



# Health economic assessment of using single-operator direct visualization cholangioscopy in the management of complex bile duct stones in Saudi Arabia



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## Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is commonly used in Saudi Arabia as part of treatment for conditions of the pancreato-biliary system, such as bile-duct stones.

Direct visualization with cholangioscopy of the target pathology with **SpyGlass DS II** during procedures for stone removal has been demonstrated to optimize treatment and increase success rates for complete stone extraction.<sup>1,2</sup>

## Objective

This study assessed the cost-consequence of switching from ERCP only to ERCP plus single-operator cholangioscopy guided lithotripsy (SOC-L) for complex biliary stones. Both are endoscopic interventions.

## Methods

A health-economic model was developed in Excel® comparing a combination of ERCP alone vs. including SOC-L in the treatment pathway for complex bile-duct stones. A decision-tree was used to capture the in-hospital management and procedure outcomes.

The model time horizon was one year and took the perspective of the Saudi Arabian public payer. Inputs were informed by peer-reviewed literature and expert interviews. Costs are reported in 2023 Saudi Arabian Riyals (SAR). One thousand probabilistic sensitivity analysis runs were performed to quantify uncertainty in the model outputs.

Figure 1 Overall costs

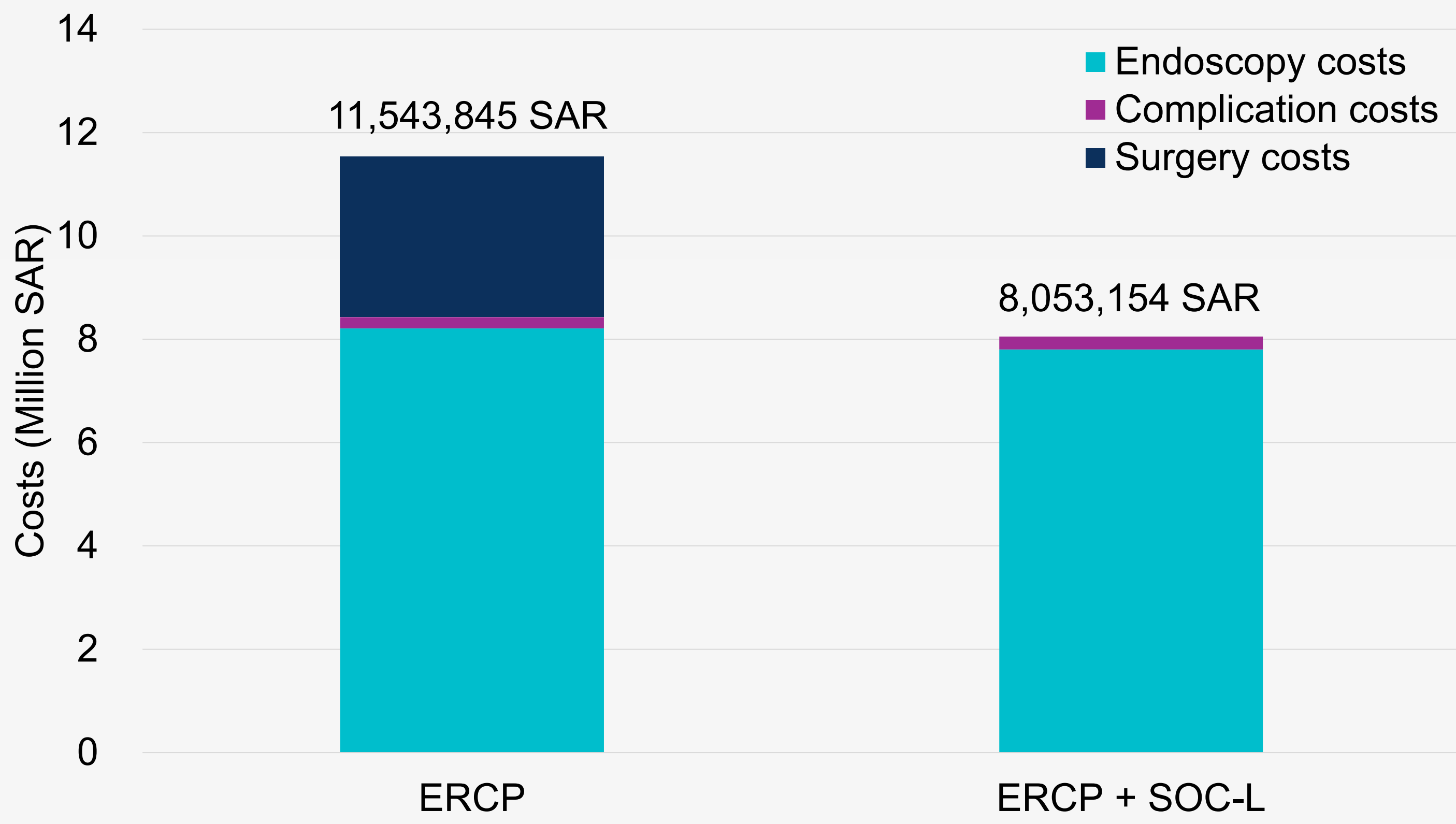
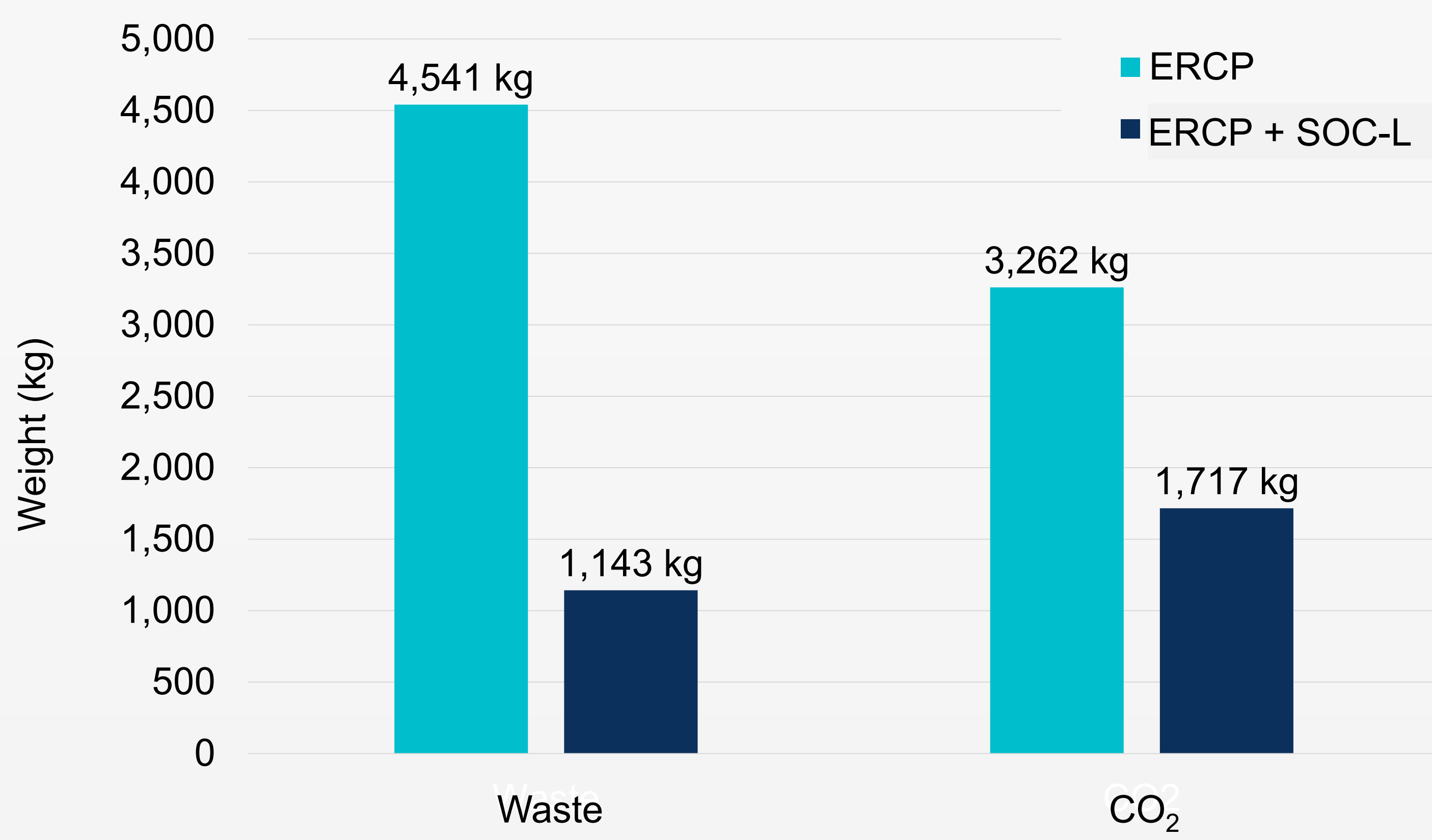


Figure 2 Overall waste and CO<sub>2</sub> outcomes



## Conclusion

Incorporating SOC-L with **SpyGlass DS II** in the management of complex biliary stones reduces the number of procedures required per patient, generating a cost saving to traditional ERCP for the Saudi Arabian public payer.

The use of SOC-L with **SpyGlass DS II** could potentially contribute to environmental sustainability of the healthcare system by reducing medical waste and lowering CO<sub>2</sub> emissions.

## Results

The use of SOC-L was found to be cost saving with a total cost reduction of **3.48 million SAR** (95% CrI: 860,609 to 7,785,344 SAR) over 475 annual patients ([Figure 1](#)).

Most of the savings were derived from avoiding all 99 surgeries in addition to reduced endoscopies (-408) with SOC-L, compared with ERCP alone ([Table 1](#)). This reflects fewer sessions to remove stones, when including SOC-L in the treatment pathway.

Furthermore, the use of SOC-L demonstrated a substantial reduction in waste generated, as well as CO<sub>2</sub> emitted through procedures ([Figure 2](#)). This was mainly driven by the avoided surgeries and endoscopies in the ERCP plus SOC-L arm.

Results were robust to changes during sensitivity analyses (data not shown).

Table 1 Clinical outcomes for 475 patients

	ERCP	ERCP+ SOC-L	Difference
Procedures (per patient)	921 (1.94)	513 (1.08)	-408 (-0.86)
Patients with successful endoscopic procedures after the:			
1st attempt	261 (54%)	439 (92%)	178
2nd attempt (incremental)	347 (73%)	473 (99%)	126
3rd attempt (incremental):	376 (79%)	475 (100%)	99
Surgeries	99	0	-99
Mean endoscopy minutes per patient	59	37	-22
Mean weeks to stone removal per patient	6.5	0.7	-5.8
Patients with complications after endoscopic procedure	77	39	-38

## References

1. Bang et al. Clin Gastroenterol Hepatol. 2020;18(10):2349-2356.e3
2. Li et al.. Surg Endosc. 2021;35(7):3723-3731.

## Disclosures

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