

# Economic Evaluations of Medical Devices Used in the Treatment of Breast Cancer: A Systematic Review

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## INTRODUCTION

- Breast cancer is the most common malignancy experienced by women worldwide. There were approximately 2.3 million women newly diagnosed with breast cancer in 2020, contributing to more than 685,000 deaths globally<sup>1</sup>
- Breast reconstruction can improve the quality of patients' lives by restoring the natural appearance of the breasts. It is associated with better psychological interactions, sexual well-being, and self-confidence.<sup>1</sup> Breast reconstruction rates continue to increase in the US, with implant-based reconstruction rising at a faster pace than autologous modalities<sup>2</sup>

## OBJECTIVES

- Our objective was to conduct a systematic literature review (SLR) to assess model-based economic evaluations of medical devices used in the treatment of breast cancer

## METHODS

- Embase.com (Embase® and MEDLINE®) was systematically searched (from database inception until May 2023) to identify relevant English-language publications
- Searches were conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The searches were not limited by study country
- Electronic searches were supplemented by bibliographic searches. Two independent reviewers performed initial screening of the title and abstract for each reference identified by the electronic database search. Two independent reviewers assessed each potentially relevant full-text article publication. Any uncertainty regarding the inclusion of a publication study was checked by a third reviewer

## RESULTS

- Among the 3,323 citations, four studies comparing different medical devices met the inclusion criteria. The details for the flow of studies are presented in Figure 1 using a PRISMA flow diagram

Figure 1: PRISMA flow diagram

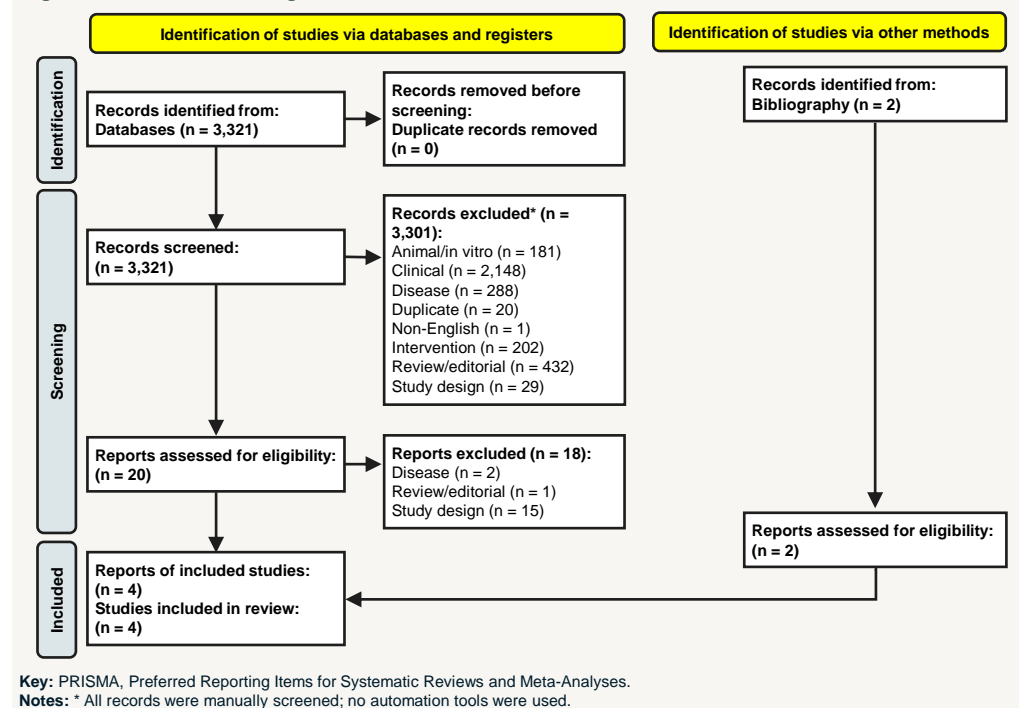


Table 1: List of included economic evaluation studies

Study name	Model	Perspective	Price year/ Discounting	Intervention Comparator	Key patient characteristics	Economic analysis
Chopra 2019 <sup>2</sup>	Decision model	Third-party payer perspective	2018 / NR	AeroForm tissue expander Saline tissue expander	Women who had undergone implant-based reconstruction via the use of conventional saline tissue expanders or with the AeroForm tissue expander	Cost-utility
Duclos 2017 <sup>3</sup>	NR	Health insurance	NR / NR	Port catheter Peripherally inserted central catheter	Breast cancer patients receiving adjuvant chemotherapy	Cost-effectiveness
Klifto 2021 <sup>4</sup>	NR	Healthcare and societal perspective	NR / NR	DTI with saline or silicone implants TEI with saline or silicone implants	Women not receiving radiation therapy and undergoing immediate implant-based breast reconstruction after mastectomy due to localized breast cancer	Cost-effectiveness
Siotos 2018 <sup>5</sup>	Decision tree model	Health care sector perspective	NR / Standard discounting of 3% per year was applied to convert future costs and health effects into present value.	Saline implant reconstruction Silicone implant reconstruction	Patients who underwent implant-based breast reconstruction between 2010 and 2015	Cost-effectiveness

**Key:** DTI, direct-to-implant; NR, not reported; TEI, tissue expander-to-implant.

## SUMMARY OF EVIDENCE

An overview of the included studies is presented in Table 1:

- Of the included studies, two studies were conducted in the US<sup>2,5</sup>, while the country was not reported in the remaining two studies<sup>3,4</sup>
- Cost-utility analysis was conducted using a decision model in one of the studies conducted in the US adopting a third-party payer perspective.<sup>2</sup> The other three studies used cost-effectiveness analyses adopting perspectives of health insurance<sup>3</sup>, healthcare and society<sup>4</sup>, and healthcare only<sup>5</sup>

## KEY FINDINGS

Results of the included studies are presented in Table 2:

- The use of AeroForm tissue expander indicated savings of USD 206,901.36 per quality-adjusted life year (QALY) compared with saline tissue expander in the US<sup>2</sup>
- In a study of port catheter (PC) versus peripherally inserted central catheter (PICC), the incremental cost-effectiveness ratio (ICER) for the relative risk was EUR 400.24, and total cost per patient was EUR 897 and EUR 1,319, respectively. A patient with a PICC represents an additional cost of EUR 400 compared with that of a patient with a PC, for an almost identical effectiveness<sup>3</sup>
- When unilateral implant-based reconstruction was compared with saline direct-to-implant (DTI), the ICER was USD -60,995.49 per QALY for silicone DTI, USD -31,892.02 per QALY for saline tissue expander-to-implant (TEI) and USD 24,948.32 per QALY for silicone TEI<sup>4</sup>
- In a study comparing saline with silicone implant reconstruction, the ICER was USD -283.48 per year of perfect breast-related health, indicating saline reconstruction to be more cost-effective than silicone<sup>5</sup>

Table 2: Results of included studies

	Chopra 2019 <sup>2</sup>	Duclos 2017 <sup>3</sup>	Klifto 2021 <sup>4</sup>	Siotos 2018 <sup>5</sup>				
	AeroForm tissue expander	Saline tissue expander	Port catheter	Peripherally inserted central catheter	DTI with saline or silicone implants	TEI with saline or silicone implants	Saline implant reconstruction	Silicone implant reconstruction
QALY	No surgical site infection: 22.97 Surgical site infection: 22.93	No surgical site infection: 22.97 Surgical site infection: 22.93	-	-	-	-	Breast-QALY: 28.11	Breast-QALY: 23.57
Incr. QALYs	Baseline analysis: QALY gained: 0.00122	-	-	-	-	-	Breast-QALY: 4.54	-
Total cost	No surgical site infection: USD 2,360 Surgical site infection: USD 25,142	No surgical site infection: USD 1,882 Surgical site infection: USD 24,664	Total cost for the 276 patients: EUR 212,745 Total cost per patient: EUR 897 Total cost for 24 complications: EUR 34,837	Total cost for the 154 patients: EUR 203,074 Total cost per patient: EUR 1,319 Total cost for 45 complications: EUR 58,629	NMB: Saline DTI: USD 336,259.66 Silicone DTI: USD 314,452.89	NMB: Saline TEI: USD 313,119.30 Silicone TEI: USD 295,403.17	USD 10,080.40	USD 11,368.63
Incr. costs	Baseline analysis: Cost difference (USD): -253.29	-	-	-	-	-	USD 1,288.23	-
ICER	ICUR (USD/QALY): -206,901.36 (AeroForm tissue expander vs saline tissue expander)	-	EUR 400 (port catheter vs peripherally inserted central catheter)	-	-60,995.49 USD/QALY (silicone DTI vs saline DTI) -31,892.02 USD/QALY (saline TEI vs saline DTI) -24,948.32 USD/QALY (silicone TEI vs saline DTI)	-	-283.48 USD/breast QALY (saline vs silicone)	-

**Key:** DTI, direct-to-implant, ICER, incremental cost-effectiveness ratio, ICUR, incremental cost-utility ratio, NMB, net monetary benefit, QALY, quality-adjusted life year, TEI, tissue expander-to-implant.

## CONCLUSIONS

- Surgeons need to understand how to navigate value analysis and economically justify products and technologies they require to provide optimal care for their patients
- Current evidence suggests that saline implant reconstruction dominated silicone implant reconstruction and that AeroForm can be strongly considered to supplant the use of saline tissue expanders following mastectomy
- However, the SLR results should be interpreted with caution due to the paucity of data and heterogeneity in medical devices considered across models
- Further exploration of cost-effective options for medical devices is warranted in future

## REFERENCES

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