A Strategy to Reduce Total Knee Arthroplasty and Healthcare Costs in Advanced Knee Osteoarthritis: Impact of Transarterial Periarticular Embolization (TAPE)

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BACKGROUND

I. Knee osteoarthritis (OA) represents a major cost driver for the German statutory health insurance (GKV), primarily due to high rates of total knee arthroplasty (TKA) and revision procedures. [4]
II. Transarterial periarticular embolization (TAPE) has emerged as a minimally invasive treatment option targeting inflammatory pain mechanisms.[1, 2, 3, 5]

OBJECTIVE

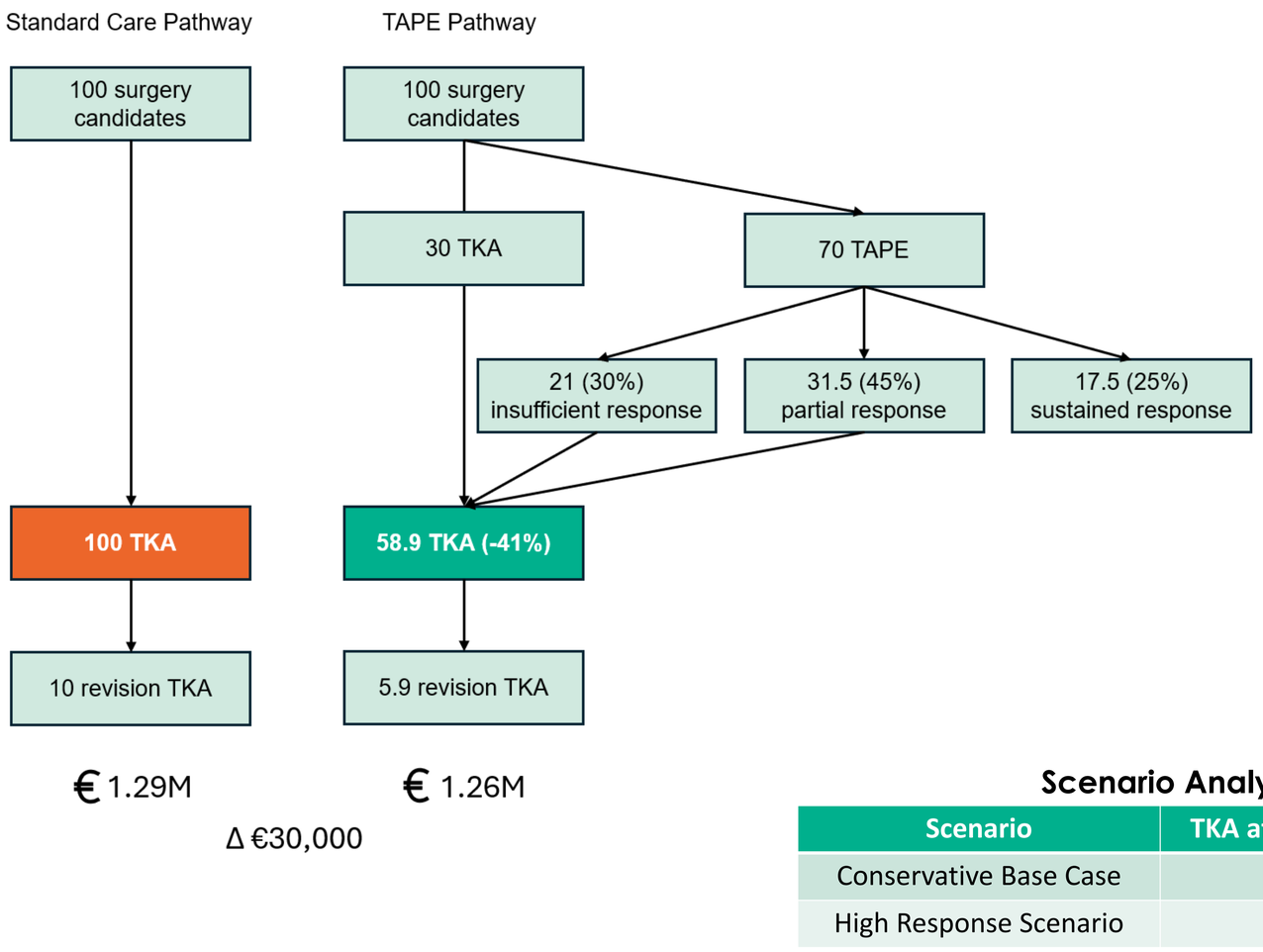
To evaluate whether incorporation of transarterial periarticular embolization (TAPE) prior to total knee arthroplasty (TKA) may reduce surgical utilization and healthcare expenditures in advanced knee osteoarthritis (OA).

METHODS

A deterministic budget impact model was developed from the German statutory health insurance (SHI) perspective over a 10-year horizon for a cohort of 100 patients with knee OA. Two scenarios were compared: (1) standard care (conservative therapy, injections, TKA, revision), and (2) a TAPE integrated pathway.
A TAPE uptake of 70% was assumed, reflecting a plausible proportion of patients treated prior to TKA, with the remainder proceeding to TKA. A decision-tree approach was applied to TAPE-treated patients to model subsequent TKA utilization.
Patients were categorized as non-responders (30%), moderate (45%), and strong responders (25%), with non-responders and 25% of moderate responders undergoing TKA. Repeat TAPE procedures were incorporated (maximum six, mean 2.6).
All intervention costs were based on German DRG and rehabilitation reimbursement tariffs paid by statutory health insurance (SHI) funds. Sensitivity analyses assessed retreatment and revision rates as well as repeat TAPE procedures.

RESULTS

TAPE Reduced TKA Utilization by 41%



In the base case, introducing TAPE into the pathway delayed and reduced TKA procedures from 100 to ~59 per 100 patients (–41%). Avoided TKA expenditures (>€450,000) exceeded TAPE-related costs (~€420,000), resulting in net savings of ~€30,000.[6]

Emerging evidence[5, 7] suggests improved clinical outcomes and was used to inform an exploratory high-response scenario (Table 1). With lower TKA conversion rates (~20%), surgical procedures decreased to ~49 per 100 patients, resulting in net savings of approximately €192,000 per 100 patients.

Table 2 demonstrates the impact of repeat TAPE procedures on overall treatment costs. While costs increased with higher retreatment frequencies, net savings were maintained up to approximately three procedures per treated patient. Beyond this threshold, economic outcomes became increasingly sensitive to retreatment intensity, highlighting repeat TAPE frequency as an important secondary driver of value.

Results were sensitive to TKA reintervention rates, with greater savings under higher long-term assumptions (7–15%).

Scenario Analysis

Scenario	TKA after TAPE	Savings
Conservative Base Case	59	€30k
High Response Scenario	49	€192k

Table 1: Exploratory high response scenario informed by recently published and conference-presented evidence.[5, 7]

Mean TAPE Procedures per Treated Patient	Total TAPE Procedures	Total TAPE Cost
2.0	140	~€321k
2.6 (Base Case)	182	~€418k
4.0	280	~€642k
5.0	350	~€803k

Table 2: Sensitivity Analysis: Impact of repeat TAPE procedures on total treatment costs

CONCLUSION

TAPE reduced TKA utilization by 41% and generated cost savings despite repeated retreatment. Economic value was primarily driven by reduced TKA conversion. Under realistic retreatment assumptions, TAPE may represent an economically attractive strategy for appropriate patients with established indication for TKA and can help optimize healthcare resource use in advanced knee osteoarthritis in Germany.

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