Supplementary material

Supplementary Table 1 PRISMA 2020 checklist of the presented objects in this review

Section and Topic	Item #	Checklist item	Reported (Yes/No)
		TITLE	
Title	1	Identify the report as a systematic review.	YES/p1
		BACKGROUND	
Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	YES/p3
		METHODS	
Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	YES/p3
Information sources	4	Specify the information sources (e.g., databases, registers) used to identify studies and the date when each was last searched.	YES/p3
Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	YES/p3
Synthesis of results	6	Specify the methods used to present and synthesise results.	YES/p3
		RESULTS	
Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	YES/p3
Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	YES/p3
		DISCUSSION	
Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g., study risk of bias, inconsistency and imprecision).	YES/p3
Interpretation	10	Provide a general interpretation of the results and important implications.	YES/p3

Study checklist

Section and Topic	Item #	Checklist item	Location where item is reported
		TITLE	
Title	1	Identify the report as a systematic review.	Page 1
		ABSTRACT	
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 3
		INTRODUCTION	
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Pages 5
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 6
		METHODS	
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Pages 6-7
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Pages 6-7
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 7

Section and Topic	Item #	Checklist item	Location where item is reported
		METHODS	
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g., for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 7-8
	10b	List and define all other variables for which data were sought (e.g., participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Pages 7-8
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g., risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g., tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Pages 8-9
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Pages 8-9
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Pages 8-9
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Pages 8-9
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g., subgroup analysis, meta-regression).	Page 9
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 9
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 7
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	
		RESULTS	
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 9, Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 9, Figure 1
Study characteristics	17	Cite each included study and present its characteristics.	Pages 9-10, Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Pages 10-11 and suppl Table 2
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g., confidence/credible interval), ideally using structured tables or plots.	Page 11
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 10, suppl table 2
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g., confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Pages 11-12, figure 2 and suppl fig 1-11
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Page 12, suppl fig 5-9
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 13, suppl fig 9

Section and Topic	Item #	Checklist item	Location where item is reported
		RESULTS	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Suppl fig 12
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	
		DISCUSSION	
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 13-16
	23b	Discuss any limitations of the evidence included in the review.	Page 16
	23c	Discuss any limitations of the review processes used.	Page 16
	23d	Discuss implications of the results for practice, policy, and future research.	Page 17

Supplementary Table 3 Quality of evidence assessment according to the GRADE system and the precision of overall evidence effect and certainty

Certainty assessment							Summary of findings					Overall effect
Participants (studies) Follow up	Risk of bias	In consistency	In directness	Im precision	Publication bias	Overall certainty of evidence	Study event rates (%)		Relative effect (95% CI)	Anticipated absolute effects		Comments
							With MPS	With SEMS		Risk with MPS	Risk difference with SEMS	
Stricture resolution after completion of therapy												
687 (9 non-randomized studies)	serious[a]	not serious	not serious	not serious	none	⨁◯◯◯ Very Low	377/436 (86.5%)	219/251 (87.3%)	OR 0.99 (0.48 to 2.01)	865 per 1.000	1 fewer per 1.000 (from 111 fewer to 63 more)	SEMS have no additional effect on stricture resolution after completion of therapy compared to MPS but the evidence is very uncertain.
Stricture recurrence during the follow-up period												
687 (9 non-randomized studies)	serious[a]	not serious	not serious	not serious	publication bias strongly suspected[b]	⨁◯◯◯ Very Low	67/436 (15.4%)	64/251 (25.5%)	OR 1.71 (0.87 to 3.38)	154 per 1.000	83 more per 1.000 (from 17 fewer to 227 more)	SEMS may increase stricture recurrence during the follow-up period compared to the MPS but the evidence is very uncertain.
Stent migration rates												
264 (7 non-randomized studies)	serious[a]	not serious	not serious	not serious	publication bias strongly suspected[b]	⨁◯◯◯ Very Low	319/62 (514.5%)	35/202 (17.3%)	OR 0.73 (0.32 to 1.68)	5.145 per 1.000	1.000 fewer per 1.000 (from 1.000 fewer to 1.000 fewer)	SEMS may have little to no effect on stent migration rates compared to MPS but the evidence is very uncertain.
Adverse events rates												
560 (8 non-randomized studies)	serious[a]	not serious	not serious	not serious	publication bias strongly suspected[b]	⨁◯◯◯ Very Low	77/335 (23.0%)	77/225 (34.2%)	OR 1.47 (0.89 to 2.43)	230 per 1.000	75 more per 1.000 (from 20 fewer to 191 more)	SEMS may increase adverse events rates compared to MPS but the evidence is very uncertain.

a. Study design. Non-RCTs mixed with RCTs included

b. Large CIs, crossing 1

c. Relative asymmetry in the Funnel plot

CI, confidence interval; OR, odds ratio

Supplementary Table 4 The precision of overall evidence effect and certainty

Patient or population: Post-liver transplant anastomotic biliary strictures

Intervention: SEMS

Comparison: MPS

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with MPS	Risk with SEMS				
Stricture resolution after completion of therapy	865 per 1.000	863 per 1.000 (754 to 928)	OR 0.99 (0.48 to 2.01)	687 (9 non-randomised studies)	⊕⊕⊕◯ Moderate[a]	SEMS likely do not reduce stricture resolution after completion of therapy compared to MPS.
Stricture recurrence during the follow-up period follow-up: range 3 months to 64 months	154 per 1.000	237 per 1.000 (136 to 380)	OR 1.71 (0.87 to 3.38)	687 (9 non-randomised studies)	⊕⊕◯◯ Low[a,b]	SEMS may result in a slight increase in stricture recurrence during the follow-up period.
Stent migration rates follow-up: range 3 months to 64 months	5.145 per 1.000	-1000 per 1.000 (-659 to 1.000)	OR 0.73 (0.32 to 1.68)	264 (7 non-randomised studies)	⊕⊕◯◯ Low[a,b]	SEMS may result in little to no difference in stent migration rates.
Adverse events rates follow-up: range 3 months to 064 months	230 per 1.000	305 per 1.000 (210 to 420)	OR 1.47 (0.89 to 2.43)	560 (8 non-randomised studies)	⊕⊕◯◯ Low[a,b]	SEMS may result in a slight increase in adverse events rates compared to MPS.

**The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI). CI, confidence interval; OR, odds ratio*

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

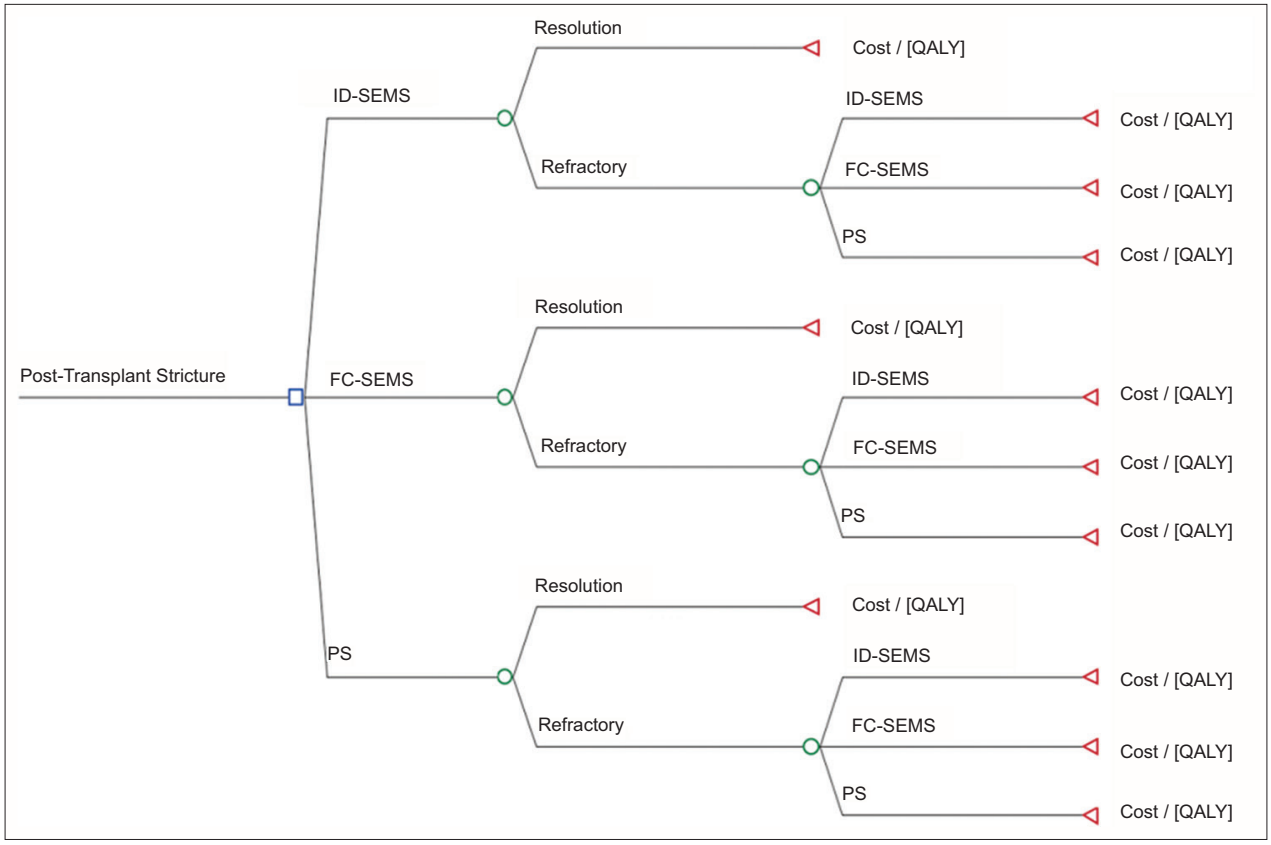
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. Study design. Non-RCTs mixed with RCTs included

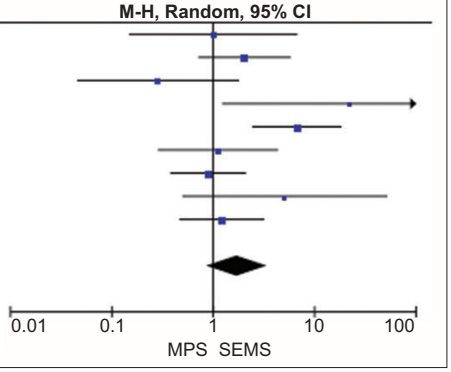
b. Relative asymmetry in the Funnel plot



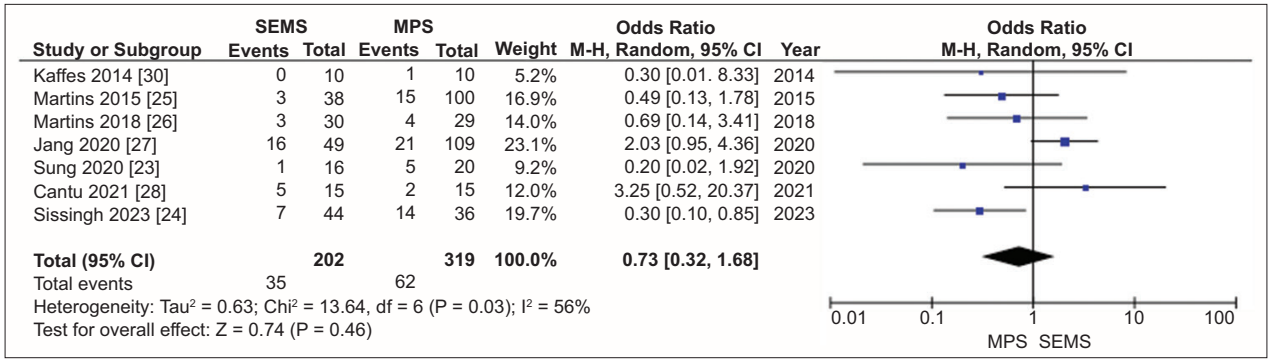
Supplementary Figure 1 Decision tree of the cost-effectiveness analysis
FC-SEMS, fully covered self-expandable metal stents; ID-SEMS, intraductal SEMS; PS, plastic stents; QALY, quality-adjusted life years

Study or Subgroup	SEMS Events	SEMS Total	MPS Events	MPS Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Kaffes 2014 [30]	3	10	3	10	8.0%	1.00 [0.15, 6.77]	2014
Martins 2015 [25]	7	38	10	100	14.6%	2.03 [0.71, 5.80]	2015
Zeair 2017 [22]	2	23	4	16	8.5%	0.29 [0.05, 1.80]	2017
Martins 2018 [26]	8	30	0	29	4.4%	22.29 [1.22, 406.89]	2018
Cantu 2018 [29]	11	26	10	101	14.9%	6.67 [2.42, 18.43]	2018
Sung 2020 [23]	6	16	7	20	11.7%	1.11 [0.28, 4.37]	2020
Jang 2020 [27]	9	49	22	109	16.4%	0,89 [0.38, 2.11]	2020
Cantu 2021 [28]	4	15	1	15	6.1%	5.09 [0.50, 52.29]	2021
Sissingh 2023 [24]	14	44	10	36	15.4%	1.21 [0.46, 3.19]	2023
Total (95% CI)		**251**		**436**	**100.0%**	**1.71 [0.87, 3.38]**	
Total events	64		67				

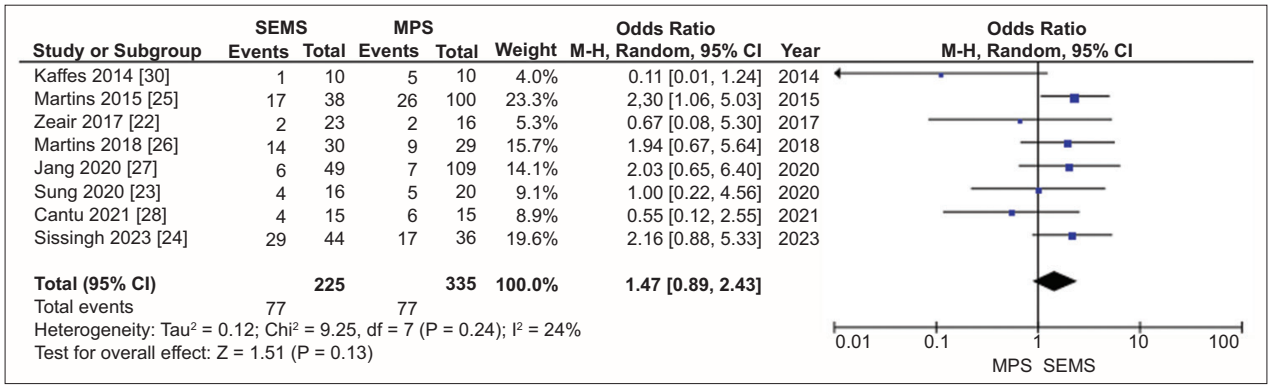
Heterogeneity: Tau² = 0.54; Chi² = 17.87, df = 8 (P = 0.02); I² = 55%
Test for overall effect: Z = 1.56 (P = 0.12)



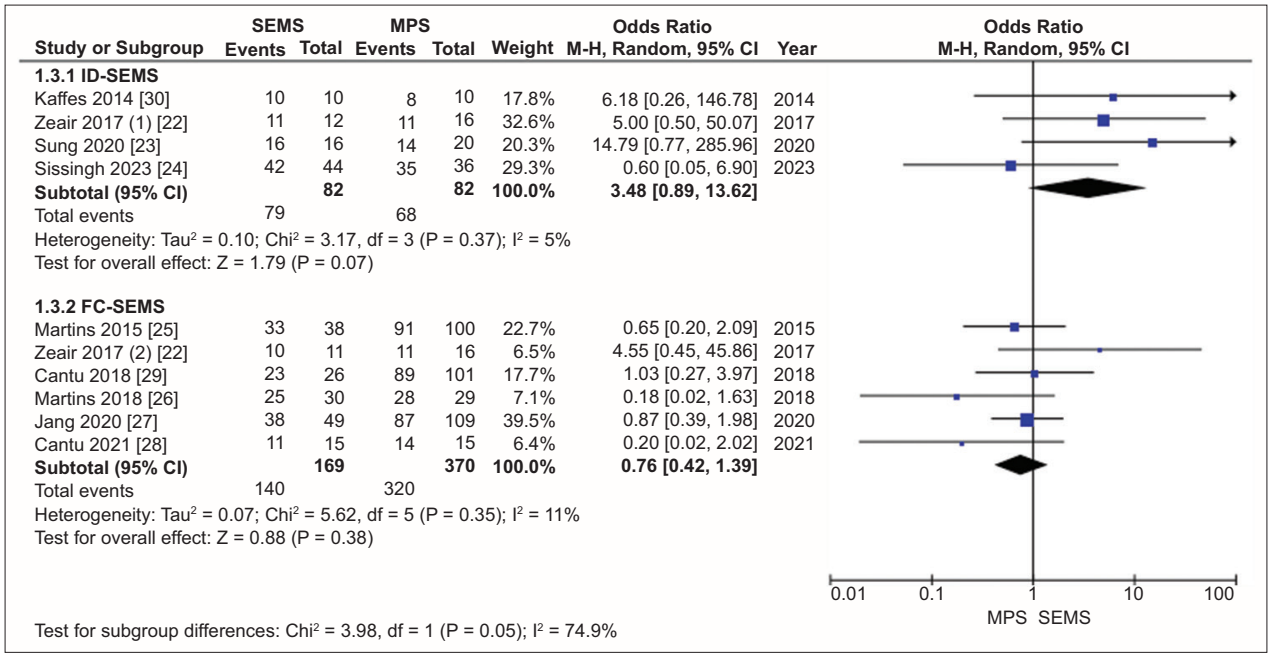
Supplementary Figure 2 Forest plot reporting the odds ratios of recurrence rates between SEMS and MPS
SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel



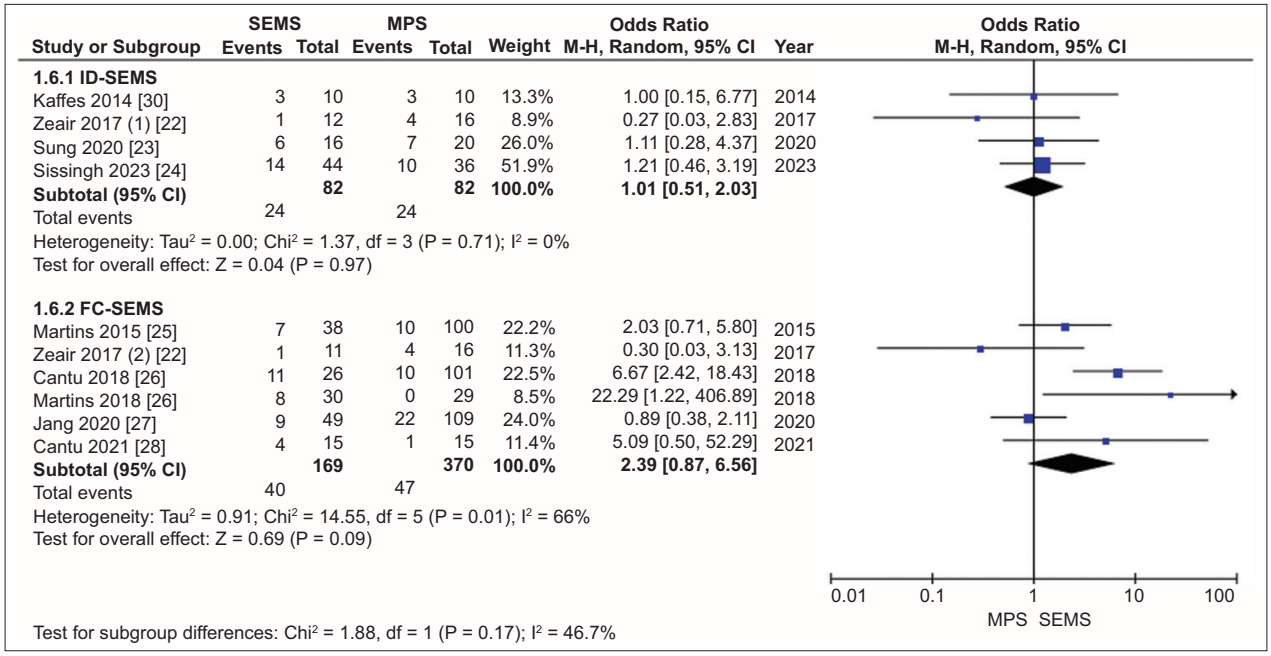
Supplementary Figure 3 Forest plot reporting the odds ratios of migration rates between SEMS and MPS
SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel



Supplementary Figure 4 Forest plot reporting the odds ratios of adverse events rates between SEMS and MPS
SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel

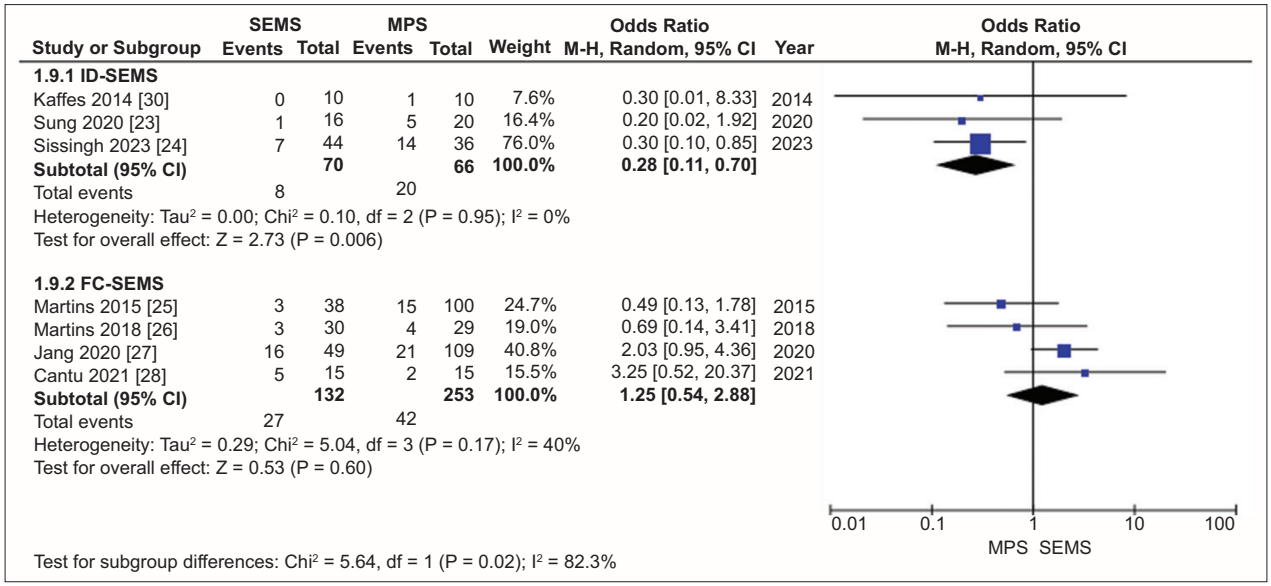


Supplementary Figure 5 Forest plot of the subgroup analysis (ID-SEMS and FC-SEMS) reporting the odds ratios of stricture resolution rates compared to MPS group
SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel; FC, fully covered; ID, intraductal



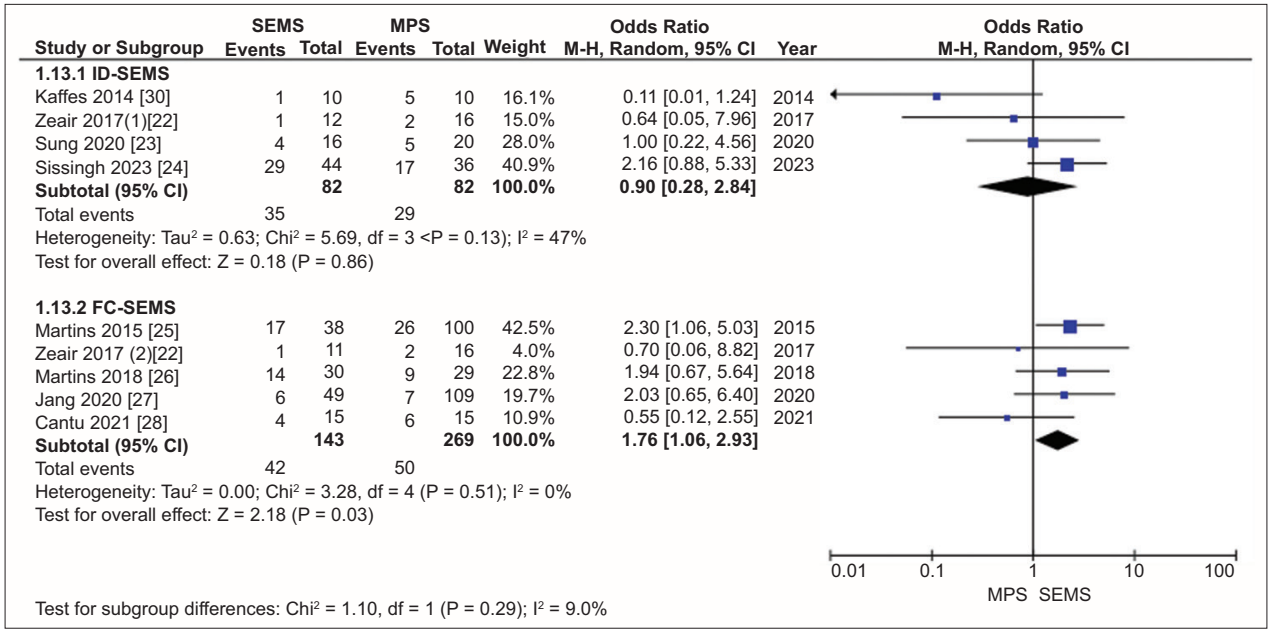
Supplementary Figure 6 Forest plot of the subgroup analysis (ID-SEMS and FC-SEMS) reporting the odds ratios of stricture recurrence rates compared to MPS group

SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel; FC, fully covered; ID, intraductal



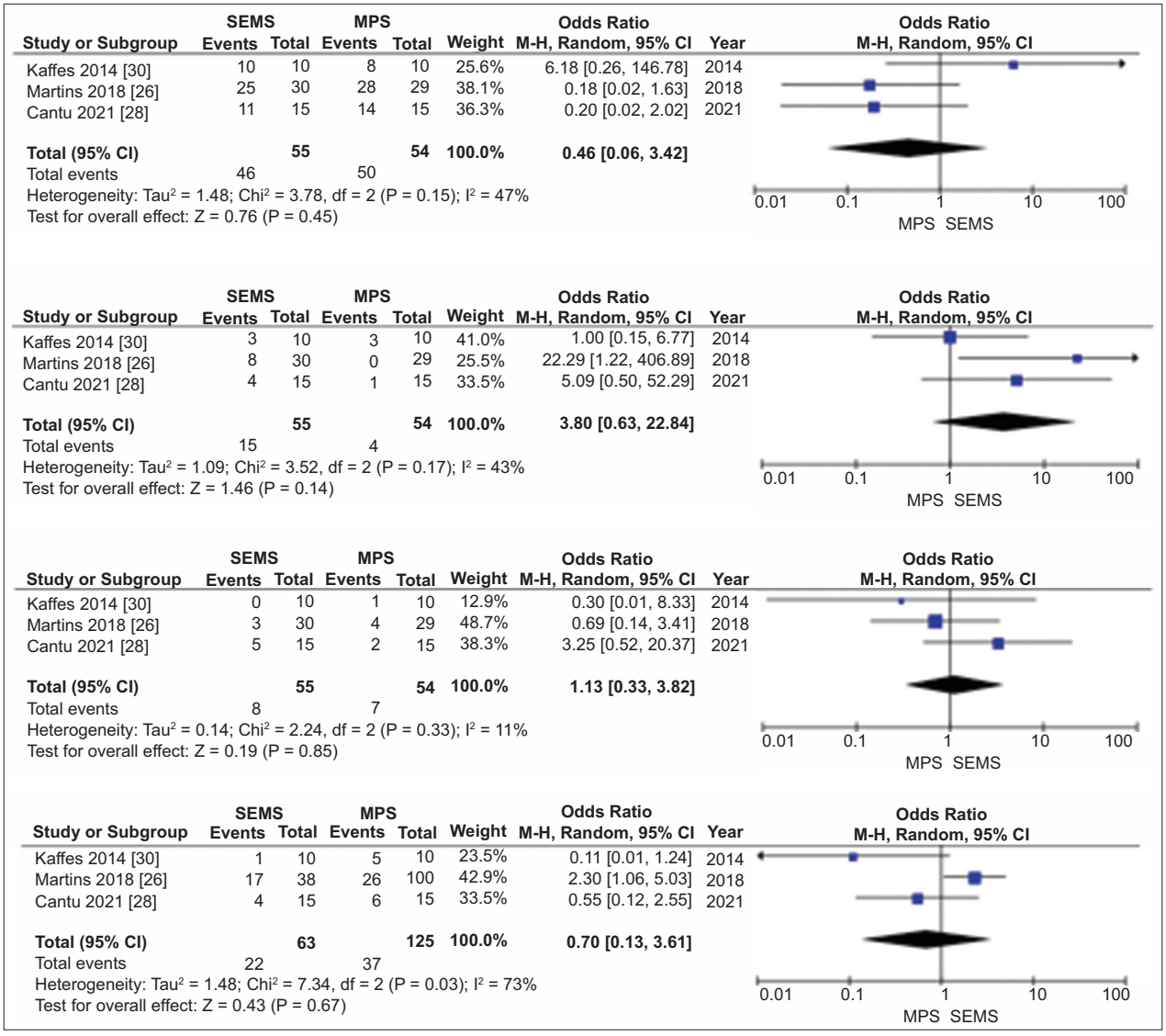
Supplementary Figure 7 Forest plot of the subgroup analysis (ID-SEMS and FC-SEMS) reporting the odds ratios of migration rates compared to MPS group

SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel; FC, fully covered; ID, intraductal



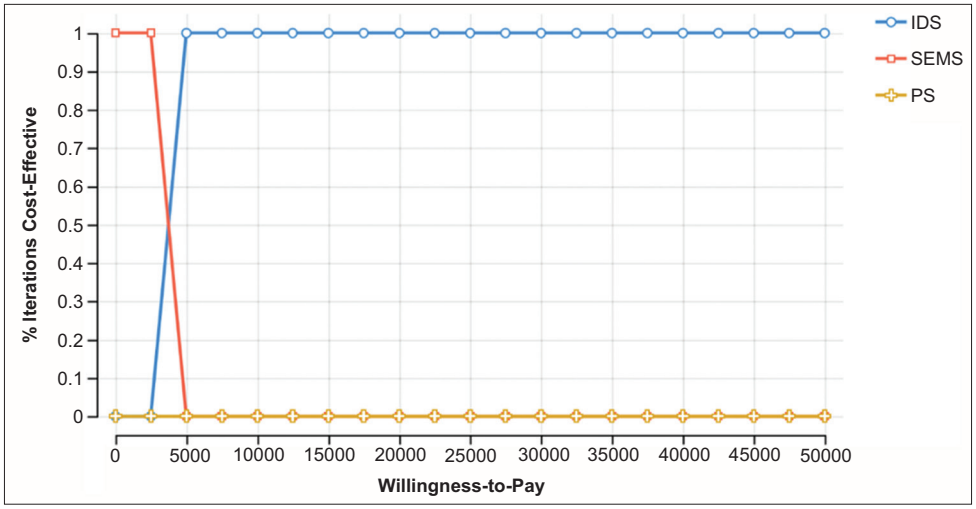
Supplementary Figure 8 Forest plot of the subgroup analysis (ID-SEMS and FC-SEMS) reporting the odds ratios of adverse event rates compared to MPS group

SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel; FC, fully covered; ID, intraductal

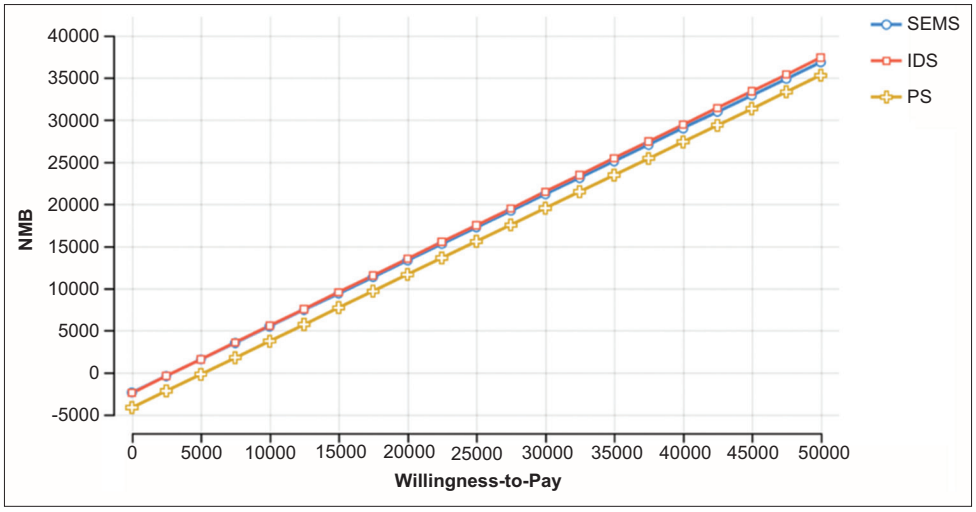


Supplementary Figure 9 Forest plots of the sensitivity analysis including RCTs and reporting the odds ratios of stricture resolution, recurrence, migration and adverse event rates between SEMS and MPS

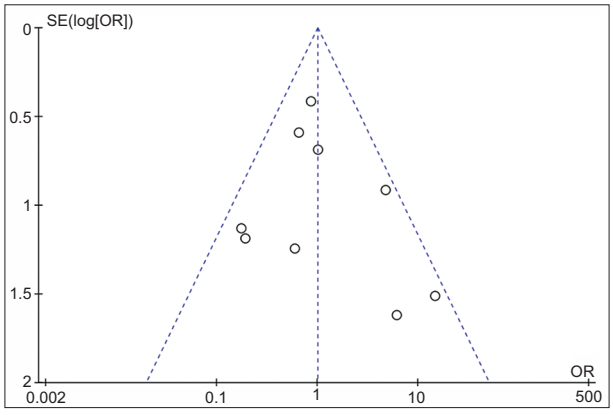
SEMS, fully covered self-expandable metal stents; MPS, multiple plastic stents; CI, confidence interval; M-H, Mantel-Haenszel



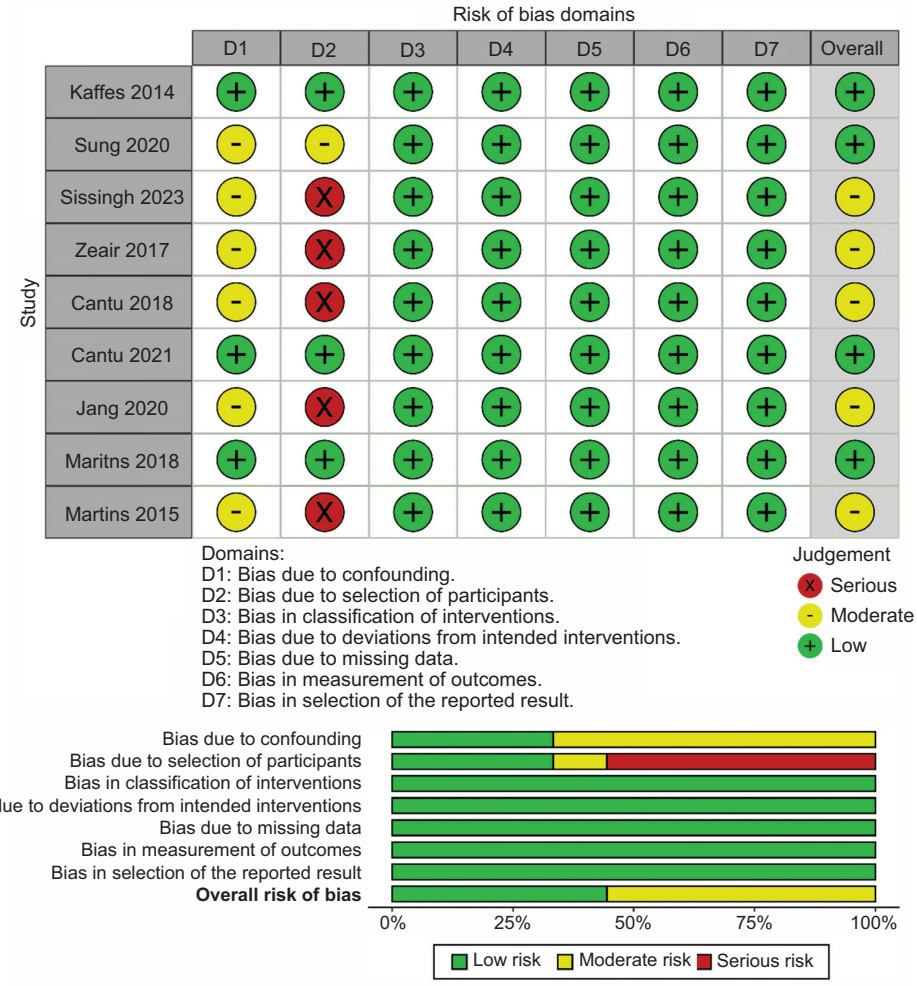
Supplementary Figure 10 The cost-effectiveness acceptability curve
SEMS, fully covered self-expandable metal stents; PS, plastic stents; IDS, intraductal stents



Supplementary Figure 11 Graph showing the net monetary benefit across a range of willingness-to-pay
SEMS, fully covered self-expandable metal stents; PS, plastic stents; IDS, intraductal stents



Supplementary Figure 12 Funnel plot illustrating the absence of publication bias of the analysis concerning the primary outcome
SE, standard error; OR, odds ratio



Supplementary Figure 13 Risk of bias assessment according to the ROBINS-I tool