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General

Preoperative strategies to prevent periprosthetic joint infection after knee replacement: evidence-based recommendations for multidisciplinary practice

Hassan Zmerly, Ph.D. , M.D.[1,2], Ibrahim Akkawi, M.D.[3], Manuela Moscato, M.D.[4], Riccardo Galletti, M.D.[5], Valentina Di Gregori, M.D.[6], Francesco Pegreffi, Ph.D., M.D.[7,8]

[1] Department for Life Quality Studies, University of Bologna, [2] 1st Orthopedics Department, Villa Erbosa, Gruppo San Donato, Bologna, Italy, [3] Orthopedics, Villa Erbosa, GSD, Bologna, Italy, [4] Orthopedics, San Pier Damiano Hopistal, GVM , [5] Internal Medecin, San Pier Damiano Hospital, GVM, [6] Health Management, San Pier Damiano Hospital, GVM, [7] Department of Medicine and Surgery, Università degli Studi di Enna Kore, [8] Recovery and Functional Rehabilitation Unit, Umberto I Hospital, Enna, Italy

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Periprosthetic joint infection (PJI) is a severe and challenging complication following joint replacement that significantly impacts patient outcomes and implant longevity. Various factors contribute to PJI onset, including patient-related comorbidities and surgical procedures. Preventive strategies are categorized into preoperative, perioperative, and postoperative measures.

Preoperative risk factors can be classified as general or local. General ones include comorbidity management (metabolic disorder, rheumatic and inflammatory diseases), nutritional optimization, weight control, bacterial decolonization, and lifestyle modifications. Local factors involve avoiding intra-articular injections before surgery and assessing previous knee interventions, in addition to implementing preoperative physiotherapy and ensuring proper skin preparation.

Preoperative patient optimization significantly improves outcomes following knee replacement by reducing PJI risk, as well as hospital stays and recovery times. Implementing standardized, evidence-based preoperative strategies can enhance surgical success and long-term implant survival. Multidisciplinary collaboration between surgeons, general practitioners, and healthcare providers is essential to minimize infection risks and improve patient outcomes following joint replacement.

This paper focuses on preoperative optimization, highlighting evidence-based recommendations to minimize the risk of PJI in patients undergoing knee replacement.

1) INTRODUCTION

Knee replacement is one of the most performed surgical procedures, with its incidence projected to increase in the coming years.[1-3] While knee replacement substantially improves the quality of life for patients with osteoarthritis, it may involve complications. Despite continuous advancements in surgical techniques and perioperative management, periprosthetic joint infection (PJI) remains the most prevalent cause of implant failure.[4] The occurrence of PJI is estimated to be between 1% and 2% in primary knee arthroplasty, with rates rising to approximately 10% in revision procedures.[5,6]

The development of periprosthetic joint infection (PJI) is influenced by a combination of patient-related factors and conditions, and surgical considerations.[7-10] Preventive strategies are crucial to minimizing the risk of PJI and improving patient outcomes; they require a multidisciplinary approach, integrating patient optimization, vigilant postoperative care, and aseptic surgical procedures.[11-16] Preventive strategies are categorized into preoperative, perioperative, and postoperative measures, with preoperative optimization playing a critical role in reducing infection risk.[17-35] Addressing modifiable risk factors before surgery, such as diabetes control, nutritional status, bacterial decolonization, and lifestyle modifications, has been shown to significantly lower the likelihood of PJI.[20-28] Additionally, a thorough preoperative evaluation, including risk stratification, patient education, and multidisciplinary collaboration, is essential for optimizing surgical outcomes.

This review aims to translate current scientific evidence into practical, evidence-based recommendations for physicians, orthopaedic surgeons, and multidisciplinary teams to enhance preoperative patient management and implement effective strategies to minimize the risk of periprosthetic joint infection (PJI) in individuals undergoing knee arthroplasty.

2) METHODOLOGY

This review was conducted to evaluate preoperative strategies aimed at reducing the risk of periprosthetic joint infection (PJI) in patients undergoing knee replacement.

LITERATURE SEARCH STRATEGY

A comprehensive literature search was performed using PubMed/Medline to identify relevant studies addressing preoperative strategies for PJI prevention in knee replacement. The search terms included "knee arthroplasty," "knee replacement," "periprosthetic joint infection," "prevention," and "preoperative." The search encompassed articles published in English between January 2000 and December 2024.

ELIGIBILITY CRITERIA

Studies were selected based on the following inclusion and exclusion criteria:

- Inclusion Criteria:
  - Review articles, observational studies, and randomized controlled trials (RCTs) relevant to preoperative prevention of PJI.
  - Studies focusing on modifiable patient-related risk factors, preoperative optimization strategies, and infection control measures.
  - Guidelines and consensus statements from recognized orthopaedic and infection control societies.
- Exclusion Criteria:
  - Studies focusing solely on perioperative or postoperative infection prevention.
  - Case reports, expert opinions without supporting data, and articles not published in English.

DATA EXTRACTION AND ANALYSIS

Relevant works were critically analysed based on study design, sample size, methodology, and relevance to preoperative PJI prevention. Key findings were synthesized to provide evidence-based recommendations for clinical practice, emphasizing practical applications for healthcare professionals managing patients undergoing knee replacement.

Due to heterogeneity in study design, outcome reporting, and populations, no formal meta-analysis was conducted. Results were grouped according to the type of preoperative risk factors evaluated (e.g., comorbidity control, dietary nutrition and lifestyle modification, bacterial decolonization, local knee control, etc.).

3) RESULTS

Prevention strategies can be categorized into preoperative, perioperative (including intraoperative), and postoperative measures.[23] The preoperative factors to be addressed before knee replacement surgery are summarized in Table 1.

Table 1. Preoperative factors to be addressed before surgery.

• Comorbidity control: metabolic disease control (diabetes, anaemia, etc.), rheumatic and inflammatory disease control (RA, drug management, hyperuricaemia)
• Dietary, nutrition, and lifestyle modification
• Bacterial decolonization (nasal, anal, dental clearance, skin, urinary tract)
• Local knee control (local injection, hardware removal, previous interventions, etc.)
• Miscellaneous: smoking, drug or alcohol use, socio-economic aspects

Preoperative factors contribute to the development of the disease through both systemic and localized mechanisms.[23-30] Several preoperative factors should be optimized to minimize the risk of periprosthetic joint infection (PJI) and improve surgical outcomes in knee arthroplasty (TKA). These factors can be categorized into general and local considerations:

1. General Factors
   - Metabolic and Comorbidity Management
     - Diabetes Control: Maintain optimal glycaemic levels (HbA1c <7%) to reduce infection risk.
     - Anaemia Correction: Optimize haemoglobin levels preoperatively to minimize transfusion-related risks.
     - Obesity and Malnutrition: Encourage weight reduction in patients with a body mass index (BMI) >40 kg/m2 and address protein or vitamin deficiencies (e.g., vitamin D, albumin).
   - Bacterial Decolonization
     - *Staphylococcus aureus* Screening: Mupirocin nasal decolonization and chlorhexidine washes can reduce bacterial load.
     - Oral and Dental Hygiene: Treat active infections and ensure good oral health before surgery.
     - Urinary Tract Screening: Identify and treat asymptomatic bacteriuria in high-risk patients.
   - Lifestyle Modifications
     - Smoking Cessation: Recommended at least four weeks before surgery to improve wound healing.
     - Alcohol Reduction: Excessive alcohol use should be managed to enhance immune function and recovery.
   - Prehabilitation and Functional Optimization

- Physical Activity and Sarcopenia Management: Strengthening programmes to improve muscle function and postoperative rehabilitation.
- Mental Health Considerations: Address psychiatric conditions that may affect adherence to postoperative care.

2. Local Factors
   - Knee Joint Condition
     - Avoid Intra-Articular Injections: Corticosteroid injections should be avoided for three months before surgery due to the increased infection risk.
     - Evaluation of Prior Surgeries: Assess residual implants, prior infections, or unresolved joint issues that could influence surgical outcomes.
     - Skin Integrity: Identify and manage skin conditions (e.g., ulcers, dermatitis) to reduce bacterial colonization.
   - Patient Education and Compliance
     - Antiseptic Showering Protocols: Encourage chlorhexidine showers before admission.
     - Nutritional Counselling: Educate patients on dietary modifications to support healing.

Addressing these modifiable preoperative factors through a multidisciplinary approach improves surgical success and reduces PJI risk in knee replacement patients.

4) COMORBIDITY CONTROL

4.1) METABOLIC DISORDERS

Metabolic disorders represent a significant risk factor for periprosthetic joint infection (PJI) following total joint arthroplasty. Poorly controlled comorbidities and abnormal laboratory parameters can substantially elevate the incidence of PJI.[30,31] Key risk factors include diabetes mellitus (DM), anaemia, obesity, hypoalbuminaemia, vitamin D deficiency, liver disease, hypothyroidism, and kidney disease.[32] Identifying and addressing these factors preoperatively enables surgeons to optimize patient health and surgical outcomes, thereby reducing the likelihood of PJI.[33]

Diabetes mellitus is one of the most widespread chronic diseases globally, with its prevalence increasing over recent decades.[29] It is a known contributor to the progression of severe osteoarthritis, resulting in a growing number of diabetic patients undergoing total joint arthroplasty (TJA) each year.[34,35] Poor glycaemic control, particularly elevated HbA1c levels, has been strongly linked to an increased risk of periprosthetic joint infection (PJI).[36] Additionally, fructosamine has been suggested as a reliable predictive marker for glycaemic management in these patients.[35]

Lovecchio et al.[37] reported that diabetes adversely impacts clinical outcomes following primary total lower extremity arthroplasty, with diabetic patients facing a significantly higher likelihood of postoperative medical complications and revision surgery within the first month after joint replacement.[38]

Previous research on the interplay between diabetes and the immune system has demonstrated that prolonged hyperglycaemia impairs leukocyte function, thereby increasing the risk of both superficial and deep tissue infections in the perioperative period.[39-43] Additionally, diabetes has been shown to have detrimental effects on the musculoskeletal system, leading to delayed collagen synthesis, impaired wound healing, and reduced phagocytic activity. These factors collectively heighten the risk of infection and contribute to slower postoperative recovery.[40]

Given these risks, stringent aseptic protocols and appropriate antibiotic prophylaxis are crucial for patients with diabetes during the perioperative period. Agos[41] reported that effective glycaemic control during surgery significantly reduced infection rates in patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA). To mitigate these risks, preoperative optimization of blood glucose levels is recommended, particularly for patients with haemoglobin A1c levels between 8% and 9% or glucose levels ranging from 180 to 200 mg/dL. Achieving optimal diabetes management before undergoing TJA may require several months or more of dedicated treatment and monitoring.[42]

Anaemia is a common condition among patients undergoing total joint arthroplasty (TJA) and has been associated with an increased risk of periprosthetic joint infection (PJI). The incidence of PJI is reported to be higher in anaemic patients (4.3%) compared to non-anaemic individuals (2%). Preoperative anaemia, defined as a haemoglobin level below 13.0 g/dL in men and 12.0 g/dL in women, is recognized as an independent risk factor for surgical site infection (SSI) and PJI in TJA patients. Low haemoglobin levels not only elevate the risk of perioperative allogenic blood transfusions, but also contribute to a higher likelihood of postoperative PJI.

Preoperative anaemia is prevalent among orthopaedic patients,[44,45] with an estimated 21% to 35% of individuals undergoing elective orthopaedic procedures being affected.[44] Studies have demonstrated a strong correlation between preoperative anaemia and increased transfusion rates, higher infection risks, prolonged hospital stays, greater postoperative complications, and elevated mortality rates in orthopaedic patients. Additionally, lower haemoglobin (Hb) levels before surgery have been linked to extended hospitalization, higher mortality, and a heightened risk of readmission, particularly in patients with hip fractures.[45,46]

Patients undergoing total joint replacement frequently receive preoperative anaemia management through patient blood management (PBM) programmes. PBM strategies encompass perioperative iron supplementation, antifibrinolytic therapy, aggressive hydration, and regional anaesthesia, as well as restrictive transfusion protocols, minimally invasive surgical techniques, anatomically guided incisions, and the use of a bipolar sealer to minimize blood loss.[47] Although autologous blood transfusion pre-

sents certain disadvantages, iron supplementation, alone or in combination with erythropoietin, has been shown to be a safe and effective approach for optimizing haemoglobin levels in patients undergoing TJA.[48] Furthermore, multiple studies have established a strong correlation between preoperative anaemia and an increased risk of infection in the TJA population.[45,49]

In addition to anaemia, several comorbidities have been identified as independent risk factors for periprosthetic joint infection (PJI). These include coagulopathy, congestive heart failure, chronic pulmonary disease, depression, renal disease, peripheral vascular disease, and valvular disease, in addition to pulmonary circulation disorders, psychoses, and metastatic tumours.[31-36]

4.2) INFLAMMATORY AND RHEUMATIC DISEASES

Patients with inflammatory joint diseases are at an increased risk of developing periprosthetic joint infections (PJI) following total joint arthroplasty.[50-54] For example, rheumatoid arthritis (RA) has been strongly associated with a higher incidence of surgical wound infections and prosthetic implant complications.[53] Individuals with RA have a 1.6 times greater risk of developing PJI compared to those undergoing joint replacement for osteoarthritis, primarily due to a compromised inflammatory response.[50]

The precise etiopathogenetic mechanism underlying this increased infection risk remains unclear. Some studies suggest that iatrogenic immunosuppression from long-term disease-modifying treatments significantly contributes to infectious complications. Others propose that the elevated risk is intrinsic to the disease itself, as chronic immune activation in inflammatory conditions may impair normal immune defences.[54,55]

Additionally, persistent systemic inflammation, especially in rheumatoid arthritis, negatively affects wound healing, increasing vulnerability to bacterial colonization at the surgical site.[55] This combination of immune dysregulation and delayed tissue repair further elevates the likelihood of PJI in patients with rheumatic and inflammatory diseases. Moreover, patients with rheumatoid arthritis frequently experience malnutrition, which further predisposes them to infection-related risk factors.[50-53]

Immunosuppressive therapies, including corticosteroids and disease-modifying antirheumatic drugs (DMARDs) such as methotrexate, have also been implicated in increasing infection susceptibility. According to the International Consensus Meeting on PJI, DMARD therapy should be temporarily discontinued before surgery, with the timing based on the specific drug's half-life. Methotrexate, which inhibits tumour necrosis factor (TNF) and interleukin-6 (IL-6), has been shown to elevate infection risk, further complicating postoperative recovery in these patients.[51]

5) DIETARY, NUTRITION, AND LIFESTYLE MODIFICATIONS

5.1) OBESITY

Many candidates for joint replacement suffer from pain and symptoms of osteoarthrosis because they are overweight or obese with a severe reduction of daily activity and sport activity, or complete immobilization.[56-58] Extremely obese patients are considerably more at risk of PJI and have a four times higher infection incidence than thinner patients. The risk of infection has been found to increase with body mass index (BMI).[59] In obese patients with BMI >40 kg/m2 the risk of infection rises by 3.3 times, while in morbidly obese individuals with a BMI >50 kg/m2, the risk of PJI grows by 21 times.[31]

Obesity is also associated with other comorbidities such as diabetes mellitus and cardiovascular disease. Furthermore, obese patients require extra time for technical considerations during surgical procedures, due to the need for blood transfusions and the presence of additional medical disorders that affect the duration of anaesthesia.[60,61] Patients who have a BMI of 35 or higher and present other risks for PJI,[62] as well as those who have a BMI of 40 or more, should postpone surgery and optimize their conditions by receiving nutritional and bariatric surgery consultations.[7,63-65]

5.2) DIETARY, NUTRITION, AND LIFESTYLE MODIFICATIONS IN PREOPERATIVE OPTIMIZATION

The preoperative optimization of diet, nutrition, hydration, and lifestyle factors plays a crucial role in reducing the risk of periprosthetic joint infection (PJI) and improving surgical outcomes in total joint replacement. Addressing these modifiable risk factors enhances immune function, promotes wound healing, and reduces perioperative complications.

Malnutrition is associated with several adverse outcomes, including prolonged hospital stays, impaired wound healing and PJI.[18] One of the key risk factors is inadequate protein levels, as indicated by serum albumin and total protein concentrations.[66]

Malnutrition is a medical condition characterized by insufficient protein intake, resulting in increased patient frailty. It is commonly defined by laboratory markers such as serum albumin levels below 3.5 g/dL, serum transferrin levels under 200 mg/dL, and serum prealbumin levels below 15 mg/dL.

Moreover, hypovitaminosis plays a significant role in musculoskeletal infections, particularly in the progression of septic conditions. The importance of vitamin D in immune function and infection control has been well documented by multiple authors.[60,66] Therefore, preoperative optimization of serum vitamin D levels should be considered as part of the strategy to reduce the risk of postoperative complications.

Hydration also plays an important role in the prevention of PJI by influencing physiological functions such as im-

mune response and tissue perfusion. Adequate hydration improves renal function and the elimination of toxins, contributing to a healthier environment for surgical recovery. Therefore, optimal hydration practices should be integrated into preoperative care to improve patients' conditions.[22,53]

5.3) SARCOPENIA AND THE ROLE OF PHYSICAL ACTIVITY IN PREOPERATIVE OPTIMIZATION

Sarcopenia is a widespread condition characterized by progressive muscle loss and reduced strength in older adults, leading to increased morbidity, mortality, and adverse healthcare outcomes.[67] Following total knee arthroplasty (TKA), sarcopenia has been linked to a higher risk of complications,[68] including periprosthetic joint infection (PJI).[69]

The sarcopenic obesity phenotype, defined by increased body fat and decreased muscle mass, is associated with higher infection rates, in addition to impaired functional recovery and prolonged rehabilitation after joint replacement. Furthermore, extended periods of inactivity before and after surgery can contribute to weight gain, which negatively impacts cardiovascular health and metabolic function[69]; however, in a systematic review and meta-analysis on the impact of sarcopenia in patients undergoing total joint arthroplasty, Sumbal[70] found no association between sarcopenia and PJI.

Sarcopenia may contribute to poorer postoperative outcomes in total knee replacement patients. Ardeljan[68] reported an increase in implant-related complications within two years, although research specifically linking sarcopenia to PJI risk remains limited. Despite this, preoperative sarcopenia screening, including muscle mass assessments, is recommended for patients undergoing TKA.

Effective sarcopenia management primarily involves nonpharmacological interventions, which are beneficial for all affected individuals. These include lifestyle modifications, targeted muscle-strengthening exercises, and physical therapy, complemented by pharmacological treatments when necessary.[68] Preoperative exercise programmes, focused on muscle strengthening and improving knee range of motion, have been shown to enhance postoperative recovery and minimize complications in TKA patients.

Regular physical activity plays a crucial role in maintaining muscle mass and strength, thereby reducing the risk of sarcopenia while supporting immune function. Additionally, exercise promotes better blood circulation and oxygenation of tissues, which enhances wound healing and lowers infection risk. Improved glycaemic control in physically active individuals also helps minimize diabetes-related infections, further supporting successful TKA outcomes.[67]

6) BACTERIAL DECOLONIZATION

Remote infections, including urinary tract, dental, skin, respiratory, and active musculoskeletal types, can act as sources of haematogenous bacterial spread, significantly increasing the risk of periprosthetic joint infection (PJI). Studies indicate that over 98% of PJI cases are caused by bacterial pathogens, with *Staphylococcus aureus* and coagulase-negative staphylococci responsible for 50% to 60% of infections.[71,72] Proper identification and management of preoperative infections are essential to minimize the risk of postoperative complications and implant-related infections.

6.1) NASAL DECOLONIZATION IN PREOPERATIVE INFECTION PREVENTION

Over the past decade, bacterial decolonization has gained increasing importance in orthopaedic surgery, particularly in industrialized countries, as a critical measure to reduce surgical site infections (SSIs) and periprosthetic joint infection (PJI). The prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in the nasal cavity is estimated at 2.2%, while *Staphylococcus aureus* colonization is detected in over 4% of patients. Due to this high colonization rate, preoperative screening for *S. aureus* has become a widely recognized standard practice among hospital administrators and orthopaedic surgeons.[73]

Nasal decolonization begins with screening for *S. aureus* and its variants using a nasal swab as part of the preoperative assessment. The presence or absence of bacterial colonization is determined using either bacterial culture methods or real-time polymerase chain reaction (RT-PCR) analysis. If a patient tests positive for *S. aureus*, the scheduled arthroplasty procedure is typically postponed, allowing sufficient time for nasal decolonization therapy to be completed before surgery.

It is recommended that patients undergoing joint replacement surgery use mupirocin 1 mg applied twice daily for five consecutive days, combined with daily antiseptic showers as part of a comprehensive infection control protocol. The surgical procedure can be rescheduled within 30 days after completing decolonization therapy to ensure optimal infection prevention.

According to a systematic review and meta-analysis conducted by Sadigursky[73] and Zhu,[74] nasal *S. aureus* screening and decolonization significantly reduced the risk of SSI, PJI, and superficial infections compared to patients who did not undergo decolonization. However, Baratz[75] reported that 22% of patients remained colonized with MRSA despite undergoing the decolonization protocol. Interestingly, no significant differences in PJI risk were observed between patients following the protocol and those in the control group, suggesting that additional measures may be required for complete bacterial eradication in some cases.

6.2) ANAL DECOLONIZATION IN PREOPERATIVE INFECTION PREVENTION

Anal screening, meanwhile, has not been shown to have either a significant protective effect or an increased risk concerning surgical site infections.[6,16] However, it is often associated with hospital-acquired infections and prolonged hospital stays. Due to its direct relationship with the intestinal microbiota, effective decontamination is not feasible. Nevertheless, preoperative intestinal preparation is already recognized as a best practice in surgical protocols.

6.3) THE ROLE OF DENTAL CLEARANCE IN INFECTION PREVENTION FOR ARTHROPLASTY

Dental clearance and oral decontamination are now recognized as essential components of infection prevention protocols for both medical and surgical admissions.[76-78] While guidelines strongly recommend preoperative dental evaluation, clinical studies specifically examining its impact on joint replacement outcomes remain limited. There is insufficient evidence to conclusively support the use of antibiotic prophylaxis in preventing surgical site infections (SSIs) in orthopaedic surgery, though some works suggest it may be beneficial.[76]

The available evidence on the role of preoperative dental clearance and hygiene assessment in reducing infection risks for arthroplasty patients is limited, particularly in cases where high-risk factors are present.[76] However, for orthopaedic surgeons, preoperative dental assessment may be valuable, particularly in patients with a history of oral infections, previous endodontic treatments, or recent tooth extractions, as these conditions could potentially contribute to bacteraemia and increase the risk of periprosthetic joint infection (PJI).[76]

6.4) OTHER INFECTIONS (URINARY TRACT, GASTROINTESTINAL, FUNGAL INFECTIONS, ETC.)

Preoperative infection screening should include urinary tract infections (UTIs), as UTIs are widely recognized as moderate- to high-risk factors for periprosthetic joint infection (PJI).[79-90] The urinary tract serves as a common entry point for pathogens, which can reach the surgical site or prosthetic components through haematogenous dissemination or direct contamination.

Several studies have investigated the impact of standard urinary antibiotic prophylaxis in reducing postoperative infections, particularly in patients with significant leukocyturia.[80,81] However, findings remain inconclusive, as while some research suggests a reduction in infection rates, others highlight the potential risks, such as acute kidney injury, which itself is a risk factor for PJI.[79] Current evidence does not support the routine use of preoperative antibiotic therapy in cases of asymptomatic bacteriuria.[81,82] Instead, it is strongly recommended that symptomatic UTIs be eradicated before surgery and urinary symptoms be closely monitored postoperatively.[80]

Additionally, patients with inflammatory bowel disease (IBD), who often exhibit gut microbiome dysregulation, are at an increased risk of PJI. Although the exact mechanism remains unclear, this association may be linked to bacterial translocation from the inflamed intestinal mucosa or a dysregulated immune response, both of which could facilitate systemic bacterial spread and contribute to prosthetic joint infections.[83]

6.5) SKIN DECOLONIZATION

Iannotti[7] recommends that high-risk patients undergo daily chlorhexidine baths for five days before surgery as part of a comprehensive infection prevention strategy to minimize the risk of postoperative complications. Preoperative skin decolonization with chlorhexidine cleansing has been shown to effectively reduce PJI rates, demonstrating superior antimicrobial efficacy compared to regular soap.[84]

Although fungal periprosthetic joint infections (PJI) are rare, accounting for approximately 1%-2% of all PJI cases, they present greater challenges in both diagnosis and management compared to bacterial infections.[71]

Patients with superficial skin or nail mycosis appear to have an elevated risk of bacterial infections following total joint arthroplasty (TJA), although the exact underlying mechanism remains unclear. Some evidence suggests that preoperative fungal infections across multiple body sites may be more indicative of an immune system alteration rather than a direct fungal transmission risk to the surgical site.

In a retrospective comparative study, Lin[85] reported that 8.6% of patients with preoperative mycosis who underwent total knee replacement developed bacterial PJI, whereas no infections were observed in patients without mycosis. This finding suggests a potential correlation between fungal colonization and increased susceptibility to bacterial infections.

7) SURGICAL STRATEGIES FOR REDUCING LOCAL INFECTION RISK

Surgeons should implement preventive measures to minimize local infection risk by avoiding procedures or interventions that could increase the likelihood of periprosthetic joint infection (PJI).

7.1) INTRA-ARTICULAR INJECTIONS AND INFECTION RISK

Preoperative intra-articular injections have been linked to a higher risk of postoperative periprosthetic joint infection (PJI) following total knee arthroplasty (TKA).[86] The risk appears to be time-sensitive, with a greater likelihood of infection when injections are administered closer to the surgery date.[87]

A systematic review by Richardson[88] found that hyaluronic acid or corticosteroid injections given within 99 days before TKA significantly increased the risk of developing PJI. However, a systematic review and meta-analysis by Charalambous[89] reported no significant association between prior steroid injections and the incidence of deep or superficial infections. While the evidence remains conflicting, careful consideration should be given to timing and necessity when administering preoperative intra-articular injections to reduce infection risk.

7.2) ARTHROSCOPY PRIOR TO KNEE REPLACEMENT

Gu,[90] in his study on the risk of arthroplasty revision in patients who underwent arthroscopy before total knee replacement, suggested that in individuals with severe osteoarthritis, arthroscopy performed within 36 weeks before

knee replacement increases the risk of periprosthetic joint infection (PJI).[90]

7.3) PREVIOUS JOINT INFECTION AND THE RISK OF PERIPROSTHETIC JOINT INFECTION

Patients with a history of septic arthritis due to prior surgery or intra-articular injections should undergo thorough preoperative evaluation to rule out the presence of quiescent or residual infection before proceeding with total joint arthroplasty (TJA).[91] Proper risk assessment and microbiological screening are essential to minimize the risk of periprosthetic joint infection (PJI) in these high-risk patients.

In a study of 207 total joint replacements, Tan[92] found no clear consensus on the optimal timing between previous septic arthritis and elective TJA. Portier[93] recommended taking intraoperative synovial fluid and tissue samples during arthroplasty and initiating empirical antibiotic therapy until culture results are available to ensure the absence of active infection.

Total joint arthroplasty in patients with prior septic arthritis can be performed using either a single- or two-stage approach. However, in a systematic review and meta-analysis of 413 patients, Luo[94] found no significant difference in reinfection rates between the two methods, suggesting that both approaches can be considered based on patient-specific factors and surgical planning.

8) MISCELLANEOUS RISK FACTORS (SMOKING, SUBSTANCE USE, ALCOHOL, AND PSYCHOSIS)

The relationship between smoking, substance use, alcohol consumption, and psychiatric disorders with periprosthetic joint infection (PJI) is complex, as these factors can independently and synergistically contribute to higher infection risk, delayed healing, and poor surgical outcomes.[95, 96] Smoking and chronic alcohol use impair immune function and wound healing, while substance abuse and psychiatric conditions may lead to poor adherence to postoperative care and hygiene protocols, further increasing the likelihood of complications. Additionally, patients with severe mental illness often experience nutritional deficiencies and reduced access to healthcare, compounding their risk of surgical site infections and delayed recovery. Addressing these modifiable risk factors through preoperative counselling, multidisciplinary support, and cessation programmes is essential to improve postoperative outcomes in total joint arthroplasty patients.[97-108]

8.1) SMOKING

Smoking and tobacco use are well-established risk factors for periprosthetic joint infection (PJI) and delayed wound healing following total joint arthroplasty (TJA). Smoking suppresses immune function, reducing the body's ability to combat infections and promote tissue repair.[97]

Nicotine contributes to these risks through multiple mechanisms, including vasoconstriction, which restricts blood flow to tissues, leading to impaired oxygenation, delayed wound healing, and a higher likelihood of surgical site infections. Additionally, chronic systemic inflammation caused by smoking may further predispose patients to postoperative infections.[98]

Several studies suggest that at least four weeks of smoking cessation before elective surgery can significantly reduce the risk of surgical complications, including infection, delayed healing, and implant failure.[99] Therefore, preoperative smoking cessation programmes should be strongly encouraged as part of comprehensive risk reduction strategies in TJA patients.

8.2) SUBSTANCE ABUSE, HIV, AND PERIPROSTHETIC JOINT INFECTION RISK

Substance abuse and HIV infection are significant risk factors for periprosthetic joint infection (PJI) due to their impact on immune function and overall health status. Intravenous drug users (IVDU) are particularly susceptible to bloodstream infections, which can lead to haematogenous spread and subsequent PJI.[100,101]

Chronic drug use weakens immune defences, making individuals more prone to postoperative infections and delayed wound healing. Additionally, patients with substance use disorders often exhibit poor adherence to post-surgical care protocols, which further increases their risk of complications and implant failure. HIV-positive patients, particularly those with uncontrolled viral loads or low CD4 counts, also face a higher incidence of postoperative infections, emphasizing the need for preoperative optimization and infection control strategies in these high-risk populations.[101]

8.3) ALCOHOL CONSUMPTION AND ITS IMPACT ON PERIPROSTHETIC JOINT INFECTION

Chronic alcohol consumption is a well-documented risk factor for periprosthetic joint infection (PJI) due to its detrimental effects on immune function, wound healing, and coagulation. Long-term alcohol use can lead to liver disease and coagulopathy, both of which increase susceptibility to infections and impair the body's ability to respond to surgical stress.

Additionally, alcoholism is strongly associated with malnutrition, particularly protein and vitamin deficiencies, which are essential for tissue repair, immune response, and overall surgical recovery. Patients with alcohol dependency may also exhibit poor adherence to postoperative care instructions, further increasing their risk of complications and implant failure. Given these risks, preoperative screening and counselling for excessive alcohol use should be an integral part of infection prevention strategies in total joint arthroplasty (TJA).

8.4) PSYCHOSIS AND THE INCREASED RISK OF PERIPROSTHETIC JOINT INFECTION

Patients with psychotic disorders, such as schizophrenia and bipolar disorder, are at an increased risk of peripros-

thetic joint infection (PJI) due to several contributing factors. These include poor self-care and hygiene, lower adherence to medical treatments, and impaired pain perception, which may result in delayed recognition and treatment of infection symptoms.[30,101]

Additionally, certain antipsychotic medications can negatively impact immune function and wound healing, further elevating the risk of postoperative complications. When psychosis is accompanied by other risk factors, such as smoking, heavy alcohol consumption, or substance abuse, the likelihood of PJI increases exponentially.[102,103]

To mitigate these risks, patients with psychotic disorders should undergo comprehensive preoperative screening, with multidisciplinary interventions including substance use treatment, mental health support, and smoking cessation programmes to improve postoperative outcomes and reduce infection risk.[103]

9) CONCLUSION

Preventing periprosthetic joint infection in knee replacement requires a multidisciplinary, proactive approach that begins well before the surgical procedure. While surgeons play a critical role in intraoperative infection control, many modifiable risk factors can be effectively addressed during the preoperative period, significantly improving patient safety and surgical outcomes.

Simple yet impactful preoperative interventions, such as lifestyle modifications, as well as weight management, metabolic disease optimization, bacterial decolonization, muscle strengthening, and knee mobility enhancement, can substantially reduce PJI risk, shorten hospitalization, and accelerate recovery. Addressing these factors before surgery allows healthcare providers to mitigate preventable complications and improve overall patient resilience.

Patients with one or more risk factors should undergo a structured, multidisciplinary preoperative assessment, integrating patient education in addition to targeted medical treatments and routine follow-ups, to optimize their condition before surgery. Standardized risk factor management protocols, involving surgeons, general practitioners, infectious disease specialists, physiotherapists, and nutritionists, can enhance infection prevention strategies and ultimately improve long-term TKA success rates.

This review serves as a starting point for raising awareness of the importance of a multidisciplinary preoperative approach. By implementing evidence-based, practical interventions, healthcare providers can make joint replacement a safer and more effective procedure, ensuring better patient outcomes and reducing the burden of PJI in orthopaedic surgery.

AUTHOR CONTRIBUTIONS

Conceptualization, H.Z. and I.A.; methodology, H.Z.; software, M.M.; validation, V.D.G.; resources, H.Z. and M.M.; data curation, R.G.; writing—original draft preparation, I.A, M.M. and R.G.; writing—review and editing, H.Z and V.D.G.; supervision, F.P. All authors have read and agreed to the published version of the manuscript.

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REFERENCES

1. Cram P, Lu X, Kates SL, Singh JA, Li Y, Wolf BR. Total knee arthroplasty volume, utilization, and outcomes among Medicare beneficiaries, 1991-2010. *JAMA*. 2012;308(12):1227-1236. doi:10.1001/2012.jama.11153. PMID:23011713

2. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am*. 2007;89(4):780-785. doi:10.2106/JBJS.F.00222. PMID:17403800

3. Culliford DJ, Maskell J, Kiran A, et al. The lifetime risk of total hip and knee arthroplasty: results from the UK general practice research database. *Osteoarthritis Cartilage*. 2012;20(6):519-524. doi:10.1016/j.joca.2012.02.636. PMID:22395038

4. Gehrke T, Citak M, Parvizi J, Budhiparama NC, Akkaya M. Periprosthetic joint infections: state-of-the-art. *Arch Orthop Trauma Surg*. 2024;145(1):58. doi:10.1007/s00402-024-05627-5. PMID:39694911

5. Mortazavi SM, Schwartzenberger J, Austin MS, Purtill JJ, Parvizi J. Revision total knee arthroplasty infection: incidence and predictors. *Clin Orthop Relat Res*. 2010;468(8):2052-2059. doi:10.1007/s11999-010-1308-6. PMID:20309657

6. Gómez-Barrena E, Warren T, Walker I, et al. Prevention of Periprosthetic Joint Infection in Total Hip and Knee Replacement: One European Consensus. *J Clin Med*. 2022;11(2):381. doi:10.3390/jcm11020381. PMID:35054075

7. Iannotti F, Prati P, Fidanza A, et al. Prevention of Periprosthetic Joint Infection (PJI): A Clinical Practice Protocol in High-Risk Patients. *Trop Med Infect Dis*. 2020;5(4):186. doi:10.3390/tropicalmed5040186. PMID:33322463

8. Parvizi J, Schmidt MG, Goldstein EJC. Periprosthetic Joint Infection. *N Engl J Med*. 2023;388(15):1439. doi:10.1056/NEJMc2302028. PMID:37043664

9. Kunutsor SK, Whitehouse MR, Blom AW, Beswick AD, INFORM Team. Patient-Related Risk Factors for Periprosthetic Joint Infection after Total Joint Arthroplasty: A Systematic Review and Meta-Analysis. *PLoS One*. 2016;11(3):e0150866. doi:10.1371/journal.pone.0150866. PMID:26938768

10. Rezapoor M, Parvizi J. Prevention of Periprosthetic Joint Infection. *J Arthroplasty*. 2015;30(6):902-907. doi:10.1016/j.arth.2015.02.044. PMID:25824026

11. Parvizi J, Tuncay I, Mont MA. The 2024 World Expert Meeting in Arthroplasty: Not All Controversies Are Actually Controversial. *J Arthroplasty*. 2024;39(12):2883-2884. doi:10.1016/j.arth.2024.10.055. PMID:39523044

12. Aftab MHS, Joseph T, Almeida R, Sikhauli N, Pietrzak JRT. Periprosthetic Joint Infection: A Multifaceted Burden Undermining Arthroplasty Success. *Orthop Rev (Pavia)*. 2025;17:138205. doi:10.52965/001c.138205. PMID:40556950

13. Yilmaz MK, Celik N, Tarabichi S, Abbaszadeh A, Parvizi J. Evidence-based Approach for Prevention of Surgical Site Infection. *Hip Pelvis*. 2024;36(3):161-167. doi:10.5371/hp.2024.36.3.161. PMID:39210568

14. Egerci OF, Yapar A, Dogruoz F, Selcuk H, Kose O. Preventive strategies to reduce the rate of periprosthetic infections in total joint arthroplasty; a comprehensive review. *Arch Orthop Trauma Surg*. 2024;144(12):5131-5146. doi:10.1007/s00402-024-05301-w. PMID:38635048

15. Elbuluk AM, Novikov D, Gotlin M, Schwarzkopf R, Iorio R, Vigdorchik J. Control Strategies for Infection Prevention in Total Joint Arthroplasty. *Orthop Clin North Am*. 2019;50(1):1-11. doi:10.1016/j.ocl.2018.08.001. PMID:30477698

16. McDonald S, Page MJ, Beringer K, Wasiak J, Sprowson A. Preoperative education for hip or knee replacement. *Cochrane Database Syst Rev*. 2014;2014(5):CD003526. doi:10.1002/14651858.CD003526.pub3. PMID:24820247

17. Chan VW, Chan PK, Fu H, et al. Preoperative optimization to prevent periprosthetic joint infection in at-risk patients. *J Orthop Surg (Hong Kong)*. 2020;28(3):2309499020947207. doi:10.1177/2309499020947207. PMID:32851909

18. Tsantes AG, Papadopoulos DV, Lytras T, et al. Association of malnutrition with periprosthetic joint and surgical site infections after total joint arthroplasty: a systematic review and meta-analysis. *J Hosp Infect*. 2019;103(1):69-77. doi:10.1016/j.jhin.2019.04.020. PMID:31054936

19. Castano-Betancourt MC, Fruschein Annichino R, de Azevedo E Souza Munhoz M, Gomes Machado E, Lipay MV, Marchi E. Identification of high-risk groups for complication after arthroplasty: predictive value of patient's related risk factors. *J Orthop Surg Res*. 2018;13(1):328. doi:10.1186/s13018-018-1036-2. PMID:30594233

20. Dobson PF, Reed MR. Prevention of infection in primary THA and TKA. *EFORT Open Rev*. 2020;5(10):604-613. doi:10.1302/2058-5241.5.200004. PMID:33204502

21. Illingworth KD, Mihalko WM, Parvizi J, et al. How to minimize infection and thereby maximize patient outcomes in total joint arthroplasty: a multicenter approach: AAOS exhibit selection. *J Bone Joint Surg Am*. 2013;95(8):e50. doi:10.2106/JBJS.L.00596. PMID:23595076

22. Parvizi J, Shohat N, Gehrke T. Prevention of periprosthetic joint infection: new guidelines. *Bone Joint J*. 2017;99-B(4 Supple B):3-10. doi:10.1302/0301-620X.99B4.BJJ-2016-1212.R1. PMID:28363888

23. Raval P, Coolican M. Preoperative, intraoperative, and postoperative concepts to prevent infection for unicompartmental knee arthroplasty. *J ISAKOS*. 2024;9(6):100345. doi:10.1016/j.jisako.2024.100345. PMID:39427820

24. Lucenti L, Testa G, Caldaci A, et al. Preoperative Risk Factors for Periprosthetic Joint Infection: A Narrative Review of the Literature. *Healthcare (Basel)*. 2024;12(6):666. doi:10.3390/healthcare12060666. PMID:38540630

25. Alamanda VK, Springer BD. Perioperative and Modifiable Risk Factors for Periprosthetic Joint Infections (PJI) and Recommended Guidelines. *Curr Rev Musculoskelet Med*. 2018;11(3):325-331. doi:10.1007/s12178-018-9494-z. PMID:29869135

26. Tarabichi S, Parvizi J. Prevention of surgical site infection: a ten-step approach. *Arthroplasty*. 2023;5(1):21. doi:10.1186/s42836-023-00174-7. PMID:37029444

27. Yoon SJ, Jutte PC, Soriano A, Sousa R, Zijlstra WP, Wouthuyzen-Bakker M. Predicting periprosthetic joint infection: external validation of preoperative prediction models. *J Bone Jt Infect*. 2024;9(5):231-239. doi:10.5194/jbji-9-231-2024. PMID:39539737

28. Shohat N, Parvizi J. Prevention of Periprosthetic Joint Infection: Examining the Recent Guidelines. *J Arthroplast*. 2017;32:2040-2046. doi:10.1016/j.arth.2017.02.072

29. Rodriguez-Merchan EC, Liddle AD. Prevention of Periprosthetic Joint Infection in Total Knee Arthroplasty: Main Studies Reported Between November 2017 and January 2020. *Arch Bone Jt Surg*. 2020;8(4):465-469. doi:10.22038/abjs.2020.48489.2403. PMID:32884967

30. Hong SH, Kwon SC, Lee JH, Moon S, Kim JI. Influence of Diabetes Mellitus on Postoperative Complications After Total Knee Arthroplasty: A Systematic Review and Meta-Analysis. *Medicina (Kaunas)*. 2024;60(11):1757. doi:10.3390/medicina60111757. PMID:39596942

31. Eka A, Chen AF. Patient-related medical risk factors for periprosthetic joint infection of the hip and knee. *Ann Transl Med*. 2015;3(16):233. doi:10.3978/j.issn.2305-5839.2015.09.26. PMID:26539450

32. Parvizi J, Cha Y, Chisari E, Kim K, Koo KH. Comprehensive Guidance for the Prevention of Periprosthetic Joint Infection After Total Joint Arthroplasty and Pitfalls in the Prevention. *J Korean Med Sci*. 2024;39(15):e147. doi:10.3346/jkms.2024.39.e147. PMID:38651227

33. Kong L, Cao J, Zhang Y, Ding W, Shen Y. Risk factors for periprosthetic joint infection following primary total hip or knee arthroplasty: a meta-analysis. *Int Wound J*. 2017;14(3):529-536. doi:10.1111/iwj.12640. PMID:27397553

34. Yang Z, Liu H, Xie X, Tan Z, Qin T, Kang P. The influence of diabetes mellitus on the post-operative outcome of elective primary total knee replacement: a systematic review and meta-analysis. *Bone Joint J*. 2014;96-B(12):1637-1643. doi:10.1302/0301-620X.96B12.34378. PMID:25452366

35. Shohat N, Goswami K, Breckenridge L, et al. Fructosamine is a valuable marker for glycemic control and predicting adverse outcomes following total hip arthroplasty: a prospective multi-institutional investigation. *Sci Rep*. 2021;11:2227. doi:10.1038/s41598-021-81803-6

36. Palmer RC, Telang SS, Ball JR, Wier J, Lieberman JR, Heckmann ND. The Limited Utility of Hemoglobin A1c as a Predictor for Periprosthetic Joint Infection Following Total Joint Arthroplasty: A Continuous Variable Analysis. *J Arthroplasty*. Published online January 13, 2025. doi:10.1016/j.arth.2025.01.004. PMID:39814114

37. Lovecchio F, Beal M, Kwasny M, Manning D. Do patients with insulin-dependent and noninsulin-dependent diabetes have different risks for complications after arthroplasty? *Clin Orthop Relat Res*. 2014;472(11):3570-3575. doi:10.1007/s11999-014-3891-4. PMID:25138473

38. Qin W, Huang X, Yang H, Shen M. The Influence of Diabetes Mellitus on Patients Undergoing Primary Total Lower Extremity Arthroplasty: A Systematic Review and Meta-Analysis. *Biomed Res Int*. 2020;2020(2020):6661691. doi:10.1155/2020/6661691. PMID:33490250

39. Turina M, Fry DE, Polk HC Jr. Acute hyperglycemia and the innate immune system: clinical, cellular, and molecular aspects. *Crit Care Med*. 2005;33(7):1624-1633. doi:10.1097/01.ccm.0000170106.61978.d8. PMID:16003073

40. Moon HK, Han CD, Yang IH, Cha BS. Factors affecting outcome after total knee arthroplasty in patients with diabetes mellitus. *Yonsei Med J*. 2008;49(1):129-137. doi:10.3349/ymj.2008.49.1.129. PMID:18306479

41. Agos F, Shoda C, Bransford D. Part II: managing perioperative hyperglycemia in total hip and knee replacement surgeries. *Nurs Clin North Am*. 2014;49(3):299-308. doi:10.1016/j.cnur.2014.05.004. PMID:25155530

42. Mraovic B, Suh D, Jacovides C, Parvizi J. Perioperative hyperglycemia and postoperative infection after lower limb arthroplasty. *J Diabetes Sci Technol*. 2011;5(2):412-418. doi:10.1177/193229681100500231. PMID:21527113

43. Tarabichi S, Parvizi J. Preventing the Impact of Hyperglycemia and Diabetes on Patients Undergoing Total Joint Arthroplasty. *Orthop Clin North Am*. 2023;54(3):247-250. doi:10.1016/j.ocl.2023.02.008. PMID:37271552

44. Goodnough LT, Maniatis A, Earnshaw P, et al. Detection, evaluation, and management of preoperative anaemia in the elective orthopaedic surgical patient: NATA guidelines. *Br J Anaesth*. 2011;106(1):13-22. doi:10.1093/bja/aeq361. PMID:21148637

45. Greenky M, Gandhi K, Pulido L, Restrepo C, Parvizi J. Preoperative anemia in total joint arthroplasty: is it associated with periprosthetic joint infection? *Clin Orthop Relat Res*. 2012;470(10):2695-2701. doi:10.1007/s11999-012-2435-z. PMID:22773393

46. Gruson KI, Aharonoff GB, Egol KA, Zuckerman JD, Koval KJ. The relationship between admission hemoglobin level and outcome after hip fracture. *J Orthop Trauma*. 2002;16(1):39-44. doi:10.1097/00005131-200201000-00009. PMID:11782632

47. Bredeche F, Gounot I, Belgaïd V, et al. Anemia before reimplantation surgery - An overlooked modifiable risk factor of septic revision knee arthroplasty failure. *SICOT J*. 2020;6:47. doi:10.1051/sicotj/2020046. PMID:33306020

48. Küçükdurmaz F, Parvizi J. The Prevention of Periprosthetic Joint Infections. *Open Orthop J*. 2016;10:589-599. doi:10.2174/1874325001610010589. PMID:28144372

49. Grosso MJ, Boddapati V, Cooper HJ, Geller JA, Shah RP, Neuwirth AL. The Effect of Preoperative Anemia on Complications After Total Hip Arthroplasty. *J Arthroplasty*. 2020;35(6S):S214-S218. doi:10.1016/j.arth.2020.01.012. PMID:32019689

50. Schrama JC, Espehaug B, Hallan G, et al. Risk of revision for infection in primary total hip and knee arthroplasty in patients with rheumatoid arthritis compared with osteoarthritis: a prospective, population-based study on 108,786 hip and knee joint arthroplasties from the Norwegian Arthroplasty Register. *Arthritis Care Res (Hoboken)*. 2010;62(4):473-479. doi:10.1002/acr.20036. PMID:20391501

51. Yeganeh MH, Kheir MM, Shahi A, Parvizi J. Rheumatoid Arthritis, Disease Modifying Agents, and Periprosthetic Joint Infection: What Does a Joint Surgeon Need to Know? *J Arthroplasty*. 2018;33(4):1258-1264. doi:10.1016/j.arth.2017.11.031. PMID:29325724

52. Ravi B, Escott B, Shah PS, et al. A systematic review and meta-analysis comparing complications following total joint arthroplasty for rheumatoid arthritis versus for osteoarthritis. *Arthritis Rheum*. 2012;64(12):3839-3849. doi:10.1002/art.37690. PMID:23192790

53. Shahi A, Parvizi J. Prevention of Periprosthetic Joint Infection. *Arch Bone Jt Surg*. 2015;3(2):72-81. PMID:26110171

54. Premkumar A, Morse K, Levack AE, Bostrom MP, Carli AV. Periprosthetic Joint Infection in Patients with Inflammatory Joint Disease: Prevention and Diagnosis. *Curr Rheumatol Rep*. 2018;20(11):68. doi:10.1007/s11926-018-0777-6. PMID:30203376

55. Morrison TA, Figgie M, Miller AO, Goodman SM. Periprosthetic joint infection in patients with inflammatory joint disease: a review of risk factors and current approaches to diagnosis and management. *HSS J*. 2013;9(2):183-194. doi:10.1007/s11420-013-9338-8. PMID:24426866

56. Zmerly H, El Ghoch M, Itani L, Kreidieh D, Yumuk V, Pellegrini M. Personalized Nutritional Strategies to Reduce Knee Osteoarthritis Severity and Ameliorate Sarcopenic Obesity Indices: A Practical Guide in an Orthopedic Setting. *Nutrients*. 2023;15(14):3085. doi:10.3390/nu15143085. PMID:37513503

57. Fehring TK, Odum SM, Griffin WL, Mason JB, McCoy TH. The obesity epidemic: its effect on total joint arthroplasty. *J Arthroplasty*. 2007;22(6 Suppl 2):71-76. doi:10.1016/j.arth.2007.04.014. PMID:17823020

58. Chen Z, Sax OC, Bains SS, et al. Super-obese patients are associated with significant infection burden after total hip arthroplasty. *Hip Int*. 2023;33(5):806-811. doi:10.1177/11207000221144740. PMID:36703261

59. Spezia MC, Stitgen A, Walz JW, Leary EV, Patel A, Keeney JA. Body Mass Index Improvement Reduces Total Knee Arthroplasty Complications Among Patients Who Have Extreme, but Not Severe, Obesity. *J Arthroplasty*. 2025;40(3):632-636. doi:10.1016/j.arth.2024.08.054. PMID:39233104

60. Lu J, Wei B, Xu J, Li Z. The impact of metabolic syndrome on clinical outcomes following total knee arthroplasty in osteoarthritis patients. *Ann Jt*. 2024;9:22. doi:10.21037/aoj-24-2. PMID:39114416

61. Indelli PF, Iannotti F, Ferretti A, et al. Recommendations for periprosthetic joint infections (PJI) prevention: the European Knee Associates (EKA)-International Committee American Association of Hip and Knee Surgeons (AAHKS)-Arthroplasty Society in Asia (ASIA) survey of members. *Knee Surg Sports Traumatol Arthrosc*. 2022;30(12):3932-3943. doi:10.1007/s00167-021-06742-1. PMID:34518895

62. Shohat N, Fleischman A, Tarabichi M, Tan TL, Parvizi J. Weighing in on Body Mass Index and Infection After Total Joint Arthroplasty: Is There Evidence for a Body Mass Index Threshold? *Clin Orthop Relat Res*. 2018;476(10):1964-1969. doi:10.1007/s11999.0000000000000141. PMID:30794240

63. Seward MW, Antonelli BJ, Giunta N, et al. Weight loss before total joint arthroplasty using a remote dietitian and mobile app: study protocol for a multicenter randomized, controlled trial. *J Orthop Surg Res*. 2020;15(1):531. doi:10.1186/s13018-020-02059-w. PMID:33187535

64. Keeney BJ, Austin DC, Jevsevar DS. Preoperative Weight Loss for Morbidly Obese Patients Undergoing Total Knee Arthroplasty: Determining the Necessary Amount. *J Bone Joint Surg Am*. 2019;101(16):1440-1450. doi:10.2106/JBJS.18.01136. PMID:31436651

65. Li S, Luo X, Sun H, Wang K, Zhang K, Sun X. Does Prior Bariatric Surgery Improve Outcomes Following Total Joint Arthroplasty in the Morbidly Obese? A Meta-Analysis. *J Arthroplasty*. 2019;34(3):577-585. doi:10.1016/j.arth.2018.11.018. PMID:30528132

66. Zajonz D, Daikos A, Prager F, et al. Significance of nutritional status in the development of periprosthetic infections : A retrospective analysis of 194 patients. *Orthopade*. 2021;50(3):188-197. doi:10.1007/s00132-020-03922-8. PMID:32424439

67. Zmerly H, Milanese C, El Ghoch M, et al. Personalized Physical Activity Programs for the Management of Knee Osteoarthritis in Individuals with Obesity: A Patient-Centered Approach. *Diseases*. 2023;11(4):182. doi:10.3390/diseases11040182. PMID:38131988

68. Ardeljan AD, Polisetty TS, Palmer J, Vakharia RM, Roche MW. Comparative Analysis on the Effects of Sarcopenia following Primary Total Knee Arthroplasty: A Retrospective Matched-Control Analysis. *J Knee Surg*. 2022;35(2):128-134. doi:10.1055/s-0040-1713355. PMID:32629511

69. Babu JM, Kalagara S, Durand W, Antoci V, Deren ME, Cohen E. Sarcopenia as a Risk Factor for Prosthetic Infection After Total Hip or Knee Arthroplasty. *J Arthroplasty*. 2019;34(1):116-122. doi:10.1016/j.arth.2018.09.037. PMID:30337254

70. Sumbal R, Abbas M, Sheikh SM, Sumbal A. Prevalence and Clinical Impact of Sarcopenia in Patients Undergoing Total Joint Arthroplasty: A Systematic Review and a Meta-Analysis. *J Arthroplasty*. 2024;39(12):3128-3135.e3. doi:10.1016/j.arth.2024.06.021. PMID:38901711

71. Chisari E, Lin F, Fei J, Parvizi J. Fungal periprosthetic joint infection: Rare but challenging problem. *Chin J Traumatol*. 2022;25(2):63-66. doi:10.1016/j.cjtee.2021.12.006. PMID:35031203

72. Rohrer F, Wendt M, Noetzli H, et al. Preoperative decolonization and periprosthetic joint infections-A randomized controlled trial with 2-year follow-up. *J Orthop Res*. 2021;39(2):333-338. doi:10.1002/jor.24916. PMID:33258495

73. Sadigursky D, Pires HS, Rios SAC, Rodrigues Filho FLB, Queiroz GC, Azi ML. Prophylaxis with nasal decolonization in patients submitted to total knee and hip arthroplasty: systematic review and meta-analysis. *Rev Bras Ortop*. 2017;52(6):631-637. doi:10.1016/j.rboe.2016.10.018. PMID:29234644

74. Zhu X, Sun X, Zeng Y, et al. Can nasal *Staphylococcus aureus* screening and decolonization prior to elective total joint arthroplasty reduce surgical site and prosthesis-related infections? A systematic review and meta-analysis. *J Orthop Surg Res*. 2020;15(1):60. doi:10.1186/s13018-020-01601-0. PMID:32075670

75. Baratz MD, Hallmark R, Odum SM, Springer BD. Twenty Percent of Patients May Remain Colonized With Methicillin-resistant *Staphylococcus aureus* Despite a Decolonization Protocol in Patients Undergoing Elective Total Joint Arthroplasty. *Clin Orthop Relat Res*. 2015;473(7):2283-2290. doi:10.1007/s11999-015-4191-3. PMID:25690169

76. Barrere S, Reina N, Peters OA, Rapp L, Vergnes JN, Maret D. Dental assessment prior to orthopedic surgery: A systematic review. *Orthop Traumatol Surg Res*. 2019;105(4):761-772. doi:10.1016/j.otsr.2019.02.024. PMID:31060914

77. Frey C, Navarro SM, Blackwell T, Lidner C, Del Schutte HJr. Impact of dental clearance on total joint arthroplasty: A systematic review. *World J Orthop*. 2019;10(12):416-423. doi:10.5312/wjo.v10.i12.416. PMID:31908990

78. Young H, Hirsh J, Hammerberg EM, Price CS. Dental disease and periprosthetic joint infection. *J Bone Joint Surg Am*. 2014;96(2):162-168. doi:10.2106/JBJS.L.01379. PMID:24430417

79. Walker H, Patton A, Bayne G, et al. Reduction in post-operative acute kidney injury following a change in antibiotic prophylaxis policy for orthopaedic surgery: an observational study. *J Antimicrob Chemother*. 2016;71:2598-2605. doi:10.1093/jac/dkw166

80. Scarlato RM, Dowsey MM, Buising KL, et al. What is the role of catheter antibiotic prophylaxis for patients undergoing joint arthroplasty? *ANZ J Surg*. Published online 2016. doi:10.1111/ans.13584

81. Sousa R, Munoz-Mahamud E, Quayle J, et al. Is asymptomatic bacteriuria a risk factor for prosthetic joint infection? *Clin Infect Dis*. 2014;59:41-47. doi:10.1093/cid/ciu235. PMID:24723280

82. Mayne AIW, Davies PSE, Simpson JM. Antibiotic treatment of asymptomatic bacteriuria prior to hip and knee arthroplasty; a systematic review of the literature. *Surgeon*. 2018;16(3):176-182. doi:10.1016/j.surge.2017.08.007. PMID:29174023

83. Chisari E, D'Mello D, Sherman MB, Parvizi J. Inflammatory Bowel Diseases Increase the Risk of Periprosthetic Joint Infection. *J Bone Joint Surg Am*. 2022;104(2):160-165. doi:10.2106/JBJS.20.01585. PMID:34648464

84. Su WC, Lai YC, Lee CH, et al. The Prevention of Periprosthetic Joint Infection in Primary Total Hip Arthroplasty Using Pre-Operative Chlorhexidine Bathing. *J Clin Med*. 2021;10(3):434. doi:10.3390/jcm10030434. PMID:33498636

85. Lin F, Li WT, Fuentes-Rivera L, Parvizi J. Superficial mycosis, at the site or distant to the surgical site, appears to predispose patients to bacterial periprosthetic joint infections. *Hip Int*. 2021;11207000211037316:11207000211037316. doi:10.1177/11207000211037316. PMID:34510963

86. Xing D, Yang Y, Ma X, Ma J, Ma B, Chen Y. Dose intraarticular steroid injection increase the rate of infection in subsequent arthroplasty: grading the evidence through a meta-analysis. *J Orthop Surg Res*. 2014;9:107. doi:10.1186/s13018-014-0107-2. PMID:25391629

87. Bedard NA, Pugely AJ, Elkins JM, et al. The John N. Insall Award: Do Intraarticular Injections Increase the Risk of Infection After TKA? *Clin Orthop Relat Res*. 2017;475(1):45-52. doi:10.1007/s11999-016-4757-8. PMID:26970991

88. Richardson SS, Schairer WW, Sculco TP, Sculco PK. Comparison of Infection Risk with Corticosteroid or Hyaluronic Acid Injection Prior to Total Knee Arthroplasty. *J Bone Joint Surg Am*. 2019;101(2):112-118. doi:10.2106/JBJS.18.00454. PMID:30653040

89. Charalambous CP, Prodromidis AD, Kwaees TA. Do intra-articular steroid injections increase infection rates in subsequent arthroplasty? A systematic review and meta-analysis of comparative studies. *J Arthroplasty*. 2014;29(11):2175-2180. doi:10.1016/j.arth.2014.07.013. PMID:25201257

90. Gu A, Fassihi SC, Wessel LE, et al. Comparison of Revision Risk Based on Timing of Knee Arthroscopy Prior to Total Knee Arthroplasty. *J Bone Joint Surg Am*. 2021;103(8):660-667. doi:10.2106/JBJS.20.00218. PMID:33849048

91. Seo JG, Moon YW, Park SH, Han KY, Kim SM. Primary total knee arthroplasty in infection sequelae about the native knee. *J Arthroplasty*. 2014;29(12):2271-2275. doi:10.1016/j.arth.2014.01.013. PMID:24703782

92. Tan TL, Xu C, Kuo FC, et al. When Total Joint Arthroplasty After Septic Arthritis Can Be Safely Performed. *JB JS Open Access*. 2021;6(2):e20.00146. doi:10.2106/JBJS.OA.20.00146. PMID:34056504

93. Portier E, Zeller V, Kerroumi Y, Heym B, Marmor S, Chazerain P. Arthroplasty after septic arthritis of the native hip and knee: retrospective analysis of 49 joints. *J Bone Jt Infect*. 2022;7(2):81-90. doi:10.5194/jbji-7-81-2022. PMID:35464147

94. Luo H, He C, Zhao Y, Yang G, Hong H. Outcomes of single- vs two-stage primary joint arthroplasty for septic arthritis: a systematic review and meta-analysis. *EFORT Open Rev*. 2023;8(9):672-679. doi:10.1530/EOR-22-0142. PMID:37655848

95. He Y, Omar M, Feng X, Neunaber C, Jagodzinski M. Impact of smoking on the incidence and post-operative complications of total knee arthroplasty: A systematic review and meta-analysis of cohort studies. *Bosn J Basic Med Sci*. 2022;22(3):353-365. doi:10.17305/bjbms.2021.6538. PMID:34923952

96. Challoumas D, Munn D, Stockdale H, et al. Outcomes of total hip and knee arthroplasty in special populations: a synopsis and critical appraisal of systematic reviews. *Arthroplasty*. 2023;5(1):34. doi:10.1186/s42836-023-00190-7. PMID:37408050

97. Wong J, Lam DP, Abrishami A, Chan MT, Chung F. Short-term preoperative smoking cessation and postoperative complications: a systematic review and meta-analysis. *Can J Anaesth*. 2012;59(3):268-279. doi:10.1007/s12630-011-9652-x. PMID:22187226

98. Sørensen LT. Wound healing and infection in surgery. The clinical impact of smoking and smoking cessation: a systematic review and meta-analysis. *Arch Surg*. 2012;147(4):373-383. doi:10.1001/archsurg.2012.5. PMID:22508785

99. Chou CM, Chuang TC, Chiang CH. Factors That Increase the Risk of Prosthetic Joint Infection Within 90 Days After THA and TKA: A Nationwide Population-based Study. *Clin Orthop Relat Res*. Published online June 26, 2025. doi:10.1097/CORR.0000000000003592. PMID:40569647

100. Enayatollahi MA, Murphy D, Maltenfort MG, Parvizi J. Human Immunodeficiency Virus and Total Joint Arthroplasty: The Risk for Infection Is Reduced. *J Arthroplasty*. 2016;31(10):2146-2151. doi:10.1016/j.arth.2016.02.058. PMID:27131415

101. Yeramosu T, Chiang B, Barnes B, Satpathy J. Optimizing Total Joint Arthroplasty for Patients Living With Human Immunodeficiency Virus. *Cureus*. 2022;14(9):e28806. doi:10.7759/cureus.28806. PMID:36225481

102. Anis HK, Warren JA, Klika AK, et al. Greater Prevalence of Mental Health Conditions in Septic Revision Total Knee Arthroplasty: A Call to Action. *J Knee Surg*. 2022;35(2):190-197. doi:10.1055/s-0040-1713756. PMID:32659814

103. Johnson NR, Otero JE. Prevention of Periprosthetic Joint Infection of the Hip and Knee: Modern Techniques and Strategies. *J Surg Orthop Adv*. 2021;30(4):202-206. doi:10.3113/JSOA.2021.0202. PMID:35108182

104. DeKeyser GJ, Anderson MB, Meeks HD, Pelt CE, Peters CL, Gililland JM. Socioeconomic Status May Not Be a Risk Factor for Periprosthetic Joint Infection. *J Arthroplasty*. 2020;35(7):1900-1905. doi:10.1016/j.arth.2020.02.058. PMID:32241649

105. Hoffman SA, Ledford G, Cameron KA, Phillips SM, Pellegrini CA. A qualitative exploration of social and environmental factors affecting diet and activity in knee replacement patients. *J Clin Nurs*. 2019;28(7-8):1156-1163. doi:10.1111/jocn.14719. PMID:30461097

106. Patel R. Periprosthetic Joint Infection. *N Engl J Med*. 2023;388(3):251-262. doi:10.1056/NEJMra2203477. PMID:36652356

107. Daines BK, Dennis DA, Amann S. Infection prevention in total knee arthroplasty. *J Am Acad Orthop Surg*. 2015;23(6):356-364. doi:10.5435/JAAOS-D-12-00170. PMID:26001428

108. Lespasio M, Mont M, Guarino A. Identifying Risk Factors Associated With Postoperative Infection Following Elective Lower-Extremity Total Joint Arthroplasty. *Perm J*. 2020;24:1-3. doi:10.7812/TPP/20.013. PMID:33482967