III</b>	<b>C</b>

Tabel 23 ESC guidelines (Geen aanpassingen)

<b>Recommendations for management of bradyarrhythmia and patients carrying cardiac implantable devices</b>	<b>Class</b>	<b>Level</b>
If indications for pacing exist according to the 2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy, <sup>481</sup> NCS surgery should be deferred and implantation of a permanent pacemaker should be considered.	<b>IIa</b>	<b>C</b>
It is recommended that patients with temporarily deactivated ICDs have continuous ECG monitoring, and during the peri-operative period are accompanied by personnel skilled in early detection and treatment of arrhythmias. In high-risk patients (e.g. pacemaker-dependant or ICD patients), or if access to the torso will be difficult during the procedure, it is recommended to place transcutaneous pacing/defibrillation pads prior to NCS	<b>I</b>	<b>C</b>
It is recommended that all patients with CIEDs that are reprogrammed before surgery have a re-check and necessary reprogramming as soon as possible after the procedure.	<b>I</b>	<b>C</b>
In high-risk CIED patients (e.g. with ICD or being pacing-dependant) undergoing NCS carrying a high probability of electromagnetic interference (e.g. involving unipolar electrosurgery above the umbilical area), CIED check-up and necessary reprogramming immediately before the procedure should be considered.	<b>IIa</b>	<b>C</b>

Tabel 24 Aangepast aan de Nederlandse praktijk

<b>Recommendations for management of patients with adult congenital heart disease undergoing non-cardiac surgery</b>	<b>Class</b>	<b>Level</b>
In patients with intermediate or severe risk ACHD, a consultation with an ACHD specialist is recommended before intermediate- or high-risk surgery.	<b>I</b>	<b>C</b>

In patients with intermediate or severe risk ACHD, planned for intermediate- or high-risk surgery a multidisciplinary consultation for the best suitable location for surgery should be considered.	<b>Ila</b>	<b>C</b>
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Tabel 25 Aangepast aan de Nederlandse praktijk

<b>Recommendations for pericardial diseases</b>	<b>Class</b>	<b>Level</b>
In patients with acute pericarditis, deferring elective NCS until complete resolution of the underlying process should be considered.	<b>Ila</b>	<b>C</b>
Avoiding elective NCS procedures until colchicine or the immunosuppressive treatment course for pericardial disease is completed may be considered.	<b>Ilb</b>	<b>C</b>

Tabel 26 ESC guidelines (Geen aanpassingen)

<b>Recommendations for patients with pulmonary arterial hypertension undergoing non-cardiac surgery</b>	<b>Class</b>	<b>Level</b>
It is recommended to continue chronic therapy for PAH in the peri-operative phase of NCS.	<b>I</b>	<b>C</b>
It is recommended that haemodynamic monitoring of patients with severe PAH continues for at least 24 h in the post-operative period.	<b>I</b>	<b>C</b>
In the case of progression of right HF in the post-operative period in patients with PAH, it is recommended that the diuretic dose be optimized and, if necessary, i.v. prostacyclin analogues be initiated under the guidance of a physician experienced in the management of PAH.	<b>I</b>	<b>C</b>
inodilator drugs (dobutamine, milrinone, levosimendan), which increase cardiac output and lower pulmonary vascular resistance, should be considered peri-operatively according to the haemodynamic status of the patient.	<b>Ila</b>	<b>C</b>

Tabel 27 ESC guidelines (Geen aanpassingen)

<b>Recommendations for patients with pulmonary arterial hypertension undergoing non-cardiac surgery</b>	<b>Class</b>	<b>Level</b>
In patients with chronic hypertension undergoing elective NCS, it is recommended to avoid large peri-operative fluctuations in blood pressure, particularly hypotension, during the peri-operative period	<b>I</b>	<b>A</b>
It is recommended to perform pre-operative screening for hypertension-mediated organ damage and CV risk factors in newly diagnosed hypertensive patients who are scheduled for elective high-risk NCS	<b>I</b>	<b>C</b>
It is not recommended to defer NCS in patients with stage 1 or 2 hypertension.	<b>III</b>	<b>C</b>

Tabel 28 Aangepast aan de Nederlandse praktijk

<b>Recommendations for management of patients with peripheral artery disease and/or abdominal aortic aneurysm undergoing non-cardiac surgery</b>	<b>Class</b>	<b>Level</b>
In patients with poor functional capacity and significant risk factors or symptoms (such as moderate-to-severe angina pectoris, decompensated HF, valvular disease, and significant arrhythmia), referral for cardiac work-up and optimization is recommended prior to elective surgery for PAD or AAA	<b>I</b>	<b>C</b>
Routine referral for cardiac work-up, coronary angiography, or CPET prior to elective surgery for PAD or AAA is not recommended.	<b>III</b>	<b>C</b>

Tabel 29 Aangepast aan de Nederlandse praktijk

Recommendations for management of patients with suspected or established carotid artery disease undergoing non-cardiac surgery	Class	Level
For patients undergoing elective, non-cardiac surgery with a history of stroke or transient ischaemic attack within the preceding six months, carotid artery imaging is recommended	I	B
For patients with a history of stroke or transient ischaemic attack in the preceding six months attributable to an ipsilateral 50-99% carotid stenosis and who are scheduled to undergo elective, non-cardiac surgery, it is recommended that carotid revascularisation be performed before the non-cardiac surgical procedure.	I	B
For patients with a history of prior stroke and no significant carotid artery disease, it is recommended that, where possible, elective non-cardiac surgery should be delayed by 6 months. The decision to proceed with semiurgent elective surgery will have to be individualised, based upon the underlying pathology.	I	B
For asymptomatic patients undergoing non-cardiac surgery procedures, routine carotid imaging is not recommended..	III	B
For patients with asymptomatic 50-99% carotid stenoses undergoing a major non-cardiac procedure, it is recommended not to stop statin therapy prior to surgery. Antithrombotic therapy withdrawal should be based on an assessment of thromboembolic and haemorrhagic risks.	III	B
For patients with an asymptomatic 50-99% carotid stenosis undergoing a major non-cardiac surgical procedure, prophylactic carotid endarterectomy or carotid stenting is not recommended.	III	B

Tabel 30 ESC guidelines (Geen aanpassingen)

Recommendations for management of patients with renal disease undergoing non-cardiac surgery	Class	Level
In patients with renal disease requiring peri-operative contrast-enhanced radiography, balanced hydration with i.v. isotonic fluids, the use of a minimal volume of contrast media, and the use of low-osmolar or iso-osmolar contrast media should be considered.	IIa	B
In patients with known risk factors (age .65 years, BMI .30 kg/m <sup>2</sup> , diabetes, hypertension, hyperlipidaemia, CV disease, or smoking) undergoing intermediate- or high-risk NCS, it is recommended to screen for pre-operative renal disease by measuring serum creatinine and GFR.	I	C
If a cystatin C measurement assay is available, cystatin C measurement should be considered in patients with impaired eGFR (,45–59 mL/min/ 1.73 m <sup>2</sup> ) to confirm kidney disease.	IIa	C

Tabel 31 Aangepast aan de Nederlandse praktijk

Recommendations for management of patients with obesity undergoing noncardiac surgery	Class	Level
The use of cardiorespiratory fitness to estimate peri-operative CV risk in obese patients, with particular attention to those undergoing intermediate- and high-risk NC is not recommended outside the context of clinical research	III	C
In patients at high risk of obesity hypoventilation syndrome, additional specialist investigation before major elective NCS should be considered.	IIa	C

Tabel 32 Aangepast aan de Nederlandse praktijk

Recommendations for management of patients with diabetes mellitus undergoing non-cardiac surgery	Class	Level
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Volg richtlijn Preoperatieve verbetering diabetesregulatie - Richtlijn - Richtlijndatabase		
A pre-operative assessment for concomitant cardiac conditions (see Sections 3 and 4) is recommended in patients with diabetes with suspected or known CAD, and those with autonomic neuropathy, retinopathy, or renal disease and scheduled to undergo intermediate or high-risk NCS.	<b>I</b>	<b>C</b>

Tabel 33 Aangepast aan Nederlandse praktijk

<b>Recommendations for peri-operative monitoring and anaesthesia</b>	<b>Class</b>	<b>Level</b>
In order to preserve optimal CV stability, it may be considered to apply goal-directed haemodynamic therapy in patients undergoing high-risk NCS..	<b>IIb</b>	<b>B</b>
It is recommended to minimize post-operative acute pain.	<b>I</b>	<b>B</b>
Avoiding arterial hypotension (mean arterial pressure < 60 mmHg) for prolonged cumulative periods (> 30 minutes) may be considered.	<b>IIb</b>	<b>B</b>
Non-aspirin NSAIDs: volg richtlijn postoperatieve pijn richtlijnen database.		

Tabel 34 Aangepast aan Nederlandse praktijk

<b>Recommendations for peri-operative cardiovascular complications</b>	<b>Class</b>	<b>Level</b>
It is recommended to have high awareness of peri-operative CV complications, combined with surveillance for PMI in patients undergoing intermediate- or high-risk NCS.	<b>I</b>	<b>B</b>
Systematic PMI work-up is recommended to identify the underlying pathophysiology and define therapy.	<b>I</b>	<b>B</b>
It is recommended to treat post-operative STEMI, NSTEMI-ACS, acute HF, and tachyarrhythmias in accordance with guidelines for the non-surgical setting, after interdisciplinary discussion with the surgeon about bleeding risk	<b>I</b>	<b>C</b>
In patients with post-operative PE of high or intermediate clinical probability: Volg richtlijn Antitrombotisch beleid richtlijndatabase		
Post-operative oral anticoagulation for PE:-Volg richtlijn Antitrombotisch beleid richtlijndatabase		
In patients with a post-operative indication for OAC: Volg richtlijn Antitrombotisch beleid richtlijndatabase		
In patients with post-operative AF after NCS: Volg richtlijn Antitrombotisch beleid richtlijndatabase		
In patients with MINS and at low risk of bleeding, treatment with dabigatran 110 mg orally b.i.d. may be considered from 1 week after NCS.	<b>IIb</b>	<b>B</b>
Routine use of beta-blocker for the prevention of post-operative AF in patients undergoing NCS is not recommended.	<b>III</b>	<b>B</b>