



**AAVBC**

AMERICAN ACADEMY OF VALUE BASED CARE

# **Value-Based Elective Total Knee Replacement Quick Reference Guide**

**2026**

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## VALUE-BASED ELECTIVE TOTAL KNEE REPLACEMENT

**Total knee replacement (TKR)** can provide substantial pain relief and functional improvement for **carefully selected patients** with advanced symptomatic knee disease.<sup>1,2</sup> But elective TKR should not be the default response to knee osteoarthritis.<sup>3</sup> **Conservative care is the default treatment pathway**, and surgery becomes appropriate only when reasonable nonoperative care has not produced acceptable relief, the patient's goals favor definitive treatment, and the patient has sufficient capacity to benefit from surgery and rehabilitation.<sup>1,4</sup>

Elective treatment creates an opportunity to **improve function before deciding that surgery is necessary**.<sup>4</sup> Exercise and physical therapy, weight and activity strategies, appropriate medications or injections, supportive devices, self-management, and management of contributing conditions can **reduce symptoms, preserve function**, and in some patients **defer or eliminate the need for TKR**.<sup>4,5</sup> Conservative care should be **individualized** and **goal-directed** rather than treated as a checklist or authorization requirement.<sup>6</sup>



### AAVBC PERSPECTIVE

**Value-based TKR begins with the right treatment, not the procedure.** For most patients with knee osteoarthritis, start with a **reasonable, individualized trial of conservative care** (physical therapy, activity and weight optimization, appropriate analgesia, and selective intra-articular steroid injection) and use the response to determine whether surgery remains necessary. Many patients continue to improve on structured nonoperative programs and roughly a quarter proceed to arthroplasty within two years, so **surgery should not be treated as the default endpoint**.<sup>1,5</sup> When symptoms remain substantially limiting despite an adequate trial and radiographic disease is moderate-to-severe, evaluate through shared decision-making whether TKR is the right intervention for the right patient.<sup>2,7</sup>

If TKR is indicated, match the surgery itself to the **lowest acuity site of care the patient can safely use**. In appropriately selected patients, outpatient TKR performed at a hospital outpatient department or a stand-alone ambulatory surgery center (ASC) yields 90-day complication, reoperation, revision, readmission, and ED-visit rates **comparable to inpatient surgery**, and large matched analyses show lower adverse-event rates with no increase in 30-day readmission.<sup>8,9</sup>

ASC's are a preferable option vs. Outpatient hospital to **lower the risk of nosocomial infections** and reduce out-of-pocket costs for patients.

**Site-of-care selection is itself part of the value-based decision:** the goal is the least intensive setting that safely meets the individual patient's needs, escalating to inpatient admission only when comorbidity, reserve, or home support require it.

For patients who do proceed to surgery, the goal of prehabilitation is not simply to make the patient "fit for surgery." It is to **build the strength, mobility, nutrition, confidence, and practical home support** needed to recover safely and return home. Prehabilitation improves preoperative function and quadriceps strength and function at 6 weeks postoperatively with **reduced length of stay**, and should **begin before surgery** linked to specific functional and home-readiness goals.<sup>10,11</sup> Because home-based rehabilitation is at least as effective as clinic- or facility-based rehabilitation after uncomplicated TKA in patients with adequate social

support, the **recovery plan should default to home** rather than institutional post-acute care **whenever feasible**.<sup>12,13</sup>

**The value-based sequence is:**

**Conservative care first** → confirm the need for TKR → assess recovery capacity → prehabilitate → select the lowest acuity safe surgical setting (ASC or outpatient when appropriate) → plan for home recovery → **proceed when the expected patient-centered benefit justifies the total burden**.

## Core Value Standards

| STANDARD                               | OPERATIONAL MEANING <sup>14,15</sup>                                                                                                                 | VALUE PROTECTED <sup>15-17</sup>                                                    |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Conservative care first</b>         | Give individualized exercise, activity, weight, medication, device, injection, and self-management strategies <b>a genuine trial</b>                 | <b>Symptoms and function improved without unnecessary surgery</b>                   |
| <b>Confirm the need</b>                | <b>Integrate:</b> symptoms, function, imaging, prior treatment, and patient goals                                                                    | <b>TKR for meaningful disease rather than imaging alone</b>                         |
| <b>Select the right patient</b>        | <b>Assess:</b> medical, geriatric, functional, cognitive, nutritional, and social capacity                                                           | Surgery offered <b>when the patient can meaningfully benefit</b>                    |
| <b>Prehabilitate before proceeding</b> | <b>Build:</b> strength, range of motion, endurance, nutrition, and recovery skills before surgery                                                    | <b>Better postoperative function</b> and greater potential for <b>home recovery</b> |
| <b>Plan for home recovery</b>          | <b>Establish:</b> mobility, transfers, stairs, equipment, caregiver, transportation, therapy, medication, and escalation plans <b>before surgery</b> | <b>Safe home discharge</b> and fewer avoidable post-acute transitions               |
| <b>Coordinate the episode</b>          | <b>Link:</b> PCP, surgeon, anesthesia, therapy, patient, caregiver, and post-acute teams                                                             | <b>Fewer gaps, duplicative services, and preventable complications</b>              |
| <b>Measure meaningful outcomes</b>     | <b>Track:</b> pain, function, recovery, complications, patient experience, and total episode cost                                                    | <b>Patient benefit</b> rather than procedure volume                                 |

**ABBREVIATIONS:** ASC = ambulatory surgery center; PCP = primary care physician



### CLINICAL PEARL: ELECTIVE MEANS THERE IS TIME TO CHANGE THE TRAJECTORY

Use the preoperative interval to **determine whether the patient needs surgery at all.**<sup>7,18</sup> If TKR remains appropriate, use that same interval to **build the capacity required for a successful recovery** rather than allowing the waiting period to become a period of deconditioning.<sup>11,19</sup>

## MEDICAL NECESSITY: CONFIRM THE NEED FOR SURGERY

**A TKR decision should answer two separate questions:**

1. Does the patient **still need surgery**?
2. If surgery is appropriate, **is the patient ready to recover from it**?

**The first question comes before the second.**<sup>2,20</sup> Advanced imaging alone does not establish the need for TKR. **The decision should integrate:**<sup>2,21</sup>

- Meaningful pain, stiffness, instability, or other symptoms
- Functional limitation affecting walking, stairs, transfers, ADLs, work, sleep, or valued activities
- Imaging consistent with advanced disease
- A documented response to reasonable conservative treatment
- Patient goals and willingness to undergo the recovery burden

## Conservative Care is the Default

**Conservative care is first-line for most knee osteoarthritis.**<sup>1,6</sup> The objective is not to complete every possible intervention before surgery. The objective is to use **reasonable, individualized treatment to improve symptoms and function** and determine whether the patient still needs an operation.<sup>1,6</sup>

A conservative plan may include **targeted exercise** and **physical therapy**, activity and weight strategies, supportive devices, self-management, appropriate medications or injections, and management of contributing sleep, mood, cardiometabolic, nutrition, smoking, and fall-risk factors.<sup>6,22</sup>

Document: **what was attempted**, the **functional goal**, the **response**, **barriers or contraindications**, and why additional conservative care **is or is not likely to provide acceptable relief.**<sup>2</sup>

## When Surgery Becomes the Appropriate Next Step

Consider TKR when **advanced symptomatic disease continues to cause meaningful functional loss despite reasonable individualized conservative care**, the **patient wants definitive treatment**, and the expected pain and functional benefit **justifies the operative and recovery burden**.<sup>2,7</sup>

**The failure of conservative care does not automatically establish surgical candidacy.** It establishes the need to assess whether surgery is the right next step.<sup>20,23</sup>

## Geriatric Preoperative Assessment

**The comprehensive geriatric assessment (CGA)** is not a one-time clearance step performed at the end of the surgical pathway. It is an **early decision tool** that should be introduced at the **very first conversation about an elective procedure and revisited at each checkpoint thereafter**, because a patient's reserve, cognition, nutrition, medication burden, and home support **all change over the interval before surgery**.<sup>14,24</sup> Used this way, **the CGA does double duty**: it is the **guiding benchmark** that defines and paces prehabilitation well in advance of the formal preoperative window (each domain sets a concrete target to optimize) and it is the **framework the PCP returns to** as those targets are met or missed.<sup>25,26</sup>

Read the table below as a **structured gate**, not a checklist. Each domain **converts a geriatric vulnerability into a concrete action**, and the pattern of findings across domains points to one of four outputs: proceed, proceed after optimization, defer and reassess, or return to a conservative pathway. Isolated, **reversible deficits** (suboptimal nutrition, a droppable high-risk medication, correctable glycemia) argue for **optimization** and a **short delay**, not cancellation. When multiple domains show **low reserve** (frailty plus cognitive impairment plus absent home support) **the likely recovery burden may exceed the expected functional benefit**, and the CGA becomes a **definitive no-go**: the PCP, through shared decision-making and the best available evidence, **recommends conservative care rather than the elective procedure** even though the joint disease itself would "qualify" for surgery. The **"Matters Most" domain is the tiebreaker**: the decision ultimately turns on whether the patient's own priorities make the recovery burden worth the expected pain relief and mobility gain.<sup>2,21</sup>

### Geriatric Assessment Domains for the TKR Go/No-Go Decision

| DOMAIN                        | TKR-SPECIFIC QUESTION <sup>20,27</sup>                                                     | EFFECT ON CARE PLAN <sup>28,29</sup>                            |
|-------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Function and mobility</b>  | <b>What is baseline:</b> ADL, IADL, gait, transfer, fall, and device status                | <b>Predict rehabilitation needs and discharge setting</b>       |
| <b>Cognition and capacity</b> | Can the patient <b>understand the decision</b> and <b>follow precautions and exercises</b> | Support consent, caregiver involvement, and delirium prevention |
| <b>Frailty</b>                | <b>How much reserve remains</b> for surgical stress and rehabilitation                     | Optimize, intensify support, defer, or reconsider               |
| <b>Nutrition</b>              | <b>Is there:</b> weight loss, low intake, swallowing, dental, or protein-energy concern    | Treat modifiable risk before elective surgery when feasible     |

| DOMAIN                    | TKR-SPECIFIC QUESTION <sup>20,27</sup>                                                                       | EFFECT ON CARE PLAN <sup>28,29</sup>                                     |
|---------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Medications</b>        | <b>Which drugs increase:</b> bleeding, hypoglycemia, kidney, falls, sedation, or delirium risk               | Create a <b>procedure-specific medication plan</b>                       |
| <b>Home and caregiver</b> | Can the patient enter the home, toilet, transfer, obtain food and medications, and receive help              | Select site and post-acute plan <b>before</b> surgery                    |
| <b>Matters Most</b>       | Is pain relief or mobility improvement <b>worth recovery burden</b> and <b>possible loss of independence</b> | Proceed only when <b>expected benefit matches the patient's priority</b> |

**ABBREVIATIONS:** TKR = total knee replacement; ADL = activities of daily living; IADL = instrumental activities of daily living

## PCP Recommendation

**State one of four conclusions:** proceed; proceed after named optimization; defer and reassess; or do not recommend because expected burden exceeds likely patient-centered benefit.<sup>21,28</sup> Document **who owns each unresolved risk** and **when readiness will be reviewed**.<sup>15,17</sup>



### MAKING CONNECTIONS

Consult the [AAVBC Geriatric Assessment Performance and Use QRG](#) for CGA domains, tool selection, 5Ms synthesis, delirium prevention, therapy referral, level-of-care decisions, and the complete preoperative consultation template.

## Medical Necessity Framework

| REQUIREMENT                      | DOCUMENTATION <sup>2,7</sup>                                                                                                                                                                                                                               | VALUE INTERPRETATION <sup>2,30</sup>                                                                                                                                        |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Symptomatic joint disease</b> | Persistent pain, stiffness, instability, deformity, or impaired sleep and mobility                                                                                                                                                                         | Symptoms must be <b>meaningful to the patient</b>                                                                                                                           |
| <b>Functional limitation</b>     | <b>Difficulty with:</b> walking, stairs, transfers, ADLs, work, or valued activity                                                                                                                                                                         | Function helps distinguish <b>high-value relief</b> from image-driven surgery                                                                                               |
| <b>Structural disease</b>        | Weight-bearing (standing) <b>plain radiographs</b> showing <b>K-L grade 3-4 tibiofemoral OA</b> : joint space narrowing to "bone-on-bone" loss, osteophytes, sclerosis, and cysts; <b>reserve MRI/CT for symptom-imaging mismatch or surgical planning</b> | Imaging <b>supports but does not replace</b> clinical correlation; advanced K-L grade <b>correlates with greatest benefit</b> , whereas mild disease predicts poor outcomes |

| REQUIREMENT                         | DOCUMENTATION <sup>2,7</sup>                                                                                                                                                                                                                                                                                                                                                              | VALUE INTERPRETATION <sup>2,30</sup>                                                                                                                   |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reasonable conservative care</b> | <b>Time-defined trial:</b> supervised PT <b>≥6 weeks</b> (~12 sessions/3 months), <b>≥5% weight loss</b> if BMI <b>≥25</b> , NSAID/analgesic trial, <b>device/activity modification</b> , and intra-articular steroid injection if indicated; <b>record baseline and post-trial function</b> (KOOS JR, Oxford Knee Score, or Timed Up-and-Go); <b>insurers commonly require ≥3 months</b> | <b>Document response and contraindications</b> , not every option; persistent, meaningful symptoms <b>despite ≥3-6 months of care support referral</b> |
| <b>Shared decision</b>              | Expected <b>pain and function benefit</b> , persistent symptoms, risks, recovery burden, alternatives, and <b>patient priority</b>                                                                                                                                                                                                                                                        | <b>Informed preference completes medical necessity</b>                                                                                                 |

**ABBREVIATIONS:** ADLs = activities of daily living; K-L = Kellgren-Lawrence; OA = osteoarthritis; MRI = magnetic resonance imaging; CT = computed tomography; PT = physical therapy; BMI = body mass index; NSAID = nonsteroidal anti-inflammatory drug; KOOS JR = Knee injury and Osteoarthritis Outcome Score for Joint Replacement

## Other Qualifying Scenarios

- Rheumatoid, post-traumatic, inflammatory, or avascular-necrosis-related destruction with **meaningful symptoms** and **functional loss**<sup>2,31</sup>
- **Tumor requiring limb-salvage reconstruction**<sup>32</sup>
- **Selected distal femur or proximal tibia fractures** not manageable by standard techniques<sup>33,34</sup>
- **Failed prior knee surgery**, arthroplasty, or osteotomy requiring **revision-level evaluation**<sup>35,36</sup>



### QUALITY OUTCOME: DOCUMENT THE DECISION, NOT ONLY THE DIAGNOSIS

A complete record shows why surgery is expected to **improve this patient's pain or function** and why, after applying conservative care first-line, further **conservative care is unlikely to meet the same goal**.<sup>2,21</sup>



### CLINICAL PEARL: LET SYMPTOMS, NOT THE X-RAY, DRIVE THE CONSERVATIVE-CARE- VERSUS-TKA DECISION

**Radiographic severity and symptoms are discordant**, so imaging should stage disease and **refine prognosis** rather than trigger surgery on its own. In a >7,500-knee Osteoarthritis Initiative analysis, **patient-reported symptoms** predicted progression to TKA **more strongly than Kellgren-Lawrence (K-L) grade**, and K-L 3 and 4 carried equal arthroplasty risk.<sup>37</sup> Practically, a symptomatic knee with only **mild-to-moderate radiographic disease** should continue **structured conservative care** (arthroplasty in mild-moderate OA yields poorer outcomes), whereas the greatest, most durable benefit follows **TKA in advanced, "bone-on-bone" disease**.<sup>30,38,39</sup>

#### For the PCP:

- **Treat clinically first.** In patients  $\geq 45$  with activity-related pain and brief stiffness, OA can be diagnosed and managed (education, exercise/weight loss, NSAIDs, intra-articular steroid) without waiting on imaging<sup>1,22</sup>
- **Use weight-bearing radiographs to stage and time referral, not to diagnose.** Standing views document K-L grade and baseline; radiographic progression predicts a 5-fold higher 2-year TKA likelihood. **Reserve MRI for atypical features** or symptom-imaging mismatch<sup>1,40,41</sup>
- **Match care intensity to discordance.** Severe symptoms with mild-moderate radiographs (K-L  $\leq 3$ ) warrant **continued nonoperative care**; a full-thickness cartilage defect independently flags progression risk beyond K-L grade alone<sup>5,30,42</sup>
- **Refer when:** advanced structural disease meets refractory symptoms after ~6-12 months minimum of appropriate therapy, using shared decision-making and realistic expectations (10-34% persistent post-TKA pain)<sup>1,30</sup>

## CONSERVATIVE CARE: CORE PATHWAY

**Conservative care is first-line for most knee osteoarthritis.**<sup>1,6</sup> The plan should be **individualized, feasible**, and **goal-directed**.<sup>6,43</sup> It may **delay** or **avoid surgery**, and it can improve conditioning if surgery is ultimately chosen.<sup>1,28</sup> A structured **12-24 week trial of the core interventions** (education/self-management, individualized exercise, and  $\geq 5\%$  weight loss in overweight patients) is **recommended before surgical referral**, with reassessment of pain, function, and adherence at the trial's end to **guide escalation**.<sup>4,6,44</sup>

| PILLAR                          | INTERVENTIONS <sup>6,45</sup>                                                                         | VALUE-BASED USE <sup>22,43</sup>                      |
|---------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>Targeted exercise and PT</b> | Quadriceps, hamstring, and gluteal strength; range of motion; balance; <b>low-impact conditioning</b> | <b>Improve:</b> pain, function, and recovery capacity |

| PILLAR                            | INTERVENTIONS <sup>6,45</sup>                                                           | VALUE-BASED USE <sup>22,43</sup>                                       |
|-----------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>Lifestyle and biomechanics</b> | <b>Weight management</b> ; activity modification; stair and standing strategies; pacing | <b>Reduce mechanical load</b> and maintain participation               |
| <b>Supportive devices</b>         | <b>Cane in opposite hand</b> ; selected brace; footwear or orthotic support             | <b>Improve stability</b> and <b>reduce load</b> when correctly fitted  |
| <b>Self-management</b>            | <b>Education</b> ; home exercise; heat or cold; <b>symptom tracking</b> ; goal setting  | Build durable capability at low burden                                 |
| <b>Comorbidity management</b>     | Sleep, mood, cardiometabolic health, smoking, nutrition, and fall risk                  | Improve both <b>nonsurgical function</b> and <b>surgical readiness</b> |

**ABBREVIATIONS:** PT = physical therapy

## Documentation that Supports Value

- **Therapy offered or completed**, functional goal, adherence barriers, and measured response<sup>43,46</sup>
- Medication or injection benefit, duration, adverse effects, and contraindications<sup>6,47</sup>
- Activity, weight, device, and home strategies actually attempted<sup>6,30</sup>
- **Why additional conservative care remains reasonable** or is unlikely to provide acceptable relief<sup>1,2</sup>

## Conservative Care: Medications and Procedures

| OPTION                                | POTENTIAL ROLE <sup>6,22</sup>                                                | OLDER ADULT AND VALUE CONSIDERATIONS <sup>47,48</sup>                                      |
|---------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Topical NSAID</b>                  | <b>Localized pain relief</b> with less systemic exposure                      | <b>Often preferable before oral NSAID</b> when skin and application factors permit         |
| <b>Oral NSAID</b>                     | <b>Individualized</b> guideline directed anti-inflammatory relief             | <b>Review:</b> kidney, GI, blood pressure, heart failure, anticoagulant, and bleeding risk |
| <b>Acetaminophen</b>                  | <b>Limited</b> or <b>episodic analgesic option</b>                            | <b>Review:</b> total daily exposure, liver disease, alcohol use, and combination products  |
| <b>Duloxetine</b>                     | Pain modulation when <b>chronic pain phenotype</b> or depression supports use | <b>Monitor:</b> nausea, falls, sodium, interactions, and tolerability                      |
| <b>Intra-articular corticosteroid</b> | <b>Short-term relief</b> for a symptomatic flare or bridge                    | <b>Discuss:</b> transient benefit, glucose effects, infection timing, and cumulative use   |

| OPTION                 | POTENTIAL ROLE <sup>6,22</sup>                                                                                                                                                                                                                                                                                                                                                                             | OLDER ADULT AND VALUE CONSIDERATIONS <sup>47,48</sup>                                                                                                            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hyaluronic acid</b> | <b>Not routine:</b> 2019 ACR/AF and 2021 AAOS conditionally <b>recommend against it</b> for knee OA (effect vs. saline approaches zero in low-bias trials); OARSI/VA-DoD/ESCEO remain <b>conditionally supportive as second-line</b> , so guidance conflicts; <b>reasonable only via shared decision-making</b> after exercise/PT, topical and oral NSAIDs, and intra-articular steroid <b>have failed</b> | <b>Variable, often modest benefit: non-invasive</b> option that is offered in primary care; may appeal when NSAIDs are contraindicated (renal, GI, cardiac risk) |
| <b>Opioid</b>          | <b>Generally avoid routine chronic OA use</b>                                                                                                                                                                                                                                                                                                                                                              | <b>High risk of:</b> sedation, falls, constipation, dependence, and poor functional value                                                                        |

**ABBREVIATIONS:** NSAID = nonsteroidal anti-inflammatory drug; GI = gastrointestinal; OA = osteoarthritis

## Medication Stewardship

- Use the **lowest effective exposure** and **define the functional goal** and stop rule<sup>47,48</sup>
- **Avoid stacking systemic NSAIDs** or combining with high-risk interacting therapy without a deliberate plan<sup>6,47</sup>
- Reassess whether analgesia **enables activity** or **merely adds medication burden**<sup>43,48</sup>
- Coordinate **injection timing** and **perioperative medication decisions** with the orthopedic team<sup>28,49</sup>



## QUALITY OUTCOME: FUNCTIONAL BENEFIT PER TREATMENT BURDEN

Track **walking, stairs, sleep, and participation** rather than judging conservative treatment only by a numeric pain score.<sup>1,45</sup> Patients should capture these domains with a **brief, repeatable toolkit** (aided by a smartwatch or phone health app) and bring the trend to each PCP visit:

- **A validated questionnaire at set intervals** (baseline, then ~every 3 months) → the free KOOS-12/KOOS-PS or WOMAC; a **WOMAC change of ~12.5 points** signals real improvement<sup>50,51</sup>
- **Passive device tracking**: a smartwatch or phone health app automatically logs daily step count, walking distance/pace, flights of stairs climbed, and sleep duration/disturbance objective trends the patient can export or screenshot for the visit<sup>50,52</sup>
- **A simple symptom log alongside the device data**: valued activities missed or resumed, and pain during a defined task rather than at rest<sup>50,52</sup>
- **A timed home test over time** (30-second chair-stand or timed up-and-go), both OARS-1 endorsed and equipment-free<sup>50,53,54</sup>
- A one-line goal note pairing the **patient's top functional goals with treatment burden** (pills, injections, PT visits, side effects) so benefit is weighed against effort<sup>50</sup>

Dated, consistent entries, ideally the same device metrics each time, let the PCP distinguish **genuine trajectory from a single bad day**.

## When to Proceed and When to Defer

| DECISION                              | CLINICAL PATTERN <sup>1,2</sup>                                                                                                                                                                            | ACTION <sup>2,28</sup>                                                   |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Continue conservative care</b>     | <b>Symptoms remain manageable</b> ; function is acceptable; treatment has not been optimized; patient does not want surgery                                                                                | <b>Refine the non-operative plan</b> and reassess                        |
| <b>Proceed to surgical evaluation</b> | <b>Advanced symptomatic disease</b> ; meaningful functional loss; reasonable nonoperative therapy has failed; <b>patient seeks definitive treatment after conservative care has failed for 6-12 months</b> | Refer <b>with complete medical necessity</b> and <b>risk information</b> |
| <b>Proceed after optimization</b>     | Indication is present <b>but</b> modifiable medical, geriatric, nutritional, medication, smoking, or support risk <b>is material</b>                                                                       | <b>Assign</b> : actions, owners, and readiness review                    |
| <b>Defer or reconsider</b>            | <b>Active infection</b> ; unstable disease; inadequate recovery support; <b>benefit is unlikely to justify burden</b>                                                                                      | <b>Treat the barrier</b> or <b>choose a less burdensome pathway</b>      |

## Indications and Contraindications

For older adults, conservative care is the default and should be prioritized first; TKR is considered only after a compelling indication is established, and even then elective surgery should be scheduled only when two conditions are both met: **nonoperative management has failed to resolve the symptoms**, and the patient has achieved optimized, objective values that **maximize the likelihood of safe surgery and the best attainable postoperative mobility and goal attainment**.<sup>2,5</sup>

The PCP is **central to this pathway**: the PCP partners with the patient to **resolve or optimize modifiable contraindications**, including measurable benchmarks such as HbA1c, tobacco status, nutritional markers, and hemoglobin, each of which must be met for the patient to be **both eligible and safe to proceed**.<sup>14,28</sup> **Absolute contraindications are non-negotiable stops**; relative, modifiable ones are the optimization worklist.<sup>2,55</sup>

### Indications

| CATEGORY                                                  | EXAMPLES <sup>2,7,49,56</sup>                                                                                                                                                                                                                                                                                                   | DECISION EFFECT <sup>2,7,29,56</sup>                                                                                                |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Common indications</b>                                 | <b>Advanced OA</b> ; rheumatoid or inflammatory destruction; post-traumatic arthritis; avascular necrosis with collapse                                                                                                                                                                                                         | <b>Consider TKR when symptoms, function, imaging, and goals align</b>                                                               |
| <b>Specialized indications</b>                            | <b>Tumor reconstruction</b> ; selected fractures; failed prior procedure                                                                                                                                                                                                                                                        | <b>Specialist-led pathway</b> with individualized urgency and complexity                                                            |
| <b>Disease-severity threshold</b>                         | <b>Moderate-to-severe radiographic OA</b> (K/L grade 3–4) plus moderate-to-severe pain or functional loss; excludes mild radiographic disease or minimal symptoms                                                                                                                                                               | <b>Confirms a true structural indication</b> ; radiographic severity alone or symptoms alone is <b>insufficient</b>                 |
| <b>Failed conservative care</b>                           | <b>Completed appropriate nonoperative therapy</b> (PT, NSAIDs, and/or intra-articular injection) without durable relief                                                                                                                                                                                                         | <b>Establishes surgical candidacy</b>                                                                                               |
| <b>Optimized preoperative values ("ready to proceed")</b> | <ul style="list-style-type: none"> <li>• <b>HbA1c &lt;7% with perioperative glucose &lt;126–180 mg/dL</b></li> <li>• <b>BMI &lt;35 or &gt;18</b></li> <li>• <b>Albumin &gt;3.5 g/dL</b></li> <li>• <b>Hemoglobin &gt;11 g/dL</b></li> <li>• <b>Nicotine cessation ≥6 weeks</b></li> <li>• <b>No active infection</b></li> </ul> | Objective, measurable targets that <b>maximize safe surgery and postoperative outcome</b> ; align with modifiable contraindications |

**ABBREVIATIONS:** OA = osteoarthritis; TKR = total knee replacement; K/L = Kellgren-Lawrence; PT = physical therapy; NSAIDs = nonsteroidal anti-inflammatory drugs; HbA1c = hemoglobin A1c; BMI = body mass index

## Contraindications to TKR for Older Adult Patients

| TYPE                         | INDICATION <sup>2,7,57,58</sup>                                                                                                                  | EFFECT ON CARE PLAN <sup>2,29,57,59</sup>                                                                                                                                                                                                                                    |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | <b>Active local or systemic infection</b><br>(septic knee, bacteremia, active periprosthetic sepsis)                                             | <b>Do not proceed</b> ; eradicate infection and reassess → infection is the leading driver of <b>periprosthetic joint infection and mortality</b>                                                                                                                            |
| <b>Absolute</b>              | <b>Extensor mechanism non-function</b> or insufficient soft-tissue/skin coverage                                                                 | Do not proceed with standard TKR; <b>surgical reconstruction</b> or <b>alternative pathway</b> required                                                                                                                                                                      |
|                              | <b>Medically unstable for anesthesia</b><br>(decompensated CHF, unstable cardiac/pulmonary disease, metastatic disease limiting life expectancy) | <b>Defer or return to conservative care</b> ; CHF, metastatic cancer, renal, cerebrovascular, and pulmonary disease are top independent predictors of <b>90-day mortality</b>                                                                                                |
| <b>Absolute (functional)</b> | <b>Multidomain low reserve</b> : frailty + cognitive impairment + absent home support where recovery burden exceeds expected benefit             | <b>Definitive no-go</b> ; recommend <b>conservative care</b> through shared decision-making                                                                                                                                                                                  |
|                              | <b>Poorly controlled diabetes/hyperglycemia</b>                                                                                                  | Delay for better glycemic control <b>before</b> elective surgery scheduled                                                                                                                                                                                                   |
|                              | <b>Active nicotine/tobacco use</b>                                                                                                               | Delay for nicotine reduction or cessation                                                                                                                                                                                                                                    |
|                              | <b>Malnutrition/protein-energy deficit</b>                                                                                                       | Optimize <b>before</b> elective surgery scheduled; independent predictor of <b>postoperative complications</b>                                                                                                                                                               |
| <b>Relative (modifiable)</b> | Health BMI target ( <b>18&lt;BMI&lt;35</b> )                                                                                                     | <b>Not a reason to deny</b> ; strongly encourage weight loss and discuss elevated infection/complication risk                                                                                                                                                                |
|                              | Preoperative <b>anemia, deliriogenic or high-risk medications</b>                                                                                | <b>Optimize anemia</b> ; build a <b>procedure-specific medication plan</b> (avoid benzodiazepines, tramadol, anticholinergics)                                                                                                                                               |
|                              | <b>Poorly controlled diabetes, HbA1c ≥9%</b> (data-driven TKA PJI threshold ≈9.7%; risk rises continuously with no true plateau)                 | <b>Delay elective TKA for glycemic optimization</b> (4–6 weeks minimum, often 2–3 months); refer to PCP/diabetes team; target perioperative glucose 100–180 mg/dL; do not use HbA1c alone as an absolute bar, as rigid cutoffs can deny access without clear outcome benefit |

| TYPE                                                                                                                                                                                                                                | INDICATION <sup>2,7,57,58</sup>                                   | EFFECT ON CARE PLAN <sup>2,29,57,59</sup>                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relative (risk-modifying)                                                                                                                                                                                                           | Age ≥80 years                                                     | <b>Not exclusionary</b> ; risk rises for cardiac, pulmonary, renal, cerebrovascular complications across all comorbidity categories → <b>intensify optimization before elective surgery scheduling</b> |
|                                                                                                                                                                                                                                     | Mild dementia                                                     | Proceed only after <b>clear discussion of increased mortality/delirium risk</b> and cognitive-reserve optimization                                                                                     |
| Relative → near-absolute                                                                                                                                                                                                            | Moderate-to-severe dementia                                       | Proceed " <b>only in exceptional humanitarian circumstances</b> " given markedly elevated death, delirium, and intensive-intervention risk                                                             |
| Relative (surgeon-dependent)                                                                                                                                                                                                        | Neuropathic (Charcot) joint, severe deformity, or major bone loss | Guideline conditionally recommends against delay for these; <b>specialized surgical planning required</b>                                                                                              |
| <b>ABBREVIATIONS:</b> TKR = total knee replacement; CHF = congestive heart failure; BMI = body mass index; HbA1c = hemoglobin A1c; TKA = total knee arthroplasty; PJI = periprosthetic joint infection; PCP = primary care provider |                                                                   |                                                                                                                                                                                                        |



## AAVBC PERSPECTIVE

*Elective surgery should not proceed when **foreseeable recovery demands exceed the patient's capacity** and **expected benefit is low**. The recommendation should explain the **patient-specific reason** and **alternatives**.*<sup>15,20</sup>

## Limited Life Expectancy and Shared Decisions

A short life expectancy **does not automatically eliminate TKR benefit**. Pain relief and mobility may be highly meaningful, but **recovery can consume weeks to months (3-6 months to breakeven)** and the risks include **infection, thromboembolism, nerve or wound complications, persistent pain, delirium, and loss of independence**.<sup>14,21,45,60</sup>

| DECISION QUESTION         | DISCUSS <sup>7,21</sup>                                                                        | DOCUMENTATION <sup>23,61</sup>                       |
|---------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------|
| What matters most         | <b>Pain relief</b> ; walking; caregiving; independence; time at home; avoiding hospitalization | <b>Patient-stated priority</b> and acceptable burden |
| What benefit is realistic | <b>Expected pain and function improvement</b> given disease, frailty, and comorbidity          | <b>Best estimate</b> and important uncertainty       |

| DECISION QUESTION         | DISCUSS <sup>7,21</sup>                                                                     | DOCUMENTATION <sup>23,61</sup>                        |
|---------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------|
| How long is recovery      | Therapy, activity limitations, caregiver work, and possible post-acute care                 | Practical recovery plan and contingency               |
| What could go wrong       | Medical and surgical complications; persistent pain; delayed recovery; higher level of care | Patient understanding and risk-mitigation plan        |
| What are the alternatives | Optimized conservative care; injection; device; home support; palliative symptom focus      | Alternative chosen if surgery is declined or deferred |

### Recommendation Principle

- Proceed when **meaningful benefit is likely within the patient's horizon** and recovery burden is acceptable<sup>2,21</sup>
- Defer or choose **conservative management** when recovery would consume much of the remaining time or likely worsen independence<sup>20,45</sup>
- Include **family** and **surrogate support** with the patient's permission, but **preserve the patient's values and decision authority**<sup>21,23</sup>



## CLINICAL PEARL: TIME TO BENEFIT MUST INCLUDE TIME TO RECOVERY

A procedure can be **clinically successful yet poorly aligned** if the **expected recovery period consumes the time the patient hoped to gain**. Quantify the recovery arc **explicitly** during shared decision-making, and **adjust it** for the factors that lengthen it in older adults.

- **Typical recovery arc:** The steepest gains occur in the **first 3 months**, with patient-reported pain, function, and daily step counts **improving most within that window**; walking asymmetry normalizes by **~6 months**, and gait speed and stair-climbing may not fully recover until **12 months**. Substantial clinical benefit on KOOS, JR is reached by **~4 months**, but clinically meaningful improvement continues to accrue **up to 5 years**, and most function is retained for **10-15 years**<sup>62-65</sup>
- **Expectation anchors patients can use:** Return to low-impact activity typically occurs at a median of **~12 weeks** (90% by ~27 weeks), return to work averages **~13 weeks** (rising to 90% by 1 year), and return to high-impact sport takes **~6 months** and is **achieved by a minority**. Early mobilization begins the day of surgery, with **assistive devices generally discontinued around 4 weeks**<sup>66-68</sup>
- **Age slows the arc:** Older age independently **lowers and delays return-to-work rates** and **lengthens hospital stay** (age >70 adds ~0.8 days), and octogenarians show persistently lower long-term physical-function scores despite still benefiting overall<sup>64,67,69</sup>
- **Frailty and sarcopenia are the dominant modifiers, often more than chronologic age:** Frailty predicts slower early mobility, delayed ambulation, longer stays, non-home discharge, and **poorer 6-month and 2-year functional scores**; it also raises 90-day and longer-term complications in a dose-dependent fashion. Non-resilient recovery trajectories cluster in **patients with frailty** (37% vs 10%), **poor self-reported health**, and **higher comorbidity burden** (CCI >2)<sup>70-73</sup>
- **Other factors that lengthen recovery or stay:** **Higher ASA class** (3-4 adds ~1.1 days), **CCI >0** (~0.8 days), preoperative hemoglobin **<13 g/dL** (~0.7 days), BMI ≥30, and **female sex** all prolong length of stay and signal a longer functional recovery<sup>69</sup>

**The practical framing:** for a patient with limited life expectancy or multidomain low reserve, a 3-6 month recovery before meaningful benefit (and up to a year before full function) **may consume much of the time horizon they hoped to improve**, which is precisely when the benefit-burden calculus should **favor conservative care**.<sup>64,73</sup>

## PREHABILITATION: BUILD CAPACITY FOR HOME RECOVERY

### Evaluating Capacity for TKR: What to Measure And Why

Capacity assessment combines **performance-based physical tests**, a **frailty measure**, and **patient-reported outcome measures** (PROMs). Performance tests **predict postoperative recovery better than PROMs alone**, and the **Clinical Frailty Scale (CFS)** **outperforms comorbidity indices** for predicting complications, length of stay, discharge destination, and 6-month to 2-year function.<sup>71,74</sup> The **OARSI core set** (30-second chair-stand, 40-m fast-paced walk, stair-climb) **plus TUG and 6MWT** is the **validated performance battery** for knee OA and joint replacement.<sup>75,76</sup>

| TOOL                                                 | WHAT IT IS/HOW TO MEASURE                                                      | SCORE RANGE AND INTERPRETATION                                                                                                                                                                    |
|------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Timed Up and Go (TUG)</b> <sup>74,77</sup>        | <b>Time to:</b> rise from a chair, walk 3 m, turn, return, and sit             | <b>Faster is better;</b> preop TUG <b>≤12.3 s</b> predicts the best postop TUG; <b>≤19.3 s</b> predicts better WOMAC-function; each 1-s increase raises odds of delayed inpatient recovery (~10%) |
| <b>6-Minute Walk Test (6MWT)</b> <sup>74</sup>       | <b>Distance walked in 6 min on a flat course</b> (endurance/aerobic capacity)  | Longer is better; Preop 6MWT <b>&gt;328 m predicts better postop walking</b> ; <b>≥421 m predicts the best postop TUG</b>                                                                         |
| <b>30-second chair-stand test</b> <sup>75,76</sup>   | Number of sit-to-stand <b>repetitions in 30 s</b> (lower-limb strength)        | <b>More reps = greater strength/reserve;</b> part of OARSI <b>minimal core set</b> (note: limited responsiveness in end-stage OA)                                                                 |
| <b>40-m fast-paced walk</b> <sup>75,76</sup>         | <b>Time to walk 4×10 m</b> at fast pace; yields gait speed                     | <b>Faster gait speed = better reserve;</b> reliable (ICC ≥0.80) in knee OA                                                                                                                        |
| <b>Grip strength (dynamometry)</b> <sup>78</sup>     | <b>Maximal handgrip</b> (kg); surrogate for global strength/sarcopenia         | Lower grip associates with non-resilient recovery trajectories after TKA                                                                                                                          |
| <b>Clinical Frailty Scale (CFS)</b> <sup>71,79</sup> | 9-point clinician judgment of <b>fitness-to-frailty</b> ; fastest tool (~10 s) | <b>1-3</b> fit/well; <b>4</b> vulnerable; <b>5-6</b> mild-moderate frailty; <b>≥7</b> severe; <b>higher scores predict:</b> complications, longer stay, non-home discharge, 2-yr reoperation      |
| <b>Knee flexion ROM (goniometer)</b> <sup>80</sup>   | Passive/active maximal knee flexion (degrees)                                  | Preop flexion <120° predicts <b>failure to reach MCID</b> in KOOS quality-of-life at 1 yr                                                                                                         |

| TOOL                                                                  | WHAT IT IS/HOW TO MEASURE                          | SCORE RANGE AND INTERPRETATION                                                                                                        |
|-----------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>KOOS/WOMAC/<br/>Oxford Knee<br/>Score<br/>(PROMs)<sup>81</sup></b> | Validated self-report pain/function questionnaires | <b>Lower baseline function = more room to gain</b> ; preop KOOS >58 means diminishing likelihood of clinically meaningful improvement |

**ABBREVIATIONS:** TUG = Timed Up and Go; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; 6MWT = 6-Minute Walk Test; OARSI = Osteoarthritis Research Society International; OA = osteoarthritis; ICC = intraclass correlation coefficient; TKA = total knee arthroplasty; CFS = Clinical Frailty Scale; ROM = range of motion; MCID = minimal clinically important difference; KOOS = Knee injury and Osteoarthritis Outcome Score; PROMs = patient-reported outcome measures

## Tests and Targets: Quick Reference

The following thresholds flag patients **likely to recover slowly or to gain little**, prompting targeted prehab or recalibrated expectations rather than automatic exclusion.

| TEST                                          | FAVORABLE TARGET                      | FLAGS FOR OPTIMIZATION/COUNSELING                             |
|-----------------------------------------------|---------------------------------------|---------------------------------------------------------------|
| <b>TUG<sup>74,77</sup></b>                    | <b>≤12.3 s</b>                        | <b>&gt;19.3 s</b> (slower inpatient recovery, worse function) |
| <b>6MWT<sup>74</sup></b>                      | <b>≥421 m</b>                         | <b>&lt;328 m</b> (poorer postop walking)                      |
| <b>Gait speed (40-m walk)<sup>75,76</sup></b> | <b>Faster/age-normal</b>              | <b>Slow gait = low reserve</b>                                |
| <b>Grip strength<sup>78</sup></b>             | <b>Age/sex-normal</b>                 | <b>Low grip = non-resilient trajectory</b>                    |
| <b>Clinical Frailty Scale<sup>71,79</sup></b> | <b>1-4</b>                            | <b>≥5</b> (graded rise in complications, non-home discharge)  |
| <b>Knee flexion ROM<sup>80</sup></b>          | <b>≥120°</b>                          | <b>&lt;120°</b> (lower odds of MCID in QoL)                   |
| <b>Preop KOOS<sup>81</sup></b>                | <b>Low-moderate</b> (room to improve) | <b>&gt;58</b> (diminishing meaningful gain)                   |

**ABBREVIATIONS:** TUG = Timed Up and Go; 6MWT = 6-Minute Walk Test; ROM = range of motion; MCID = minimal clinically important difference; QoL = quality of life; KOOS = Knee injury and Osteoarthritis Outcome Score

## Modifiable Risk Factors: The Optimization Worklist

These are the PCP-led targets to resolve **before scheduling**. Per ACR/AAHKS, **delay for poorly controlled diabetes and for nicotine use**, however, BMI or HbA1c cutoffs should be **individualized** to incorporate considerations for elective procedure safety and maximizing postoperative success.<sup>2</sup>

| FACTOR                        | BENCHMARK/TARGET                                                                         | ACTION                                                                                                  |
|-------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Glycemia</b>               | HbA1c <7% (optimization); perioperative glucose <126-180 mg/dL; HbA1c ≥9% triggers delay | <b>Refer to diabetes team;</b> 4-6 wk minimum, often 2-3 months; do not use HbA1c alone as absolute bar |
| <b>Tobacco/nicotine</b>       | <b>Cessation ≥4 weeks</b> preop                                                          | <b>Counsel + pharmacotherapy;</b> conditionally delay for cessation                                     |
| <b>Nutrition</b>              | Albumin >3.5 g/dL; adequate protein intake                                               | Screen; dietitian referral; ~20 g protein supplement peri-exercise                                      |
| <b>Anemia</b>                 | Hemoglobin >11-13 g/dL                                                                   | <b>Identify and treat</b> (iron, workup) <b>before</b> elective surgery                                 |
| <b>Obesity</b>                | BMI <40 ( <b>ideally &lt;35</b> )                                                        | <b>Encourage weight loss</b>                                                                            |
| <b>Frailty/deconditioning</b> | <b>CFS ≤4;</b> improved strength/endurance                                               | <b>Multi-component prehab</b> (exercise + nutrition + psychological), <b>3-4 wk minimum</b>             |
| <b>High-risk medications</b>  | <b>Avoid:</b> benzodiazepines, tramadol, anticholinergics                                | <b>Procedure-specific medication plan;</b> delirium prevention                                          |

**ABBREVIATIONS:** HbA1c = hemoglobin A1c; PCP = primary care provider; BMI = body mass index; CFS = Clinical Frailty Scale

## Prehabilitation Should Have Functional Targets

Establish measurable goals such as **safe transfers, appropriate device use, stair performance** when required, **adequate endurance for essential household mobility**, and the **ability to participate** in the **planned rehabilitation program**.

## PT, OT, and SLP Referral Pathways

**Early engagement of therapy** is a core component of successful prehabilitation and meeting physiologic reserve goals defined by the CGA; PT/OT referral is among the most common CGA-generated recommendations.

| DISCIPLINE                  | HIGH-YIELD INDICATIONS                                                                                    | REFERRAL QUESTION                                                                  |
|-----------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Physical therapy</b>     | <b>Gait instability;</b> falls; weakness; pain-limited mobility; deconditioning; need for prehabilitation | Can strength, balance, endurance, transfers, or device use <b>improve safely</b> ? |
| <b>Occupational therapy</b> | <b>ADL or IADL difficulty;</b> unsafe home tasks; cognitive-functional mismatch; equipment need           | Which task, environmental, or adaptive changes <b>preserve independence</b> ?      |

| DISCIPLINE                                                                                                                    | HIGH-YIELD INDICATIONS                                                                           | REFERRAL QUESTION                                                             |
|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Speech-language pathology</b>                                                                                              | <b>Dysphagia; aspiration concern;</b> communication disorder; cognitive-communication difficulty | What swallowing, communication, or compensatory strategy is <b>required</b> ? |
| <b>ABBREVIATIONS:</b> PT = physical therapy; ADL = activities of daily living; IADL = instrumental activities of daily living |                                                                                                  |                                                                               |

## Home Discharge Should be Planned Before Surgery

For an appropriate surgical candidate, the goal should be **safe recovery at home whenever feasible**, not routine placement in post-acute care. Home recovery requires more than a preference for outpatient treatment. **Before surgery, confirm:**

- **Safe transfers**, toileting, walking, and stairs or home entry
- Appropriate assistive equipment **delivered and fitted**
- **In home caregiver availability** and backup support
- Transportation and medication access
- **Therapy arrangements** and start date
- **Written** medication, wound, exercise, and escalation **instructions**
- A reliable clinical contact pathway



### CLINICAL PEARL: PREHABILITATION IS PART OF THE SURGERY, NOT AN OPTIONAL ADD-ON

If the patient cannot yet perform the functions required for safe home recovery, use the preoperative interval to **build that capacity when feasible**. The objective is not simply to arrive at surgery medically cleared; it is to **arrive prepared to recover**.

## SITE OF CARE AND SPECIALIST SELECTION

**Successful prehabilitation does more than clear the patient for surgery:** it directly shapes where that surgery and recovery should happen. A patient who has built the functional reserve, home readiness, and caregiver support described above has, by design, **earned the option of the least intensive appropriate setting**. The site-of-care conversation should therefore **begin from the prehabilitation result**: when functional targets are met, the default is same-day surgery in an **ambulatory surgery center (ASC)** or **hospital outpatient department** with planned discharge home, reserving inpatient admission and costly post-acute placement for genuine clinical need.

**TKR is no longer an inpatient-only Medicare procedure.** Elective knee replacements may occur in a **hospital outpatient department** or an **ambulatory surgery center**, while inpatient care remains appropriate when medical complexity, monitoring, or rescue needs justify it.<sup>16,82-84</sup> **Site selection is a clinical decision**, not a price-only decision.<sup>16,84</sup>

## Site of Care Selection for Elective TKR: Value-Based Use and Clinical Considerations

| SITE                             | VALUE-BASED USE <sup>83,85</sup>                                                                                     | SELECTION CONSIDERATIONS <sup>82,84</sup>                                                                      |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Ambulatory surgery center</b> | Appropriate <b>lower-risk (prehabilitated) patients</b> with <b>reliable same-day discharge</b> and recovery support | <b>Comorbidity; frailty;</b> anesthesia; mobility; home; caregiver; travel; emergency transfer                 |
| <b>Hospital outpatient</b>       | <b>Outpatient pathway with broader hospital diagnostics</b> and rescue capability                                    | <b>Medical complexity;</b> anesthesia risk; expected observation; network; patient burden; facility capability |
| <b>Inpatient hospital</b>        | <b>Retain when:</b> instability, monitoring, procedure complexity, or discharge risk requires admission              | Do not force outpatient care when <b>clinical or operational risk is unacceptable</b>                          |

## Site Selection and Discharge Checklist

- Clinical stability, frailty, cognition, anesthesia risk, bleeding risk, and expected procedure complexity<sup>29,84</sup>
- Ability to ambulate, transfer, toilet, eat, manage medications, and **recognize red flags before discharge**<sup>46,86</sup>
- **Caregiver availability**, home access, transportation, distance, language, accessibility, and geoaccess<sup>84,87</sup>
- **24-hour clinical contact, emergency transfer**, pharmacy access, therapy start, and **follow-up reliability**<sup>16,88</sup>
- **Specific Medicare product, network participation**, authorization, and patient cost sharing<sup>89,90</sup>



### CLINICAL PEARL: OUTPATIENT IS A SETTING, NOT A RISK CATEGORY

A patient is suitable for same-day care only when the **clinical, functional, home, caregiver, access, and rescue plan all support it**.<sup>83,84</sup>

## Value-Based Surgeon and Surgical Selection for TKR

The site of care should be chosen deliberately rather than by default, **so should the surgeon and surgical team**. Under the status quo, orthopedic referrals are often routed by habit, proximity, personal familiarity, or first available appointment, with **surgeon-specific quality and total episode cost rarely examined before the order is signed**. A value-based approach **inverts that default for TKR**: it screens for **clinical quality first**, then compares total value, access, and patient fit, and finally confirms the referral loop closed with the expected result. Because prehabilitation has already positioned the patient for the least intensive appropriate setting,

matching that prepared patient to a high-quality, cost-efficient surgeon and pathway is what **converts readiness into a durable value-based outcome**.

### Quality-First Surgeon and Pathway Selection Workflow for TKR

| STEP                                  | DECISION <sup>2,36,37</sup>                                                                                                               | REQUIRED EVIDENCE <sup>10,38-40</sup>                                                                                    | OUTPUT <sup>3,19,41</sup>                                                                                                                             |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 Confirm need and route</b>       | Is <b>surgical referral, e-consult, direct procedure, urgent escalation</b> , or <b>continued nonoperative/PCP management</b> appropriate | <b>Clinical pathway</b> ; TKR candidacy; prior conservative treatment; red flags; patient goals                          | <b>Appropriate route and response window</b>                                                                                                          |
| <b>2 Establish the quality gate</b>   | Which surgeons and facilities meet minimum clinical effectiveness and safety standards for TKR                                            | <b>Risk-adjusted outcomes</b> ; complications; readmissions; guideline measures; credentialing                           | <b>Clinically effective candidate set</b>                                                                                                             |
| <b>3 Compare total value</b>          | Which acceptable candidates <b>manage similar TKR episodes</b> with the <b>most cost efficiency</b>                                       | <b>Total episode cost</b> ; implant and site selection; length of stay; post-acute utilization; imaging; downstream care | Cost-efficient candidate set                                                                                                                          |
| <b>4 Check access and network fit</b> | Which candidate can operate inside the <b>required timeline, within the healthcare plan network and is geo-accessible</b>                 | Network tier; authorization; surgical wait; location; language; digital access                                           | Shortlist of surgeons who <b>can actually be booked</b> , each with patient burden noted (expected wait, travel, out-of-pocket cost, access barriers) |
| <b>5 Use shared selection</b>         | Which option best fits the patient and the planned site/discharge pathway                                                                 | <b>Preference</b> ; cost sharing; transportation; caregiver needs; continuity                                            | Documented surgeon and pathway selection                                                                                                              |
| <b>6 Track performance</b>            | Did the TKR complete and produce the expected clinical and operational result                                                             | Operative and note return; functional outcomes; total cost; complications; discharge disposition; patient experience     | <b>Closed loop</b> and updated patient outcomes                                                                                                       |

**ABBREVIATIONS:** PCP = primary care physician

**Match the prepared patient to the right surgeon and pathway.** The quality gate comes first: a lower price is never a substitute for risk-adjusted outcomes, low complication and revision rates, and adequate case volume. Only among surgeons who clear that gate should **total episode cost**, including **implant choice, site of service**, and **downstream post-acute utilization**, drive the value comparison. Because a **well-prehabilitated patient is a strong candidate for ASC or outpatient surgery with home discharge**, prioritize surgeons and facilities whose pathways **reliably deliver that low-intensity, home-based recovery** rather than defaulting to inpatient

admission and post-acute placement. Finally, **close the loop**: track that the referral completed and produced the expected functional result and discharge disposition, **feeding that performance data back into future selection**.



### MAKING CONNECTIONS

Use the [Referral Management: Cost Efficient/Clinically Effective Specialist Selection QRG](#) to compare surgeon, group, facility, access, episode performance, and total cost after the clinical site requirements are defined.

## PCP-to-Surgeon Handoff: Transmitting the Longitudinal Baseline

The primary care physician who has championed conservative care **holds the patient's longitudinal record**, a record that is a clinical asset that should be **deliberately packaged and transmitted to the selected TKR surgeon**, not left for the surgical team to reconstruct at the last visit. A structured handoff serves two distinct purposes.<sup>14,28</sup> First, it **establishes each patient's own baseline** for intraoperative and perioperative comparison: trended labs (hemoglobin, platelets, renal function, HbA1c, albumin, coagulation status) and prior functional measures let the surgical and anesthesia teams **recognize a true deviation** (a new anemia, an acute kidney injury, a glycemic excursion, an unexpected bleeding tendency) **against the patient's norm** rather than a population reference, so abnormalities are detected and acted on during the episode rather than missed.<sup>91,92</sup> **Second, it operationalizes prehabilitation**: by sharing the surgeon's medical and functional thresholds back to the PCP early, the two clinicians can close any gaps (glycemic control, nutrition and albumin, tobacco cessation, functional reserve, deprescribing) so the **patient arrives already meeting the surgeon's criteria** rather than being deferred at the door.<sup>14,28</sup>

Practically, the PCP should transmit, **before scheduling is finalized**:<sup>14,28</sup>

1. The trended baseline labs and assessments with the dates they were performed.
2. The current problem, medication, allergy, and anticoagulation lists with **any planned perioperative holds**.
3. **Objective functional and prehabilitation metrics** (e.g., TUG, gait/ambulation status, ADL/IADL baseline, endurance) with their trajectory.
4. The outstanding optimization targets are managed by the PCP and are met **before** the procedure.

This handoff lets the surgeon **confirm candidacy against explicit criteria**, sets the **intraoperative comparison points in advance**, and keeps the fully prehabilitated patient **on track for the least intensive appropriate site** and home discharge established earlier in the pathway.<sup>89</sup>

With the baseline transmitted and the patient optimized to the surgeon's criteria, the surgical team can then apply a **standardized, stewardship-minded operative approach**, varying from it only for documented patient-specific need.<sup>89</sup>

### Surgeon Acceptance Criteria: Prehabilitation Targets the Patient Should Meet Before TKR

To make the handoff **actionable**, the PCP and surgeon should agree on the **concrete thresholds that define a "prehabilitated" candidate**: the physiologic and functional window most surgical teams expect for the **highest probability of same-day/outpatient success** and **home**

**discharge.**<sup>28,89</sup> These are targets to optimize toward through shared decision-making, not rigid hard stops; guidelines explicitly caution against inflexible universal cutoffs that worsen access disparities.<sup>2</sup> The table below consolidates the metrics into **surgeon-facing acceptance criteria**, then the standardization table follows unchanged.

### Prehabilitation Acceptance Criteria for Elective TKR

| DOMAIN                               | TARGET FOR A “READY” PREHABILITATED PATIENT <sup>2,56</sup>                                                                                       | RATIONALE/SOURCE OF THRESHOLD <sup>56,93</sup>                                                                                                                                                                       |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Body mass index</b>               | Optimize toward <b>BMI &lt;35, &gt;18</b> ; for ASC/same-day pathways many teams <b>prefer &lt;30-35</b> (30-day morbidity rises at BMI ≥31.4)    | Obesity (BMI ≥35) <b>increases surgical-site infection</b> ; higher BMI predicts inpatient stay and outpatient complications; malnutrition (BMI <18) increases risk of poor wound healing and lowers recovery chance |
| <b>Glycemic control (HbA1c)</b>      | <b>HbA1c &lt;9%</b> within 3 months (individualized; <b>optimal 7-8%</b> ); CGM alternative <b>GMI &lt;8%</b> and/or time-in-range <b>&gt;50%</b> | ADA preoperative goal to <b>reduce infection and length of stay</b> ; AAOS favors tighter perioperative control given complication risk                                                                              |
| <b>Perioperative glucose</b>         | Maintain <b>100-180 mg/dL</b> peri- and postoperatively; AAOS target <b>&lt;126 mg/dL</b>                                                         | Hyperglycemia threshold for excess complications is <b>100-180 mg/dL</b> ; AAOS strong recommendation                                                                                                                |
| <b>Pulmonary/tobacco</b>             | Tobacco cessation ( <b>target ≥6 weeks</b> ); COPD/chronic dyspnea optimized; ASA class                                                           | Current smoking, COPD, and chronic dyspnea <b>independently raise outpatient TKA 30-day morbidity</b> ; low ASA supports outpatient candidacy                                                                        |
| <b>Functional reserve (mobility)</b> | <b>TUG &lt;12 s</b> (ideally <12.3 s); <b>safe transfers</b> and independent ambulation with device as needed                                     | Faster preoperative TUG predicts <b>better postoperative TUG/function</b> and <b>same-day discharge readiness</b>                                                                                                    |
| <b>Endurance/walking capacity</b>    | 6-minute walk distance toward <b>≥328-421 m</b> ; adequate for essential household mobility                                                       | Higher preoperative 6MWD <b>predicts better postoperative walking capacity</b> and mobility recovery                                                                                                                 |
| <b>Home and caregiver readiness</b>  | <b>Confirmed caregiver</b> , home access, transportation, and 24-h contact before scheduling                                                      | <b>Support at home</b> and <b>reliable logistics</b> are core selection criteria for outpatient/ASC arthroplasty                                                                                                     |

**ABBREVIATIONS:** BMI = body mass index; ASC = ambulatory surgery center; HbA1c = hemoglobin A1c; CGM = continuous glucose monitoring; GMI = glucose management indicator; ADA = American Diabetes Association; AAOS = American Academy of Orthopaedic Surgeons; COPD = chronic obstructive pulmonary disease; ASA = American Society of Anesthesiologists; TKA = total knee arthroplasty; TUG = Timed Up and Go; 6MWD = 6-minute walk distance

## POST-OPERATIVE RECOVERY PATHWAY

Defining the postoperative plan before discharge, and teaching it back to the patient, is where much of the **value of a successful TKR is won or lost in older adults**. A technically excellent arthroplasty can still end in an emergency visit, an avoidable readmission, or a stalled recovery when **pain control, medications, mobility, wound care, thromboprophylaxis**, and the **escalation route are left undefined** or poorly understood at the point of transition. The periods of greatest risk for older adults are the care transitions themselves: patients and families routinely contact the primary care physician first with postoperative problems, so the PCP must own a clear, written, reconciled plan rather than reconstruct one reactively.<sup>94</sup>

**Structured, enhanced-recovery and integrated-pathway approaches** (early mobilization, multimodal non-opioid-first analgesia, explicit functional milestones, and proactive discharge planning) **consistently shorten length of stay**, speed functional recovery, and improve satisfaction in elderly TKA patients **without increasing complications**.<sup>7,95-97</sup> Equally important is **matching the recovery setting to genuine need**: most patients recover as well or better discharged directly home than to a skilled facility, and routine facility placement based on age or habit adds cost and complication risk rather than benefit.<sup>46,98</sup> The practical goal of the pathway below is therefore **recovery without preventable harm**, anchored by one reconciled medication list, teach-back of wound, mobility, and thromboembolism warning signs, a 24-hour contact route, and early follow-up, so that **deviations are caught and corrected early** and the patient stays on track to the **least intensive safe setting**.<sup>46,94</sup>

### Postoperative Recovery Domains: Expected Controls and Escalation Triggers after TKR

| RECOVERY DOMAIN                   | EXPECTED CONTROL <sup>7,99,100</sup>                                                        | ESCALATION CONCERN <sup>60,101,102</sup>                                               |
|-----------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Pain and medications</b>       | <b>Multimodal plan</b> ; bowel regimen when needed; taper expectations; one reconciled list | <b>Uncontrolled pain; oversedation</b> ; confusion; constipation; refill fragmentation |
| <b>Mobility</b>                   | Early ambulation; <b>transfer and stair safety</b> ; prescribed exercise and device         | <b>New weakness; repeated falls</b> ; inability to transfer or bear weight             |
| <b>Wound</b>                      | <b>Clear dressing and bathing instructions</b> ; patient and caregiver observation          | <b>Drainage</b> ; spreading erythema; dehiscence; fever; rapidly increasing swelling   |
| <b>Thromboembolism prevention</b> | <b>Procedure-specific</b> : prophylaxis, adherence, mobility, and duration plan             | <b>Dyspnea; chest pain</b> ; syncope; unilateral calf swelling or pain                 |
| <b>Nutrition and hydration</b>    | Adequate intake with <b>glucose</b> and <b>renal considerations</b>                         | <b>Persistent vomiting</b> ; dehydration; poor intake; delirium                        |
| <b>Communication</b>              | 24-hour contact route and <b>scheduled follow-up</b>                                        | No response pathway or <b>unclear ownership</b>                                        |

## Transition Medication Reconciliation

- **Confirm which home drugs were:** held, resumed, changed, or temporarily replaced<sup>14,17</sup>
- **Resolve duplicate:** analgesics, acetaminophen-containing combinations, NSAIDs, anticoagulants, sedatives, and bowel medications<sup>47,48</sup>
- Give the patient and caregiver **one dosing schedule and duration plan**<sup>48,86</sup>
- **Communicate urgent medication concerns** to the surgical team rather than creating conflicting instructions<sup>15,17</sup>



### QUALITY OUTCOME: RECOVERY WITHOUT PREVENTABLE HARM

Track **pain control, mobility, opioid exposure, falls, delirium, wound concerns, unplanned acute care, and time to functional milestones.**<sup>88,102</sup>

## Post-Acute Care and Home Recovery

| SETTING                      | APPROPRIATE USE <sup>12,46,103</sup>                                                                    | AVOIDABLE MISUSE <sup>12,46,98,104</sup>                                          |
|------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Home with outpatient therapy | <b>Mobile</b> , safe, <b>reliable transport</b> , and limited skilled need                              | Sending home <b>without executable transport</b> or <b>caregiver plan</b>         |
| Home health                  | Homebound patient with <b>intermittent</b> skilled nursing or therapy need                              | Using home health <b>when outpatient care is feasible and preferable</b>          |
| Skilled nursing facility     | <b>Daily skilled nursing or rehabilitation need</b> that cannot be met safely at home                   | <b>Routine placement based on:</b> age, habit, or lack of early planning          |
| Inpatient rehabilitation     | <b>Medically stable patient</b> needing and able to tolerate intensive interdisciplinary rehabilitation | <b>Using high intensity</b> when therapy tolerance or <b>need is insufficient</b> |

## Home Readiness

- **Safe:** transfers, toileting, walking, stairs or entry; **ability to obtain food and medications**<sup>12,98</sup>
- Caregiver **capability, willingness, schedule, and backup support**<sup>103,104</sup>
- Equipment delivered and fitted; therapy start confirmed; transportation arranged<sup>86,87</sup>
- **Written:** wound, medication, prophylaxis, exercise, and emergency **instructions with teach-back**<sup>46,86</sup>
- **Early follow-up** and **rapid response route** for change in pain, wound, mobility, breathing, cognition, or intake<sup>88,105</sup>



## MAKING CONNECTIONS

Consult the [AAVBC Post-Acute Care Utilization QRG](#) for placement criteria, the lowest safe setting, home readiness, concurrent review, preferred post-acute networks, and examples of overprescribed and underprescribed care.



## CLINICAL PEARL: HOME FIRST REQUIRES HOME READINESS

**Home-based recovery** is high value only when the patient **can function safely** and the caregiver, equipment, therapy, medication, and escalation plan are **real rather than assumed**.<sup>12,103</sup>

## QUALITY, PROMS, AND PATIENT EXPERIENCE

For TKR specifically, the measures in this section are **central to value-based care**. Value in these models is defined as **patient outcomes achieved per dollar spent across the episode**, and knee replacement is a focus of **bundled-payment and episode-accountability programs** (CJR, BPCI-Advanced, and the Transforming Episode Accountability Model).<sup>106-108</sup> CMS now requires collection of a **validated KOOS JR-based patient-reported outcome measure (PROM) before and after elective TKA**, with reporting tied to hospital and ASC payment determinations; pre- and postoperative PROM capture, risk-adjusted safety and utilization tracking, and patient experience therefore **distinguish a high-value program from a high-volume one**.<sup>67,109,110</sup> The meaningful endpoint is not a completed arthroplasty but a **change in pain and function** that crosses the instrument-specific substantial-clinical-benefit threshold, with acceptable complications, burden, and experience; roughly **20% of TKA patients do not reach that threshold**, which is why these metrics are risk-adjusted and fed back into case review and shared decision-making.<sup>111,112</sup> **For the PCP**, this links to the prehabilitation and conservative-care sections above: the **same baseline optimization and expectation-setting that make surgery safe also drive the PROM improvement** on which program value is judged.<sup>113,114</sup>

### TKR Value Measures: Outcome Domains, Examples, and Program Use

| MEASURE DOMAIN                | EXAMPLES <sup>7,60,88,115</sup>                                                                          | USE <sup>35,105,116,117</sup>                                         |
|-------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>Pain and function PROM</b> | <b>KOOS-based instruments</b> ; Oxford Knee Score; other validated program tool                          | Collect <b>before surgery</b> and at a defined postoperative interval |
| <b>Meaningful improvement</b> | Change <b>exceeding the instrument-specific threshold</b>                                                | <b>Distinguish</b> : statistical change from patient-relevant benefit |
| <b>Patient experience</b>     | <b>Expectation alignment</b> ; communication; access; recovery support; willingness to choose care again | Identify <b>operational</b> and <b>educational gaps</b>               |

| MEASURE DOMAIN     | EXAMPLES <sup>7,60,88,115</sup>                                                          | USE <sup>35,105,116,117</sup>                      |
|--------------------|------------------------------------------------------------------------------------------|----------------------------------------------------|
| <b>Safety</b>      | <b>Infection; thromboembolism;</b> wound complication; manipulation; revision; mortality | <b>Risk-adjust</b> and compare with credible peers |
| <b>Utilization</b> | <b>ED visits; readmissions;</b> post-acute setting; therapy; repeat procedures           | Locate <b>avoidable</b> episode cost and harm      |

**ABBREVIATIONS:** PROM = patient-reported outcome measure; KOOS = Knee injury and Osteoarthritis Outcome Score; ED = emergency department

## PROM Collection Controls

- Use the same validated instrument **at baseline and follow-up** when possible<sup>115,116</sup>
- Record the **outcome the patient most wants to improve** before surgery<sup>21,117</sup>
- Track **response** and **missing-data rates** so results do not represent only easily reached patients<sup>107,115</sup>
- Interpret **surgeon and facility performance with risk adjustment** and **adequate case volume**<sup>16,107</sup>
- Use **poor improvement** or **persistent pain patterns** for case review and expectation improvement<sup>35,117</sup>



### QUALITY OUTCOME: IMPROVEMENT, NOT PROCEDURE COMPLETION

**A completed TKR is not the outcome.** High performance requires **meaningful pain** or **functional improvement** with acceptable complications, burden, and patient experience.<sup>107,115</sup>

## TOTAL COST OF CARE AND PAYMENT MODELS

Most of the cost, and most of the value, of a total knee arthroplasty **lies outside the operating room**. TKA is among the **highest-volume, highest-spend Medicare procedures**, but the index hospitalization is only one part of a 90-day-to-1-year episode that **also includes post-acute care, home health, therapy, readmissions, and ED visits**; post-acute care has been the **largest source of cost variability** between providers, and a complicated recovery (infection, PE, reoperation, readmission) is disproportionately expensive.<sup>118-120</sup> Value-based care **reframes the goal accordingly**: not a cheaper operation, but an **optimized patient who recovers to durable function and uses fewer downstream resources** (healthier for longer with less utilization).<sup>107,121</sup> The PCP levers map directly onto these costs, since preoperative optimization and prehabilitation **shorten stays and reduce complications, readmissions, and institutional post-acute care**.<sup>122,123</sup> Accountable-episode models (CJR, BPCI-Advanced, successors) make **one entity responsible for the whole episode**; their savings have come overwhelmingly from

**shifting recovery from skilled nursing to home** without worsening outcomes, though with some evidence of risk-based patient selection warranting social-risk adjustment.<sup>124,125</sup>

| COST PERSPECTIVE           | WHAT IS INCLUDED <sup>107,126,127</sup>                                                                                 | WHY IT MATTERS <sup>90,118</sup>                                |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Transactional price</b> | One visit, image, implant, facility fee, or therapy session                                                             | <b>Useful but incomplete</b>                                    |
| <b>Procedure episode</b>   | Preoperative work, surgery, facility, professional services, drugs, complications, and recovery over the defined window | <b>Captures downstream consequences and care coordination</b>   |
| <b>Patient burden</b>      | Cost sharing, travel, equipment, time, caregiver work, and uncovered services                                           | Determines <b>whether the recovery plan is executable</b>       |
| <b>Long-term value</b>     | Pain, function, revision, durability, and <b>ongoing health-service use</b>                                             | Prevents short episode savings from <b>obscuring later harm</b> |

## Current Payment Context

- The original **CMS CJR test** ran from 2016 through 2024 and is **historical** rather than an active 2026 national model<sup>124,128</sup>
- The **CMS Ambulatory Specialty Model (ASM; performance years 2027-2031)** extends accountability upstream into chronic-condition management, assessing selected specialists (including orthopedic surgeons treating low back pain) on quality, cost, care improvement activities, and interoperability, with Medicare Part B payment adjustments of –9% to +9% beginning in 2029. Although it does not target TKA, it signals CMS’s direction toward **rewarding specialist-primary care collaboration, lifestyle-based prevention, patient-reported function, and avoidance of care lacking clear evidence of benefit**<sup>129</sup>
- Its core lesson was that **episode accountability can reduce Medicare spending while maintaining quality**<sup>125,130</sup>
- Organizations should verify **current**: payer-specific bundle rules, episode windows, risk adjustment, quality gates, and beneficiary protections<sup>128,130</sup>



### CLINICAL PEARL: MATCH THE COST WINDOW TO THE CARE EPISODE

**Include:** preparation, surgery, complications, post-acute care, and recovery. A lower facility price is **not efficient if it produces preventable emergency care** or a **failed discharge**.<sup>131,132</sup>

## COMPLICATION AND READMISSION PREVENTION

**Complication prevention begins before surgery** and continues through recovery. Value-based care focuses on **modifiable risks**, **reliable transitions**, **early recognition of problems**, and **rapid communication** to prevent avoidable complications and readmissions.

### Preventing Complications and Readmissions: Risk, Prevention, and Early Response

| RISK AREA                                                                      | PREVENTION STRATEGY <sup>7,133</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                        | EARLY RESPONSE <sup>134,135</sup>                                                                                                    |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Infection and wound</b>                                                     | <b>Optimize modifiable risks</b> ; prophylaxis; skin and wound instructions; reliable contact                                                                                                                                                                                                                                                                                                                                                                               | <b>Prompt surgical evaluation for</b> : drainage, erythema, dehiscence, fever, or increasing pain                                    |
| <b>Thromboembolism</b>                                                         | <b>Risk-stratified extended prophylaxis (up to 35 days)</b> : primary-prevention anticoagulation with a <b>DOAC</b> (rivaroxaban, apixaban) or <b>aspirin after a generic rivaroxaban lead-in</b> ; adjunctive <b>intermittent pneumatic compression device inpatient</b> , or as the primary measure when anticoagulation is contraindicated; early mobility; adherence education; monitor renal function and bleeding, and <b>INR when a vitamin K antagonist is used</b> | <b>Emergency evaluation for</b> : chest pain, dyspnea, syncope, or suspected embolism; bleeding or wound hematoma on anticoagulation |
| <b>Falls and delirium</b>                                                      | <b>Geriatric assessment</b> ; medication reduction; orientation; mobility and home safety                                                                                                                                                                                                                                                                                                                                                                                   | <b>Same-day assessment</b> for acute confusion or repeated falls                                                                     |
| <b>Pain and opioids</b>                                                        | Multimodal plan; expectation setting; <b>taper</b> and <b>refill ownership</b>                                                                                                                                                                                                                                                                                                                                                                                              | <b>Address</b> : uncontrolled pain, oversedation, constipation, or misuse <b>early</b>                                               |
| <b>Medical decompensation</b>                                                  | <b>Stabilize</b> : heart, lung, kidney, diabetes, and anemia concerns <b>before surgery</b>                                                                                                                                                                                                                                                                                                                                                                                 | Use <b>rapid PCP-surgical communication</b> and appropriate acute evaluation                                                         |
| <b>Failed discharge</b>                                                        | <b>Functional milestones</b> ; <b>caregiver readiness</b> ; equipment; therapy; transportation                                                                                                                                                                                                                                                                                                                                                                              | Escalate support <b>before</b> unsafe coping produces ED use                                                                         |
| <b>ABBREVIATIONS</b> : PCP = primary care physician; ED = emergency department |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                      |

## Readmission Review Questions

- Was the patient **clinically** and **functionally ready** for the selected site?<sup>16,98</sup>
- Were medication, wound, prophylaxis, mobility, and red-flag **instructions understood**?<sup>86,88</sup>
- Did the patient have **timely access** to the surgical team, PCP, therapy, and pharmacy?<sup>17,105</sup>
- **Could the event have been prevented by:** optimization, earlier response, or a different discharge setting?<sup>12,88</sup>



### MAKING CONNECTIONS

Consult the [AAVBC Reducing All-Cause Readmissions QRG](#) for transition-risk tiers, medication reconciliation, early follow-up, red-flag routing, root-cause review, and closed-loop accountability after a hospital encounter.



### QUALITY OUTCOME: PREVENT HARM, NOT NECESSARY CARE

**Lower acute-care use** is valuable only when **patients still receive prompt evaluation for:** infection, thromboembolism, wound failure, delirium, and other medically necessary concerns.<sup>20,88,134,135</sup>

## TEAM, TECHNOLOGY, AND GOVERNANCE

Value-based TKR requires **clear roles**, **closed-loop communication**, and **technology with a defined purpose** so that every participant contributes to a coordinated, executable episode of care.

### Team Roles and Shared Outputs

| PARTICIPANT                         | CORE RESPONSIBILITY <sup>23,46,86</sup>                                                                               | SHARED OUTPUT <sup>87,136</sup>                      |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| PCP                                 | <b>Conservative care;</b> medical and geriatric assessment; chronic disease; medication and transition reconciliation | <b>Longitudinal risk and recovery context</b>        |
| <b>Orthopedic surgeon and group</b> | Indication; surgery; implant; wound; restrictions; outcome reporting                                                  | <b>Procedure and follow-up plan</b>                  |
| <b>Anesthesia and facility</b>      | <b>Perioperative risk,</b> monitoring, pain, prophylaxis, rescue, and discharge readiness                             | <b>Safe operative and immediate-recovery pathway</b> |

| PARTICIPANT                 | CORE RESPONSIBILITY <sup>23,46,86</sup>                                          | SHARED OUTPUT <sup>87,136</sup>        |
|-----------------------------|----------------------------------------------------------------------------------|----------------------------------------|
| Therapy and post-acute team | Mobility, function, equipment, home safety, and rehabilitation progression       | Functional milestones and barriers     |
| Care coordinator            | Scheduling, education, records, benefits, post-acute placement, and loop closure | Executable patient journey             |
| Patient and caregiver       | Goals, informed choice, preparation, adherence, symptom reporting, and feedback  | Shared plan and real-world feasibility |

**ABBREVIATIONS:** PCP = primary care physician

### Technology with a Defined Purpose

- EHR order sets, decision support, and shared medication and discharge plans<sup>86,136</sup>
- **PROM capture with baseline** and follow-up reminders<sup>115,116</sup>
- **Telehealth** or **portal review** when examination or testing is not required<sup>137,138</sup>
- **Remote symptom** or **activity monitoring** for selected patients with a response workflow<sup>139,140</sup>
- **Registry** and **cost data** for risk-adjusted surgeon, facility, and episode improvement<sup>107,126</sup>

**GOVERNANCE STANDARD:** New implants, robotics, wearables, and digital tools should enter the pathway **only with a defined:** Clinical question, outcome measure, patient burden assessment, and total-cost review.<sup>56,141</sup>

## VALUE-BASED PROGRAM SCORECARD

**A value-based TKR program should measure more than surgical outcomes.** The scorecard should assess appropriateness, recovery, patient outcomes, utilization, access, and coordination across the full episode to identify opportunities for improvement.

| DOMAIN                  | EXAMPLE MEASURES                                                                                  | REVIEW QUESTION                                                 |
|-------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Appropriateness</b>  | <b>Indication documentation;</b> conservative-care response; shared decision; cancellation reason | Are the <b>right patients proceeding at the right time?</b>     |
| <b>Clinical outcome</b> | <b>Risk-adjusted complications;</b> infection; thromboembolism; revision; mortality               | Are outcomes <b>clinically acceptable</b> and <b>improving?</b> |
| <b>Patient outcome</b>  | <b>Baseline</b> and <b>follow-up PROM;</b> meaningful improvement; persistent pain                | Did <b>surgery improve what mattered?</b>                       |

| DOMAIN                                                                                   | EXAMPLE MEASURES                                                                        | REVIEW QUESTION                                                                                 |
|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Recovery</b>                                                                          | <b>Same-day discharge success</b> ; therapy start; home recovery; functional milestone  | Did the selected setting <b>support safe recovery</b> ?                                         |
| <b>Utilization</b>                                                                       | <b>ED use</b> ; readmission; post-acute setting; duplicate testing; episode cost        | Which downstream services reflect <b>preventable failure</b> or <b>appropriate complexity</b> ? |
| <b>Access and equity</b>                                                                 | <b>Wait</b> ; <b>cancellation</b> ; geography; language; cost burden; outcome variation | Do optimization and site policies <b>create unequal access</b> ?                                |
| <b>Experience and coordination</b>                                                       | <b>Teach-back</b> ; note return; contact reliability; patient and caregiver feedback    | <b>Can the patient navigate one coherent pathway</b> ?                                          |
| <b>ABBREVIATIONS:</b> PROM = patient-reported outcome measure; ED = emergency department |                                                                                         |                                                                                                 |

## Improvement Method

- Use registry and local episode data **with appropriate risk adjustment** and **adequate volume**<sup>107,142</sup>
- Review patterns over **a clinically meaningful period rather** than reacting to one short interval<sup>105,127</sup>
- **Use root-cause analysis for:** infection, readmission, persistent pain, failed discharge, or high-cost outliers<sup>60,88</sup>
- **Test pathway changes** through structured improvement cycles and remeasure balancing outcomes<sup>86,136</sup>



### MAKING CONNECTIONS

Use the [Referral Management: Cost Efficient/Clinically Effective Specialist Selection QRG](#) to interpret quality gates, episode cost, site of service, risk adjustment, attribution, access, and preferred-network performance.

## TEN TAKEAWAYS FOR PCPS

### 1 **Treat surgery as a decision, not a default**

Confirm that conservative care has had a genuine trial before referring; roughly a quarter of patients still proceed to arthroplasty within two years, so surgery should never be the automatic endpoint for knee osteoarthritis.

### 2 **Let symptoms, not imaging, drive the pathway**

Radiographic severity and patient-reported symptoms are often discordant; use weight-bearing X-rays to stage disease and time referral, not to diagnose, and reserve MRI for atypical or mismatched cases.

### 3 **Individualize and document conservative care**

Give exercise/PT, weight and activity strategies, devices, self-management, and appropriate medications or injections a real, goal-directed trial, and document what was tried, the response, and why further nonoperative care is or isn't likely to help.

### 4 **Start the geriatric assessment at the first visit, not at clearance**

Introduce the comprehensive geriatric assessment (function, cognition, frailty, nutrition, medications, home/caregiver support, and patient priorities) early and revisit it at each checkpoint, since it should guide prehabilitation, not just clear the patient at the end.

### 5 **Optimize to evidence-based thresholds through individualized plans**

Elective surgery has defined readiness cutoffs (e.g., HbA1c, BMI, albumin, hemoglobin, nicotine abstinence), and in value-based care they must be met for surgery to deliver value; use individualized, evidence-based optimization plans as the route to reach them, adjusting the approach and timeline to each patient's starting point rather than the target itself.

### 6 **Use the preoperative interval to prehabilitate, not just wait**

Build strength, endurance, nutrition, glycemic control, and home-readiness against concrete targets (e.g., TUG, 6-minute walk, HbA1c) before surgery, since this improves postoperative function and supports safe home discharge.

## 7 Plan home discharge and site of care before the operation

Confirm transfers, equipment, caregiver support, transportation, and medication access in advance; a well-prehabilitated patient is often a strong candidate for ambulatory/outpatient surgery with same-day home discharge.

## 8 Package and transmit the longitudinal baseline to the surgeon

Send trended labs, medication/allergy lists, functional metrics, and outstanding optimization targets before scheduling so the surgical team can recognize true deviations and confirm the patient meets acceptance criteria.

## 9 Reconcile medications and close the discharge loop postoperatively

Confirm which home medications were held, resumed, or changed; give one unified dosing plan; and ensure a clear 24-hour contact and escalation pathway for pain, wound, thromboembolism, or delirium concerns.

## 10 Track outcomes that reflect patient benefit, not procedure volume

Use baseline-to-follow-up PROMs (e.g., KOOS, Oxford Knee Score), safety and utilization data, and root-cause review of poor outcomes or readmissions to confirm the pathway is delivering meaningful, well-tolerated improvement.

# AAVBC SUMMARY AND CONCLUSION

Value-based elective total knee replacement starts with the **right treatment**, not the procedure. **Most patients with knee osteoarthritis** should receive a **genuine, individualized trial of conservative care**, including exercise and physical therapy, weight and activity strategies, appropriate medications or injections, and management of contributing conditions, **before surgery is considered**. Imaging stages disease and informs prognosis; **it does not by itself establish medical necessity**. Surgery becomes appropriate only when **advanced symptomatic disease persists despite reasonable nonoperative treatment**, the **patient's goals favor definitive treatment**, and the expected benefit **justifies the recovery burden**.

For patients who do proceed, the **comprehensive geriatric assessment** functions as an **early and recurring decision tool**, not a final clearance step, pacing prehabilitation toward **concrete functional, nutritional, glycemic, and home-readiness targets**. A well-prehabilitated patient has, by design, **earned access to the least intensive safe setting**: ambulatory or outpatient surgery with planned home discharge, reserving inpatient admission and post-acute placement for genuine clinical need. Surgeon and site selection should follow a quality-first sequence, with **clinical outcomes assessed before cost**, and cost assessed before access and convenience. The

PCP's longitudinal record should be actively transmitted to the surgical team rather than reconstructed at the last visit.

Value is sustained after surgery through **standardized, stewardship-minded operative care**; a structured postoperative recovery and medication reconciliation plan; proactive complication and readmission prevention; and outcome measurement anchored in patient-reported function rather than procedure completion alone. **Total cost of care should be evaluated across the full episode**, including preparation, surgery, complications, and recovery, since a lower transactional price is not efficient if it produces avoidable emergency care or a failed discharge.

Ultimately, value-based TKR asks **two disciplined questions in order**: does this patient **still need surgery**, and if so, is this patient **ready to recover from it**. Answering both well, through conservative care first, confirmed necessity, deliberate prehabilitation, informed site and surgeon selection, coordinated recovery, and honest outcome tracking, is what **converts an elective procedure** into a **durable, patient-centered gain** rather than a default response to a radiograph.

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