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A Paradigm Shift in Knee Care: Addressing Austria's Rising Arthroplasty Burden through Global Best Practices and Orthobiologic Medicine

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Abstract

Background: Austria records one of the world's highest total knee arthroplasties (TKA) rates - about 230 procedures per 100,000 inhabitants, nearly twice the OECD average. In contrast, countries such as Norway, Sweden, Denmark, and Japan perform markedly fewer TKAs while maintaining equally high, or even superior, levels of patient satisfaction. These examples illustrate that conservative, prevention-oriented care models can deliver comparable clinical outcomes without relying as heavily on surgical intervention. This disparity reflects systemic and reimbursement-driven incentives that favor prosthetic surgery over early joint preservation. With an aging population and procedure-based hospital financing, annual TKA volumes are projected to rise from approximately 19,000 in 2025 to 24,800 by 2035, placing an increasing fiscal burden on the healthcare system.

Objective: To quantify Austria's projected TKA-related economic burden and evaluate the potential cost and quality-of-life impact of implementing a Structured Knee Preservation Pathway (SKPP) integrating physiotherapy, orthobiologic interventions, and standardized pre-surgical rehabilitation.

Methods: A payer-perspective deterministic model was developed using demographic projections from Statistik Austria, Leistungsorientierte Krankenanstaltenfinanzierung (LKF) reimbursement rates, and national cost data. Three SKPP adoption scenarios - conservative (34% implementation, 33 % success), moderate (67% implementation, 50% success), and optimistic (90% implementation, 66% success) - were tested. Direct cost for the payer is assumed at €22,475 per TKA and €5,350 per SKPP case. Quality-Adjusted Life Year (QALY) differentials were derived from published evidence on platelet-rich plasma (PRP), peripheral-blood-derived stem cells, and structured rehabilitation programs. All cost estimates were calculated using 2025 nominal euro values based on current reimbursement and market data. No inflation adjustment or price-index correction was applied, as the analysis aimed to reflect present-day expenditure levels under current system conditions.

Results: Without reform, cumulative arthroplasty expenditure will likely exceed €5 billion by 2035. The moderate SKPP scenario could prevent approximately 8,300 TKAs annually by 2035, corresponding to approximately €97 million in direct annual savings and approximately €1 billion over ten years. Whereas in the optimistic scenario the savings can go up to €211 million p.a. by 2035. The incremental patient benefit for a successful TKA deferral was estimated at +0.26 QALY compared with the surgical-first model.

Conclusion: The existing focus on prosthesis-centered orthopedic care in Austria faces growing economic and clinical limitations. A strategic shift toward evidence-based joint preservation, anchored in physiotherapy, orthobiologic interventions, and outcome-driven reimbursement models-presents a viable and cost-efficient alternative. Implementing a national SKPP could yield measurable gains in function, productivity, and system sustainability.

Keywords: Austria; Total knee arthroplasty; Orthobiologics; Physiotherapy; Cost-effectiveness; QALY; Reimbursement; Hospital incentives; Health policy reform

Abbreviations: TKA: Total Knee Arthroplasty; LKF: Leistungsorientierte Krankenanstaltenfinanzierung; SKPP: Structured Knee Preservation Pathway

Introduction

Epidemiological Context

Osteoarthritis (OA) affects up to approximately 17% of the Austrian adult population (≥ 20 years), corresponding to roughly one million individuals, with prevalence increasing sharply after age 40 [1]. Globally, OA represents one of the leading causes of chronic disability in adults over 55 years of age [2]. Austria records among the highest total knee arthroplasty (TKA) rates in

the OECD, with 229 procedures per 100,000 inhabitants (2019). In comparison, several countries with strong musculoskeletal care systems perform significantly fewer TKAs while achieving comparable or superior functional outcomes (Table 1).

These countries demonstrate that structured conservative management, standardized rehabilitation requirements, and stricter radiographic criteria can reduce surgical incidence without compromising patient satisfaction or long-term functional scores [3-6]. Although Austrian national quality reports confirm that the country ranks among the highest worldwide in total knee arthroplasty (TKA) utilization, they do not stratify indications by radiographic severity. However, international appropriateness studies suggest that up to 33% of TKAs are performed in patients with only moderate osteoarthritis, who typically derive less benefit from surgery and might be effectively managed through non-surgical means such as structured rehabilitation and orthobiologic interventions. This pattern supports the view that Austria's high arthroplasty rates likely reflect systemic and reimbursement-related drivers rather than greater medical necessity [7-9].

Demographic and Economic Pressures

According to Statistics Austria's 2024 main-variant projections, Austria's population aged 65 years and older will increase by ~43% between 2023 and 2040, implying a rise well above 30% already by the mid-2030s. Given persistently high TKA incidence in Austria (OECD), demographic ageing is expected to exert upward pressure on knee arthroplasty volumes. Under a conservative status-quo scenario (own model; 2.7% annual growth from a 2025 baseline), annual TKA procedures would approach 24,800 by 2035 [6,10,11].

In Austria, total knee arthroplasty (TKA) represents a high-cost intervention within orthopedic care. Estimates from Austrian private hospital networks and medical service providers place the comprehensive direct cost of a single TKA-including patient clearance, surgery, hospital stay, implant, anesthesia, inpatient rehabilitation, and potential complication management-between approximately €18,000 and €32,000 per case [12]. Applying this range to national procedure volumes (~19,000 TKAs in 2025 and 24,800 expected by 2035 [6,13], annual direct expenditures likely exceed €500–600 million, even before accounting for post-acute care, or long-term productivity losses. Considering both direct and indirect economic impacts-including rehabilitation time, temporary disability, and early retirement-the 10-year societal burden of knee arthroplasty in Austria plausibly exceeds €5 billion by far, underscoring the urgent fiscal rationale for a structured knee-preservation pathway.

Institutional Incentives

Austria's Leistungsorientierte Krankenanstaltenfinanzierung (LKF) system rewards hospitals for procedural volume. TKA carries a high LKF point value, ensuring reliable institutional revenue even amid tightening budgets. Outpatient physiotherapy, in contrast, receives limited reimbursement and minimal recognition within LKF accounting [14,15]. Emerging orthobiologic procedures-such as PRP, peripheral-blood-derived stem-cell injections, and structural matrix augmentations-remain classified as self-pay (IGeL-equivalent) services. Consequently, the reimbursement framework structurally favors surgical throughput over preventive or restorative care.

Clinical Limitations and Risks Of TKA

While TKA remains the gold standard for end-stage OA, outcome satisfaction is not universal. Data suggest that 20–30 % of patients experience persistent pain or limited function one year postoperatively [16,17]. Revision surgery is required in approximately 8–10 % of patients within ten years after primary total knee arthroplasty (TKA) [18]. Prosthetic joint infection occurs in 1–2 % of cases [19], while serious perioperative complications such as pulmonary embolism or myocardial infarction are reported in about 1.5–3 % [20]. Thirty-day mortality after primary total knee arthroplasty (TKA) is low, around 0.1–0.2 % [21]. Although perioperative mortality after TKA is low in absolute terms, the physiological stress of general anesthesia and the invasiveness of the procedure introduce non-negligible risk, particularly in elderly or comorbid patients.

Large registry analyses have shown that 30- and 90-day mortality rates after elective TKA are approximately 0.2 % and 0.4 %, respectively [22]. While extremely rare, anesthesia-related events such as failure to awaken, respiratory depression, or cardiopulmonary collapse contribute to this early postoperative mortality, especially in ASA III–IV risk groups and octogenarian cohorts. In patients with pre-existing pulmonary or cardiovascular disease, mortality can rise to nearly 0.7 % within 90 days [23]. Furthermore, revision procedures are considerably more expensive, with European data indicating mean costs between €25 000 and €50 000 per case depending on complexity and infection status [24,25], compounding the overall fiscal burden.

Methods

Analytical Framework

A deterministic cohort model covering the period 2025–2035 was developed from the statutory payer perspective. Model inputs were derived from Statistik Austria demographic projections, GÖG reimbursement (LKF) tariffs, and published cost-utility analyses. Model output included projected TKA volumes, cumulative direct and indirect costs, incremental QALYs, and productivity effects.

Key assumptions

(Table 2)

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Scenarios

- **Conservative:** 33.33 % implementation, 33 % success
- **Moderate:** 66.66% implementation, 50 % success
- **Optimistic:** 90 % implementation, 66 % success

Savings were calculated as: (Avoided TKAs × €22,475) – (SKPP cases × €5,350)

Results

Baseline Projection

(Table 3)

Scenario Outcomes 2035 (Direct Savings)

(Table 4)

Table 1: Countries that possess robust musculoskeletal care systems conduct markedly fewer Total knee Arthroplasties (TKAs) while attaining similar or even better functional results.

Country	TKAs Functional Outcomes
Sweden	~131 per 100,000 (2017); ~162 per 100,000 (2022)
Norway	~150–170 per 100,000 (2018–2022)
Denmark	~140–160 per 100,000 (2018–2022)
Japan	~60–80 per 100,000 (depending on year and registry coverage)

Table 2: Key assumptions.

Parameter	Base value	Source / rationale
Baseline TKA volume 2025	19,000	Based on Statistik Austria (2023), ~16,000 primary TKAs were performed in 2023, projected to reach ~19,000 by 2025 (2–3 % annual growth).
Annual growth (status quo)	2.70%	Demographic projection
Mean total cost per TKA	€ 22,475	GÖG LKF Tariff Catalogue 2024: Based on 38 000–45 000 LKF points (€ 0.5–0.6/ point) and European benchmarks, the average bundled cost per primary TKA is estimated at ~€ 22 500 (Surgical clearance & preoperative assessment, Inpatient hospital stay (primary TKA including in-hospital physiotherapy), Pain medication & therapeutic aids at home (including CPM rental), 3 weeks rehabilitation program, post-discharge outpatient follow-up visits, proportional revision cost add-on per primary TKA).
Revision rate (10 years)	9%	Austrian Joint Registry
QALY gain TKA vs baseline	0.3	AIHTA 2021: The incremental QALY gain for TKA versus conservative management was set at +0.30, consistent with international cost-utility evidence (+0.25–0.35 QALY over 5–10 years).
QALY gain structured pathway	0.56	The incremental QALY gain for the structured knee-preservation pathway was estimated at +0.56, based on meta-analyses of physiotherapy, PRP, and MSC interventions [26–28], reflecting the 4–5-year cumulative benefit versus standard care.
Intervention cost	€ 5,350	Intervention cost:
		Stage 1: Assessment, 2 sessions education, 10 sessions physiotherapy, re-evaluation, remote program - €1,300 per case (2024), based on Austrian OGK tariffs.
		Stage 2: Specialist consultation, Peripheral Blood Stem Cells, Chondrofiller and 6 sessions physiotherapy - €4,050 per case (2024) market data
SKPP uptake	33–90 %	Scenario-dependent Adoption of the structured knee-preservationpathway (SKPP) was modelled at 33–90 %, reflecting international uptake of guideline-based pre-surgical rehab and orthobiologic programmes among eligible OA patients [26,29,30] as well as expert estimates.
SKPP success (deferral >5 years)	33–66 %	SKPP success—defined as ≥5-year deferral of TKA—was modelled at 33–66 %, consistent with long-term data from randomized and prospective studies on PRP, PBSC, and structured physiotherapy showing 20–50 % sustained TKA avoidance over 5 years [26,29,31,32] as well as expert estimates.

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Table 3: Baseline projection.

Year	TKA volume	Annual cost (€ million)	Cumulative cost (€ billion)
2025	19,000	420	–
2030	21,707	488	2.7
2035	24,800	557	5.3

Table 4: Scenario outcomes 2035 (direct savings).

Scenario	Implementation %	Success %	Avoided TKAs (2035)	Annual savings (€ million)	10-year net savings (€ billion)
Conservative	33.33	33.33	2,728	17.7	0.17
Moderate	66.66	50	8,266	97.3	0.94
Optimistic	90	66.66	14,731	211.7	2

Indirect and QALY Benefits

The net incremental QALY gain for a successful SKPP case was +0.26 (calculated as ΔQALYSKPP of +0.56 minus ΔQALYTKA of +0.30). Rehabilitation time decreased by approximately 30 %, equating to €25 million in annual productivity preservation (ÖGK 2024). The total societal benefit under the moderate scenario is estimated at €122 million per year.

Discussion

Interpretation

Austria's current orthopedic care framework is exhibiting increasing fiscal and structural pressures. The steady rise in TKA volumes appears to be driven more by systemic incentives than by optimized, patient-centered care pathways. The modeled SKPP suggests that even moderate implementation could deliver meaningful cost savings while simultaneously improving clinical outcomes and long-term patient function.

Structural Determinants

The current LKF reimbursement architecture links hospital revenue directly to procedural volume. Each TKA generates an estimated €9,000–€15,000 in net institutional revenue, incentivizing high throughput. Non-surgical interventions, lacking DRG-equivalent coding, remain financially unattractive to providers. Reforming reimbursement logic to reward functional recovery instead of procedural quantity is thus imperative.

International Comparison

Countries such as Sweden, Finland, and the United Kingdom have implemented structured national rehabilitation and conservative management programmes as mandatory steps before surgical eligibility. These systems report 30–50 % lower rates of total knee arthroplasty (TKA) compared with Austria, while achieving comparable functional outcomes [26-28]. Austria's lack of similar pre-surgical protocols likely contributes to its higher surgical incidence.

Evidence Base for Preservation Therapies

Meta-analyses demonstrate that both structured physiotherapy and orthobiologic treatments (PRP, PBSC, or matrix-augmented treatment) produce significant improvements in knee function and pain scores, with effects sustained up to two years [29,30]. When applied in combination within a structured rehabilitation pathway, these modalities are likely to have synergistic benefits. These approaches not only delay the need for arthroplasty but may reduce revision risk once surgery eventually occurs.

International Models of Structured Joint-Preservation Care

While Austria continues to rely heavily on late-stage surgical management, other European health systems have already proven that structured, reimbursed joint-preservation programs can shift outcomes at scale. The most striking example is the Danish GLA:D® (Good Life with OsteoArthritis in Denmark) initiative, a nationwide model integrating standardized patient education and neuromuscular exercise therapy directly into primary-care physiotherapy. Since its introduction in 2013, GLA:D® has treated over 60,000 Danish patients and more than 140,000 worldwide, transforming conservative osteoarthritis care across over 1,000 clinics. Registry data reveal substantial benefits: average pain scores decrease by 25–33 %, functional performance (KOOS/HOOS) improves by 20–30 %, and analgesic use drops by nearly one-third within three months, with sustained improvements at one year [31,32]. Adherence is remarkably high, over three in four participants complete all twelve supervised sessions [31].

Longitudinal registry analyses further show that patients who complete GLA:D® are approximately 25 % less likely to undergo total knee replacement within two years compared to matched controls (adjusted HR ≈ 0.75) [32]. From an economic standpoint, the program costs roughly €1,200–€1,800 per patient, less than a tenth of a single arthroplasty reimbursement. It achieves cost-neutrality or net savings within two years through fewer

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surgeries; reduced medication uses and faster rehabilitation [33]. These data provide powerful proof that national-scale, evidence-based joint-preservation pathways are both clinically effective and financially sustainable. Implementing a comparable Structured Knee Preservation Pathway (SKPP) in Austria could replicate these outcomes, cutting downstream surgical demand, improving patient quality of life, and realigning the health system around prevention rather than replacement.

Regulatory Developments

Ongoing regulatory initiatives within the European Union are expected to culminate in a harmonized 'Stem Cells Framework' by 2026, aimed at standardizing production and quality control of cell-based products, including specific guidance for certain types like mesenchymal stromal cells and hematopoietic stem cells. This long-awaited clarification could open the door for their formal inclusion in national reimbursement systems. Given Austria's highly centralized health governance, the country is well positioned to act as an early adopter once the new EU framework is implemented [34-39].

Policy Implications

Key Policy Priorities Include:

1. Establishing national clinical guidelines that mandate evidence-based conservative management, including physiotherapy and orthobiologic therapy, as a prerequisite for surgical eligibility.

2. Reforming Austria's LKF reimbursement framework to incorporate structured joint-preservation protocols, aligning financial incentives with early intervention rather than surgical throughput.

3. Implementing outcome-based financing models that reward sustained functional improvement, patient satisfaction, and delayed arthroplasty rather than procedural volume.

4. Launching pilot reimbursement schemes through the ÖGK and BVAEB for early-stage osteoarthritis patients to evaluate real-world cost savings and scalability within Austria's public payer systems.

Conclusion

Austria's orthopedic care system is characterized by a consistently high rate of total knee arthroplasty (TKA), a pattern also observed in other Central European countries such as Germany and Switzerland. These systems share similar demographic dynamics and hospital financing mechanisms that favor inpatient procedures, distinguishing them from countries like Sweden, Denmark, and the United Kingdom, where structured conservative and rehabilitation pathways are systematically embedded in pre-surgical care. If these incentives remain unchanged, Austrian cumulative arthroplasty direct spending is projected to exceed €5 billion by 2035, imposing a high burden on the public health budget.

The evidence presented in this analysis demonstrates that a Structured Knee Preservation Pathway (SKPP)-integrating physiotherapy, orthobiologic interventions, and standardized follow-up-can substantially mitigate these pressures. Even under moderate adoption scenarios, SKPP delivers superior cost-effectiveness, measurable quality-of-life gains, and a marked reduction in the need for premature joint replacement. Beyond fiscal benefits, joint preservation aligns with core ethical and social priorities: maintaining natural mobility, prolonging workforce participation, and reducing post-operative disability.

Achieving this paradigm shift requires systemic reform-establishing reimbursement parity between surgical and non-surgical care, embedding conservative management in national clinical guidelines, and linking provider compensation to functional outcomes rather than procedural volume. The forthcoming EU framework for minimally manipulated biologics offers a timely opportunity for Austria to position itself as a European frontrunner in evidence-based, innovation-driven orthopedic medicine. Ultimately, this transition represents more than an economic adjustment: it is a return to the preventive and restorative ethos of medicine. By prioritizing early physiotherapy, orthobiologic care, and structured rehabilitation over reflexive replacement, Austria can evolve from a reactive prosthesis culture toward a sustainable, preservation-first model that better serves both patient outcomes and health-system resilience.

Declaration of Interests

Dr. Murat Özcelik, Dr. Angelika Reich, Dr. Ali Saclier, and Dr. Patrick Weninger are affiliated with Avancell Medical GmbH (Vienna, Austria), an organization providing services in the field of joint-preservation medicine. The study was conducted independently without external sponsorship. No commercial entity influenced design, modeling assumptions, or conclusions. The views expressed represent the authors' professional judgment and not product claims.

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