

Assessing the Economic Impact of Standardization of Operating Room Workflows Through a Digital Solution

Kocaman M¹, Galvain T², Patzer L³, Pashley A⁴, Kloska T⁵

¹Johnson & Johnson MedTech, Berkshire, UK; ²Johnson & Johnson MedTech, New Brunswick, NJ, USA; ³Johnson & Johnson MedTech, Dubai, UAE; ⁴Costello Medical, Cambridge, UK; ⁵Costello Medical, London, UK

Introduction

- Surgical operating rooms (ORs) are resource-intensive environments associated with substantial costs.¹
- Digital solutions can improve OR coordination, standardize procedural steps, and provide efficiency insights to optimize healthcare resource utilization (HRU) and reduce costs.^{2,3}

Objective

- To assess the potential economic impact of a digital solution that standardizes OR processes and digitizes surgical workflows.

Methods

- A budget impact model with a 3-year horizon and a German hospital perspective estimated the economic impact of the introduction of a digital solution into the OR for total knee and hip arthroplasty (TKA and THA) procedures.
- Hospital resource use inputs were sourced from real-world data analysis and published studies of surgical workflow standardization (**Table 1**).
- Published costs associated with inpatient stay, instrument tray sterilization, and OR time were combined with costs of the digital solution to calculate the potential cost savings, resulting from a reduction in OR time, postoperative length of stay (LOS), and instrument use following digital solution implementation (**Table 2**).

Table 1: Hospital Resource Use and OR Capacity Inputs

Input	Digital solution	Total knee arthroplasty		Total hip arthroplasty	
		Median value	% reduction	Median value	% reduction
Surgery duration, mins ³	No	110	-	115	-
	Yes	68	38.2%	68	40.9%
Length of stay, days ^{4,5}	No	10	-	11	-
	Yes	8	19.1%	9	18.7%
Number of Instrument trays ⁶	No	8	-	9	-
	Yes	6	25.0%	7	22.2%

Table 2: Cost Inputs

Cost Input	Value
Hospital stay (per patient, per day) ⁷	€ 633
Operating room cost (per minute) ⁸	€ 15
Sterilization (per instrument tray) ⁸	€ 60

Results

- In an OR with a daily 480-min capacity, utilized half the year for TKA and half the year for THA, it was estimated that the OR time saved per day was 144 mins and 156 mins for TKA and THA, respectively, which could enable hospitals to do 1 additional, complete TKA or THA procedure per day, per OR.
- The digital solution implementation led to a 19.1% and 18.7% reduction in LOS and a 25.0% and 22.2% reduction in the number of instrument trays used for TKA and THA procedures, respectively (**Table 1**), resulted in substantial cost savings (**Table 3**).

Table 3: Cost Saving Results

Annual Savings	Total knee arthroplasty	Total hip arthroplasty
OR cost saved	€ 280,800	€ 303,393
Hospital stay cost saved	€ 544,525	€ 563,885
Instrument sterilization cost saved	€ 53,486	€ 51,641
Total cost saving	€ 878,810	€ 918,920

- Overall, introducing this digital solution could produce a budget impact of €5,134,090 over 3 years (**Table 4**).

Table 4: Budget Impact over Three Years

Three Year Results	Total
Cost savings	€ 5,393,190
Digital solution cost	€ 259,100
Budget impact	- € 5,134,090

Conclusion

- Introducing a digital solution that standardizes OR workflows for TKA and THA may be associated with cost savings in a hospital setting. Similar cost savings and benefits of standardization could be realized by implementing digital solutions for other surgical procedures.

References

- Behar BI, GC, Salfeld R. Modernes Krankenhausmanagement: Springer, 2018.
- Neumuth, T; Jannin, P; Schlomberg, J et al. Analysis of surgical intervention populations using generic surgical process models. Int J Comput Assist Radiol Surg. 2011;6(1):59-71.
- Johnson & Johnson. Data on File. 2022
- von Schudnat, C; Lahmann, B; Schoeneberg, KP et al. Impact of a digitized workflow for knee endoprosthesis implantations on hospital-specific ratios. Technol Health Care. 2022.
- Lahmann, B; Hampel, D. Impact of Digital Supported Process Workflow Optimization for Hip Joint Endoprosthesis Implantation on Hospital - Specific Process and Quality Ratios. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis. 2020;68:755-763.
- Surgical Process Institute. Enhancing the TKA/THA care pathway in an orthopedic surgery center. A case story for Patient Pathway Optimization and Surgical Process Institute. 2022.
- Arefian, H; Hagel, S; Heublein, S et al. Extra length of stay and costs because of health care-associated infections at a German university hospital. Am J Infect Control. 2016;44(2):160-166.
- von Eiff, MC; von Eiff, W; Roth, A et al. Process optimization in total knee arthroplasty procedures : Impact of size-specific instrument sets on costs and revenue. Orthopade. 2019;48(11):963-968.