

Supplementary Online Content

Welch HG, Skinner JS, Schroeck FR, Zhou W, Black WC. Regional variation of computed tomographic imaging in the United States and the risk of nephrectomy. *JAMA Intern Med*. Published online December 26, 2017. doi:10.1001/jamainternmed.2017.7508

eTable 1. Current Procedural Terminology (CPT) codes

eMethods. Sensitivity of findings to the choice of population

eTable 2. 30- and 90-day operative case-fatality

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This supplementary material has been provided by the authors to give readers additional information about their work.

**Regional Prevalence of CT Imaging
and the Risk of Nephrectomy**

Online-Only Supplements

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eTable 1:
Current Procedural Terminology (CPT) codes used for the analysis:

Procedure Name <i>(or grouping)</i>	CPT codes
<i>Exposure</i>	
Thoracoabdominal CT	71250 – 71275 (Chest) 74150 – 74178 (Abdomen)
<i>Outcomes</i>	
Total Nephrectomy	50220, 50225, 50230, 50234, 50236, 50545, 50546, 50548
Partial Nephrectomy	50240, 50543
Any Nephrectomy	50220, 50225, 50230, 50234, 50236, 50240, 50543, 50545, 50546, 50548
Renal Ablation	50250, 50542, 50592, 50593
Any Renal Procedure	50220, 50225, 50230, 50234, 50236, 50240, 50250, 50542, 50543, 50545, 50546, 50548, 50592, 50593

eMethods:

Sensitivity of findings to the choice of population

Because of our interest in determining the risk of imaging over 5-years, we analyzed the population of Medicare beneficiaries that were alive for the entire 5-year period (January 1, 2010 through December 31, 2014). In this section, we explore the potential effect of this restriction on our findings.

Our primary analysis of the risk of thoracoabdominal imaging was conditioned on being alive – producing a 5-year risk of 43%. We chose not to include beneficiaries who died during the period because we suspected that beneficiaries would experience an increased risk of imaging towards the end of life (e.g. last 6 months of life). In fact, the unconditional risk (i.e. including those who died) of thoracoabdominal imaging was 47%.

However, the conditional (alive only) and unconditional (all) risks of imaging were highly correlated across the HRRs ($r = 0.99$). So too were the conditional and unconditional risks of nephrectomy ($r = 0.95$) and any renal procedure ($r = 0.95$). Therefore, it is not surprising that our major correlation analyses were not sensitive to how the population was specified – as shown in the table below:

Effect of population specification (alive only vs. all) on major correlation analyses

	Any Nephrectomy		Any Renal Procedure	
	Alive Only	All	Alive Only	All
CT prevalence (Alive Only)	.38	.39	.46	.46
CT prevalence (All)	.38	.39	.45	.45

Because including those at the end of life slightly raises the risk of imaging – yet also includes those who face a lower risk of major renal procedures because they were at the end of life – we would argue that the ideal population specification for the imaging risk would be those who were alive for 5 years. At the same time, we would argue that the ideal population specification for the procedure risk would include those who died – because some died because of the procedure.

But these turn out to be theoretical arguments; practically, the population specification has no meaningful impact on our results. The table on the following page recreates the table in the main article (based on alive only population) while superimposing our theoretical ideal population (alive only population for imaging, all for procedures) in red.

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Correlations between imaging prevalence and renal procedures with sensitivity to population specification.

Black: alive only population (reported in article)

Red: alive only population for imaging/all for procedures

Correlation between imaging prevalence and	Level of Restriction		
	None (all HRRs) [n=306]	HRRs >20,000 [n=229]	HRRs >50,000 [n=104]
Total Nephrectomy	.28	.31	.34
	.32	.36	.39
Partial Nephrectomy*	.28	.28	.30
	.25	.26	.27
Any Nephrectomy	.38	.41	.47
	.39	.42	.47
Renal Ablation†	.18	.20	.25
	.18	.19	.23
Any Renal Procedure	.46	.49	.56
	.46	.49	.53

* Partial nephrectomies were performed in 270 of the 306 HRRs and in 222 of the 229 HRRs with over 20,000 beneficiaries. Partial nephrectomies were performed in all HRRs with over 50,000 beneficiaries.

† Renal ablations were performed in 221 of the 306 HRRs, in 197 of 229 HRRs with over 20,000 beneficiaries, and in 103 of the 104 HRRs with over 50,000 beneficiaries.

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eTable 2:
30- and 90-day operative case-fatality for each procedure (or grouping):

Procedure	Count	Operative Case-Fatality	
		30-day [95% CI]	90-day [95% CI]
Total Nephrectomy	41799	2.60% [2.45 - 2.76%]	5.34% [5.13 - 5.56%]
Partial Nephrectomy	15726	0.95% [0.80 - 1.11%]	1.60% [1.41 - 1.81%]
Any Nephrectomy	56891	2.13% [2.01 - 2.25%]	4.31% [4.14 - 4.48%]
Renal Ablation	10678	0.55% [0.42 - 0.71%]	1.43% [1.22 - 1.68%]
Any Renal Procedure	66817	1.89% [1.79 - 2.00%]	3.88% [3.73 - 4.03%]

**eFigure 1:
Negative Control: Imaging Prevalence and Radical Prostatectomy**

Imaging prevalence could simply be a reflection of the regional intensity of medical care and not specifically related to procedures for renal masses. In other words, HRRs in which Medicare beneficiaries face a high risk of thoracoabdominal CT imaging might also be those in which beneficiaries face a high risk of surgical procedures in general – including those surgeries that have nothing to do with specific CT findings.

We considered this possible explanation by seeking a negative control: a procedure that would be expected to reflect the regional intensity of urologic practice, but be unrelated to imaging findings on CT. Radical prostatectomy meets these criteria – a procedure that reflects local urologic practice, yet has nothing to do with incidental CT detection.

As shown in the figure below, while imaging prevalence was strongly correlated with any renal procedure (Panel A – a reproduction of Figure 4 in the article), it was not correlated with radical prostatectomy (Panel B). This suggests that our findings do not simply reflect regional medical intensity in general and, further, they do not reflect the supply of urologists in particular. Instead, these data suggest that the observed correlations are, in fact, the result of incidental detection of renal masses.

Scatterplot of the 5-year risk of Thoracoabdominal Imaging and Any Renal Procedure (Panel A) vs. Radical Prostatectomy (Panel B) in HRRs with > 50,000 beneficiaries.

