

# Does Experience makes Better Doctors? Evidence from LASIK Eye Surgeries\*

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## Motivation

### High Volume of Surgeries – Better Outcome:

Over 135 studies, 70% find a positive correlation

Possible Explanations: Selective Referral  
Learning By Doing

Difficulty in Differentiating between  
Learning by Doing and Selective Referral

1. Health outcomes are hard to define and measure
2. Outcomes are affected by patients' underlying conditions
3. Lack of appropriate individual-level longitudinal data

## Main Ideas

- A. Use LASIK surgery to test Learning by Doing
- B. Collect patient-chart level data from a surgical center for all surgeons since the moment it opened.

### Why LASIK Surgeries?

#### Solve problem 1:

Outcome is easily and precisely measured

#### Solve problem 2:

Less affected by patient's underlying conditions

#### Additionally:

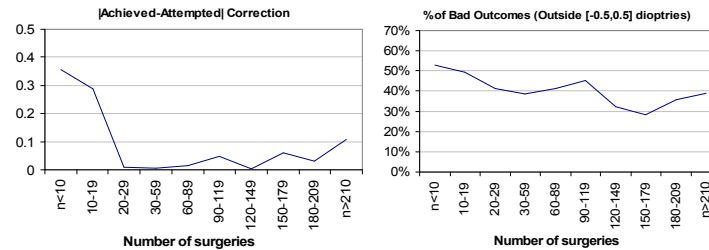
- Identify individual and not group experience: Executed entirely by one doctor
- Performed in one machine (can isolate technology)
- Less dependent on pos surgical care

### Why this data requirement?

#### Solve problem 3:

Variation in time and across doctors allows to identify the learning curve

## Evidence of Learning by Doing in LASIK



### Econometric model:

$$\text{Outcome}_{ijk} = X_{ij}\beta + L_k\delta + U_k + \mu_{ijk}$$

- For patient i, eye j (right, left) and doctor k
- X = age, sex, pre surgery eyesight
- L = measure of experience (cumulative surgeries)
- U = Doctor fixed effect

### IMPACT OF CUMULATIVE NUMBER OF SURGERIES ON OUTCOME MEASURES

	Defocus Equivalence	≥0.5 D 1)	≥ 1 D	Re-surgery	Number of Follow ups
√Cumulative surgeries including older machine experience	-0.0200 (0.0094)	-0.0204 (0.0082)	-0.0055 (0.0047)	-0.0015 (0.0062)	0.0125 (0.0459)
Age	0.0140 (0.0017)	0.0047 (0.0019)	0.0101 (0.0011)	0.0021 (0.0003)	0.0183 (0.0042)
Sex	0.1247 (0.0732)	0.0699 (0.0236)	0.0584 (0.0344)	0.0221 (0.0220)	0.0810 (0.0952)
Operating Room Temperature	0.0003 (0.0006)	0.0021 (0.0007)	-0.0015 (0.0003)	0.0000 (0.0002)	-0.0041 (0.0019)
Operating Room Humidity	0.0045 (0.0059)	0.0036 (0.0018)	0.0035 (0.0042)	0.0052 (0.0033)	0.0115 (0.0117)
Pre-surgery spherical equivalence	0.0811 (0.0183)	0.0243 (0.0082)	0.0455 (0.0068)	0.0136 (0.0035)	0.0498 (0.0201)
N	1,210	1,218	1,218	1,615	1,420

Surgeon Fixed effects are included. ( ) are robust S.E. S.E. are clustered by surgeon. S.E. are clustered by surgeon. LPM is used for the regression of ≥0.5 D and re-surgery  
1) We used only the first surgery sample.  
2) Drop the observations that did not have any follow-ups

## Background in LASIK Surgery



### Surgeon Skills:

- Decides whether a patient is eligible for the surgery
- Decide amount of correction (ablation)
- Create a flap
- Clean or not the cornea

## Data: Individual Patient Charts

- Census of LASIK surgeries, 2042 patients, 3892 surgeries (unit observation is an eye)
- CLOFAN Clinic, Medellin, Colombia, July 2003– July 2005, 29 doctors. Survey doctors for previous # of LASIK surgeries
- Demographic data, surgery date and time, and surgeon
- Pre surgery eyesight measures
- Post surgery eyesight measure and follow-up date

## Measures of Eyesight and Outcome

- **Snellen (20/20):** uses a chart to measure visual acuity
- **Refraction measure:** used for glass prescription
  - sphere = cylinder \* axis (units are called diopters)
  - Sphere: measures myopia / hyperopia
  - Cylinder \* axis: measures astigmatism
  - Can be expressed in one called Defocus Equivalent (DE)
- **Outcome Measures:** (1) DE, (2) DE<0.5 diopters as success, (3) Repeat-Surgery (4) # Follow-ups

## Conclusions

1. We observe directly the learning curve in LASIK surgeries for a census of patients in a surgical center using individual patient charts and a precise measure of outcome
2. The magnitude of the learning was about a 10% improvement after the 100 surgeries.

\*The views expressed in this poster are those of the authors and should not be interpreted as those of the Congressional Budget Office.