North Dakota Cardiac System of Care
STEMI, NSTEMI, & Acute Coronary Syndrome Guide

Tertiary Hospital One Call:

Altru Health System – Grand Forks
Phone: 701-780-5206 or 1-855-425-8781
Fax: 701-780-1097

CHI St. Alexius Health - Bismarck
Phone: 701-530-7699 or 1-877-735-7699
Fax: 701-530-7005

Essentia Health System - Fargo
Phone: 701-364-CALL (2255) or
844-865-CALL (2255)
Fax: 701-364-8405

Sanford Health System- Bismarck
Phone: 1-855-550-1225
Fax: 701-323-5751

Sanford Health System- Fargo
Phone: 701-234-6304 or 1-877-647-1225
Fax: 701-234-7203

Trinity Health System - Minot
Phone: 701-857-3000 or 1-800-223-1596
Fax: 701-857-3260

Revised 9/2023

ACS Risk Stratification Guide

Revised 9/2023

Patient presenting with chest pain or anginal equivalent.

YES

12 Lead ECG obtained and interpreted ≤10 minute

YES

ST elevation at the J point in at least 2 contiguous leads of ≥2 mm (0.2 mV) in men or ≥1.5 mm (0.15 mV) in women in leads V2-V3 and/or of ≥ 1 mm (0.1mV) in other contiguous chest leads or the limb leads
OR New or presumed new LBBB (discuss with cardiologist)
OR isolated ST depression >2 mm in V1-V3
OR Cardiogenic Shock –
OR Sustained Ventricular Tachycardia

YES → **Emergent**
Contact tertiary center to arrange for immediate transfer

-Dispatch EMS
-If patient is a STEMI, follow statewide STEMI Guideline

Obtain serial ECG at 5–10-minute intervals if symptoms persist or change

NO

Hemodynamic instability
OR other evidence of life-threatening differential chest pain diagnosis*: pulmonary embolism, aortic aneurysm, aortic dissection, pericardial tamponade, tension pneumothorax (*Life threatening Differential Chest Pain Diagnoses supplemental guide)

YES →

NO

Troponin*, CBC, BMP, Portable Chest X-ray
ASA 324 mg chewable PO or 300 mg PR
Nitroglycerine prn *- Hold for inferior MI -Hold 24 hrs. for Sildenafil or Vardenafil, or within 48 hrs. of Tadalafil*
Oxygen at 2 LPM if SpO2 <90%, titrate to maintain SpO2 90-94%
Morphine for analgesia prn

ST depression >0.5 mm in ≥2 leads
OR Dynamic T Wave Inversion
OR Positive Biomarkers
OR HEART Score 7-10

YES → **High Risk**
Follow Non-ST-Elevation ACS Guideline

NO

Persistent chest pain
OR Classic angina increased with exertion, decreased with rest/NTG
OR Known CAD or PVD
OR HEART Score 4-6

YES → **Intermediate Risk**
Follow Intermediate Risk Guideline

NO

No ECG Changes
AND Negative Biomarkers
AND Heart Score 0-3

YES → **Low Risk**
Follow Low Risk Guideline

The HEART Score for Chest Pain Patients in the ED		
History	• Highly Suspicious • Moderately Suspicious • Slightly or Non-Suspicious	• 2 points • 1 point • 0 points
ECG	• Significant ST-Depression • Nonspecific Repolarization • Normal	• 2 points • 1 point • 0 points
Age	• ≥65 years • ≥45-<65 years • ≤45 years	• 2 points • 1 point • 0 points
Risk Factors (DM, current or recent smoker, HTN, HLP, family history of CAD, obesity)	• >3 Risk Factors or History of CAD • 1-2 Risk Factors • No Risk Factors	• 2 points • 1 point • 0 points
Conventional Troponin	• ≥3 x normal limit • >1-<3 x normal limit • ≤ normal limit	• 2 points • 1 point • 0 points
High-Sensitivity Troponins	• >3x normal limit: Females <48ng/L, Males <102ng/L • 1-3x normal limit: Females 16-48ng/L, Males 34-102ng/L • <normal limit: Females <16ng/L, Males <34ng/L	• 2 points • 1 point • 0 points
Score 0-3: 2.5% MACE over next 6 weeks (Discharge Home) Score 4-6: 20.3% MACE over next 6 weeks (Admit for Observation) Score 7-10: 72.7% MACE over next 6 weeks (Early Invasive Strategies)		

*High-Sensitivity Troponins (hs-cTn) Preferred

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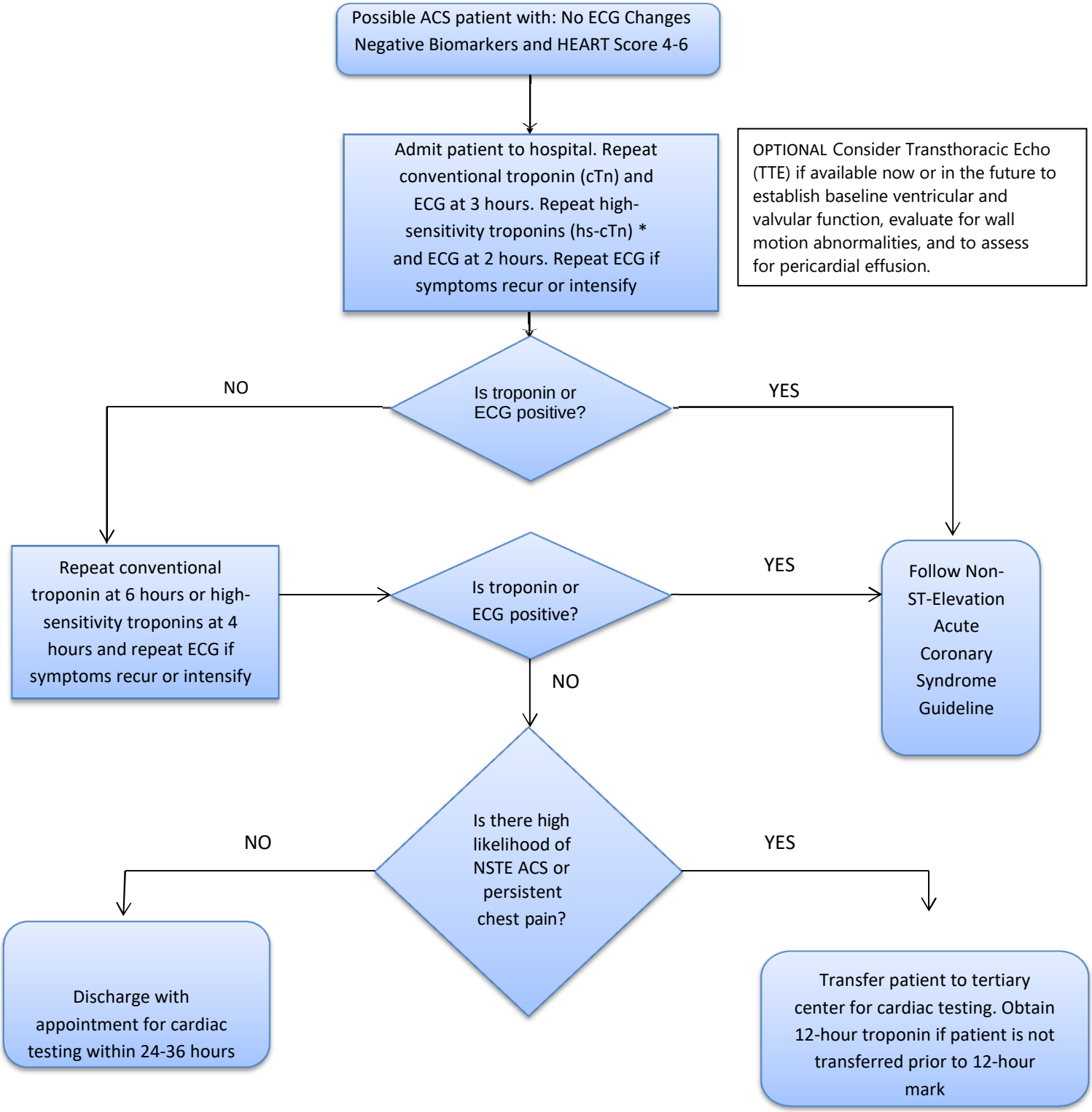
Intermediate Risk ACS Flowchart



*High-Sensitivity Troponins (hs-cTn) Preferred
See reference for Cardiac Testing pg. 9-10

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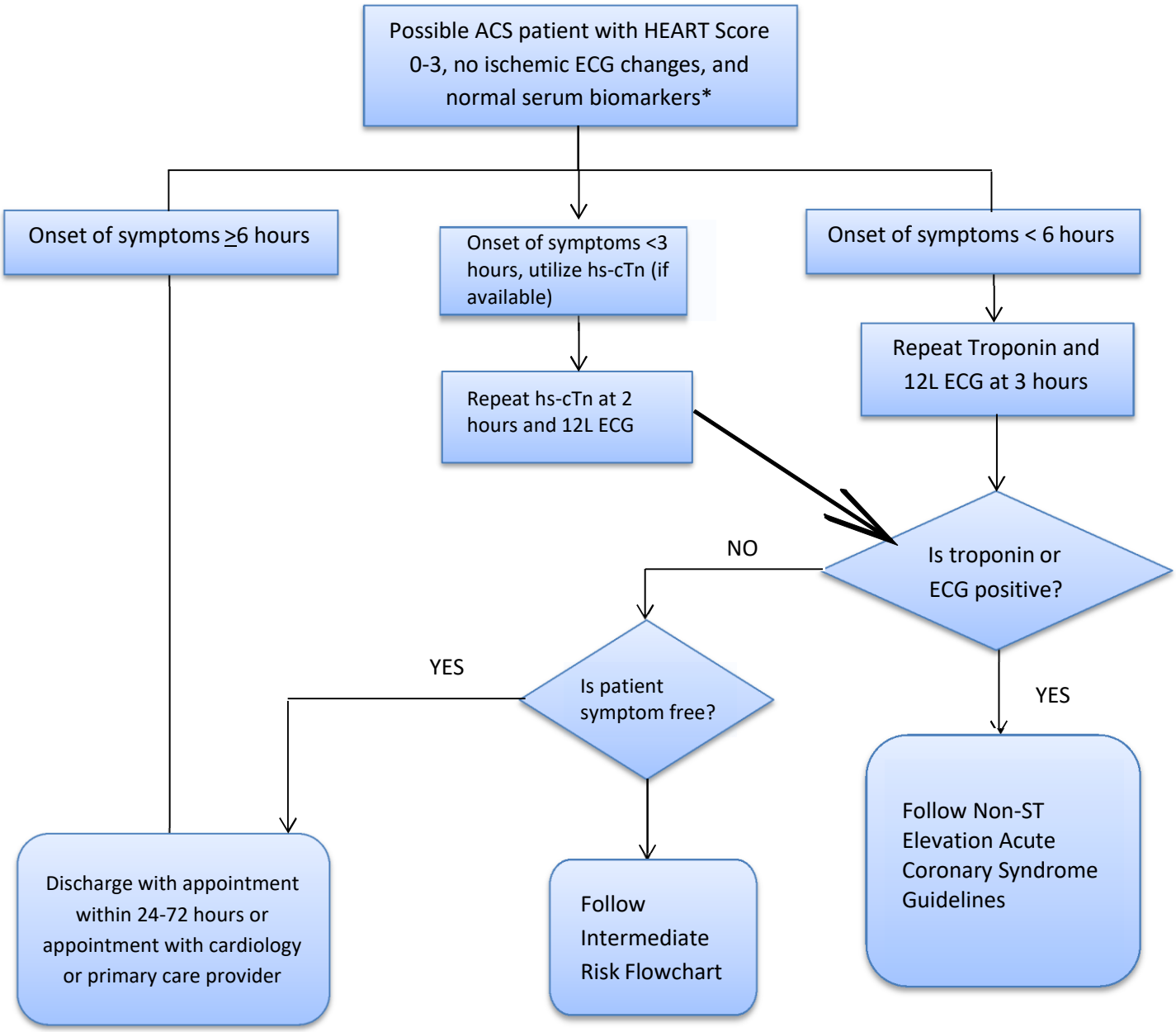
Low Risk ACS Flowchart



*High-Sensitivity Troponins (hs-cTn) Preferred

ND STEMI
Inter-Hospital Transfer Guideline
(ST-Segment Elevation Myocardial Infarction)

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Ideal STEMI Treatment Goals:

- **First Medical Contact-to-First ECG** time ≤10 minutes unless pre-hospital ECG obtained
- All eligible patients receive **Reperfusion** (PCI or fibrinolysis) therapy
- Fibrinolytic–eligible patients with **Door-to-Needle** time ≤ 30 minutes
- Reperfusion – eligible patients transferred to a PCI receiving center with referring center **Door in- Door out** time *(Length of Stay)* ≤ 45 minutes
- Referring Center ED **Door-to-PCI device time** ≤ 100 minutes *(includes transport time)*
- All STEMI patients without a contraindication receiving **aspirin** before ED discharge
- **Upon Transfer Fax the following documents to the accepting facility:** 12 L ECG, ED Record, Lab Results, Current Medication Record, ND STEMI documentation

Patients with a contraindication to transfer or PCI/Medical Therapy Option:

- Documentation of contraindication or Patient refusal to transfer for PCI or medical treatment
- Aspirin within 24 hours of hospital arrival, and aspirin at discharge
- Beta blocker at discharge
- High intensity statin at discharge
- P2Y12 (Plavix or Brilinta) at discharge
- STEMI patients who smoke receive smoking cessation counseling at discharge
- Scheduled Cardiology Consultation within 1-2 weeks at discharge
- Cardiac Rehabilitation referral at discharge

Revised 9/2023

ND STEMI Guideline
(ST-Segment Elevation Myocardial Infarction)

Revised 9/2023

Diagnostic Criteria for STEMI

- ST elevation at the J point in at least 2 contiguous leads of ≥2 mm (0.2 mV) in men or ≥1.5 mm (0.15 mV) in women in leads V2–V3 and/or of ≥1 mm (0.1 mV) in other contiguous chest leads or the limb leads.
- New or presumably new LBBB at presentation occurs infrequently, may interfere with ST-elevation analysis, and should not be considered diagnostic of acute myocardial infarction (MI) in isolation. If doubt persists, immediate referral for invasive angiography may be necessary. Consult with Cardiology.
- ECG demonstrates evidence of ST depression suspect of a Posterior MI consult with PCI receiving center
- If initial ECG is not diagnostic but suspicion is high for STEMI obtain serial ECG at 5–10-minute intervals

ACTIVATE EMS TRANSFER TEAM

ACTIVATE STEMI ALERT at Receiving PCI Hospital

STANDARD ORDERS & LABS

□ Apply Continuous Cardiac Monitor

□ Insert (2) peripheral IV large bore Saline lock

□ Troponin (hs-cTn preferred)

□ BMP □ Magnesium

□ CBC □ Glucose

□ INR □ aPTT

-Do not delay transfer awaiting results

CONSIDER:
Estimated transfer time in minutes to PCI facility take into account first medical contact time:
Air:_____and/or Ground: _____

ASSESS: Symptom Onset Date:_____Time:_____

Code Status □ Full Code □ DNR
-If patient wishes to remain DNR Status, consult receiving facility MD prior to initiation of transfer

REVIEW: Thrombolytic Contraindications Page 7

OPTIONAL MEDICATION

☐ **Nitroglycerin IV** or 0.4 mg SL
-Hold for inferior MI
-Evaluate if erectile dysfunction or pulmonary hypertension medications taken in the past 24 hours including: Sildenafil (Viagra, Revatio), Vardenafil (Levitra, Staxyn), or Avanafil (Stendra), Tadalafil (Cialis, Adcirca). -Hold nitrates for 48 hours following the last dose.

☐ **Analgesia as needed**

☐ **Ondansetron** (Zofran) 4 mg PO or IV

☐ **Metoprolol Tartrate** ☐ 25 mg PO
CONTRAINDICATION FOR METOPROLOL TARTATE: Do not give if any of the following: signs of heart failure or shock, heart rate less than 60 or more than 110, systolic blood pressure less than 100-, second- or third-degree heart block, severe asthma, or reactive airway disease

Choose One Reperfusion Pathway

Time of First Medical Contact to PCI arrival Expected to be LESS THAN ≤ 100 minutes

PRIMARY PCI
Direct to CATH LAB for Emergent PCI

□ **Aspirin** 324 mg chewed or 300mg rectally

□ **Ticagrelor (Brilinta) 180 mg PO** ***preferred*** **OR**

□ **Clopidogrel (Plavix) 600 mg PO**
-DO NOT give both Plavix & Brilinta

□ **Heparin IV Bolus** (60 Units/kg, max 4,000 Units)

□ **Transport** patient directly to Cath Lab for PCI (Percutaneous Coronary Intervention)
- *Goal Arrival to Departure < 30 minutes unless awaiting air transport*

□ **Oxygen as needed** to keep SpO2 90-94%

-DO NOT give Thrombolytics ***TNKase, rPA, or TPA***

Time of First Medical Contact to PCI arrival anticipated to be GREATER THAN ≥ 100 minutes

THROMBOLYTIC Therapy

□ **Aspirin** 324 mg chewed or 300mg rectally

□ **Tenecteplase IV (TNKase)** per attached protocol

- *Facility Arrival to lytic administration goal LESS THAN ≤ 30 minutes*

□ **Plavix 300 mg** PO
-If patient > 75 yrs. consult with cardiologist and reduce dosage to 75 mg PO

□ **Heparin IV Bolus** (60 Units/kg, max 4,000 Units)

□ **Heparin IV Drip** (12 Units/kg/hr., max 1,000 Units/hr.)

□ **Transport** patient urgently directly to PCI capable hospital
- *Goal Arrival to Departure < 45 minutes unless awaiting air transport*

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Revised 9/2023

ND STEMI (ST-Segment Elevation Myocardial Infarction) Guideline

Tenecteplase (TNKase) Dosing		
Patient weight **(kg)**	**TNK** (mg)	**TNK** (mL)
Less than 60 kg	30 mg	6 mL
60 or more but less than 70	35 mg	7 mL
70 or more but less than 80	40 mg	8 mL
80 or more but less than 90	45 mg	9 mL
90 or more kg	50 mg	10 mL

ABSOLUTE CONTRAINDICATIONS FOR FIBRINOLYSIS (TNK) IN STEMI

1. Any prior intracranial hemorrhage
2. Known structural cerebral vascular lesion (e.g., arteriovenous malformation)
3. Known malignant intracranial neoplasm (primary or metastatic)
4. Ischemic stroke within 3 months except acute ischemic stroke within 4.5 hours
5. Suspected aortic dissection
6. Active bleeding or bleeding diathesis (excluding menses)
7. Significant closed-head or facial trauma within 3 months
8. Chest Pain/Symptom Onset >12 hours

RELATIVE CONTRAINDICATIONS FOR FIBRINOLYSIS: (TNK) IN STEMI

1. History of chronic, severe, poorly controlled hypertension
2. Severe uncontrolled hypertension on presentation (SBP more than 180 or DBP more than 110 mmHg)
3. History of prior ischemic stroke more than 3 months, dementia, or known intracranial pathology not covered in contraindications
4. Traumatic or prolonged CPR (over 10 minutes)
5. Major surgery (within last 3 weeks)
6. Recent internal bleeding (within last 2-4 weeks)
7. Noncompressible vascular punctures
8. Streptokinase/anistreplase: prior exposure (more than 5 days ago) or prior allergic reaction to these agents
9. Pregnancy
10. Active peptic ulcer
11. Current use of anticoagulants: the higher the INR _____
12. Symptom Onset > 6 hrs. prior to presentation consult Cardiology

Weight: lb. kg | Height: in. | Age: yrs.

Allergies: _____

Medication	Dose	Time Start	Time Stop	RN (Initials)
Aspirin (81 mg chew x 4)	324 mg			
Ticagrelor (Brilinta) PO (PPCI therapy arm only) -Do not give ticagrelor (Brilinta) and Plavix together	180 mg			
Clopidogrel (Plavix) PO PPCI therapy dose	600 mg			
Clopidogrel (Plavix) PO Lytic therapy dose If >75 y/o, give 75mg	300 mg 75mg			
Heparin IV Bolus PCI Dose 60 U/kg, max 4000 Units Lytic Dose 60 U/kg, max 4000 Units	Units			
Heparin IV Infusion Lytic Dose 12 U/kg/hr. max 1000 U/hr.	Units/hr.			
Tenecteplase (TNKase) IV -Do not give ticagrelor (Brilinta) with Lytic (TNK)	mg (= mL)			
Nitroglycerin Sublingual -Erectile Dysfunction Medication within past 24 hrs. □ Yes □ No	0.4 mg 0.4 mg 0.4 mg			
Nitroglycerin IV Infusion	mcg/min			
Morphine Sulfate IV	mg			
Fentanyl IV	mcg			
Ondansetron (Zofran) PO	4 mg			
Ondansetron (Zofran) IV	4 mg			
Metoprolol Tartrate 25 mg or 50 mg PO	mg			

Notes: _____

RN Name (Print): RN Signature: RN Initials: Date: Time:

Data Elements in the ND State STEMI Registry

1. **Initial Symptom Onset Time**
   Date:_____ Time:_____
2. **FMC EMS Agency:** _____
3. **Referring Hospital Arrival (Door-in)**
   Date:_____ Time:_____
4. **Referring Hospital 1st ECG Time:** _____
5. **STEMI ECG Time:** _____
6. **STEMI Activation (STEMI Receiving contacted)**
   Date:_____ Time:_____
7. **Referring Hospital Departure (Door-out)**
   Date:_____ Time:_____
8. **Transfer EMS Agency Name**: _____

☐ Call Report when patient leaves your hospital and confirm update departure time and ETA

☐ **Copy ECG, ED physician and Nurses documentation and send with patient – DO NOT delay transport**

☐ **Fax** All paperwork to referring Hospital (ECG, Vital Signs, Labs, Orders, Physician Order, Notes, Medication administration record)

Patient Name:

North Dakota Cardiac System of Care

Non-ST-Elevation Acute Coronary Syndrome Guideline

Diagnostic Criteria

- New >0.5 mm ST segment depression or new >2 mm anterior T-wave inversion and/or positive biomarkers
- If patient experiences persistent or worsening symptoms obtain serial ECGs at 15–30-minute intervals to monitor for new onset ST elevation

- Contact PCI Center to arrange for transfer of patient
- Dispatch EMS service once transfer is confirmed

ACC/AHA Guideline Based Treatment

Standard orders and labs

- Assess vital signs stat, repeat per unit routine
- Continuous cardiac monitoring (telemetry)
- Insert 1-2 large bore peripheral saline lock IV(s)
- Obtain following labs: CBC, BMP, PT/INR, PTT, Troponin I at 3 and 6 hours or hs-cTn at 2 and 4 hours (if stay is extended)
- Oxygen at 2 LPM if SpO2<90%, titrate to maintain SpO2 90-94%

Standard Medications*-Discuss with accepting provider prior to administration*

- **Aspirin 324 mg** (chewable non-enteric coated 81 mg x 4) orally stat x 1 or if patient is unable to swallow give: **Aspirin 300 mg** rectally
- **Ticagrelor** (Brilinta)180 mg orally stat x 1 **OR**
  Clopidogrel (Plavix) 300 mg orally stat x 1 (do not give both Ticagrelor and Clopidogrel)

Heparin*-Adjust dose according to weight-based protocol if patient stay is extended*

- **Heparin 60 units/kg IV bolus** (max bolus 4000 units)
- **Heparin IV drip 12 units/kg/hr.** (max 1000 units/hr.)

Optional Labs

- BNP, HCG

Optional Medications

- **Nitroglycerine** 0.4 mg SL every 5 minutes x 3 as needed for chest discomfort
- **Nitroglycerine** IV continuous infusion as needed for chest pain

-Hold Nitro if recent phosphodiesterase inhibitor, 24 h of sildenafil or vardenafil, or within 48 h of tadalafil.

- For severe uncontrolled pain, consider use of **Morphine** or other narcotic analgesic of choice IV as needed.
- **Ondansetron** (Zofran) 4 mg IV as needed for nausea/vomiting x 1
- **Metoprolol Tartrate** (Lopressor) 25 mg orally x 1

-Hold Beta Blocker if Signs of heart failure or shock, SBP less than 110, Heart rate less than 60 bpm or heart block, severe asthma, or reactive airway disease

- Transfer patient to PCI center for possible early invasive strategy
- Send with or fax the following documents to accepting facility:12L ECG, ED record, lab results, current medication record, EMS record

Revised 9/2023

Diagnostic Testing may include:

- Exercise ECG Coronary Computed Tomography Angiography
- Echocardiography/Stress Echocardiography Invasive Coronary Angiography
- Stress Nuclear (PET or SPECT) Myocardial Perfusion Imaging
- Cardiovascular Magnetic Resonance Imaging

Anatomic Testing may include:

- Coronary Computed Tomography Angiography
- Invasive Coronary Angiography

For further direction on choosing proper provocative testing, see attached algorithms from the 2021 AHA/ACC/ASE/CHEST/SAEM/SC CT/SCMR Chest Pain Guideline and cardiac testing algorithms:

- Patients With Suspected ACS at Intermediate Risk With No Known CAD
- Patients With Suspected ACS at Intermediate Risk With Known CAD

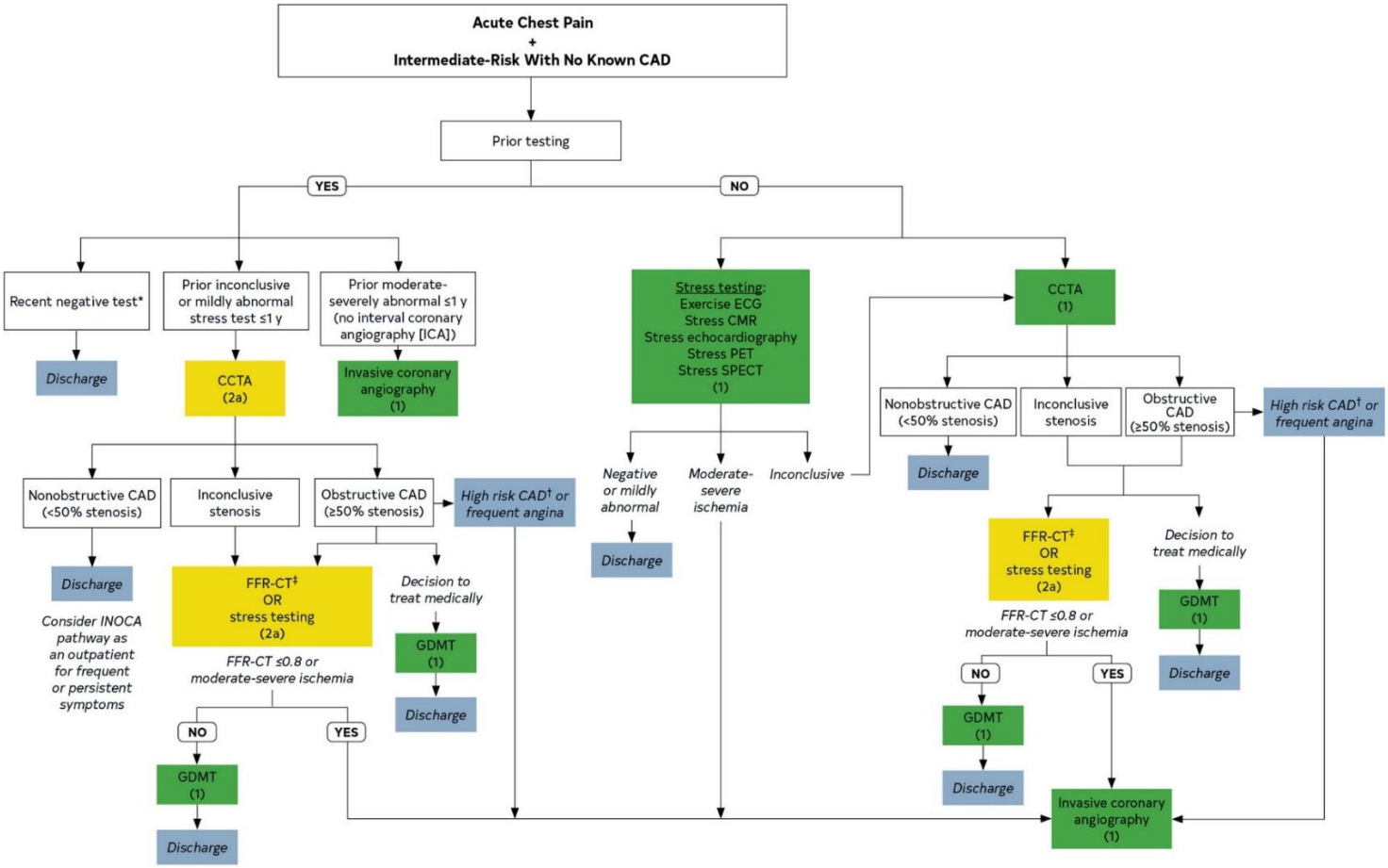

Figure 9. Evaluation Algorithm for Patients With Suspected ACS at Intermediate Risk With No Known CAD
Test choice should be guided by local availability and expertise. *Recent negative test: normal CCTA ≤2 years (no plaque/no stenosis) OR negative stress test ≤1 year, given adequate stress. †High-risk CAD means left main stenosis ≥ 50%; anatomically significant 3-vessel disease (≥70% stenosis). ‡For FFR-CT, turnaround times may impact prompt clinical care decisions. However, the use of FFR-CT does not require additional testing, as would be the case when adding stress testing. CAD indicates coronary artery disease; CCTA, coronary CT angiography; CMR, cardiovascular magnetic resonance imaging; CT, computed tomography; FFR-CT, fractional flow reserve with CT; GDMT, guideline-directed medical therapy; ICA, invasive coronary angiography; INOCA, ischemia and no obstructive coronary artery disease; PET, positron emission tomography; and SPECT, single-photon emission CT.

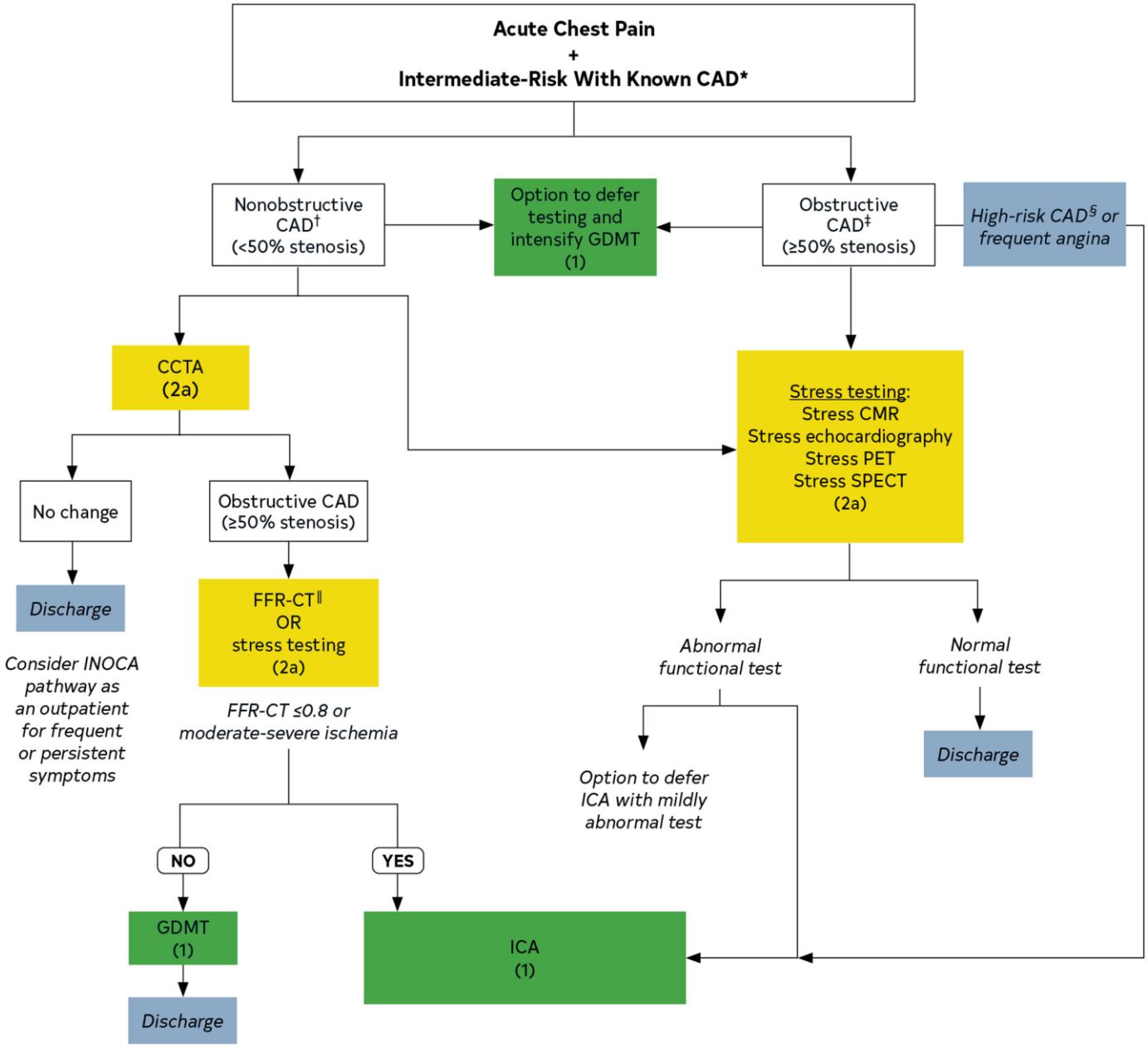

Figure 10. Evaluation Algorithm for Patients With Suspected ACS at Intermediate Risk With Known CAD
Test choice should be guided by local availability and expertise. *Known CAD is prior MI, revascularization, known obstructive or nonobstructive CAD on invasive or CCTA. †If extensive plaque is present a high-quality CCTA is unlikely to be achieved, and stress testing is preferred ‡Obstructive CAD includes prior coronary artery bypass graft/percutaneous coronary intervention. §High-risk CAD means left main stenosis ≥50%; anatomically significant 3-vessel disease (≥70% stenosis). ‖FFR-CT turnaround times may impact prompt clinical care decisions. ACS indicates acute coronary syndrome; CAD, coronary artery disease; CCTA, coronary CT angiography; CMR, cardiovascular magnetic resonance; CT, computed tomography; FFR-CT, fractional flow reserve with CT; GDMT, guideline-directed medical therapy; ICA, invasive coronary angiography; INOCA, ischemia and no obstructive coronary artery disease; PET, positron emission tomography; and SPECT, single-photon emission CT.

Reference: 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines J Am Coll Cardiol. Oct 28, 2021. Epublished DOI: 10.1016/j.jacc.2021.07.053