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Introduction

Osteoarthritis (OA) is the most common rheumatic disease, affecting more than 500 million people worldwide, with a greater incidence in women¹. It is characterized by a progressive degeneration of joint cartilage and surrounding tissues, leading to pain, stiffness, and functional limitations that significantly **reduce patients’ quality of life and autonomy**². Although OA rarely causes premature mortality, it is a **major contributor to disability**, accounting for **over 21 million years lived with disability (YLDs)**³.

OA is widely recognized as a **high-cost condition**, ranking among the leading causes of **primary care consultations**⁴. Estimates indicate that it may represent up to **1–2.5% of the gross domestic product (GDP) in high-income countries**⁵.

In **Portugal**, the EpiReumaPT survey estimated the prevalence of **knee OA at 12.4%** and **hip OA at 2.9%**⁶. Despite its significant burden, OA remains **underdiagnosed and undertreated**, and there is no national registry to provide comprehensive data on its clinical, social, and economic impact.

Objectives

- To provide a comprehensive assessment of the burden of OA in Portugal from both societal and healthcare perspectives;
- To estimate the long-term economic burden through a health economic model to support informed policy and decision-making.

Methods

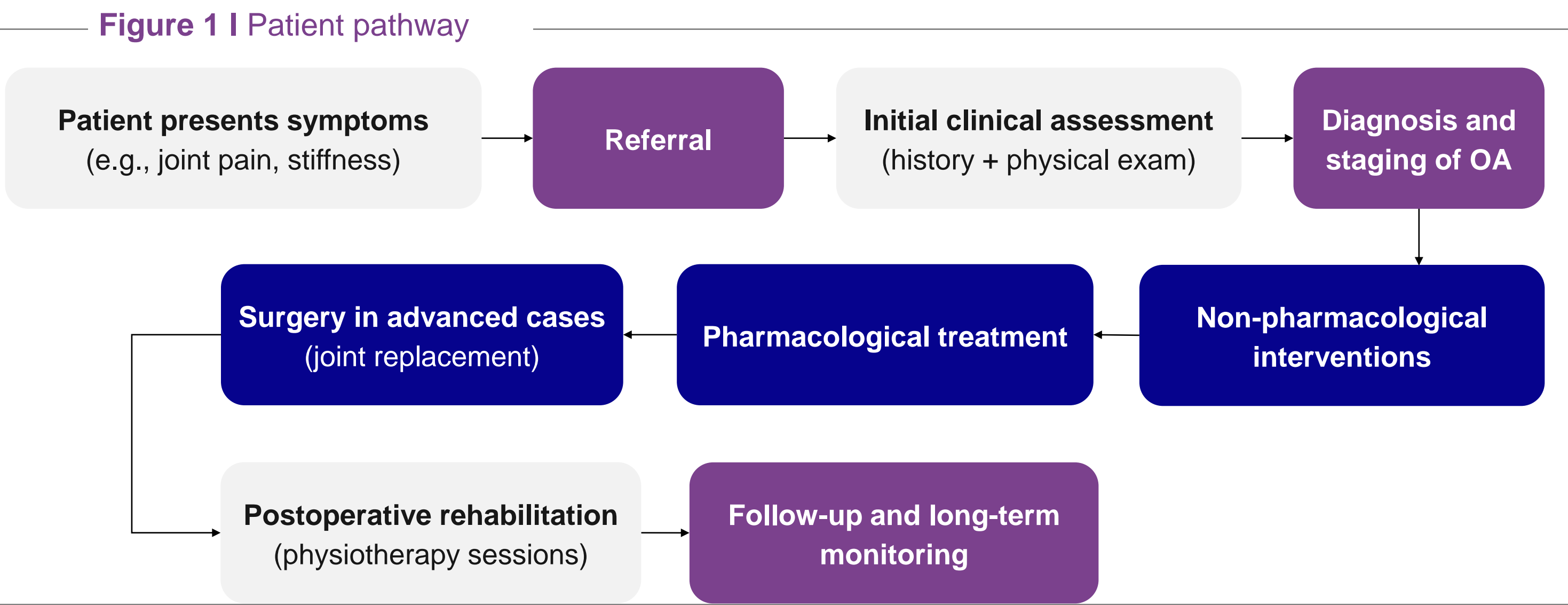
A quantitative approach was adopted, integrating epidemiological, clinical, and economic data to estimate both the average and total costs of OA, including direct and indirect expenses from the perspectives of the National Health Service (SNS) and society.

This study was structured into 5 steps:

- Data Sources and Clinical Inputs:** Comprehensive desk research complemented by 12 in-depth interviews with Portuguese key opinion leaders (KOLs) (9 orthopedic surgeons, 1 rheumatologist, 1 physiatrist, 1 physical therapist).
- Patient Pathway:** Mapped in accordance with international guidelines and validated by KOLs. It encompasses the entire patient journey, including initial referral, diagnostic procedures, pharmacological and non-pharmacological management, and surgical (arthroplasty) and non-surgical (physical therapy, joint infiltrations, and medications) interventions.
- Resource Utilization and Costing:** Based on clinical guidelines, expert input, and national tariffs. A micro-costing approach was employed, combining resource utilization along the care pathway with corresponding unit costs derived from official Portuguese health expenditure tables and legislation.
- Cost Model and Assumptions:** A societal perspective was adopted, reporting costs by payer (public system vs. patients). The model estimated average annual cost per patient and the national burden of OA in Portugal. For joint replacement, a case-mix assumption applied the average cost of severity grades 1–2, reflecting the majority of cases. Direct medical costs included the diagnosis-to-treatment pathway (consultations, diagnostics, surgery, inpatient stay, follow-up) and post-surgery physiotherapy. Physiotherapy was modeled separately for knee (26 sessions) and hip (13 sessions) surgery patients, accounting for frequency, duration, and sector distribution (2% public hospitals, 58% contracted, 40% private). Indirect costs captured productivity losses from absenteeism during post-surgery recovery. The scope covered costs from referral to surgery, inpatient care, and early post-discharge follow-up (including post-surgery physiotherapy); primary care long-term follow-up and informal care were excluded due to data limitations.
- Sensitivity Analysis:** A deterministic sensitivity analysis (±20%) was conducted on key input parameters. The model tested variations in time from diagnosis to treatment, number of sick leave days, and proportion of working-age patients. This allowed the assessment of model robustness and the identification of the most influential cost drivers.

Results

OA Care Pathway in Portugal



- ~**90%** of patients referred from **primary care**; ~20% seek care only in the **private sector**.
- Delays:** first hospital appointment takes **3–18 months** after referral; additional imaging may add **2 weeks to 3 months**.
- Diagnostics:** ~75% bring an X-ray from primary care; ~20% require advanced imaging (MRI/CT).
- Treatment:**
 - Non-pharmacological measures recommended for all patients (education, physiotherapy, weight loss, assistive devices).

- Pharmacological therapy widely used (100% of patients), with a stepwise approach (topical/oral NSAIDs (80% of patients) → opioids (5% of patients) → intra-articular injections (20% of patients).
- Surgery: Although 20–30% of patients become candidates for surgical intervention, only about 15% actually undergo joint replacement. Among these, arthroplasty is the predominant procedure, accounting for approximately 99% of hip surgeries and more than 95% of knee surgeries. Other surgical options, such as osteotomy or arthroscopy, are rarely performed.
- Rehabilitation:** crucial after surgery; Typically, longer and more intensive for knee OA (3–12 months) vs hip OA (1–2 months).
- Follow-up:** patients are monitored with 2–3 visits in the first 2 years post-surgery, followed by annual reviews.

Costs distribution associated with OA management

Table 1 | Distribution of direct and indirect costs associated with disease management

Costs of treated disease	Disease total cost	% applicable prevalent population	Weighted cost per patient
Direct costs	€ 1 416 775 900		€ 1 407
Diagnosis & treatment pathway (consultations, imaging, laboratory, surgery, inpatient stay, follow-up)	€ 1 261 239 393 <i>Knee: € 1 026 464 714</i> <i>Hip: € 234 774 679</i>	100%	€ 920 <i>Knee: € 923</i> <i>Hip: € 903</i>
Post-surgery physiotherapy (public & contracted care)	€ 65 059 548	15% (Surgical patients)	€ 47
Post-surgery physiotherapy (OOP private sessions)	€ 90 476 959	15% (Surgical patients)	€ 440
Indirect Costs			
Absenteeism cost - 15 days post surgery recovery	€ 275 790 162	6.5% (Working Force & Surgical patients)	€ 203
TOTAL COSTS	€ 1 692 566 061		€ 1 610

COSTS OF TREATED DISEASE

- Direct costs (€1.42B)** were mainly driven by the **diagnosis and treatment pathway (€1.26B)**, including **€1.03B for knee OA (€923/patient)** and **€235M for hip OA (€903/patient)**.
- Post-surgery physiotherapy** added €155M (€487/patient total); funding was mostly private/out-of-pocket.
- Indirect costs (absenteeism)** reached €276M (€203/patient).

Total costs

- Surgical treatment** incurred an average direct cost of **€5,286 per patient**, totaling €1.02B nationally.
- Non-surgical patients** managed in primary care generated **€282 per patient**, totaling €0.33B, reflecting only hospital-based resources (consultations, imaging, and intra-articular injections). As post-discharge and primary care data were unavailable, non-surgical costs are likely underestimated.

Table 2 | Total costs of OA

	Total cost	Average cost per OA patient
Costs of treated disease (total)	€1,692,566,061	€1,610
Costs of untreated disease (total – 2.8 years)*	€3,907,913,987	€2,849
TOTAL COSTS	€5,600,480,049	€4,459

* Based on Culliford et. Al (28), the median time from diagnosis to treatment is 2.8 years (34 months). There is no data from Portugal and surgery waiting list is not diagnosis specific.

Figure 2 | Deterministic sensitivity analysis for total patient cost.

Parameter	Value	Value
Time from diagnosis to Treatment (years)	€3 601,72	€5 680,33
Sick leave days (per patient/year)	€3 601,72	€5 316,64
Working age population %	€4 001,87	€4 916,49
Moderate Knee OA %	€4 276,81	€4 666,08
Total number of Knee OA patients	€4 367,64	€4 586,14
Surgical Patients Knee %	€4 356,98	€4 561,38
Knee joint replacement Cost €	€4 359,68	€4 558,68
OOP Physiotherapy Cost €	€4 371,22	€4 547,14
Severe Knee OA %	€4 388,56	€4 533,06
Total number of Hip OA patients	€4 421,82	€4 499,48
Moderate Hip OA %	€4 424,88	€4 499,21
Surgical Patients Hip %	€4 435,25	€4 483,11
Hip joint replacement Cost €	€4 435,88	€4 482,48
Severe Hip OA %	€4 446,41	€4 472,64
Joint Infiltration Knee %	€4 450,85	€4 467,50
Joint Infiltration Hip %	€4 457,88	€4 460,48

- Limitations
- Primary care resource use data were not available; therefore, estimates for non-surgical patients reflect only hospital-based costs, likely underestimating the overall burden.
 - Indirect costs were adapted from international studies to the Portuguese context, which may not fully capture local variability.
 - Intangible costs (e.g., quality-of-life loss) were not included, suggesting that the true societal burden of OA is even greater than reported.

- Take-home messages
- OA imposes a major burden in Portugal: €5.6B total (≈€4,459 per patient), rising to €7.7B in the most conservative scenario.
 - Although direct medical costs dominate in the short term, accumulated productivity losses and OOP expenses make **delayed surgery more costly to society than early intervention**.
 - Surgical management** is resource-intensive (€5,286/patient) but may be cost-effective long term, as productivity gains offset costs.
 - Timely treatment and physiotherapy** may reduce productivity losses and overall burden.