

Explore Cohort Definitions

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Defining general surgery surgeons is difficult becasue we don't have complete data for fellowship training records. As June 2021, we have ABS and fellowship council data that contain fellowship training information.

Below we are going to explore 3 different ways to define general surgery surgeons, and their pros and cons for using each definition.

Cohort definition

1. Exclude fellowship-trained surgeons using ABS and fellowship council data

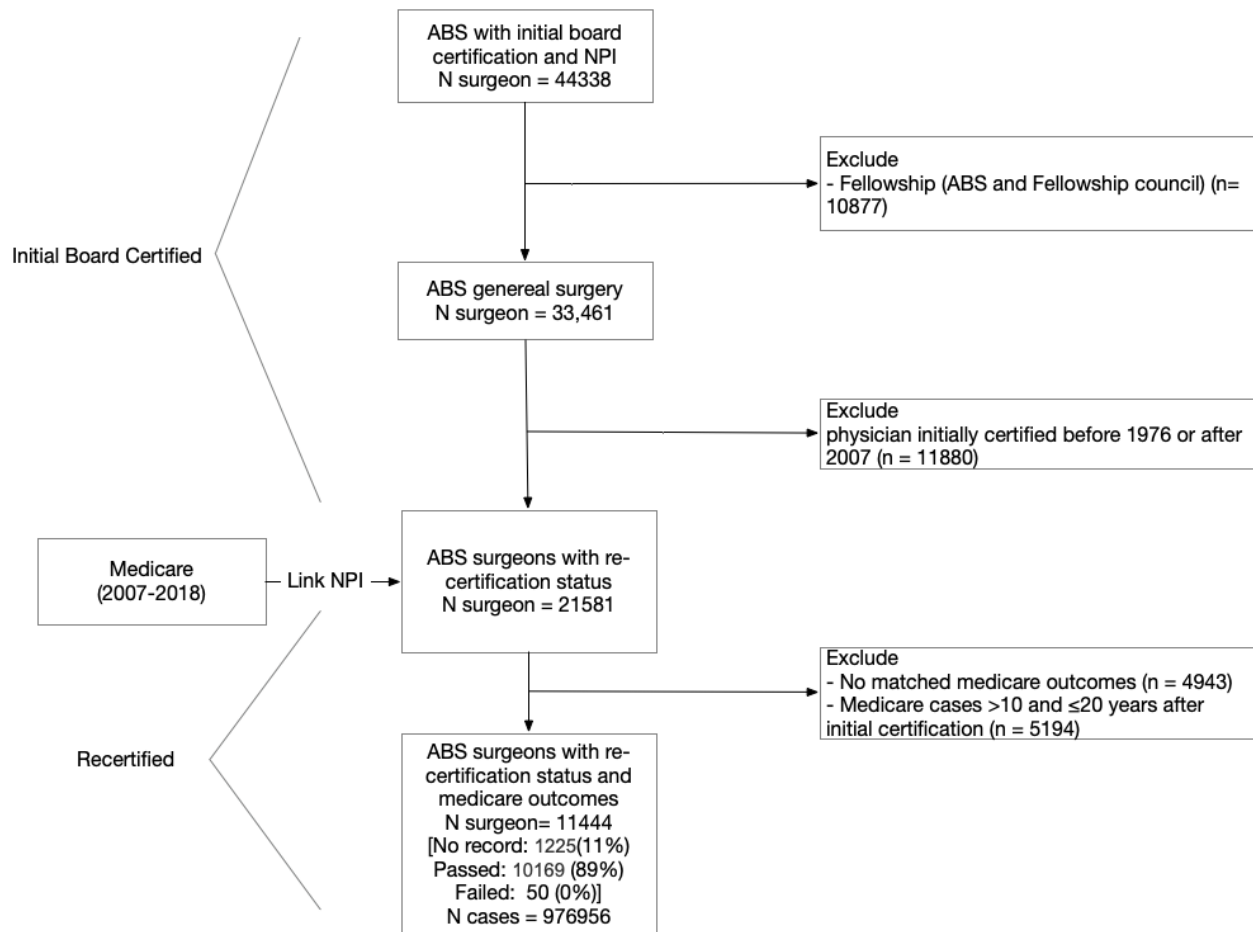
Pros:

1. ABS and fellowship council data have reliable fellowship training data.
2. Most ABS and fellowship council surgeons records have matched NPIs.

Cons:

1. Can't exclude fellowship trained suregons who were not in ABS or fellowship council data. ABS and fellowship council only have a subset of fellowship training program. ABS fellowship includes Vascular, Pediatric, Oncology and Critical Care. fellowship council includes Adv GI, Bariatric, Colorectal, Flexible Endoscopy, HPB and Thoracic.
2. ABS and fellowship council data don't have complete NPI. 56% of ABS surgeos have NPI; 80% of fellowship council data have matched NPI.

Cohort definition diagram



dataset at `/Volumes/George_Surgeon_Projects/MOC_vs_Outcome/data/abs_medicare_10_20yr.rdata`

2. Exclude fellowship-trained surgeons using ABS, fellowship council and medicare specialty code

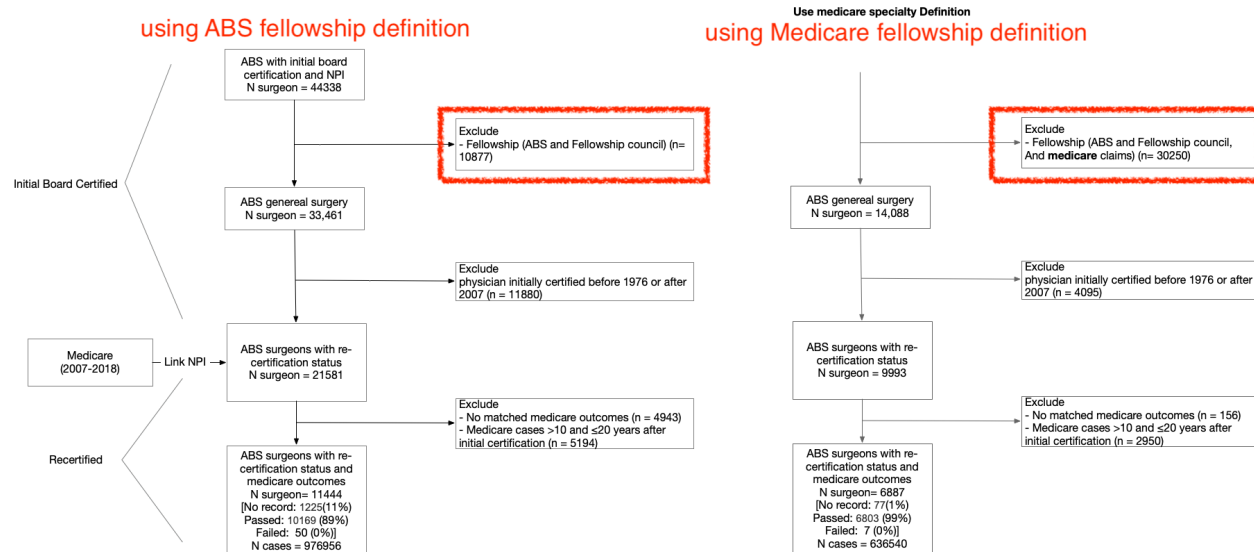
the same as option 1 but add medicare specialty as an additional data source. medicare specialty code was from Carrier file. Only surgeons who have only filed as general surgery specialty in carrier file are considered general surgery surgeons.

Pros 1. Using medicare specialty code excluded most of the specialty trained surgeons.

Cons 1. Medicare specialty code excluded a lot of general surgery surgeons. 2. Among the excluded surgeons (based on medicare specialty code only group), 85% of the surgeons were identified as general surgery surgeons based on NPES dataset. 3. I also manually checked 10 surgeons for their specialty info on their personal websites from the exclude surgeons cohort. 6 out of 10 were general surgery surgeons.

Cohort definition diagram

The two data flow compares the difference between adding medicare specialty code filter vs. not.



dataset at `/Volumes/George_Surgeon_Projects/MOC_vs_Outcome/data/abs_medicare_10_20yr_medicare_splty.rdata`

3. Exclude non-GS surgeons by practice patterns, i.e. surgeon who don't perform cases like GS. using n types of procedures as threshold.

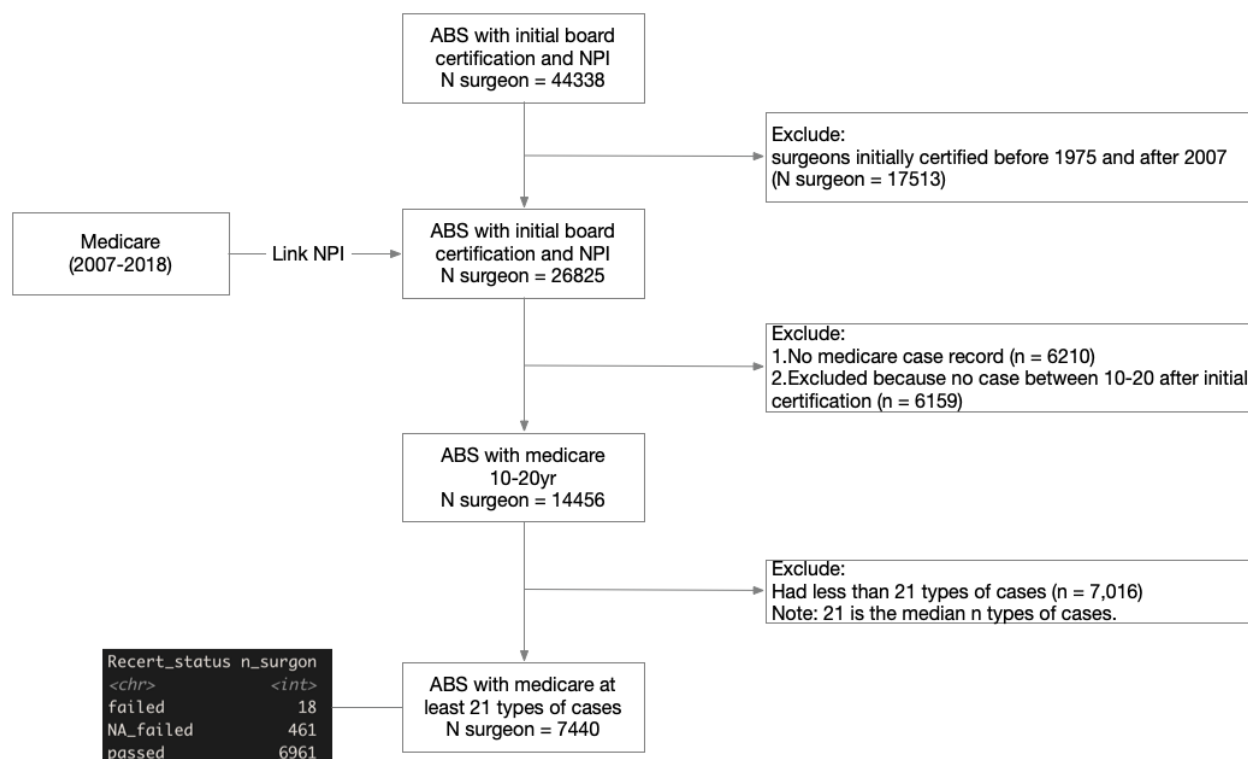
N types of procedures is defined using median number of types of procedures performed in ABS medicare data cohort. N = 21.

Pros: 1. Don't need to rely on fellowship training data.

Cons:

1. Hard to define how many types of procedures a surgeon should perform to be defined as general surgery surgeon.

Cohort definition diagram



dataset at `/Volumes/George_Surgeon_Projects/MOC_vs_Outcome/data/abs_medicare_10_20yr_21_types_procs.rdata`

Table1 and model results on cohort definition

1. ABS and fellowship council

table1

case level

Characteristic	Failed, N = 52,170	Passed, N = 847,207	p-value
flg_male	27,334 (52%)	359,049 (42%)	<0.001
age_at_admit	74 (70, 80)	75 (70, 82)	<0.001
AHRQ_score	9 (2, 17)	9 (1, 19)	0.2
race_white	45,980 (88%)	739,283 (87%)	<0.001
ses			<0.001
high_ses	21,684 (42%)	384,934 (45%)	
low_ses	30,486 (58%)	462,273 (55%)	
emergent_admit	16,371 (31%)	406,781 (48%)	<0.001
had_assist_surg	1,113 (2.1%)	7,727 (0.9%)	<0.001

¹ n (%); Median (IQR)

² Pearson's Chi-squared test; Wilcoxon rank sum test

Surgeon level

Characteristic	Failed, N = 4,125	Passed, N = 45,229	p-value
surgeon_yearly_load	7 (3, 16)	13 (6, 25)	<0.001

¹ Median (IQR)

² Wilcoxon rank sum test

Model results

Regression table

```
# A tibble: 11 x 4
  term          estimate    OR p_value
  <chr>         <dbl> <dbl> <dbl>
1 (Intercept)   -7.12  0.001    0
2 re_cert_binPassed  0.012  1.01  0.546
3 flg_male       0.132  1.14    0
4 age_at_admit    0.044  1.04    0
5 AHRQ_score      0.054  1.06    0
6 race_white      0.067  1.07    0
7 seslow_ses      0.181  1.20    0
8 emergent_admit   0.865  2.38    0
9 year          -0.038  0.963    0
10 surgeon_yearly_load -0.001  0.999    0
11 had_assist_surg   0.089  1.09   0.035
```

2. ABS, fellowship council and medicare

table1 case level

Characteristic	Failed, N = 3,989	Passed, N = 588,578	p-value
flg_male	1,738 (44%)	243,391 (41%)	0.005
age_at_admit	76 (71, 82)	76 (70, 82)	0.14
AHRQ_score	9 (2, 19)	9 (0, 18)	<0.001
race_white	3,449 (86%)	515,040 (88%)	0.047
ses			<0.001
high_ses	996 (25%)	261,022 (44%)	
low_ses	2,993 (75%)	327,556 (56%)	
emergent_admit	2,557 (64%)	313,495 (53%)	<0.001
had_assist_surg	35 (0.9%)	3,177 (0.5%)	0.004

¹ n (%); Median (IQR)

² Pearson's Chi-squared test; Wilcoxon rank sum test

Surgeon level

Characteristic	Failed, N = 287	Passed, N = 31,523	p-value
surgeon_yearly_load	11 (5, 18)	14 (7, 25)	<0.001

¹ Median (IQR)

² Wilcoxon rank sum test

Model results Regression table

```
# A tibble: 11 x 4
  term          estimate    OR p_value
  <chr>         <dbl> <dbl> <dbl>
1 (Intercept)   -6.7   0.001    0
2 re_cert_binPassed -0.248  0.78    0
3 flg_male       0.134  1.14    0
4 age_at_admit    0.043  1.04    0
5 AHRQ_score      0.053  1.05    0
```

```

6 race_white          0.059 1.06    0
7 seslow_ses          0.183 1.20    0
8 emergent_admit      0.825 2.28    0
9 year                -0.036 0.965   0
10 surgeon_yearly_load 0      1      0.918
11 had_assist_surg     0.248 1.28    0

```

3. Practice patterns to define general surgery surgeons

table1 case level

Characteristic	Failed, N = 76,155	Passed, N = 954,274	p-value
flg_male	41,237 (54%)	425,548 (45%)	<0.001
age_at_admit	75 (70, 81)	76 (70, 82)	<0.001
AHRQ_score	8 (2, 17)	9 (2, 19)	0.028
race_white	62,142 (82%)	825,322 (86%)	<0.001
ses			<0.001
high_ses	32,348 (42%)	427,104 (45%)	
low_ses	43,807 (58%)	527,170 (55%)	
emergent_admit	35,766 (47%)	479,498 (50%)	<0.001
had_assist_surg	795 (1.0%)	8,009 (0.8%)	<0.001

¹ n (%); Median (IQR)

² Pearson's Chi-squared test; Wilcoxon rank sum test

Surgeon level

Characteristic	Failed, N = 2,784	Passed, N = 40,143	p-value
surgeon_yearly_load	24 (14, 37)	19 (10, 31)	<0.001

¹ Median (IQR)

² Wilcoxon rank sum test

Model results Regression table

A tibble: 11 x 4

```

  term          estimate    OR p_value
  <chr>         <dbl> <dbl> <dbl>
1 (Intercept)   -6.86  0.001    0
2 re_cert_binPassed 0      1      0.974
3 flg_male       0.116 1.12    0
4 age_at_admit   0.041 1.04    0
5 AHRQ_score     0.054 1.06    0
6 race_white     0.074 1.08    0
7 seslow_ses     0.171 1.19    0
8 emergent_admit 0.836 2.31    0
9 year          -0.038 0.963   0
10 surgeon_yearly_load -0.001 0.999   0
11 had_assist_surg 0.179 1.20    0

```