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Short- and Long-Term Effects of Early Weight Bearing After Total Knee Arthroplasty: A Literature Review

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Abstract Introduction: Total knee arthroplasty (TKA) is a popular choice of surgery to improve mobility and quality of life in select patients with degenerative joint disease of the knee. Many studies have shown early mobilization after TKA leads to decreased hospital costs and hospital length of stay. With its increasing popularity, it is necessary to determine the effects of early weight bearing (EWB) to ensure the effects are positive in the short-term and long-term following TKA. Methods: Five authors searched the databases PubMed, Google Scholar, and Elsevier for relevant articles while evaluating their impact. Reviewers used Boolean operators and search terms including "early weight bearing (EWB)," "total knee arthroplasty (TKA)," and "weight bearing protocols." Data from the articles was assessed to determine the short-term and long-term effects of EWB after TKA. Results: Four studies indicated significant differences in promoting early weight bearing (EWB) and strength training after total knee arthroplasty (TKA). These significant differences between EWB and limited or non-weight bearing groups include range of motion (ROM), quadriceps strength, less pain, and higher overall satisfaction. Looking at the long-term effects, one study demonstrated that there was no loosening at the bone-cement interface after 2-5 years. Conclusion: The short-term effects of early weight bearing (EWB) are generally positive. Patients, on average, have higher patient-reported outcomes scores, and greater range of motion (ROM) following EWB after total knee arthroplasty (TKA). However, there are limitations in research about the long-term effects of EWB in TKA. Complications, such as implant loosening or malalignment, can occur with trauma to a joint after arthroplasty, especially in the setting of comorbidities like osteoporosis or diabetic neuropathy. Studies highlight the importance of considering patient risk factors for falls or trauma, such as fragility scores and in low-demand geriatric patients. Risk factors for falls post-TKA, such as advanced age, obesity, or intraoperative continuous femoral nerve block, should be considered when planning rehabilitation for TKA patients. Although the short-term benefits are overall positive, more research is necessary to determine if there are higher rates for revision and complications in the long-term in patients that follow EWB protocols.

Keywords: *orthopedic surgery, early weight bearing, total knee arthroplasty, rehabilitation, arthroplasty*

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1. Introduction

Total knee arthroplasty (TKA) remains one of the most prevalent joint surgeries in the United States, with some projections predicting a demand of around 3.48 million procedures per year by 2030 [1]. This, in part, can be attributed to ongoing advancements in the technology behind total joint arthroplasty (TJA), but it is also attributed to streamlining of the postoperative management of TKA patients. With certain studies endorsing patient satisfaction greater than 85.5% and revision rates of less than 5.5%, TKA has widely become the treatment of choice for end-stage osteoarthritis [2]. However, despite these advancements in the approaches and technology for TKA, no procedure is without inherent risks of complications and adverse events. In 2012, The Knee Society published a standardized list of TKA complications [3]. They included 22 complications including postoperative bleeding, thromboembolic disease, periprosthetic joint infections, and hospital readmission [3]. To reduce the risk of complications, multidisciplinary protocols, such as Enhanced Recovery After Surgery

(ERAS), have been widely implemented. These protocols provide recommendations for preoperative and postoperative care with the objective of reducing complications after TKA and hospital length of stay. While early studies have reported positive patient-reported outcomes, it is unclear which specific recommendations provide the greatest impact in overall patient healing due to variance between protocols [4]. One component of these "fast track" protocols that is consistently associated with positive outcomes is postoperative early weight bearing (EWB).

EWB has become a universal factor for successful TKA postoperative recovery plans due to its ability to counter the well-documented, negative effects of prolonged bed rest and immobilization [5,6]. The flexibility of EWB allows for all individuals to benefit due to flexibility in EWB protocols. Early ambulation has been shown to greatly reduce adverse outcomes, such as postoperative stiffness and deep vein thrombosis. While there are currently no universally accepted guidelines for when an individual should begin EWB after TKA, studies have shown that weight bearing as early as postoperative day 1 can improve overall knee function, as well as reduce hospital length of stay if admitted [7]. The purpose of this study is to further examine the short-term and long-term effects of EWB after TKA. While there are many studies examining the short-term benefits of EWB after TKA, this study will take into consideration the long-term effects, as well as the risks of EWB, to provide a holistic, transparent overview of the effects of EWB on TKA recovery. By considering all the risks and benefits of EWB, this will allow for further advancement in recovery plan customization and the ability to provide individualized care to all in need.

2. Methods

This literature review examined the short-term and long-term effects of early weight bearing (EWB) after total knee arthroplasty (TKA). A comprehensive review of the relevant literature was conducted using PubMed, Google Scholar, and Elsevier. The search terms and Boolean operators used included (early-weight bearing AND total knee arthroplasty), (early weight bearing AND total knee arthroplasty AND weight bearing protocols), (total knee arthroplasty AND complications), (total knee arthroplasty AND kinematics), (((total knee arthroplasty[Title] OR TKA[Title] OR total knee replacement[Title]) AND (Early[Title] OR same day[Title])) AND (Weight bearing[Title] OR walking[Title] OR exercise[Title]))), and (total knee arthroplasty AND (complication OR falls) AND risk factors). Additional references were identified through manual searches of the reference lists of the retrieved articles.

Inclusion Criteria:

- Studies examining early-weight bearing (EWB) effects on total knee arthroplasty (TKA), postoperative weight bearing comparisons after TKA, and rehabilitation protocols after TKA.
- Article types: randomized-control trials, prospective cohort studies, retrospective cohort studies, review articles, and clinical practice guidelines.
- Articles published in peer-reviewed journals.
- Articles published in English from 1993 to 2025.

Exclusion Criteria:

- Studies not related to total-knee arthroplasty.
- Article types: opinion pieces, letters, and non-peer-reviewed publications.
- Studies on animals.
- Articles not published in English.

Data Extraction and Synthesis

In a narrative review format, the relevant data from the included studies were extracted and synthesized based on information relevant to the research question. Statistical information comparing EWB to restricted rehabilitation and function, pain, and postoperative outcomes were extracted to compare outcomes, and identify unique insights. To maintain quality and credibility, only articles published in peer-reviewed journals were included, placing high priority on RCTs, prospective cohort studies, and systematic reviews. Lower priority was given for retrospective studies, case series, and case reports.

3. Literature Review

Rationale for Early Weight Bearing

Due to the complexity and invasive nature of total knee arthroplasty (TKA), rehabilitation protocols require a multidisciplinary approach to manage pain, maximize range of motion (ROM), improve ambulation, increase muscle strength, and provide emotional support [8]. Improvement of patient-reported outcomes after TKA are dependent on patient expectations among other factors in their recovery. Mistry et al. assessed the various modalities following TKA, such as exercise therapy, aquatic therapy, balance training, continuous passive motion, cold therapy and compression, neuromuscular electrical stimulation, transcutaneous electrical nerve stimulation, and instrument-assisted soft tissue therapy [9]. They highlight the wide variety of rehabilitative options developed for postoperative care following TKA. Additionally, rehabilitation options are limited due to factors outside of patient motivation, such as insurance coverage, location of rehabilitation services, access to transportation, health literacy of the patient, and whether the patient has family or other social support. Castrodad et al. conducted a systematic review that determined that early rehabilitation demonstrated strong evidence for improved outcomes after TKA [10]. While there are various options for early rehabilitation, EWB has shown improved postoperative recovery and patient reported outcomes which further supports its use. Although EWB is only one component of the rehabilitation protocol, it remains a crucial and effective component of postoperative management.

Historically, rehabilitation protocols following TKA have emphasized an initial period of immobilization with a delayed initiation of therapy to allow for soft tissue rest and osseous integration [11]. This has been challenged by numerous studies identifying the benefits of EWB and mobilization. Dittmer & Teasell described several general disadvantages to prolonged immobilization and bed rest including muscle weakness and atrophy, contractures, disuse osteoporosis, venous thromboembolism, and orthostatic hypotension [6]. Epstein reviewed studies

across various subspecialties that utilized early mobilization protocols, which identified that early mobilization led to a reduction in pulmonary issues, deep vein thrombosis, infections, and a shorter hospital length of stay [12]. Similar studies provide continued evidence for exploring the benefits of EWB in postoperative TKA rehabilitation. Many of the advantages of EWB address the disadvantages of prolonged immobilization. Advantages of EWB include improving functional outcomes, preserving muscle mass and ROM, reducing post operative complications, and reducing length of hospital stays. Weight bearing status is an important consideration following TKA and EWB may be advantageous for many patients. Potential risks of falls, dislocations, nerve damage, and wound dehiscence in EWB patients 24 hours after TKA have also been found to be of low occurrence [13]. While the risk of complications from EWB is low, there are comorbidities or risk factors that may contribute to a higher risk. Therefore, more research is needed to investigate other potential risk factors for EWB complications.

Risks of Early Weight Bearing

Although early weight bearing (EWB) is generally safe for patients following total knee arthroplasty (TKA), it is critical to recognize and consider the potential risk factors associated with trauma post-TKA before implementing EWB protocols. Memtsoudis et al. found the incidence of inpatient falls after TKA to be at 1.6% based on a national database of more than 190,000 TKA patients, while Wasserstein et al. found an inpatient fall rate of 2.7% with two-thirds of these falls occurring in the first 48 hours post-operatively [14][15]. Despite the low incidence rates, it is imperative to consider these risk factors to reduce the potential for causing harm and mitigate the financial burden complications may cause for the patient and healthcare system. For example, obesity has been shown to correlate with decreased postoperative ROM, increased complications, and a higher number of technical errors during surgery [16]. Thus, patients with obesity must be monitored carefully if an EWB rehabilitation protocol is considered, given that these associations can hinder the healing process if not assessed appropriately. Along with obesity, Wasserstein et al. also determined that advanced age (66 years and older) and continuous femoral nerve block (CFNB), were also individual risk factors for falls, showing an odds ratio for falls increased by 4% for each year of increased age and a 4.5 times greater risk of falling if CFNB was used versus no nerve block [15]. Advanced aging should also be considered on a case-by-case basis before initiating an EWB rehabilitation protocol, given that the geriatric population has a higher chance of falling due to multiple factors. In contrast, Memtsoudis et al. found that the use of peripheral nerve blocks had no significant influence on inpatient falls, and that neuraxial anesthesia usage reduced the risk by 30% when compared with general anesthesia [14]. Lo et al. conducted a meta-analysis that included the previously mentioned articles, and identified that revision total hip and knee arthroplasty, post-operative complications or comorbidities, medications, psychiatric pharmaceutical use, living alone, prior history of TKA, history of falls, and female gender demonstrated moderate evidence as risk factors for falls post-TKA [17]. The variety of risk factors demonstrates the complexity and heterogeneity of patients who undergo TKA, implying that EWB rehabilitation protocols should evaluate each patient on an individual basis.

Postoperative Pain Control Considerations

Overcoming postoperative pain is essential to increasing postoperative rehabilitation, patient satisfaction and overall outcomes. Multimodal analgesia is considered the optimal regimen for preoperative, intraoperative, and postoperative pain management. These include preemptive analgesia, neuraxial anesthesia, peripheral nerve blockades, patient-controlled analgesia and local infiltration analgesia, and oral opioid/non opioid medications [18]. The PROSPECT group of surgeons and anesthesiologists most recent recommendations for pain management after total knee arthroplasty (TKA) include paracetamol, nonsteroidal anti-inflammatories (NSAIDs), adductor canal block, and peri-articular local infiltration analgesia with a single intraoperative dose of intravenous dexamethasone as the optimal analgesic regimen [19]. Preemptive opioid use intended to reduce the intensity of postoperative pain has been linked to increased postoperative opioid consumption, early revision, postoperative complications, and reduced postoperative pain relief [18,20,21]. Some strategies to improve postoperative mobilization include minimally invasive surgeries, multimodal analgesia, and early removal of analgesic catheters [22]. Prior studies have demonstrated reduced overall intake of analgesic drugs with a lower number of adverse events while following early weight bearing (EWB) protocol [22,23,24]. Hertog et al. found that the EWB protocol group required a greater need for analgesic drugs in the first two days postoperatively. However, thereafter the need for analgesia in the EWB group was lower than the standard rehabilitation group, as evidenced by earlier termination of drug consumption and lower daily dosages [23].

A peripheral nerve block is used to relieve postoperative pain of TKA, reduce consumption of opioids, and promote early mobilization [18]. Extra precaution may be necessary for those with a preoperative femoral nerve block (FNB) as 1.6% of patients sustained falls within 48 hours of surgery [25]. Of the 1.6% that sustained falls, 0.4% of those underwent a reoperation due to subsequent injury while engaging in an EWB program [25]. Injuries included a disruption of the extensor mechanism along the medial arthrotomy, medial collateral ligament rupture, and patella dislocation. Eight patients documented quadriceps weakness before the fall, highlighting the caution required when ambulating patients with FNB [25]. An alternative to a femoral nerve block (FNB) is the adductor canal (ACB) to block the sensory saphenous nerve while sparing the major motor branches of the femoral nerve without causing quadriceps weakness [18]. Patients with ACB have superior early mobilization and ambulation compared to those with FNB [26,27]. These studies highlight the benefit of ACB over FNB for TKA pain management.

Postoperative Instability Risks

Patients are commonly susceptible to instability postoperatively from their total knee arthroplasty (TKA) due to factors, such as soft tissue tension, pain, fragility in some geriatric patients, and recovery from a preoperative anesthetic block. Instability with early weight bearing

(EWB) increases the force necessary to achieve joint stability while increasing stress on surrounding supporting structures. Flexion instability accounts for 11-26% of failures in TKA, which limits patients that can participate in EWB [28]. Identifying patients with instability due to weakness or soft tissue forces is critical to ensure they utilize appropriate assistive devices, such as a walker, to help reduce risk of falls with EWB.

Risk of Postoperative Periprosthetic Fractures

Postoperative periprosthetic fractures is a rare complication of total knee arthroplasty (TKA) and occurs most commonly at distal femur with an incidence rate estimated to be between 0.26-2.0% [29,30]. With a steadily rising geriatric population, risk of falls and fragility fractures increases the risk for postoperative periprosthetic fractures increases [31]. These injuries commonly necessitate prolonged non-weight bearing or modified weight bearing, such as touch down weight bearing, which decreases activities of daily living (ADL), and increases mortality rates. Watanabe et al. discussed three cases where dual-plate fixation using locking plates through medial and lateral incisions, was used to begin early postoperative weight bearing after periprosthetic distal femur fractures (PPDFFs) [32]. All three patients were able to walk independently and approached near-normal values in average ADL scores, and functional independence measures [32]. There are other types of fixation methods to help increase weight bearing after PPDFFs, such as retrograde intramedullary nails, nail and plate combinations, and distal femur replacements [29,30]. Deciding on the fixation method is dependent on the fracture morphology, patient factors, and surgeon preference. These studies highlight the necessity of early weight bearing (EWB) in decreasing mortality and morbidity risk following long-term complications from a TKA, especially after PPDFFs.

Short-Term Outcomes of Early Weight Bearing

A patient that undergoes a total knee arthroplasty (TKA) may temporarily experience pain, a reduction in knee muscle strength, a decline in knee range of motion, and a decrease in walking speed [33]. The greatest loss of strength and functional performance occurs in the first month after a TKA [34]. Early weight bearing (EWB) is a postoperative rehabilitation method designed to improve walking ability and activities of daily living (ADL). The Enhanced Recovery After Surgery (ERAS) Society strongly recommends early mobilization after TKA and THA to avoid the adverse physiological effects of prolonged bed rest including insulin resistance, reduced pulmonary function, and increased risk of thromboembolism [35]. In general, the literature seems to show the earlier patients can move and bear weight after surgery, the better their recovery will progress.

There are limited studies investigating the impact of EWB rehabilitation on the incidence of many of these short-term complications. However, early mobilization ranging from sitting upright to walking down the hallway, reduces the risk of postoperative complications, while accelerating the recovery of functional walking capacity [5,22].

Early mobilization has shown enhanced recovery of functional measures of the knee. Hertog et al. used measures, such as American Knee Society Score (AKSS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score, to investigate functional recovery using EWB rehabilitation over three months [23]. The AKSS evaluates pain and joint function on a scale of 0 to 100 with 100 being the highest function [23]. The results of this study showed a cumulative area under the curve AKSS score for patients undergoing TKA to be significantly higher for the fast-track rehabilitation group than for the standard rehabilitation group (4089.62 vs. 2413.61, p= 0.0003) [23]. WOMAC is used as a health status instrument to assess everyday fitness with 10 as the lowest score and 0 as the highest [23]. The WOMAC osteoarthritis index showed earlier improvements in the fast-track rehabilitation group at each visit compared to the standard rehabilitation group [23]. These different patient outcome measures collectively support the benefits of EWB postoperative TKA.

Defining EWB has variability, but it is commonly thought of as within 24 hours of the TKA. Labraca et. al compared the benefits of initiating rehabilitation within 24 hours versus 48-72 hours after TKA [36]. Patients in early rehabilitation showed significantly less pain, greater joint range of motion in flexion and extension, and improved strength in quadriceps and hamstring muscles [36]. Harikesavan et al. found that at one month postoperatively, early mobilization can result in reduced pain and an increased walking speed [37]. At three months postoperatively, functional markers, such as knee strength, knee ROM, timed up and go test (TUG), six-minute walk test (SMWT), and Knee injury and Osteoarthritis outcome score (KOOS) were improved compared to baseline [37]. Although Harikesavan et al. shows significant changes in functional short-term outcomes of EWB postoperative TKA, it is important to note a lack of age-matched controls or those in a standard of care rehabilitation program [37]. Further investigation is needed to compare patient-reported outcomes and objective measurements in EWB postoperative TKA.

Early mobilization and EWB have also been associated with a 1.8 to 6.45 day decreased length of hospital stay compared to those on a standardized rehabilitation protocol [23,24,38,39,40]. Physical therapy initiated less than 12 hours postoperatively was correlated with a shorter length of hospital stay compared to those that began therapy within 12-24 hours postoperatively [41]. These reports suggest that EWB within 12 hours postoperative TKA helps reduce rate of admission and subsequent length of stay.

Long-Term Outcomes of Early Weight Bearing

With total knee arthroplasty (TKA) implants having increasing longevity, it is necessary to examine the long-term benefits or disadvantages of early weight bearing (EWB). In an article from 2003, it was reported TKA were expected to last at least 10-15 years [42]. However, in a 2019 systematic review and meta-analysis with 6490 patients who underwent TKA, it was found that a TKA lasted 25 years in 82% of the patients [42][43]. Common reasons for TKA failure are implant loosening or joint infection. Risk factors that should be considered when thinking about implant loosening and infection are neuromuscular conditions, specific implant type, history of drug abuse, preoperative mechanical deformity, preoperative trauma diagnosis, and younger age [44,45]. With younger age and increased activity level among

others being cited as risk factors for TKA failure, it is necessary to determine if EWB plays a role in mitigating or propagating these effects. Long-term outcomes of patients after TKA include worsening functional abilities, such as limited knee active range of motion (ROM) and quadriceps strength, compared to healthy age-matched controls [46]. Although kinematics becomes limited after receiving a TKA, Shimizu et al. found that one year post surgery, kinematics of dynamic deep knee flexion under weight bearing and non-weight bearing conditions are not significantly different [47]. Therefore, weight bearing versus non-weight bearing conditions are not expected to affect kinematics of the knee.

Pozzi et al. compared clinical outcomes in patients 12 months after receiving a TKA to investigate performance in those that underwent a progressive strengthening rehabilitation versus those who underwent a standard of care rehabilitation [46]. The progressive strengthening rehabilitation group started therapy at least three weeks postoperatively and averaged 17 sessions total with a frequency of two or three times per week [46]. The standard of care group underwent supervised outpatient physical therapy that had no specific guidelines and averaged 23 sessions per patient [46]. It is also not stated when this group began rehabilitation postoperatively, which is a limitation of the study. Compared to the standard of care rehabilitation group, patients in the EWB program were two to four times more likely to achieve normal clinical and functional scores of an age-matched control in knee extension angle, performance on the stair climbing time, and quadriceps strength [46]. This suggests that patients that participate in an EWB rehabilitation program may have an improved likelihood of achieving normal age-matched outcomes compared to a standard rehabilitation program.

Jiao et al. compared patients with high-intensity progressive training postoperative TKA to a standardized rehabilitation group at two weeks, three months, and 12 months postoperatively [38]. Outcome measures utilized include the American Hospital for Special Surgery Knee Score (HSS), six-minute walk test, first time standing after surgery, and a mental component summary [38]. The intervention group that participated in high-intensity progressive training had an earlier first time of standing after surgery and a longer six-minute walk test [38]. Additionally, the HSS scores were higher in the intervention group compared to a routine training group at all three-time measures ($P < 0.001$) [38]. The only measure that was not statistically significant one year after surgery was the mental component summary [38]. This demonstrates the benefit of high-intensity progressive training with EWB postoperatively after a TKA.

Over time, implants may loosen due to breakdown of components parts, reactions to the components by the patient's immune system (e.g. pseudotumor), high-impact activities, obesity, and infection. In a 2024 article, they described how the metal debris and wear components of a TKA may enter the joint space and vasculature [48]. These effects can raise levels of cobalt in the blood, causing systemic effects [48]. EWB has not been associated with an increased risk of implant loosening over time. Another study by Crawford et al. does not mention EWB directly, but it demonstrates a correlation between higher activity levels and lower incidence of revision surgery in TKA postoperatively at 11.4 years follow up [49]. In addition to diminishing the assertion that younger age and high activity levels are correlated with higher rates of revision, this study emphasized that patients that undergo TKA at a younger age have a longer time for the implant to fail [49]. These studies highlighted the association between patient activity and TKA success rates.

Comparing Early Weight Bearing to Traditional Perspective

Studies comparing early weight bearing (EWB) to restricted weight bearing protocols for total knee arthroplasty (TKA) have shown EWB can improve functional outcomes without an increase in postoperative complications. This review deferred to the definitions provided in each study to determine the categorization of EWB or traditional rehabilitation. Generally, EWB protocols have patients at least partially weight bearing within two weeks after TKA. However, a traditional perspective may restrict patients from weight bearing for several weeks. Due to its immense benefits, EWB rehabilitation following TKA has become increasingly popular with orthopedic surgeons. A cohort study performed by Lei et al. showed that EWB is associated with improved functional scores, lower lengths of hospital stay, and lower adverse events, such as deep vein thrombosis (DVT), and pulmonary infections [13]. While these outcomes were primarily focused on the short-term postoperative period, it does support the use of EWB protocols. Additionally, EWB protocols have been shown to significantly lower rates of DVT postoperative from TKA with up to a 30-fold difference when compared to restricted weight bearing [5,50]. If implemented, EWB protocols are a cost-effective way to reduce perioperative complications following TKA. Guerra et al. found that early mobilization following total hip arthroplasty (THA) and TKA can reduce length of stay in the hospital compared to restricted weight bearing without an increase in negative outcomes [40]. While this study does include patients who underwent a THA, it further supports that EWB can improve patient outcomes in arthroplasty without an increase in adverse events compared to the more traditional restricted weight bearing protocols.

Early Weight Bearing Recommendations

The proportion of total knee arthroplasty (TKA) performed in an outpatient setting has increased over the last decade [51]. With this, advocacy in the orthopedic community supporting early mobilization following TKA has continued to increase as well. The American Academy of Orthopedic Surgeons (AAOS) recommends early mobilization following elective TKA to prevent thromboembolic events postoperatively [52]. While there is limited information regarding AAOS endorsing early weight bearing (EWB) for increasing functional outcomes in TKA, their recommendation is supportive of early mobilization. There have also been numerous protocols promoting faster recovery times following TKA. Berend et al. focused on rapid recovery in the perioperative period following TKA to improve outcomes while reducing postoperative complications and reducing hospital length of stay [53]. While this does support early mobilization, their protocols do encompass multiple factors that affect outcomes, so there are limitations in generalizability.

Fransen et al. performed a randomized control trial on a similar concept with "fast-track" total knee arthroplasty [54]. They found that the fast-track group had improved pain and functional scores within seven days postoperatively following TKA compared to controls, but it lacked any significant difference past that point [54]. A limitation to their study was differences in surgical protocol between the two groups [54]. These differences included omitting intraoperative tourniquet, pain pumps, wound drains, or bladder catheters, and taking a subvastus approach in the fast-track group compared to the standard parapatellar approach in the control group [54]. Still, there appears to be general support from experts in the field for early mobilization leading to faster recovery.

Patient Selection Considerations

Implant type may also need to be considered for early weight bearing (EWB) protocols. The proportion of cementless total knee arthroplasty (TKA) continues to increase, which has shown good outcomes when compared to the gold standard cemented TKA [55]. However, there is a lack of published data on long term outcomes of EWB in cementless TKA. Long-term studies have found cementless TKA were associated with higher aseptic loosening and revision rates within two-years postoperatively compared to cemented [56]. Chen at al. found cementless TKA to have increased implant migration when researching long-term outcomes comparing cementless to cemented TKA [57]. While there is strong short-term support, EWB may increase these associated long-term risks of cementless TKA. Future research may be necessary to determine the appropriate weight bearing protocol for cementless TKA to balance EWB benefits, and risks of early revision. Patient selection is also crucial for success in cementless TKA. Patients with poor bone quality or tobacco use have shown worse outcomes with cementless TKA when compared to younger active males [58,59]. EWB may be viable for younger patients with better bone quality, but more traditional restrictions or avoiding cementless TKA altogether may be necessary for patients with poor bone quality or other risk factors.

Patient selection and assessing individual risk factors is important for determining who would benefit from EWB and determining appropriate weight bearing restrictions. Anderson et al. explored the patient adherence to weight bearing restrictions following TKA [60]. They found that patients over 65 years old failed to adhere to partial weight bearing restrictions following surgery more often than patients under 65 years old [60]. There are many factors, such as patient health literacy, social support, if they use any assistive devices at baseline, a patient's comorbidities, and the patient's native language, which can impact a patient's ability or decision to follow postoperative instructions [61]. It is important to consider these factors when counseling patients preoperatively before a TKA to help set expectations of recovery including EWB goals.

Challenges and Limitations

A limitation in reviewing current literature on early weight bearing (EWB) following total knee arthroplasty (TKA) is defining EWB, which is commonly considered to be within 24 hours postoperatively. Chua et al. found few patients mobilized on the day of surgery [62]. However, that study was performed in 2017, and more patients are now ambulating the day of surgery [62]. TKA is becoming more commonly performed in the outpatient setting, with Rullan et al. finding a 20-fold increase in outpatient TKA from 2010-2020 [63]. Another limitation of studies on EWB following TKA is long-term outcomes. Most of the current data surrounds the perioperative period benefits, but there is a lack of longitudinal data. There is an expected increase in revision TKA primarily due to aseptic implant loosening, infection, and polyethylene wear [64]. Additionally, there are limited long-term studies investigating cementless TKA compared to cemented TKA, especially comparing different patient groups.

Future Directions

There is a need for more high-quality randomized control trials when assessing the effects of early weight bearing (EWB) after total knee arthroplasty (TKA). Many studies have a small sample size, so larger investigations with more participants across several surgical centers would greatly benefit this topic. Additionally, standardizing rehabilitation protocols would bring more validity to studies. There were several studies that used different terminology and different measures of effectiveness of EWB. Sattler et al. wrote that there is a "lack of large, randomized trials and adequate methodology" to conclude on EWB recommendations [65]. Another area where more research is needed is the long-term outcomes and functional recovery after TKA with EWB. Many studies focus on the short-term benefits, including range of motion and pain, but other aspects, such as prosthesis longevity, osteolysis, and revision rates in the long-term need to be further investigated. Future studies should consider long-term effects of EWB and revision rates compared to restricted weight bearing. Importantly, determining what patients may have increased risk factors with EWB after TKA is vital to the success of patient recovery. Research could help evaluate the effectiveness of EWB in reducing hospitalization duration, need for home health, and long-term rehabilitation costs.

4. Conclusion

The short-term effects of early weight bearing (EWB) after total knee arthroplasty (TKA) are overall positive. EWB postoperative TKA improves objective measures and patient-reported outcomes, such as greater strength, Knee injury and Osteoarthritis outcome score (KOOS), improved knee range of motion, and walking speed. Studies consistently showed EWB is correlated with decreased time spent in the hospital and decreased complication rate. The American Academy of Orthopaedic Surgeons (AAOS) strongly supports early mobilization after TKA to shorten hospital stay and improve recovery measures. However, the risk factors of the patient should be considered when planning treatment. Studies have shown there are some factors that contribute to falls shortly after TKA. Patients undergoing continuous femoral nerve block for TKA, low-demand geriatric patients, or patients with obesity may be at a higher risk for falling with EWB. Studies addressing the long-term impacts of EWB longer than one year are limited. One study following patients one year postoperatively indicated a significant difference between patients that

participated in a progressive strength training program and patients that followed the standard of care treatment plan following TKA. There are few studies discussing the potential long-term effects or complications following EWB, such as implant loosening or implant malalignment. As the number of TKA performed increases, more research on the long-term effects of EWB and risk factors for complications must be conducted, so orthopedic surgeons are able to optimize treatment plans for their patients.

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