Budget Impact of Liposomal Bupivacaine in the Commercial and Medicare Advantage Hospital Outpatient Department Setting for Total Knee Arthroplasty

Gabriel Wong, PharmD, MS[1]*; Gabriel Tremblay, DBA[2]; Jennifer Lin, PhD[1]

[1]Pacira BioSciences Inc., Brisbane, CA, USA; [2]Geneconomics, Quebec City, QC, Canada

*Affiliation at the time of study

OBJECTIVE

To evaluate the budget impact of liposomal bupivacaine (LB) compared with ropivacaine for total knee arthroplasty (TKA) performed in the hospital outpatient department (HOPD) setting from Commercial and Medicare Advantage payer perspectives within a hypothetical 1 million–member health plan

CONCLUSIONS

1. Adopting LB for TKA represents a cost-neutral analgesic treatment option over ropivacaine in the HOPD setting from the Commercial and Medicare Advantage payer perspectives, showing the acquisition of increased pharmacy costs were offset by reductions in overall healthcare expenditures
2. Future budget impact investigations with longer follow-up and incorporation of relevant clinical outcomes are warranted to strengthen the current model

PRESENTING AUTHOR: Jennifer Lin; Jennifer.lin@pacira.com

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INTRODUCTION

- TKA is a widely performed surgical procedure used to relieve pain and restore function in patients with knee osteoarthritis (OA) characterized by substantial pain and functional limitation[1,2]
- The volume of total joint arthroplasty procedures in the United States has increased substantially and is projected to continue growing, underscoring the importance of evaluating the clinical and economic implications of these procedures[3]
- Postoperative pain management following TKA is critical to avoid the use of opioids after surgery[1,2]
- Multimodal analgesia strategies are commonly used in surgical care to improve postoperative pain control while reducing opioid requirements and opioid-related adverse effects[4-6]
- While arthroplasty volumes rise, healthcare systems and payers are increasingly focused on the potential impact of perioperative interventions on healthcare utilization and overall costs[3]
- Budget impact analyses estimate the financial consequences of adopting new healthcare interventions within defined healthcare populations and are commonly used to inform payer decision-making[7]
- The present study evaluated the budget impact of adopting LB compared with ropivacaine for TKA performed in the HOPD setting

METHODS

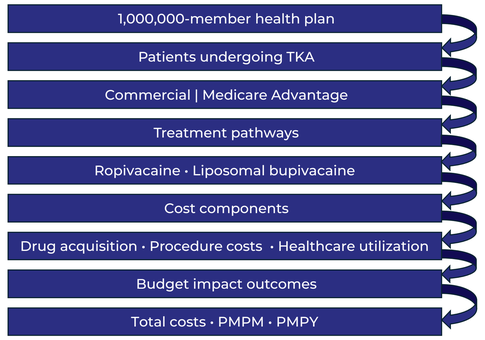
STUDY DESIGN

- A budget impact model was developed to estimate the financial implications of adopting LB compared with ropivacaine for TKA performed in the HOPD setting
- The model was developed in Microsoft Excel to estimate the financial impact of LB administration on the postsurgical pain management treatment pathways for HOPD TKA
- The model simulated a hypothetical health plan consisting of 1,000,000 covered members over a 3-year time horizon
  - The market shares of LB and standard local anesthetics at baseline were 22.1% and 77.9%, respectively
- The following 2 treatment pathways were evaluated:
  - Ropivacaine (the reference scenario)
  - LB with increasing market share (the new treatment pathway)
- Comparative healthcare resource utilization and cost inputs were derived from NorstellaLinQ, a nationwide US closed claims database including Commercial and Medicare Advantage adult patients who had an outpatient TKA procedure with ropivacaine or LB and were discharged between June 1, 2020, and September 30, 2024
  - Patient evaluations were inclusive of the day of surgery through 30 days of follow-up
- Market share assumptions were informed by internal IQVIA claims and sales data
- Drug acquisition costs were obtained from Red Book wholesale acquisition cost pricing data
- Epidemiologic inputs were obtained from published literature

STUDY OUTCOMES AND STATISTICAL ANALYSIS

- Model outcomes included
  - Absolute and relative budget impacts
  - Per-member-per-month (PMPM) and per-member-per-year (PMPY) impacts
- Sensitivity analyses were conducted using standard errors of the mean and ±30% variations of the following model parameters:
  - Patient flow (TKA incidence, commercial insurance coverage, and LB/ropivacaine market size)
  - Market share growth (LB baseline market share and LB market share growth)
  - Costs (outpatient, inpatient, productivity, and transport)
- A scenario analysis evaluated the potential budget impact associated with reductions in opioid addiction risk
- A conceptual framework of the budget impact model evaluating the adoption of LB versus ropivacaine for TKA in the HOPD setting from Commercial and Medicare Advantage payer perspectives over a 3-year time horizon is depicted in Figure 1

Figure 1. Budget impact model framework.



PMPM, per member per month; PMPY, per member per year; TKA, total knee arthroplasty.

- Population parameters and data sources were incorporated into the budget impact model evaluating LB versus ropivacaine for TKA performed in the HOPD setting (Table 1)

Table 1. Key Population and Cost Inputs Used in Budget Impact Model for TKA

Parameter	Value	Source
Hypothetical health plan population	1,000,000 members	Model assumption
Estimated annual patients undergoing TKA	1819	Model estimate
Commercial patients	1065	Model estimate
Medicare Advantage patients	754	Model estimate
Drug acquisition cost	Wholesale acquisition cost	Red Book
Healthcare utilization inputs	Claims analysis	NorstellaLinQ database

TKA, total knee arthroplasty.

RESULTS

- Budget impact estimates were evaluated over a 3-year time horizon; in the baseline year, the model estimated 1819 patients undergoing TKA within the simulated 1 million–member health plan, with evaluations made inclusive of the day of surgery through 30 days of follow-up
  - The patient distribution included 1065 patients with commercial insurance and 754 patients with Medicare Advantage insurance
- Using the TKA incidence estimates based on Shichman et al,[8] there were 612,163 eligible patients at year 1 (Medicare Advantage: 250,987; commercial: 361,176), 637,058 patients at year 2 (Medicare Advantage: 273,935; commercial: 363,123), and 667,998 patients at year 3 (Medicare Advantage: 293,919; commercial: 374,079)
- By year 3, the cumulative absolute budget impact was −$117,868 for 1 million members; the relative budget impact was estimated at −0.07%, and the corresponding cumulative PMPM impact was −$0.003 (Table 2)
- The adoption of LB (the new treatment pathway) for TKA was associated with cost neutrality to modest cost savings compared with ropivacaine (the reference scenario) in the modeled health plan

Table 2. Budget Impact Results Over the 3-Year Time Horizon

	Total costs, reference scenario (ropivacaine)	Total costs, new treatment pathway (LB)	Absolute budget impact	Relative budget impact	PMPM	PMPY
Payer perspective (direct costs)	$179.20 million	$179.08 million	−$117,868	−0.07%	−$0.003	−$0.039

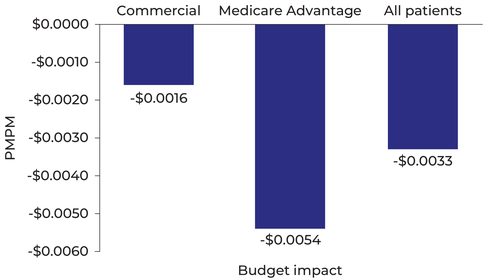
LB, liposomal bupivacaine; PMPM, per member per month; PMPY, per member per year.

- The estimated PMPM budget impact associated with adoption of LB compared with ropivacaine for outpatient TKA stratified by Commercial and Medicare Advantage payer populations is shown in Figure 2
  - Most cost savings were driven by Medicare Advantage compared with the Commercial payer cohort (−$0.0054 vs $−0.0016), primarily due to the cost differential between ropivacaine and LB within the Medicare Advantage cohort

SENSITIVITY ANALYSES

- Sensitivity analyses demonstrated that model outcomes across a range of conservative and extreme assumptions remained consistent with the primary analysis
- Using standard error of the mean, the annual budget impact ranged from −$124,745 to −$111,018, while PMPM remained consistent at approximately −$0.003 (data not shown)
- When model parameters were varied by ±30%, the projected annual budget impact per 1 million patients ranged from −$154,846 to −$81,644 and the PMPM savings ranged from −$0.004 to −$0.002 per 1 million patients (Table 3)

Figure 2. Average PMPM impact by payer type over the 3-year time horizon.



PMPM, per member per month.

Table 3. Deterministic Sensitivity Analysis (Absolute BI and PMPM)

	Lower bound estimates		Reference scenario		Upper bound estimates	
Category and scenario	**Absolute BI**	**PMPM**	**Absolute BI**	**PMPM**	**Absolute BI**	**PMPM**
Patient flow						
TKA incidence	−82,508	−0.002	−117,868	−0.003	−153,228	−0.004
Commercial insurance coverage	−99,944	−0.003	−117,868	−0.003	−135,792	−0.004
LB/ropivacaine market size	−82,508	−0.002	−117,868	−0.003	−153,228	−0.004
Market share growth						
LB baseline market share	−117,868	−0.003	−117,868	−0.003	−117,868	−0.003
LB market share growth	**−81,644**	**−0.002**	**−117,868**	**−0.003**	**−154,846**	**−0.004**
Costs						
Transportation	−117,868	−0.003	−117,868	−0.003	−117,868	−0.003
Productivity	−117,868	−0.003	−117,868	−0.003	−117,868	−0.003
Outpatient	−85,403	−0.002	−117,868	−0.003	−150,334	−0.004
Inpatient	−110,394	−0.003	−117,868	−0.003	−125,342	−0.003

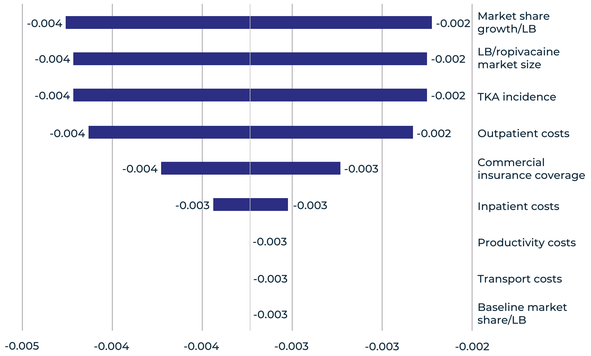
BI, budget impact; PMPM, per member per month.

- The variables with the greatest influence on the modeled budget impact included market size and market share, TKA incidence, and outpatient costs (Figure 3)
  - No sensitivities crossed the 0 mark
- Sensitivity analyses varying model parameters by ±30% demonstrated that LB remained cost saving across all tested scenarios

SCENARIO ANALYSIS

- A scenario analysis evaluated potential cost offsets associated with reductions in opioid addiction risk; inclusion of opioid-related complication costs resulted in additional projected cost savings without materially changing PMPM results
- The adoption of LB resulted in projected cost savings of $189 PMPY but did not materially change PMPM results (data not shown)

Figure 3. Tornado plot of deterministic sensitivity analysis of budget impact.



LB, liposomal bupivacaine; TKA, total knee arthroplasty.