

Title: Surgical, Anesthesia and Obstetrics (SAO) workforce training capacity in India: A retrospective analysis of postgraduate and subspecialty residency training spots

Authors: Shirish Rao MBBS Student^{1,2}, Siddhesh Zadey BSMS, MSc-GH^{1,3,4}

Affiliations:

1 Association for Socially Applicable Research (ASAR), Pune, Maharashtra, India

2 Seth GS Medical College and KEM Hospital, Mumbai, India

3 Department of Surgery, Duke University School of Medicine, Durham, North Carolina, United States of America

4 D.Y. Patil Medical College, Hospital, and Research Centre, Pune, Maharashtra, India

Background: India faces a massive shortage of Surgical, Anesthesia and Obstetrics (SAO) workforce with merely 81,150 personnel for 1.3 billion people. We assessed the production capacity, i.e., number of postgraduate (PG) and subspecialty (SS) SAO training spots available in India to better understand the need for workforce scale up.

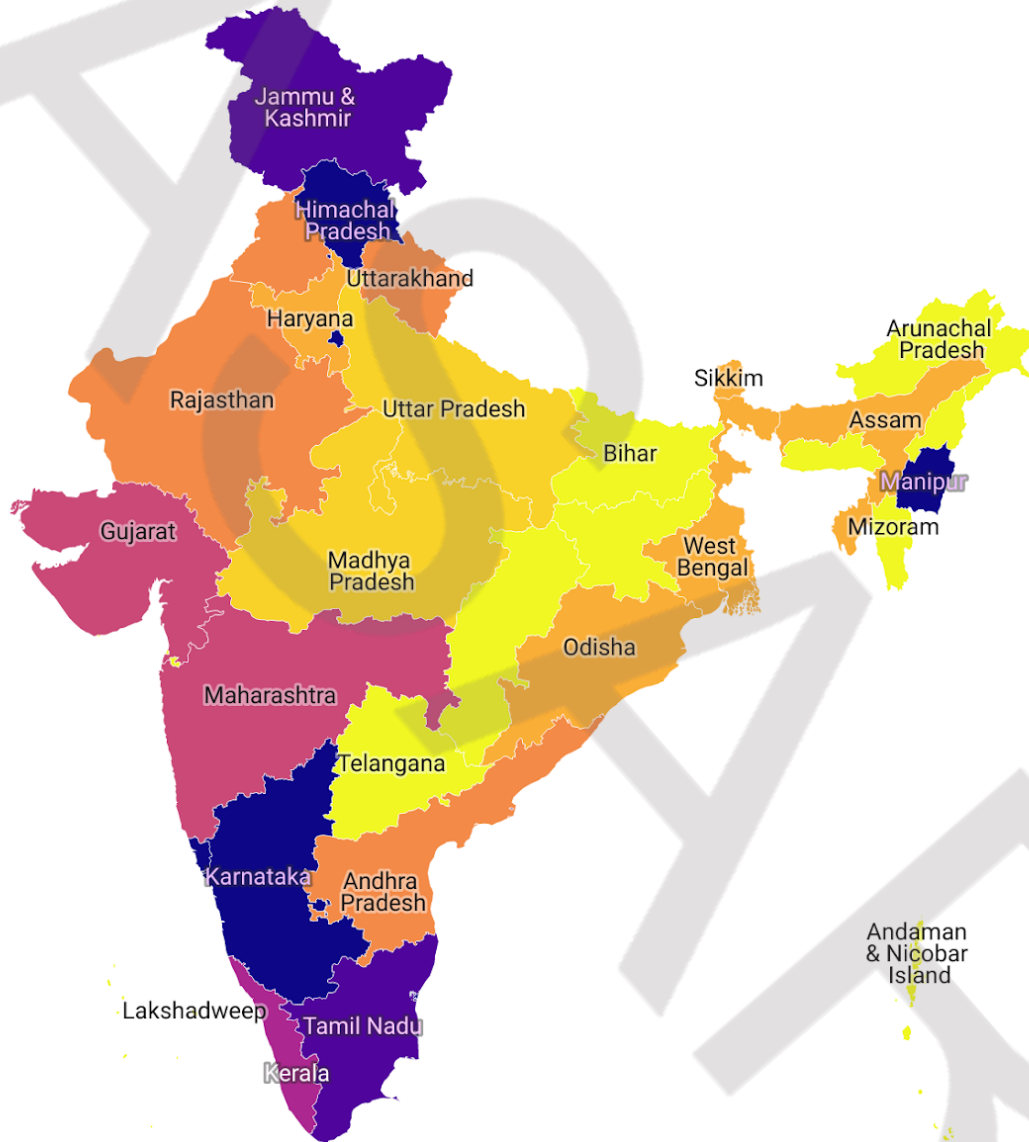
Methods: We conducted a retrospective secondary data analysis of postgraduate and subspecialty SAO spots across 36 states for 2018 using data from the National Health Profile (2019) and census-based population projections. The number of PG & SS SAO spots per 10 million population i.e. spot densities were calculated and classified based on type of program and type of SAO speciality to investigate SAO workforce production capacity in each state. Ratios of PG spots per 100 MBBS spots and SS spots per 100 PG spots were also calculated as a metric of competitiveness in training. Further, we tested if SAO and non-SAO PG and SS spot densities differed significantly using Wilcoxon's signed rank test with significance level set at $\alpha=5\%$.

Results: in 2018, there are a total 13793 PG and 1350 SS SAO spots making densities of 104.60 and 9.90 per 10 million people, respectively. PG spot density for General Surgery (23.56), Anesthesia (24.81), and Obstetrics (21.55) were comparable and were much higher than Orthopedics (14.64), Ophthalmology (11.96), and Otorhinolaryngology (8.08). SS spot densities were greater for Urology (1.90), Neurosurgery (1.86) and Cardiothoracic and Vascular Surgery (1.83), followed by Plastic Surgery (1.52), and Pediatric Surgery (1.27). The average density was significantly lower for SAO specialties than non-SAO specialties ($p=0.001$). For 100 MBBS spots, there were only 20 PG SAO spots while for 100 PG SAO spots there were just 9 SS SAO spots available. The distribution of spots was geographically uneven with about two-third spots concentrated in ten states/union territories.

Conclusion: India's SAO workforce production capacity is limited and inadequate to meet LCoGS SAO workforce targets by 2030. Hence, scale up of SAO training capacity needs to be carried out with attention to reducing disparities.

State-wise Post Graduate (PG) Surgical Workforce Production Capacity in India

PG Surgical Spots per 1,00,00,000 population



All Diploma and MD/MS programs spots in General Surgery, Obstetrics & Gynaecology, Anesthesia, Orthopedics, Ophthalmology and Otorhinolaryngology have been considered at PG Surgical Spots

Map: Association for Socially Applicable Research • Source: National Health Profile report 2019 • Created with Datawrapper

Figure: State-wise SAO workforce production capacity in India



Surgical, Anesthesia and Obstetrics (SAO) workforce training capacity in India: A retrospective analysis of postgraduate and subspecialty residency training spots

Shirish Rao MBBS Student^{1,2}, Siddhesh Zadey BSMS, MSc-GH^{1,3,4}

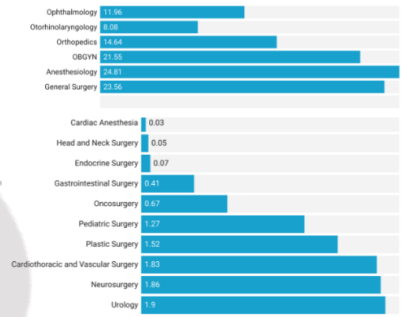
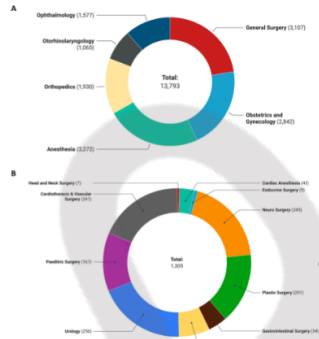
1 Association for Socially Applicable Research, Pune, Maharashtra, India, 2 Seth GS Medical College and KEM Hospital, Mumbai, India, 3 Department of Surgery, Duke University School of Medicine, United States of America, 4 D.Y. Patil Medical College, Hospital, and Research Centre, India,

INTRODUCTION

- According to the Lancet Commission on Global Surgery (LCoGS), 5.3 billion people globally lack timely access to surgical care, with over a fifth of them living in India.
- LCoGS recommendations that each country must have at least 20 surgical, anesthetic, and obstetric physicians per 100 000 population by 2030
- India has 81,150 surgical specialists for 1.3 billion people, denoting a massive shortage.
- We assessed the production capacity, i.e., number of postgraduate (PG) and sub-specialty (SS) surgical training spots available in India to better understand the need for workforce scale up.

FINDINGS

SAO PG & SS spot Counts



SAO Spot densities across Specialties

In PG Spots densities of General Surgery, OBGYN and Anesthesia were higher

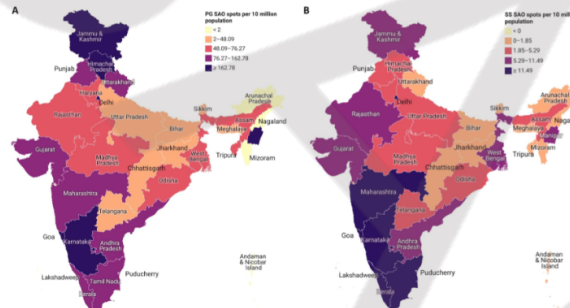
In SS Spots Densities of Urology, Neuro, CTV, Pediatric and Plastic Surgery were higher

METHODS

- Study Design-** Retrospective Secondary Analysis
 - Data Sources**
 - National Health Profile (2019)- State wise PG & SS Residency Spot Matrix of 2018
 - Census Based Population Projections-mid-year population of 2018
 - Data Outcomes**
 - SAO PG and SS spot counts
 - SAO PG and SS spot Density (spots per 10 million population)
 - SAO PG spots per 100 MBBS spots
 - SAO SS Spots per 100 PG SAO spots
- Outcomes were analysed across states and types of SAO specialties
- Data Analysis**
 - Difference between non-surgical PG and SS spot densities using Wilcoxon's signed rank test with significance level set at alpha=5%
 - Data was wrangled using Google Sheets, analysed in JASP, and visualized in Datawrapper.

SAO Spot densities across States

National Spot densities were 105 (PG) and 10 (SS) per 10 million people. The geographic distribution of spots was uneven with about two-third spots concentrated in 10 states.



Ratio of PG to MBBS & SS to PG Spots

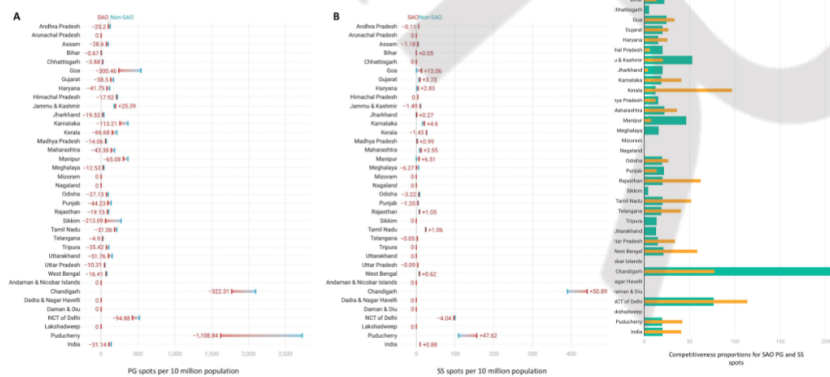
For 100 MBBS spots, there were only 20 PG SAO spots while for 100 PG SAO spots there were just 40 SS SAO spots available

PG Specialty Proportions - 4:100 for General Surgery, OBGYN, and Anesthesia, 3:100 for Orthopedics, 2:100 for Ophthalmology, and 2:100 for Otorhinolaryngology.

SS Specialty Proportions - 8:100 for Urology and Neurosurgery, 8:100 for Cardiothoracic and Vascular Surgery, 6:100 for Plastic Surgery, 5:100 for Pediatric Surgery, 3:100 for Onco-surgery, and 2:100 for Gastrointestinal Surgery.

Difference between SAO & non-SAO PG and SS spot densities

PG Surgical spot density in each state was significantly lower than non-surgical specialties where as SS Surgical spot density in most state was significantly higher than non-surgical specialties (Wilcoxon signed rank test: $p=0.001$)



CONCLUSION

- As of 2018, India can produce only about 24 General Surgeons, 15 Orthopedic Surgeons, 12 Ophthalmologists, 8 Otorhinolaryngologists, 25 Anesthetists, 22 OBGYNs, and 10 super-specialist surgeons per 10 million population
- The surgical workforce training capacity is not enough to meet the global workforce standards. The distribution of spots is inequitable
- Findings from our study can be used to estimate the rate at which the spots need to