

Figure S1 Opioid prescribing patterns prior to discharge. (A) Percentage of patients provided a prescription for opioids at discharge; (B) distribution of prescription sizes at discharge.

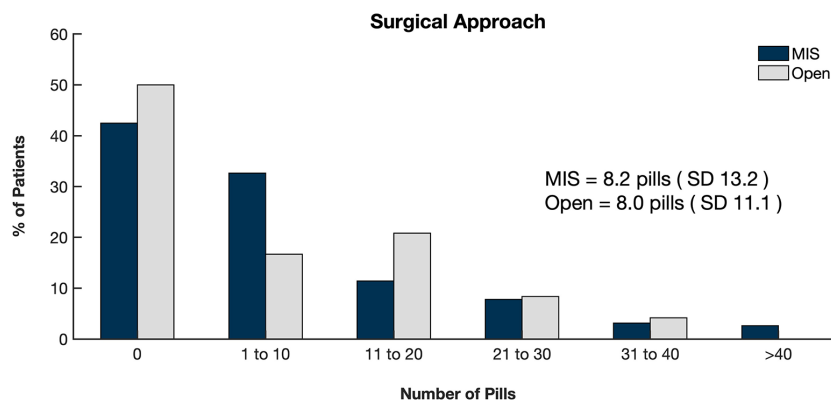


Figure S2 Distribution of patient-reported opioid use after discharge for patients undergoing minimally invasive surgery (MIS, blue) versus open thoracotomy (grey). Chi-square stratification revealed that a higher proportion of open thoracotomy patients used 11 to 20 pills versus 1 to 10 pills ($P=0.007$), despite no difference in the overall mean number of pills used after discharged when compared with MIS patients.

Appendix 1 Additional data analysis

As an additional sub-analysis, we investigated the association of patient demographics and clinical factors with opioid prescribing and post-discharge use after lung resection. Evaluated factors included demographic information, operative approach, procedure performed, and length of stay (LOS). Opioid quantities are reported in number of 5-mg oxycodone tablets (mean \pm SD).

Current smokers ($P=0.028$) and patients with military/government insurance providers ($P=0.041$) were prescribed fewer opioids. Patients undergoing robot-assisted operations used significantly fewer opioids (5.2 ± 9.7) compared to VATS (11.3 ± 15.5) and open (8.0 ± 11.1) approaches ($P=0.004$), despite comparable quantities prescribed at discharge ($P=0.396$; *Table S1*). Of the 11 participating sites, 9 offered robot-assisted procedures comprising a variable percentage of overall institutional volume ranging from 14% to 89% of all procedures performed. Robot-assisted

and open approaches were also associated with a greater likelihood of requiring no opioids after discharge compared to VATS (51.5% and 50.0% versus 31.5%, respectively). Nevertheless, patient-reported pain scores for incision site ($P=0.184$) and overall pain ($P=0.783$) were not different among operative approaches at one week prior to follow-up. LOS was shortest for VATS (3.6 ± 2.0 days) compared to robot-assisted (4.1 ± 3.3 days) and open (5.7 ± 4.9 days) approaches ($P<0.001$). LOS was associated with both opioid prescribing at discharge ($P=0.003$) and post-discharge use ($P=0.043$) where patients staying >7 days used the fewest opioids after discharge with more than 80% requiring no opioids. Patients undergoing pneumonectomy received the largest prescription size ($P=0.016$), although there was no significant difference in reported post-discharge opioid use among the procedures performed ($P=0.835$).

In summary, operative approach and LOS were associated with post-discharge opioid use, whereas patient demographics and procedure performed were not.

Table S1 Patient demographics and clinical factors affecting opioid prescribing and post-discharge use

Factors	Prescribed at discharge	P value	Post-discharge opioid use	P value
Age		0.586		0.298
<60 years	14.0±10.5		11.4±13.1	
60–69 years	13.2±12.2		9.1±16.2	
>69 years	14.4±11.5		8.0±11.8	
Gender		0.890		0.363
Female	13.7±10.3		9.6±13.4	
Male	14.5±12.8		8.6±13.6	
Race		0.065		0.100
Asian	17.3±3.3		14.8±17.3	
Black	17.7±10.5		13.3±10.6	
Caucasian	13.6±11.6		8.6±13.6	
Other	5.00±0.0		0.0±0.0	
Diabetes		0.942		0.303
Yes	14.0±11.9		12.1±18.4	
No	14.1±11.3		8.3±11.7	
Major vascular disease		0.143		0.157
Yes	10.4±9.3		8.9±18.1	
No	14.5±11.6		9.2±12.9	
Congestive heart failure		0.177		0.459
Yes	10.2±10.6		8.0±11.8	
No	14.4±11.4		9.2±13.6	
Major psychiatric disorder		0.091		0.935
Yes	12.0±10.3		8.6±11.1	
No	14.9±11.8		9.4±14.4	
Cigarette smoking		0.028*		0.387
Never	16.6±7.8		9.8±11.1	
Former (>30 days prior)	14.3±12.1		9.2±15.0	
Current (<30 days prior)	11.4±11.4		8.5±10.6	
Primary insurance		0.041*		0.180
Medicare	14.0±11.8		9.1±14.1	
Medicaid	7.7±5.5		9.6±14.2	
Military/other government	3.3±5.8		0.0±0.0	
Commercial	15.3±10.6		9.2±12.0	
HMO	18.9±10.4		13.0±10.7	
Surgical approach		0.396		0.004*
VATS	21.5±11.6		11.3±15.5	
Robot-assisted	19.4±14.8		5.2±9.7	
Open thoracotomy	20.4±11.5		8.0±11.1	
Length of stay		0.003*		0.043*
<4 days	18.6±11.1		8.6±11.1	
4–7 days	23.6±14.5		9.2±16.5	
>7 days	20.1±17.2		1.5±4.0	
Operation performed		0.016*		0.835
Wedge resection	20.0±11.6		8.0±10.0	
Segmentectomy	21.6±11.0		6.5±10.4	
Lobectomy	20.6±12.4		8.8±14.1	
Pneumonectomy	33.9±29.4		12.0±18.0	

Data presented as mean ± standard deviation. *P<0.05. VATS, video-assisted thoracoscopic surgery.