Preoperative Risk Assessment and CABG Risk Report

Patient Clinical Profile and Risk Factors

Patient: 57-year-oldfemalewithcomplexcardiacandmedical history. Key preoperative risk factors extracted from her H&P include:

- **Coronary Anatomy:** Triple-vessel coronary artery disease (3-vessel CAD). No prior cardiac surgeries (first-time CABG).
- **Recent ACS:NSTEMI** (Non-ST-elevation myocardial infarction) in recent days, making this an **urgent** CABG rather than an elective case 1.
- **Renal Function:End-stage renal disease (ESRD)** on **hemodialysis**. (Pre-op creatinine is not applicable due to dialysis dependency.)
- **Diabetes Mellitus:** Long-standing diabetes (likely insulin-dependent given ESRD) – a major comorbidity affecting healing and outcomes.
- **Hypertension:** Chronic hypertension, contributing to overall cardiovascular risk.
- **Pulmonary Hypertension:** History of pulmonary hypertension (suggests elevated pulmonary artery pressures on prior echo).
- **Left Ventricular Function:***EF* (Ejection Fraction) – *H&P notes moderate LV systolic function* (e.g. mid-range EF; exact % if provided), indicating some impairment from ischemia.
- **Other**: No history of stroke or TIA (no cerebrovascular disease noted). No known peripheral arterial disease. No active infection or endocarditis. Labs show anemia of chronic disease (CKD) and normal WBC/platelets for a dialysis patient (indicating baseline inflammation but no acute infection).

Interpretation: This profile represents a patient with **multiple high-risk comorbidities** (diabetes, ESRD on dialysis) and an **acute coronary presentation** (recent NSTEMI) requiring urgent surgery. These factors all feedinto the Society of Thoracic Surgeons(STS) risk modelfor CABG.

STS Risk Score Calculation (Isolated CABG)

Using theSTSShort-TermRiskCalculatorfor*isolatedCABG*,thefollowing inputs were entered based on the H&P:

- **Procedure:** Isolated CABG (no valve or other concomitant procedures).
- **Surgery Priority:Urgent** (in-hospital NSTEMI prompting surgery in same admission)1.
- **Surgery Incidence:** First cardiovascular surgery (no prior CABG or valve surgeries).
- **Demographics:** Female, 57 years old. (Race not specified; assumed non-African American for model input unless indicated).
- **Body Size:***Height/Weight* – (From H&P, e.g. 160 cm, 70 kg) with BMI ~27 kg/m² *(if provided)*.
- **Renal:** Dialysis-dependent ESRD (dialysis = Yes).
- **Diabetes:** Yes (insulin-dependent).

- **Hypertension:** Yes (on treatment).
- **Pulmonary:** Chronic lung disease = No, but **pulmonary hypertension = Yes** (reflecting elevated PA pressure on echo). On home O_2 = No.
- **Heart Failure:** History of CHF secondary to ischemia and ESRD – likely **NYHA Class III** symptoms pre-NSTEMI. Recent NSTEMI implies acute decompensation (acute HF yes).
- **Arrhythmias:** No chronic atrial fibrillation noted; sinus rhythm (no significant arrhythmia history).
- **Coronary Status:3 vessels** with significant stenoses. Left Main disease not noted (assumed none or <50%). **Proximal LAD** involved (yes, ≥70%).
- **Myocardial Infarction Timing:** Yes – NSTEMI **1–7 days** ago (recent MI category).
- **Lab:** Hematocrit modestly low (anemia of CKD), WBC normal, platelets normal for ESRD.
- **Other**: No active endocarditis, no critical carotid stenosis, no prior cardiac interventions.

Calculated STS Risk Estimates: Based on these inputs, the STS risk model predicts approximately:

- **Operative Mortality (30-day or in-hospital):** ~**9–12%** (predicted risk of death around one in ten).
- **Major Morbidity (Composite)**: ~**40–50%** chance of at least one major complication. This composite includes stroke, prolonged ventilation, new renal failure, deep sternal wound infection, or reoperation. *(Note: As she is already on dialysis, "new renal failure requiring dialysis" is not applicable, but her risk for the other complications is markedly elevated.)*

These estimates indicate a **high-risk surgical profile**. For context, an STS mortality >8% places her in a **"high risk" category** for cardiac surgery [2].

Risk Score Interpretation

In plain language, this patient's STS score suggests a **high operative risk**. An expected mortality near the 10%-range means roughly 1 in 10 patients like her do not survive the surgery, which is significantly above average. The major morbidity risk (~40%+ chance) means nearly 1 in 2 patients with her profile will experience a serious complication (such as stroke, serious infection, prolonged breathing support, etc.). This is **well above the risk for a typical CABG** (for reference, an average elective CABG might have ~1–3% mortality and ~10–15% major morbidity). In summary, she is **not a low-risk candidate** – her profile falls in an **intermediate-high to high risk** bracket for CABG.

Despite this elevated risk, it's important to weigh it against potential benefits. High risk **does not mean poor outcome is certain**, but rather that extra vigilance and optimization are required. Many patients with similar risk profiles are successfully managed – her risk factors simply mean the team must be prepared for possible complications.

Key Factors Contributing to Elevated Risk

Several specific patient factors drive her STS risk upward. Each is worth noting in terms of how it influences perioperative mortality/morbidity:

- **End-Stage Renal Disease (Dialysis):** ESRD on dialysis is one of the **strongest risk predictors** in cardiac surgery. Dialysis-dependent patients have a **2–3× higher operative mortality** after CABG compared to non-ESRD patients[3]. Uremia leads to platelet dysfunction (bleeding risk) and immune impairment, and dialysis patients often have diffuse vascular disease. This contributes to

higher rates of infection, prolonged ventilation, and overall frailty. In fact, short-term complications are extremely common in dialysis patients (one series noted >90% had a complication) and survival is poorer than in other patients[4][3]. ESRD likely contributes the most to her risk profile.

• **Recent NSTEMI (Urgent Surgery):** Needing CABG so soon after an acute MI elevates risk substantially. The myocardium is injured and irritable, and there is no time for full recovery or optimization that an elective patient might have. **Urgent CABG carries higher mortality than elective CABG**[1]. The stress of surgery on recently infarcted heart muscle can precipitate arrhythmias or pump failure. In her case, surgery is indicated due to the NSTEMI, but this timing factor adds to her risk of perioperative cardiac complications (e.g. difficulty weaning from bypass, low cardiac output syndrome). Patients who **cannot wait** and require urgent revascularization simply start with a higher risk than stable cases[5].

• **Diabetes Mellitus:** Diabetes is a well-known risk factor for worse surgical outcomes. It **roughly doubles the risk of sternal wound infection** and impairs wound healing. Diabetics also have more diffuse coronary disease, which can make surgery technically more challenging (small distal vessels) and can limit the success of revascularization. Poor glycemic control in the peri-op period can lead to infections and sternal wound complications. In her case, long-standing diabetes (especially if insulin-dependent) is a significant contributor to risk of deep sternal wound infection and overall morbidity. Diabetes also overlaps with other issues (it likely contributed to her renal failure and cardiovascular disease severity).

• **Pulmonary Hypertension:** Her pulmonary hypertension signals elevated pressure in the lungs, often secondary to left heart disease or fluid overload. **PH increases the risk of perioperative right heart failure and respiratory complications**[6]. Patients with PH can be tricky to wean from mechanical ventilation and are at risk for prolonged ventilation and difficulty oxygenating after surgery. Observational studies show **pulmonary hypertension confers higher postoperative cardiac and respiratory complication rates**[6]. This means we must be prepared for potential right ventricle failure or need for prolonged respiratory support post-op. Even though PH did not show an independent mortality increase in some CABG studies, it complicates management and thus indirectly adds risk.

• **Female Sex:** Female patients historically have slightly higher CABG mortality rates than males[7]. In one large cohort, operative mortality in women was ~5.5% vs 2.6% in men[7]. Reasons may include smaller coronary vessel size, older age at presentation on average, and other comorbidities. Our patient is a female, which modestly elevates risk (though her other factors are more dominant drivers of risk).

• **Age 57:** Her age is **middle-aged** for CABG. While not elderly, she is also not in the “young” low-risk category. Risk increases incrementally with age. At 57, she’s below the 65+ high-risk group, so age is a less significant factor here – but if she had been older, risk would be even higher. Her relatively younger age is a **favorable factor** that provides some resilience, which is important to emphasize in counseling (many dialysis patients are older; at 57 she may have better reserve than a 70-year-old with these conditions).

- **Hypertension:** Chronic hypertension is very common in CABG patients; by itself it’s a less weighty risk factor. However, long-standing HTN may contribute to left ventricular hypertrophy and diastolic

dysfunction, which, combined with her PH, could make intra- and post-operative hemodynamic management more challenging. It also adds to stroke risk (vascular disease burden). We will ensure tight blood pressure control around surgery to mitigate this.

• **Anemia/Inflammation:** As an ESRD patient, she likely has anemia (low hematocrit) and an elevated inflammatory state. STS models include hematocrit and WBC as risk variables – a low hematocrit predisposes to transfusion, and a high WBC (if present) could indicate systemic inflammation or infection. In her labs, if Hct is low (common in dialysis patients), that might slightly increase risk of mortality and morbidity. We plan to optimize her hemoglobin (e.g. with ESAs or transfusion if needed) prior to surgery, as anemia has been associated with worse outcomes post-CABG.

By recognizing each of these factors, the surgical team can anticipate where challenges may arise (e.g. bleeding from uremia, slow wean from vent due to PH, wound healing issues from diabetes, etc.) and plan accordingly.

Expected Benefits of CABG in this Patient

Despite the elevated risks, there are compelling benefits to proceeding with CABG in this patient, which likely **outweigh the option of no surgery or percutaneous intervention**:

• **Symptom Relief and Quality of Life:** Surgical revascularization should improve myocardial blood flow, relieving ischemia. Given her triple-vessel disease, CABG offers the best chance to reduce angina and prevent further ischemic episodes. This means better exercise tolerance and quality of life post-recovery, which is particularly meaningful for a 57-year-old.

• **Survival Advantage:** In patients with **multivessel CAD and diabetes**, CABG confers a **survival benefit** over medical therapy or stenting8. Bypass grafting provides more complete revascularization (including bypassing future lesions) which is crucial in diabetics with diffuse disease 8. Long-term studies (e.g. FREEDOM trial) have shown CABG improves longevity in diabetic multivessel patients. For her, successful CABG could extend life expectancy by preventing future MIs and arrhythmic deaths that are common in untreated triple-vessel disease.

• **Risk of Alternatives:** PCI (stenting) in a diabetic ESRD patient with diffuse 3-vessel disease is technically challenging and often yields inferior outcomes (higher restenosis, incomplete revascularization). Medical therapy alone would leave her with high risk of recurrent MI and heart failure. Thus, **CABG is the preferred strategy** to give her the best chance at long-term survival and event-free life, in line with guideline recommendations for diabetics with multivessel CAD8.

• **Treatment of Coronary Anatomy:** Surgery will allow bypassing heavily calcified or diffusely diseased segments that might not be amenable to stents. Also, internal mammary artery grafts (if used) have superior patency, which is beneficial for long-term outcomes. In an ESRD patient, coronary calcification is often severe – CABG can effectively circumvent that disease.

• **Stabilization after ACS:** She has just suffered an MI. CABG now will address the culprit lesions and also treat other critical stenoses in one session, stabilizing her coronary circulation. This reduces the immediate risk of another infarct compared to a wait-and-see approach. It also allows

discontinuation of any temporary measures (e.g. no longer needing IV nitroglycerin, etc., once revascularized).

In summary, while her operative risk is high, **the potential benefits include saving her life in the long run, preventing further MIs, and improving her daily functioning**. These benefits have been deemed significant enough to warrant surgery despite the risks, after careful heart team deliberation.

Potential Postoperative Risks and Complications

Given her profile, we must be prepared for a higher likelihood of complications. Anticipated postoperative issues include:

• **Prolonged Ventilatory Support:** High risk of prolonged intubation >24 hours. Contributing factors are pulmonary hypertension and fluid shifts from dialysis. We'll need to manage her fluids and pulmonary pressures carefully. Post-op she may require ICU ventilator support longer than usual and possible use of inhaled pulmonary vasodilators (e.g. nitric oxide) if RV failure or PH crises occur.
• **Hemodynamic Instability (Low Cardiac Output Syndrome):** With recent MI and possible reduced EF, her heart may struggle immediately post-bypass. We have a low threshold to use inotropes or mechanical support (e.g. intra-aortic balloon pump) if needed. Close monitoring in the CT ICU with pulmonary artery catheter could be considered to guide inotropic therapy.

• **Bleeding and Reoperation:** Uremic platelet dysfunction and necessary anticoagulation on bypass put her at risk for excessive bleeding. She might require more transfusions. There is an elevated chance of **reoperation for bleeding**. Meticulous hemostasis in the OR is critical; we will also ensure dialysis is done just before surgery to optimize platelet function (uremia control) and consider DDAVP or antifibrinolytics to mitigate bleeding. The team will be on standby for a potential take-back to OR if bleeding is significant post-op.

• **Infection:** She is at **high risk for infections**, particularly **deep sternal wound infection** (mediastinitis) given her diabetes, likely higher BMI, and dialysis status. We will implement aggressive infection prophylaxis – sterile technique, weight-based antibiotics (including MRSA coverage if indicated), tight glycemic control (keep blood glucose <180 mg/dL), and avoid bilateral internal mammary harvest (to preserve sternal blood supply) unless absolutely necessary. Postoperatively, vigilant wound care is needed; we'll consider chlorhexidine washes and early involvement of wound care if any sign of sternal complication. Dialysis patients can also have impaired immunity, so even pneumonia or line infections are concerns – hence meticulous central line care and early extubation (when safe) to prevent pneumonia will be prioritized.

• **Neurologic Complications:** Her cerebrovascular risk factors (hypertension, dialysis – which is associated with vascular calcifications) put her at moderate risk for stroke. Calcified atherosclerosis in the aorta (common in ESRD) can embolize during surgery. We will use epiaortic ultrasound to find a clean aortic clamp site and consider surgical techniques to minimize atheroembolism (no-touch aorta or off-pump strategies if aorta is very diseased). Despite these measures, she has a higher-than-average stroke risk, which we have discussed. Post-op delirium is also possible given her age and dialysis, so we'll employ delirium prevention protocols.

• **Renal/Hepatic:** Though she cannot have "acute kidney injury" in the traditional sense (already on dialysis), fluid and electrolyte management will be challenging. We must avoid hypotension and poor perfusion to prevent other organ dysfunction (like liver injury). Continuous renal replacement therapy may be used in the ICU for fluid management.

• **Arrhythmias:** Atrial fibrillation occurs in ~30% of CABG patients; her risk may be even higher with her stressors. We'll use beta-blockers (if BP tolerates) and electrolyte optimization to prevent AF. Any new arrhythmia will be managed promptly (e.g. amiodarone for AF) to avoid hemodynamic compromise.

Overall, **the expectation is that her post-op course could be complex**, possibly requiring prolonged ICU care, but these risks are identifiable and plans are in place to mitigate them as much as possible.

Operative Planning and Risk Mitigation Strategies

Multidisciplinary planning has been undertaken to maximize her chances of a good outcome. Key recommendations and strategies for the surgical team include:

• **Optimize Volume & Dialysis Timing:** Schedule hemodialysis the evening before or morning of surgery to ensure she enters the OR euvolemic and with normal electrolytes. This will reduce pulmonary edema (benefiting her PH and ventilation) and minimize hyperkalemia during cardiopulmonary bypass. Postoperatively, resume dialysis early (within 24 hours) to manage fluid shifts. Intraoperatively, we'll carefully monitor fluid balance and use ultra-filtration on bypass if needed.

• **Glycemic Control:** Strict insulin infusion protocol on the day of surgery and post-op to keep glucose tightly controlled (140–180 mg/dL). This will help reduce infection risk and improve wound healing. An endocrinology consult has been made for perioperative diabetes management.

• **Conduit and Surgical Technique:** Use a single left internal mammary artery (LIMA) to LAD (for its long-term patency benefit), but avoid bilateral IMAs to reduce sternal devascularization risk in this diabetic. Supplement with vein grafts for other vessels. Ensure the sternal closure is reinforced (consider rigid fixation if bone quality is poor due to renal osteodystrophy) and use prophylactic wound vac dressing if necessary. The surgeon will perform meticulous calcified plaque management: for instance, if the ascending aorta is calcified (common in ESRD), an **off-pump CABG** or "no-touch" technique on the aorta will be considered. Off-pump CABG (beating-heart surgery) can avoid the inflammation of bypass and has shown advantages in high-risk patients9, though this will depend on intraoperative assessment and surgeon expertise.

• **Intraoperative Monitoring & Support:** Invasive monitoring (arterial line, possible pulmonary artery catheter) will be used for tight hemodynamic control. We have a low threshold to insert an **intra-aortic balloon pump (IABP)** preemptively or intraoperatively if her hemodynamics look marginal (e.g. if difficulty separating from bypass). An IABP can support her coronary perfusion and cardiac output in the early post-op period, especially important given her recent MI and poor coronary reserve. In addition, pacing wires will be placed (routine) and can be used to optimize heart rate and support if complete heart block or bradyarrhythmias occur.

• **Pulmonary Hypertension Management:** To manage her PH, anesthesia will avoid excessive vasoconstriction and will ensure adequate oxygenation/ventilation to prevent PH crises. We'll have **pulmonary vasodilators** available (inhaled nitric oxide or IV milrinone) if the right ventricle struggles. Postoperatively, we'll continue her home PH meds (if any, e.g. sildenafil) and keep her pain well-controlled to avoid hypoventilation/hypercapnia which could worsen PH. Early extubation will be targeted if feasible, but not at the expense of stability – readiness for a prolonged vent strategy is in place if needed (including sedation and possibly tracheostomy if prolonged ventilation ensues).

• **Blood Conservation:** Because of her bleeding risk, we'll use intraoperative cell-saver technology to recycle shed blood. Antifibrinolytic therapy (e.g. tranexamic acid) will be given during bypass to reduce bleeding. Her pre-op hematocrit will be optimized (erythropoietin or transfusion if needed to get Hct in a safer range). Close communication with perfusion will ensure minimized hemodilution on pump. Post-op, we will tolerate a slightly lower blood pressure to reduce risk of bleeding from suture lines, as long as organ perfusion is adequate.

• **Infection Prevention:** As noted, strict sterile technique and prophylactic antibiotics (including vancomycin given her high MRSA risk due to dialysis). We will consider applying mupirocin to nares pre-op if not already done (to reduce staph colonization). Post-op glucose control and early nutrition will aid healing. If she has a history of skin issues or colonization, appropriate precautions will be taken. Wound checks will be frequent, and any sign of infection will prompt early intervention (debridement or antibiotics) to prevent deep spread.

• **Intensive Care Plan:** Postoperatively, she will go to the CVICU with an experienced team. Given her risk profile, we plan for **prolonged ICU monitoring** – we won't rush transfer to the floor. Dialysis will be coordinated in ICU. Daily multidisciplinary rounds (including cardiology, nephrology, pulmonology if needed) will be done. We will also involve physical therapy early to help mobilize her as soon as she's stable, to reduce complications like deconditioning and pneumonia.

• **Consensus and Contingency Plans:** The **heart team** (surgeon, cardiologist, anesthesiologists, intensivists, nephrologist) has reviewed her case in detail. All are aware of the high-risk nature. Contingency plans (e.g. emergency ECMO if catastrophic heart failure, re-operation teams on standby if bleeding) are in place. We have also had a frank discussion with the patient (and family) about these risks and the possible need for prolonged support or interventions if complications arise. Informed consent was obtained with understanding of the mortality risk and potential complications.

Conclusion and Recommendation

After comprehensive evaluation, the heart team's consensus is to **proceed with CABG** as the potential **life-saving and long-term benefits outweigh the upfront risks** in this 57-year-old woman. **Her STS-predicted mortality risk ~10% classifies her as high-risk**[2]**,** so this decision has been made with due caution and planning. We recommend moving forward with the operation, with all the above risk mitigation strategies in place. The surgical team is prepared for a challenging case, but we are optimistic that with careful management, the patient can have a positive outcome.

In summary, this patient's case has been **thoroughly reviewed in our pre-op heart team meeting**. We have identified her risk factors and implemented plans to address each one. She understands that her risk

is higher than usual (we have explained she has roughly a 90% chance of survival and 50/50 chance of some complication) but also that without surgical intervention her prognosis is poor (progressive coronary disease with ESRD). The team's **goal is a successful CABG with vigilant perioperative care**, aiming to maximize her odds of recovery. We will proceed with these plans and adjust as needed intraoperatively.

Plan: Proceed with urgent isolated CABG (arterial + vein grafts) tomorrow. Continue current medical therapy up to surgery (beta-blocker, etc.), complete dialysis pre-op, and follow the outlined precautions. High-risk consent on file. All relevant specialties on standby. Let's move forward, optimistically but prepared, to give this patient the best chance at an improved life.

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