Supplementary Material

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Supplementary Material Table S1: Baseline characteristics in low-, intermediate- and high-volume centers performing renal surgeries.

Characteristic	**Overall**, n 1 57,308	**Partial nephrectomy**, n = 17,108	**Radical nephrectomy**, n = 40,200	**p-value**
Age (years)	68 (58-76)	68 (57-74)	68 (58-76)	**<0.001**
Males	32,794 (57%)	10,391 (61%)	22,403 (56%)	**<0.001**
Diabetes	10,933 (19%)	3,172 (19%)	7,761 (19%)	**0.034**
Chronic heart failure	4,856 (8.5%)	1,171 (6.8%)	3,685 (9.2%)	**<0.001**
Chronic obstructive pulmonary disease	4,569 (8.0%)	1,342 (7.8%)	3,227 (8.0%)	0.47
Chronic kidney disease	11,743 (20%)	2,433 (14%)	9,310 (23%)	**<0.001**
Cerebrovascular disease	1,593 (2.8%)	341 (2.0%)	1,252 (3.1%)	**<0.001**
Dementia	941 (1.6%)	143 (0.8%)	798 (2.0%)	**<0.001**
Hypertension	33,546 (59%)	10,186 (60%)	23,360 (58%)	**0.002**
Obesity	6,159 (11%)	1,884 (11%)	4,275 (11%)	0.19
Operative technique				**<0.001**
Open	51,464 (90%)	14,903 (87%)	36,561 (91%)	
Laparoscopic	4,925 (8.6%)	1,528 (8.9%)	3,397 (8.5%)	
Robotic	919 (1.6%)	677 (4.0%)	242 (0.6%)	

Supplementary Material Table S1A: Baseline characteristics of the included patients based on the type of renal cancer surgery in low-volume centers. Variables are presented as median with interquartile range or frequencies with proportions. The Mann-Whitney test was performed for comparisons between continuous variables and the chi-squared test for categorical variables. The bold cells indicate statistically significant p-values.

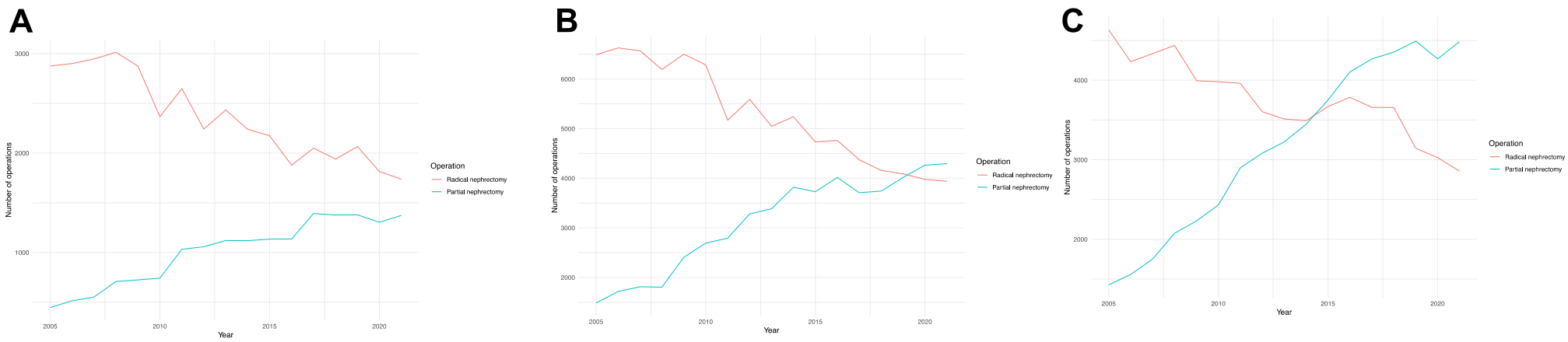
Characteristic	**Overall**, n = 142,702	**Partial nephrectomy**, n = 52,966	**Radical nephrectomy**, n = 89,736	**p-value**
Age (years)	67 (57-75)	66 (57-74)	68 (57-76)	**<0.001**
Males	83,733 (59%)	32,700 (62%)	51,033 (57%)	**<0.001**
Diabetes	26,696 (19%)	9,683 (18%)	17,013 (19%)	**0.002**
Chronic heart failure	9,276 (6.5%)	2,548 (4.8%)	6,728 (7.5%)	**<0.001**
Chronic obstructive pulmonary disease	10,817 (7.6%)	3,895 (7.4%)	6,922 (7.7%)	**0.013**
Chronic kidney disease	29,433 (21%)	7,369 (14%)	22,064 (25%)	**<0.001**
Cerebrovascular disease	3,620 (2.5%)	1,009 (1.9%)	2,611 (2.9%)	**<0.001**
Dementia	1,879 (1.3%)	343 (0.6%)	1,536 (1.7%)	**<0.001**
Hypertension	82,427 (58%)	31,104 (59%)	51,323 (57%)	**<0.001**
Obesity	14,845 (10%)	5,564 (11%)	9,281 (10%)	0.34
Operative technique				**<0.001**
Open	113,349 (79%)	39,619 (75%)	73,730 (82%)	
Laparoscopic	21,358 (15%)	7,102 (13%)	14,256 (16%)	
Robotic	7,995 (5.6%)	6,245 (12%)	1,750 (2%)	

Supplementary Material Table S1B: Baseline characteristics of the included patients based on the type of renal cancer surgery in intermediate-volume centers. Variables are presented as median with interquartile range or frequencies with proportions. The Mann-Whitney test was performed for comparisons between continuous variables and the chi-squared test for categorical variables. The bold cells indicate statistically significant p-values

Characteristic	**Overall**, n = 117,833	**Partial nephrectomy**, n = 53,850	**Radical nephrectomy**, n = 63,983	**p-value**
Age (years)	65 (54-73)	64 (55-72)	65 (54-73)	**0.009**
Males	71,596 (61%)	34,026 (63%)	37,570 (59%)	**<0.001**
Diabetes	19,526 (17%)	8,464 (16%)	11,062 (17%)	**<0.001**
Chronic heart failure	6,008 (5.1%)	2,003 (3.7%)	4,005 (6.3%)	**<0.001**
Chronic obstructive pulmonary disease	7,756 (6.6%)	3,457 (6.4%)	4,299 (6.7%)	**0.04**
Chronic kidney disease	24,429 (21%)	6,578 (12%)	17,851 (28%)	**<0.001**
Cerebrovascular disease	2,394 (2.0%)	776 (1.4%)	1,618 (2.5%)	**<0.001**
Dementia	869 (0.7%)	207 (0.4%)	662 (1.0%)	**<0.001**
Hypertension	63,413 (54%)	29,092 (54%)	34,321 (54%)	0.19
Obesity	11,004 (9.3%)	4,936 (9.2%)	6,068 (9.5%)	0.06
Operative technique				**<0.001**
Open	84,520 (72%)	34,705 (64%)	49,815 (78%)	
Laparoscopic	18,711 (16%)	6,898 (13%)	11,813 (18%)	
Robotic	14,602 (12%)	12,247 (23%)	2,355 (3.7%)	

Supplementary Material Table S1C: Baseline characteristics of the included patients based on the type of renal cancer surgery in high-volume centers. Variables are presented as median with interquartile range or frequencies with proportions. The Mann-Whitney test was performed for comparisons between continuous variables and the chi-squared test for categorical variables. The bold cells indicate statistically significant p-values.

Supplementary Material Figure S1: Annual trends in low-, intermediate- and high-volume centers performing renal surgeries



Supplementary Material Figure S1: The annual trends for radical and partial nephrectomy in low- (2A), intermediate- (2B), and high-volume centers (2C).

Supplementary Material Table S2: Regression analysis in low-, intermediate- and high-volume centers performing renal surgeries.

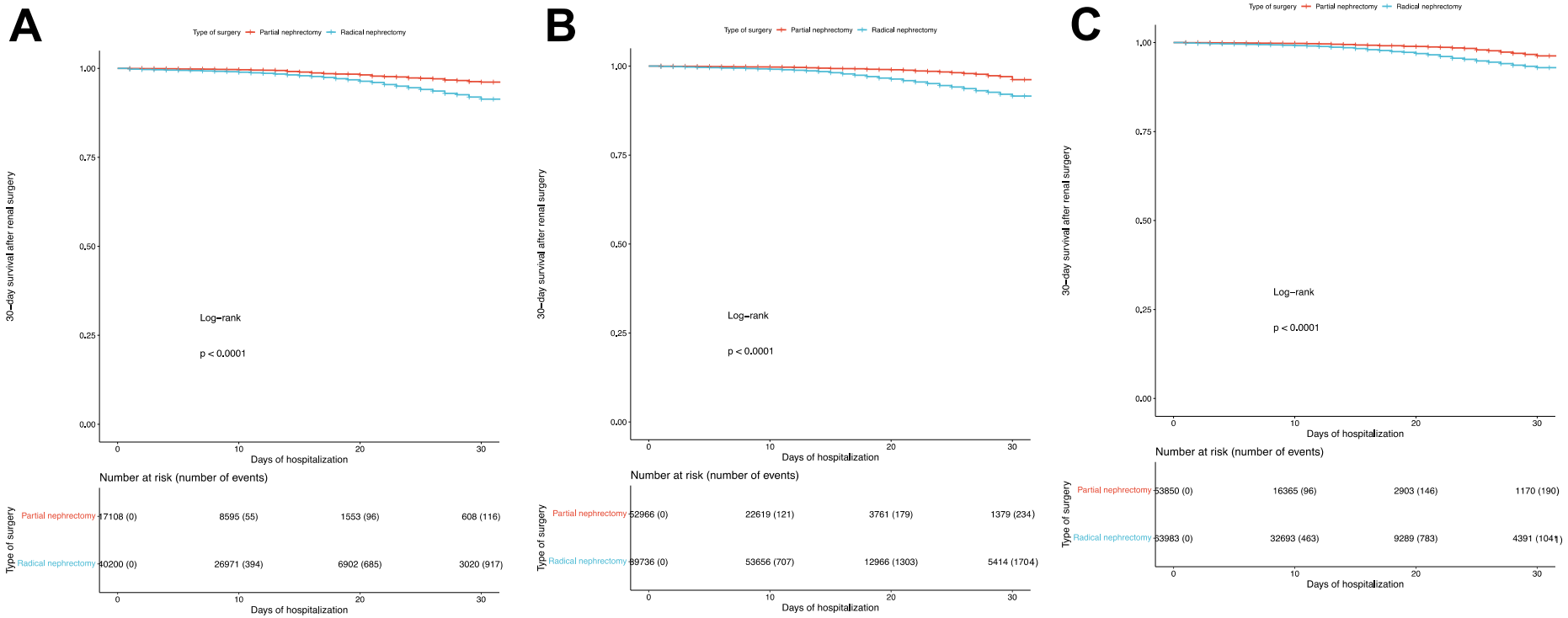
		Transfusion			Sepsis			Acute respiratory failure			Acute kidney disease			Acute thromboembolism			Surgical wound infection		
Annual caseload	**Surgery**	**Events**	**OR**	**p-value**	**Events**	**OR**	**p-value**	**Events**	**OR**	**p-value**	**Events**	**OR**	**p-value**	**Events**	**OR**	**p-value**	**Events**	**OR**	**p-value**
Low-volume centers (<40)	Partial nephrectomy	2,487 (15%)	—	—	226 (1.3%)	—	—	969 (5.7%)	—	—	768 (4.5%)	—	—	76 (0.4%)	—	—	82 (0.5%)	—	—
	Radical nephrectomy	10,243 (25%)	1.7 (1.6, 1.8)	**<0.001**	1,274 (3.2%)	2.2 (1.9, 2.56)	**<0.001**	2,595 (6.5%)	1.3 (1.2, 1.4)	**<0.001**	2,397 (6%)	1.6 (1.5, 1.7)	**<0.001**	303 (0.8%)	1.7 (1.3, 2.2)	**<0.001**	328 (0.8%)	1.5 (1.2, 2)	**<0.001**
Intermediate-volume centers (40-99)	Partial nephrectomy	6,375 (12%)	—	—	550 (1%)	—	—	2,136 (4%)	—	—	2,293 (4.3%)	—	—	219 (0.4%)	—	—	188 (0.4%)	—	—
	Radical nephrectomy	21,232 (24%)	1.9 (1.9, 2)	**<0.001**	2,675 (3%)	2.5 (2.3, 2.8)	**<0.001**	4,902 (5.5%)	1.5 (1.4, 1.6)	**<0.001**	5,376 (6.0%)	1.6 (1.5, 1.7)	**<0.001**	711 (0.8%)	2 (1.7, 2.3)	**<0.001**	635 (0.7%)	1.9 (1.6, 2.2)	**<0.001**
High-volume centers (≥100)	Partial nephrectomy	6,453 (12%)	—	—	484 (0.9%)	—	—	1,343 (2.5%)	—	—	1,924 (3.6%)	—	—	335 (0.6%)	—	—	121 (0.2%)	—	—
	Radical nephrectomy	17,694 (28%)	2.3 (2.2, 2.4)	**<0.001**	2,069 (3.2%)	2.9 (2.6, 3.2)	**<0.001**	2,941 (4.6%)	1.8 (1.7, 2)	**<0.001**	3,635 (5.7%)	1.6 (1.5, 1.7)	**<0.001**	788 (1.2%)	2 (1.8, 2.3)	**<0.001**	406 (0.6%)	2.4 (2, 3)	**<0.001**

Supplementary Material Table S2A: Multivariable logistic regression analysis in low-, intermediate- and high-volume centers for partial and radical nephrectomy on transfusion, sepsis, acute respiratory failure, acute kidney disease, acute thromboembolism, and surgical wound infection. All models are adjusted for sex, age, obesity, history of chronic obstructive pulmonary disease, chronic heart failure, chronic kidney disease, cerebrovascular accident, hypertension, diabetes, surgical approach, and year of operation. The bold cells indicate statistically significant p-values. OR: odds ratio.

		Ileus			30-day mortality			ICU admission			Length of hospital stay			Costs			Pancreatitis		
Annual caseload	**Surgery**	**Events**	**OR**	**p-value**	**Events**	**Euros**	**Beta**	**Euros**	**Beta**	**Euros**	**Beta**	**Beta**	**p-value**	**Euros**	**Beta**	**p-value**	**Events**	**OR**	**p-value**
Low-volume centers (<40)	Partial nephrectomy	317 (1.9%)	—	—	116 (0.7%)	—	—	3,398 (20%)	—	—	10 (8-12)	—	—	7,087 (6,332-8,408)	—	—	39 (0.2%)	—	—
	Radical nephrectomy	947 (2.4%)	1.2 (1.1, 1.4)	**0,001**	917 (2.3%)	2.8 (2.3, 3.5)	**<0.001**	8,899 (22%)	1 (0.98, 1.1)	0,2	11 (9-16)	1.8 (1.6, 2)	**<0.001**	7,311 (6,320-10,252)	1,607 (1,400, 1,814)	**<0.001**	147 (0.4%)	1.6 (1.1, 2.3)	**0,013**
Intermediate-volume centers (40-99)	Partial nephrectomy	709 (1.3%)	—	—	234 (0.4%)	—	—	9,348 (18%)	—	—	9 (7, 11)	—	—	7,087 (6,500-8,145)	—	—	73 (0.1%)	—	—
	Radical nephrectomy	1,725 (1.9%)	1.4 (1.3, 1.5)	**<0.001**	1,704 (1.9%)	3.6 (3.1, 4.1)	**<0.001**	19,537 (22%)	1.1 (1, 1.1)	**<0.001**	11 (8, 15)	1.5 (1.4, 1.6)	**<0.001**	7,314 (6,472-10,252)	1,398 (1,289, 1,507)	**<0.001**	222 (0.2%)	1.6 (1.2, 2.1)	**0,001**
High-volume centers (≥100)	Partial nephrectomy	597 (1.1%)	—	—	190 (0.4%)	—	—	7,370 (14%)	—	—	8 (6, 10)	—	—	7,087 (6,544-7,920)	—	—	54 (0.1%)	—	—
	Radical nephrectomy	1,231 (1.9%)	1.4 (1.3, 1.6)	**<0.001**	1,041 (1.6%)	3.7 (3.2, 4.4)	**<0.001**	12,919 (20%)	1.5 (1.5, 1.6)	**<0.001**	10 (7, 14)	2.3 (2.2, 2.5)	**<0.001**	7,664 (6,768-10,946)	2,415 (2,261, 2,570)	**<0.001**	267 (0.4%)	3.4 (2.5, 4.6)	**<0.001**

Supplementary Material Table S2B: Multivariable logistic regression analysis in low-, intermediate- and high-volume centers for partial and radical nephrectomy on ileus, 30-day mortality, ICU admission, length of hospital stay, costs, and pancreatitis. All models are adjusted for sex, age, obesity, history of chronic obstructive pulmonary disease, chronic heart failure, chronic kidney disease, cerebrovascular accident, hypertension, diabetes, surgical approach, and year of operation. The bold cells indicate statistically significant p-values. ICU: intensive care unit, OR: odds ratio.

Supplementary Material Figure S2: 30-day survival in low-, intermediate- and high-volume centers performing renal surgeries.



Supplementary Material Figure S2: Kaplan-Maier curve for the 30-day survival in patients undergoing radical versus partial nephrectomy in low- (4A), intermediate- (4B), and high-volume centers (4C).