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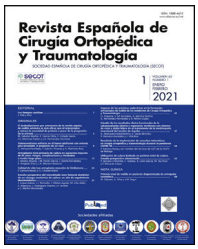

ORIGINAL PAPER

[Translated article] A perioperative optimisation programme can improve results and reduce hospital length of stay in hip and knee arthroplasty: Experience in Chile

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Short stay surgery

Abstract
Background and objective: Perioperative optimisation programmes have been shown to improve outcomes in total hip and knee arthroplasty; however, the evidence in Latin America is limited. Our objective is to evaluate the impact of implementing a multidisciplinary optimisation programme in prosthetic surgery at a Latin American centre.
Materials and methods: A retrospective cohort study evaluating elective hip and knee prosthesis surgeries between 2016 and 2023 at a private hospital. We compared pre-intervention (2016–2018) and post-intervention (2019–2023) groups following the implementation of a multidisciplinary perioperative optimisation programme in 2019. The impact of the programme on hospital length of stay and 90-day readmission rates was assessed.
Results: A total of 1462 patients (1636 surgeries) were included, with 429 surgeries in the pre-intervention group and 1207 in the post-intervention group. Hospital length of stay decreased from 3.5 to 2.22 days ($p < 0.05$). The 90-day readmission rate decreased from 2.56 to 2.24% ($p = 0.71$), with a significant reduction in knee arthrofibrosis (from 0.9 to 0.2%, $p < 0.05$). The optimisation programme was the main factor contributing to the reduction in hospital length of stay.
Conclusions: The multidisciplinary perioperative programme implemented significantly reduced hospital stay without increasing 90-day readmission rates. Furthermore, it equated outcomes between patients with public and private insurance.

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PALABRAS CLAVE
Artroplastia total de cadera;
Artroplastia total de rodilla;
Estancia hospitalaria;
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América Latina;
Cirugía de corta estadía

Un programa de optimización en el perioperatorio puede mejorar los resultados y disminuir el tiempo de hospitalización en la artroplastia de cadera y rodilla: experiencia en Chile

Resumen
Antecedentes y objetivo: Los programas de optimización perioperatoria han mostrado mejorar los resultados en la artroplastia total de cadera y rodilla, sin embargo, la evidencia en Latinoamérica es escasa. Nuestro objetivo es evaluar el impacto de la implementación de un programa de optimización multidisciplinario en cirugía protésica en un centro latinoamericano.
Materiales y métodos: Estudio de cohorte retrospectivo que evaluó las cirugías electivas de prótesis de cadera y rodilla entre 2016 y 2023 en un hospital privado. Se compararon grupos preintervención (2016-2018) y postintervención (2019-2023) tras la implementación de un programa de optimización multidisciplinario perioperatorio en 2019. Se evaluó el impacto del programa sobre la estancia hospitalaria y las readmisiones a 90 días.
Resultados: Se incluyeron 1.462 pacientes (1.636 cirugías), con 429 cirugías preintervención y 1.207 postintervención. La estancia hospitalaria disminuyó de 3,5 a 2,22 días ($p < 0,05$). La tasa de readmisión a 90 días descendió del 2,56 al 2,24% ($p = 0,71$), con una reducción significativa en rigidez de rodilla postoperatoria (0,9 al 0,2%; $p < 0,05$). El programa de optimización fue el principal factor en la reducción de la estancia hospitalaria.
Conclusiones: El programa multidisciplinario perioperatorio implementado redujo significativamente la estancia hospitalaria sin aumentar las tasas de readmisión a 90 días. Además, equiparó resultados entre los pacientes con seguro público y privado.

Introduction

Total hip arthroplasty (THA) and total knee arthroplasty (TKA) are the most effective interventions for relieving pain and improving quality of life in patients with severe hip and/or knee osteoarthritis, respectively.[1–3] In OECD member countries, these surgeries have experienced significant growth over the last decade, with a 22% increase in THA and a 35% increase in TKA.[4]

In recent years, multiple strategies have been developed to optimise outcomes in THA and TKA surgery. The implementation of optimisation programmes has been shown to reduce complications and readmission rates, improve mobility, and decrease hospital stay.[5] Prolonged hospital stays, postoperative complications, and hospital readmissions remain a significant problem for patients and healthcare systems.[6–8]

Although optimisation programmes in THA and TKA have been shown to improve the quality of care, evidence of interventions in Latin America is scarce,[9] and outcome reports from the Southern Cone are lacking.

To address this gap in the literature, this paper describes the implementation of a multidisciplinary optimisation programme in patients undergoing elective THA and TKA in a private Chilean hospital. The purpose of this study was to evaluate the impact of implementing the programme on length of hospital stay and unscheduled readmissions. Our hypothesis is that it would reduce hospital stay and readmissions. As a secondary objective, we sought to evaluate the differences between patients with public and private insurance.

Materials and methods

Research design

Retrospective cohort study of all patients undergoing elective THA and TKA between January 2016 and December 2023 at our hospital. The sample was divided into two groups: pre-intervention (January 2016–December 2018) and post-intervention (January 2019–December 2023).

Inclusion criteria included patients over 18 years of age who underwent elective THA or TKA. Arthroplasties indicated for fractures, tumours, and those with no record of postoperative follow-up were excluded. No bilateral arthroplasties were performed at one stage. No navigation systems or robotic assistance were used during the surgeries.

Demographic variables were analysed: age, sex, and type of insurance (private or public) in both groups, as well as the type of surgery (THA or TKA). The variables studied were hospital stay, unscheduled hospital readmissions within 90 days, and mortality within 90 days after surgery.

Statistical analysis was structured into univariate and bivariate analyses. For the univariate analysis, the mean and standard deviation were used for quantitative variables, and absolute and relative frequencies were used for qualitative variables. The bivariate analysis consisted of Student's *t* test for comparing normally distributed quantitative variables, and the Mann–Whitney *U* test for comparing non-normally distributed quantitative variables (hospital days and readmission rates). Fisher's exact test was used to identify differences in the causes of readmission by group. A multivariate analysis was then performed, consisting of the

generation of a multiple linear regression model with the variables considered in the study.

The statistical analysis was performed using Stata® 18 software (StataCorp LLC, 2023); statistical significance was defined as 5% and power was defined as 80%.

Intervention programme

An outcomes optimisation programme for elective arthroplasty was developed by a multidisciplinary team consisting of orthopaedic surgeons, anaesthesiologists, nurses, a hospitalist, and physical therapists. The following interventions were analysed and included, based on the literature: preoperative optimisation of medical and psychiatric conditions; optimisation of haemoglobin (Hb) and glycated haemoglobin levels; education and information provided by the nurse; tobacco cessation counselling; surgeries performed at an optimal time; a standardised multimodal analgesia protocol; use of tranexamic acid; prevention of nausea/vomiting; early rehabilitation; and thromboprophylaxis (Fig. I in Appendix B).

The optimisation programme was applied to all patients undergoing surgery from January 2019 to December 2023 who met the aforementioned inclusion and exclusion criteria. The intervention was structured in three phases.

Prehospital phase

At the appointment where THA or TKA was indicated, the surgeon ordered a battery of standardised blood tests, including Hb, glycosylated Hb, urinalysis, and a nasal swab for the detection and eradication of Staphylococcus aureus. Operative passes were requested through dentistry and through any other specialty as required based on the patient's medical conditions.

During the interview with the programme nurse, the patient's blood tests and access to the patient's medical records were reviewed to ensure they were up-to-date. Patient and caregiver education was provided, outlining the milestones from hospital admission to home care and the warning signs for which they should be consulted, as well as thromboprophylaxis education.

The patients were then evaluated by the internist to review their blood tests and optimise their medical conditions, such as improving their pre-surgery Hb and achieving a glycated Hb < 7%. In addition, tobacco withdrawal counselling was provided, aiming for a 3-month tobacco-free period prior to surgery.

Finally, the surgical teams held weekly surgical board meetings for preoperative planning and case discussion.

Hospital phase

The patients were admitted to the hospital on the same day as surgery, a few hours before surgery. A standardised multimodal analgesia protocol was applied, which included: (1) spinal anaesthesia in THA and TKA, associated with an anaesthetic block of the adductor canal in patients undergoing TKA; (2) local infiltration anaesthesia in patients undergoing TKA; (3) buprenorphine patch upon discharge from the operating room; and (4) administration of dexamethasone 4 mg during anaesthesia induction to prevent nausea and vomiting. Tranexamic acid 1 g was administered before the start of surgery and 1 g 3 h after surgery. Thromboprophylaxis with LMWH was initiated between 6 and 8 h after surgery. The use of drains and postoperative urinary catheters was avoided.

Early postoperative kinesiology was indicated, attempting to achieve assisted walking within 24 h of surgery, and training in basic activities of daily living.

Post-hospital phase

A home exercise guide was provided while awaiting the first follow-up with the surgeon 15 days after surgery, along with a prescription for oral analgesic medications and anticoagulants for thromboprophylaxis. At discharge, patients were given an emergency contact number in case of complications or questions.

Results

After applying the inclusion and exclusion criteria, a total of 1462 patients underwent 1636 THA and TKA surgeries during the described period. 26.2% ($n = 429$) of the sample corresponded to the pre-intervention period (2016–2018), and 73.8% ($n = 1207$) to the post-intervention period (2019–2023). The mean age (SD) of the sample was 62.43 ($n = 1001$) years, and 61.2% ($n = 1001$) were female (Table 1). Regarding social security, 70.04% were from private insurers and 29.9% from public insurers.

There was a significant reduction in hospital stay after the intervention, from 3.5 ($n = 2.33$) to 2.22 ($n = 1.6$) days ($p < .05$), with a median of 3.1 to 2.1 days (IQR = 1). In the THA subgroup, the mean hospital stay was reduced from 3.32 ± 1.53 to 2.02 ± 1.17 days post-intervention ($p < .05$), with a median reduction from 3 to 2 days (IQR = .8). In the TKA subgroup, the mean hospital stay decreased from 3.96 ± 3.58 to 2.61 ± 2.17 days post-intervention ($p < .05$), with a median reduction from 3.3 to 2.3 days (IQR = 1) (Table 2).

Regarding the type of insurance provider, a significant difference was found in hospital stays in the pre-intervention period, with the private insurer representing 3.7 days and the public insurer representing 3.2 days ($p = .002$). No significant difference was found between the two groups post-intervention (Table 3).

Regarding unscheduled readmissions, the overall rate was 2.56% in the 2016–2018 period and 2.24% in the 2019–2023 period, a difference that was not significant ($p = .71$). In the pre-intervention period, .7% ($n = 3$) of the sample were readmitted for medical reasons, and 1.86% ($n = 8$) were readmitted for surgical reasons. Postintervention, 1.1% ($n = 13$) of the sample were readmitted for medical reasons and 1.16% ($n = 14$) for surgical reasons. Regarding the causes of readmission, knee prosthesis stiffness (loss of range of motion requiring reintervention) was significantly reduced from .93% to .17% ($p = .031$), while other complications such as dislocation, deep infection, and thromboembolic disease (DVT and PE) did not show statistically significant changes. Only one case of 90-day mortality was reported in the entire

Table 1 Sample and subgroup demographics.

	Pre	Post	Total
THA group			
n	125	400	525
Age (years), mean (SD)	65.87 (8.2)	65.95 (7.83)	65.93 (7.92)
Female, *n*	79	271	350
Male, *n*	46	129	175
TKA group			
n	304	807	1111
Age (years), mean (SD)	58.45 (14.5)	61.65 (12.62)	60.78 (23.23)
Female, *n*	195	456	651
Male, *n*	109	351	460
Global			
n (%)	429 (26.2)	1.207 (73.8)	1636
Age (years), mean (SD)	60.61 (13.4)	63.07 (11.4)	62.43 (12.03)
Female, *n*	274	727	1001
Male, *n*	155	480	635

The table describes the sample of 1636 patients undergoing hip and knee arthroplasty. Women represented the majority in both periods. THAs were more common than TKAs, and a difference in average age was observed between the two types of surgery.

Table 2 Hospital stay and readmission rate: pre- and post-intervention comparison.

	n	Hospital stay		Readmissions	Readmissions rate (%)
		Mean (SD)	Median (IQR)		
THA group					
Pre	304	3.32 (1.53)	3 (1.1)	5	1.2
Post	807	2.02 (1.17)	2 (0.8)	12	1.18
p		.0000001	.0000001		
TKA group					
Pre	125	3.96 (3.58)	3.3 (1.1)	6	4.72
Post	400	2.61 (2.17)	2.3 (1)	15	3.73
p		.0000001	.0000001		
Global					
Pre	429	3.5 (2.33)	3.1 (1)	11	2.56
Post	1207	2.22 (1.6)	2.1 (1)	27	2.24
p		.0000001	.0000001		.031

A significant decrease was observed in both the mean and median hospital stay in both groups. Readmission rates also decreased after the intervention, especially in the case of knee arthroplasty, with statistically significant values in all analyses.

study sample, which corresponded to a patient who underwent THA in the preintervention period (Appendix B).

Finally, the regression model showed high overall significance ($F = 46.43$; $p < .0001$) and explained 12.47% of the variability in hospital length of stay ($R^2 = .1247$). All variables were found to be significant: female sex was associated with an average increase of .25 days, age with an increase of .014 days per additional year, and the intervention reduced hospital stay by 1.4 days. Furthermore, undergoing TKA increased the average length of stay by .5 days compared to undergoing THA, while patients with private insurance had .2 days more hospital stay than those with public healthcare. The intervention was the variable that had the greatest impact on reducing hospital stay in this model.

Discussion

The implementation of a multidisciplinary optimisation programme at our institution achieved a significant reduction in hospital stay for patients undergoing THA and TKA, without increasing the rate of unscheduled readmissions. These findings are consistent with previous studies demonstrating the benefits of implementing clinical pathways in joint replacement surgery.[5,9,10]

Pilares Ortega et al.[11] studied the determinants of hospital stay in TKA. Modifiable factors included the need for blood transfusion, the timing of postoperative rehabilitation, the need for analgesic rescue, and postoperative nausea/vomiting. This reinforces the view that the

Table 3 Hospital stay and health system.

Type of intervention	Type of insurance	Hospital stay (days) Mean (*n*)		
		Pre-intervention	Post-intervention	Global
THA group	Public	3.24 (137)	2 (215)	2.48 (352)
	Private	3.36 (167)	2.02 (592)	2.32 (759)
	p	.046	.71	.01
TKA group	Public	3.13 (43)	2.54 (95)	2.72 (138)
	Private	4.4 (82)	2.63 (305)	3.01 (387)
	p	.002	.39	0.056
Total	Public	3.22 (180)	2.17 (310)	2.55 (490)
	Private	3.70 (249)	2.23 (897)	2.55 (1146)
	p	.002	.57	.13

Table showing the mean hospital stay by insurance type, arthroplasty type, and pre- or post-intervention subgroup. There is a significant difference in pre-intervention hospital stay by insurance type for both THA and TKA; this difference is comparable and non-significant after the intervention.

implementation of evidence-based interventions, such as the use of tranexamic acid, optimisation of Hb and glycated Hb levels, early rehabilitation, and multimodal anaesthetic regimens, contribute to faster patient recovery.[10,12–14]

Reducing hospital stays is not the goal of these programmes, but rather a consequence of seeking a better and safer recovery. However, studies have shown that shorter stays do have benefits for patients. A meta-analysis of 22 studies conducted by Barbieri et al.[15] showed that standardised clinical protocols reduce complications associated with longer hospital stays, such as thromboembolic disease, sepsis, and urinary tract infections.[16,17] Furthermore, in a review of one million Medicare patients Benito et al.,[18] showed that a hospital stay of more than one day was associated with a higher risk of 90-day readmission compared to a hospital stay of 2, 3, or 4 days. The results obtained highlight the importance of not unnecessarily extending hospital stays, thus reducing the risk of complications and unscheduled readmissions.

Reported 90-day readmission rates range from 7.7% for THA and 9.7% for TKA[19] to an overall rate of 5.4% in more recent reviews.[20] Our results reflect a lower incidence of readmissions compared to those reported, a phenomenon that could explain the lack of a significant decrease in readmissions after the programme's implementation (2.56% to 2.24%; $p = .71$). Of note is the significant reduction in readmissions for knee stiffness (.9% to .2%; $p < .05$), likely associated with early rehabilitation and multimodal postoperative pain management. Given that readmissions are associated with higher costs and lower patient satisfaction,[21,22] we can infer that maintaining this low readmission rate is beneficial for the healthcare system and the patient.

Comprehensive patient support was a key element of the programme, especially in the preoperative phase. Education and information about the ''patient journey'' would help reduce preoperative anxiety and align patient expectations, a factor shown to influence postoperative satisfaction.[23–26] Furthermore, the identification and management of medical and psychiatric comorbidities contributes to reducing medical complications and readmissions.[27,28]

The programme equalised outcomes by offering a standard of care for all patients, regardless of their socioeconomic status. The difference in hospital stay between patients with public and private insurance became non-significant after the intervention. These results are encouraging in terms of reducing health inequalities. In developing countries like Chile, where healthcare budgets are limited and waiting lists are long, the implementation of improvement programmes represents a step forward in the efficient use of resources. Molko and Combalia,[29] in a review of European literature, found that fast-track surgery meant a saving of approximately 20% in costs per patient, highlighting that the economic impact was not the objective, but simply a consequence of doing what was right for the patient.

Our study reinforces the importance of developing multidisciplinary optimisation programmes in joint replacement surgery and fills an important gap in the Latin American literature on this topic, standing out as one of the first in Chile and the region.[9] It also gives us hope for the implementation of a safe and effective outpatient surgery programme for THA and TKA.[30]

In Spain, Molko et al.[31] showed that there is great disparity in the implementation of arthroplasty surgery programmes, leading to significant differences in outcomes and process indicators. A study of this type implemented in Chile would enable us to understand the current national situation and evaluate the impact of implementing outcome optimisation protocols in prosthetic surgery nationwide. We hope, as a group, to contribute to such implementation.

Regarding the limitations of this work, as it is a non-randomised, retrospective study, there are inherent limitations in the design, such as potential biases in data selection and analysis. Furthermore, the fact that the study was conducted in a private institution limits the extrapolation and external validity of the results to public hospitals. Although clinical quality indicators were measured, patient-reported outcomes and satisfaction were not assessed, relevant aspects that should be addressed in future research.

To conclude, the multidisciplinary perioperative programme implemented significantly reduced hospital stay without increasing 90-day readmission rates, with an equalising effect for public and private health insurance. Future studies are needed to measure the economic impact of the programme and its effect on patient satisfaction. As a team of authors, we hope that this programme can serve as a basis for modification and implementation in different public and private institutions in Chile and the region.

Level of evidence

Level of evidence III.

Ethical considerations

Approval from the Clinical Research Ethics Committee was obtained before extracting patient data.

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Conflict of interests

None.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.recot.2025.08.002.

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