

Cost-Effectiveness of a bone transplant fixation „SHARK SCREW” transplamt compared to metal devices in osteosynthesis in Austria

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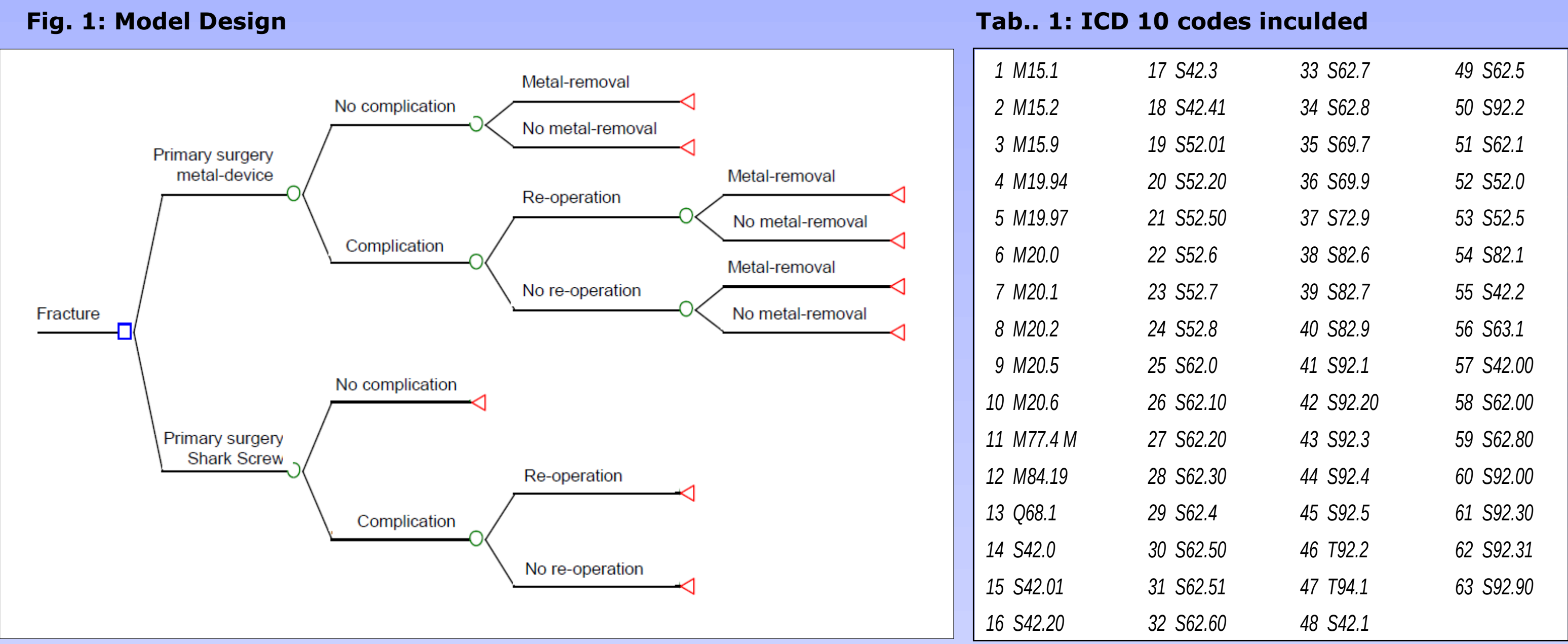
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Background:

Fractures are a considerable public-health burden in Austria. In 2014, 41,831 hospital stays needing osteosynthesis were recorded in public hospitals. Implantable devices made of metal are regarded as the “gold standard”. Predominantly, it is necessary that metal is removed following bone-healing in a second operation (35% in total; between 9% and 60% depending on fracture according ICD10), which puts pressure on the operation room capacity. Postoperative complications like infection, bleeding, diminished wound healing, etc. also occur. Bone-transplant-fixation „SHARK SCREW”-transplant is able to reduce problems associated with metal-devices. The aim of the present study was to compare the cost-effectiveness between bone-transplant fixations and metal-devices.

Methods:

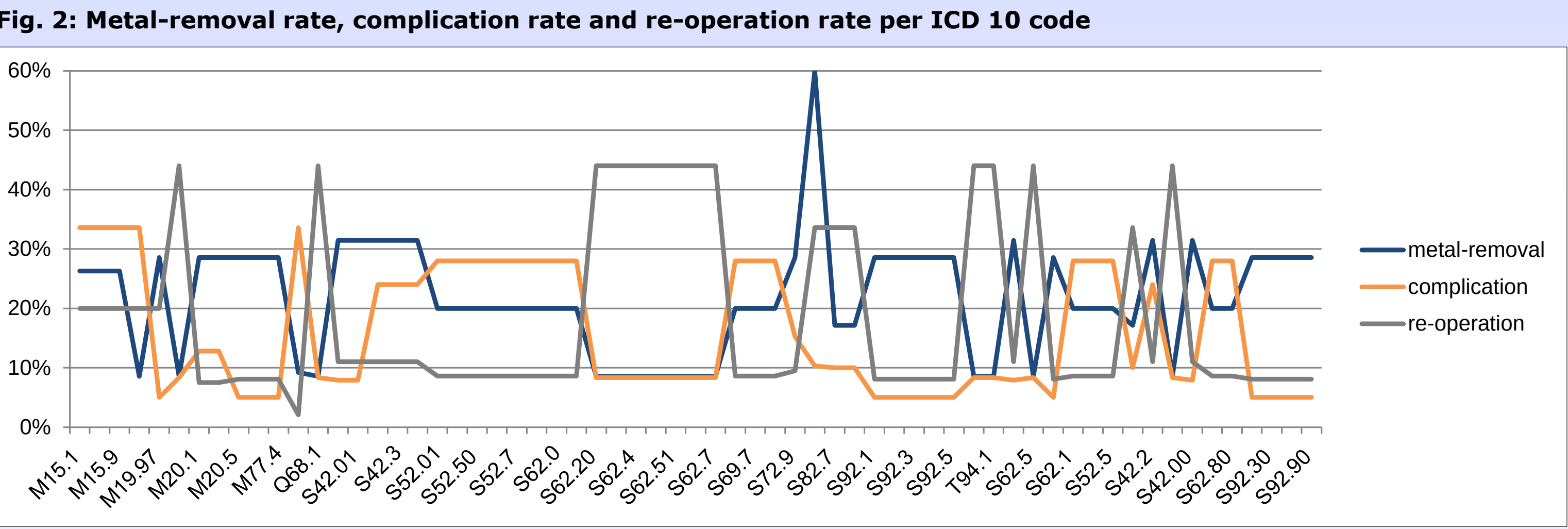
The analysis is based on a representative cohort of 28,139 (67.3%) patients in 63 ICD10 (3 and 4 digits), which represent the target population. For the target population substitution from a metal-device to bone-transplant fixations is feasible. We developed a two arm decision-analytic model. One arm of the model assessed the costs and consequences of osteosynthesis with metal-device, while the other one evaluated the bone-transplant fixations „SHARK SCREW”. The model includes resource-use and costs for the primary surgery, metal removal, complications and re-operations. Health benefits were measured in complications saved (including re-operations). Complication and re-operation rates derived via systematic-literature-review were included for each ICD10 category. Costs were presented per patient and for the total included cohort. Costs from published sources were used (2016 Euro) from the health-care system’s perspective. Costs were projected over a one-year time-horizon. A one-way deterministic sensitivity-analysis accounts for uncertainty.



Source: own developed

Clinical Data

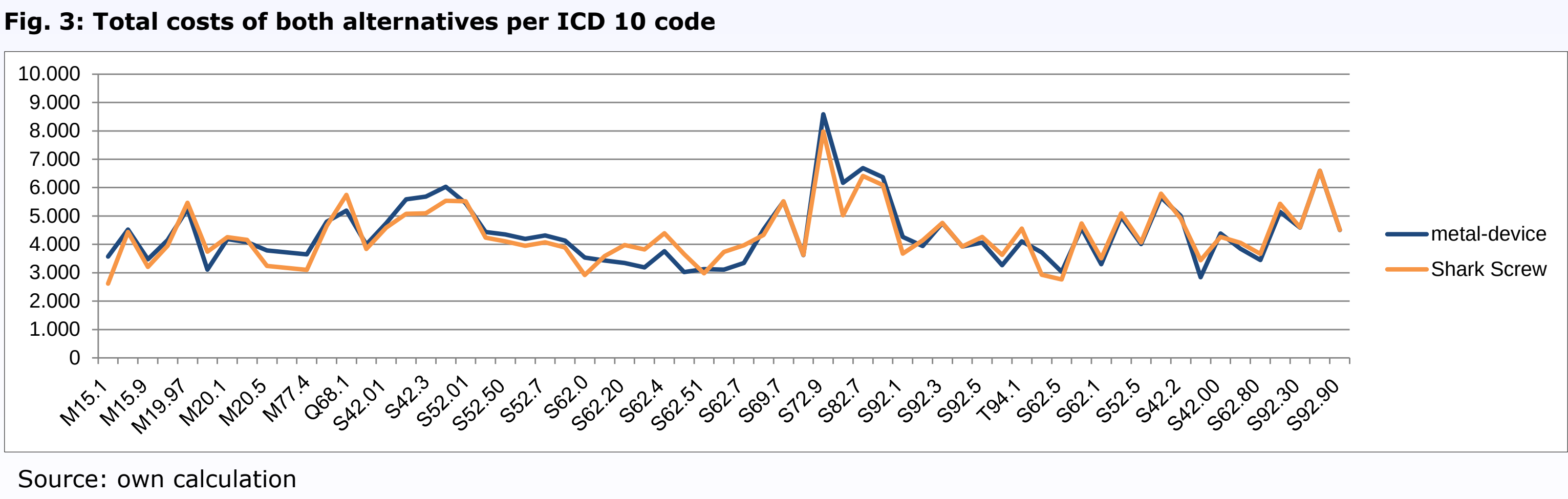
A literature search was undertaken in the databases Medline, Embase and SciSearch in May 2016. To identify targeted literature following search terms were used: “osteosynthesis” AND “metal-removal ” AND “complication” AND “re-operation”. Additionally, a manual search was conducted. The search yielded 42 studies; 17 were included.



Source: literature review

Resource Use and Costs

Data on the resource use (screws, plates and spikes or SHARK SCREW), the hospital length of stay of the primary surgery, metal removal and follow-up costs like infections, bleedings, diminished wound healing, etc. of complications and re-operations were derived from the Austrian DRG statistics, the literature as well as were validated by experts. Direct medical costs derived from a number of publicly available sources like the DRG catalogue (LKF) and the Austrian pharmaceutical price lists. All costs were collected for the year 2016.



Source: own calculation

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Results:

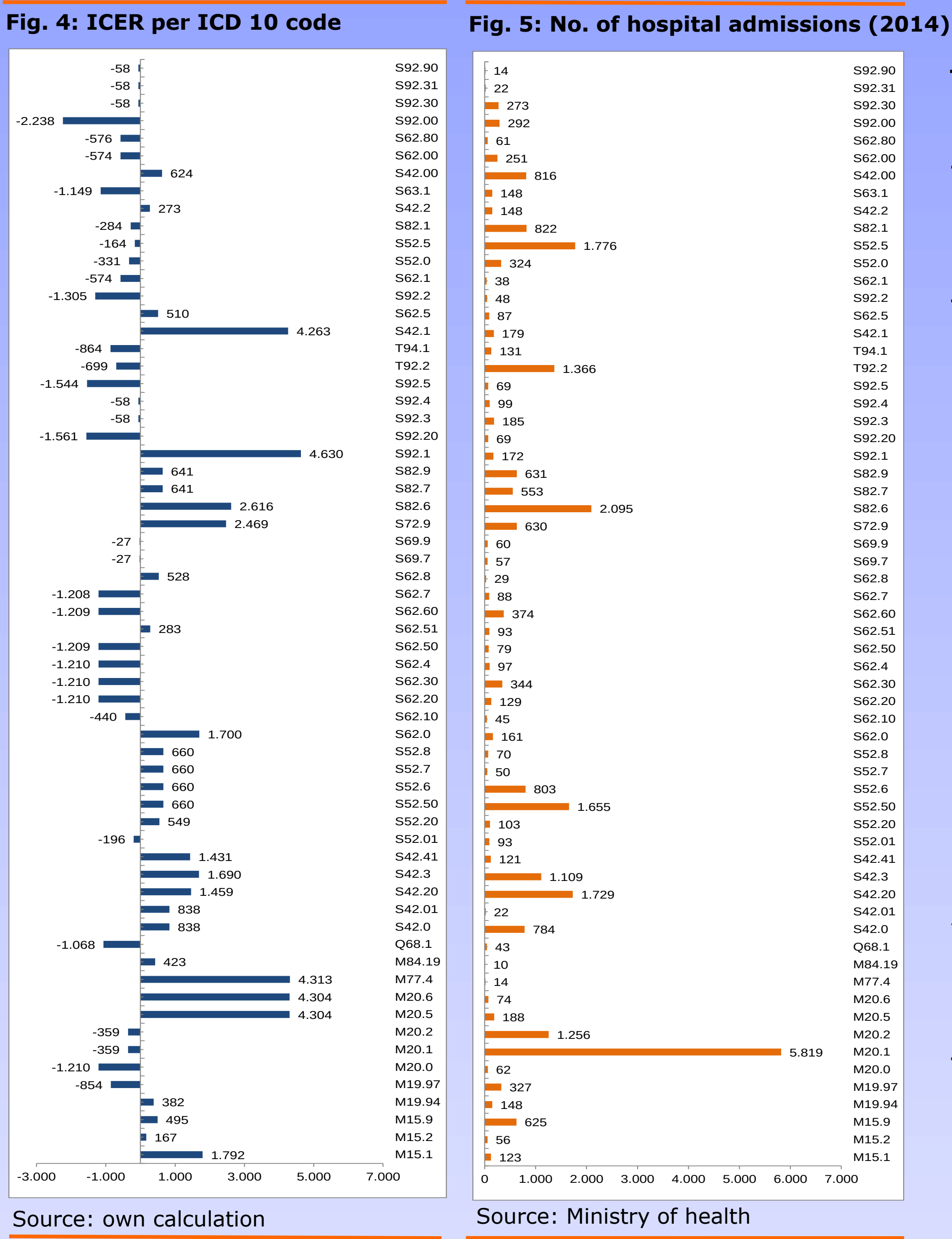
Austrian costs associated with metal-devices amount to €130.5 million for the total cohort (n=28,139) or €4,638 per patient in average. 9,241 complications (including re-operations) are recorded corresponding to an average of 0.33 events per patient. Using the „SHARK SCREW”-transplant instead, would lead to a decrease of health care costs by 3.9 million, but with an improved cost-recovery by DRG-system.

Tab. 2: Results, 2016

Cost components	Total cohort		Per patient (weighted average)	
	Metal-devices	Shark Screw	Metal-devices	Shark Screw
Primary surgery	103.377,382,53	126.429.115,47	3.673,81	4.493,02
Metal-removal	20.121.206,36		715,06	
Re-operations	2.381.501,21	0,00	84,63	0,00
Complication	4.615.200,47	99.407,62	164,01	3,53
Total costs	130.495.290,56	126.528.523,10	4.637,52	4.496,55
Cost difference		-3.966.767,47		-140,97
Outcomes				
Number of complications and re-operations	9.241	98	0,33	0,003
Complications and re-operations in %	32,8%	0,3%	32,8%	0,3%
Complication-free	67,2%	99,7%	67,2%	99,7%
Complication difference		0,32		0,32
Costs per complication-free patients	194.307.285,77	126.969.389,03	6.905,27	4.512,22
ICER				-433,84

Source: own calculations

The disaggregated ICERs per ICD 10 code were presented in figure 4. Figure 5. displays the number of hospital admissions in the year 2014 in Austria

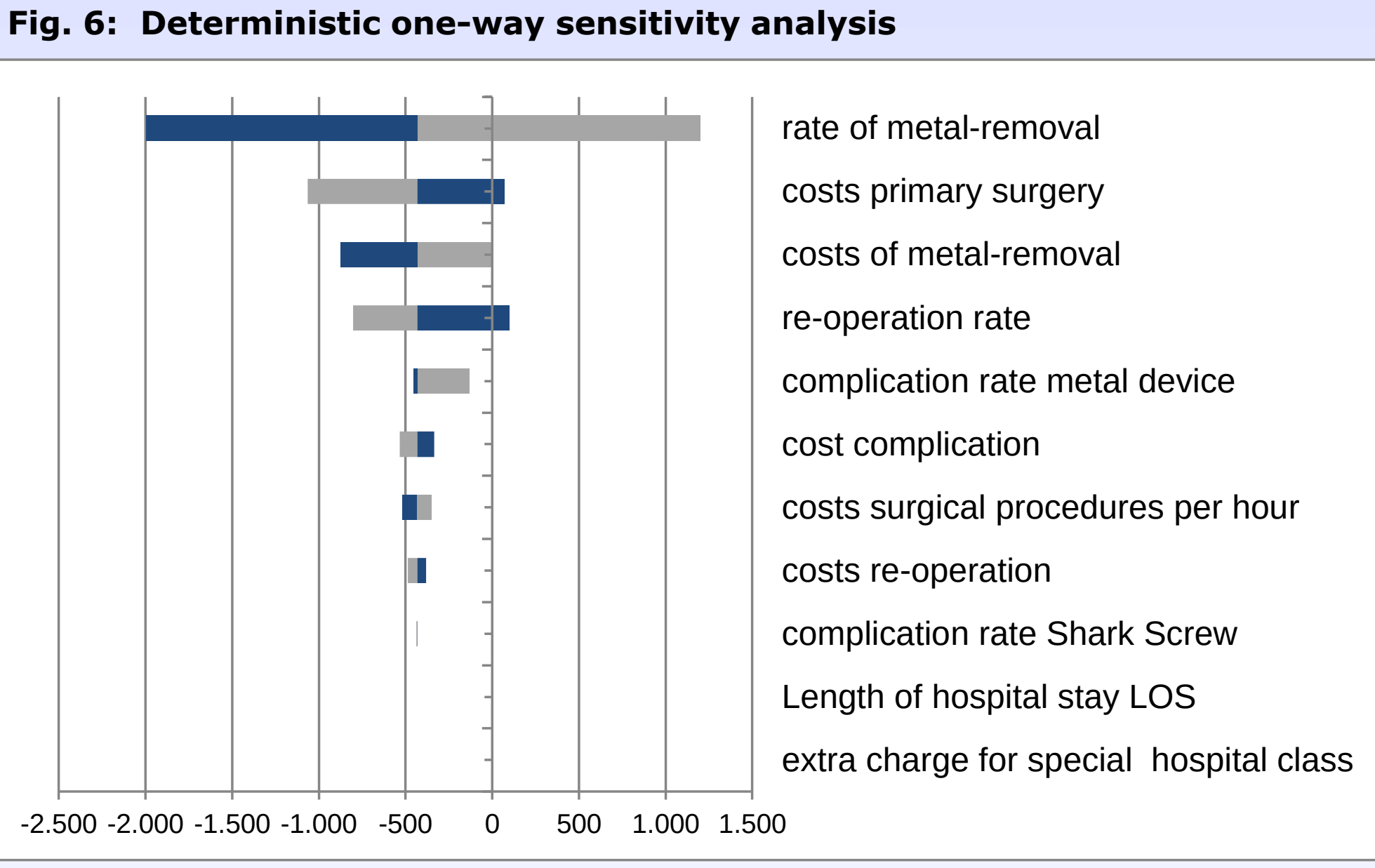


Source: own calculation

Source: Ministry of health

Sensitivity Analysis

In the deterministic one-way sensitivity analyses (Figure 6), our weighted average results were robust to a wide range of variations.



Source: own calculation

Conclusion:

The great advantage for the patient is, that the Shark Screw transplant does not need to be removed and the patient does not need second surgery, as well as escaping all additional risks that come with surgery. Using bone-transplant fixation saves money in the Austrian health care system and leads to a higher degree of cost recovery in the hospital setting.

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Additional Literature with the author