

Quantitative analysis of loss of anesthesia management opportunities and procedural skills due to COVID-19 pandemic lockdown: An experience of six months from a tertiary care cancer teaching institute

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Abstract

Background and Aims: COVID-19 has necessitated restrictions on elective surgical workload, which could adversely affect the learning of the core clinical competencies of the postgraduate anesthesiology trainees. The aim was to assess and compare the loss of elective cases requiring anesthesia management and associated procedural skills in six months since lockdown compared to the same duration in 2019.

Material and Methods: We compared the data, obtained from electronic medical records, of the total number of elective surgeries requiring anesthesia management and the following procedural skills in both adults and pediatric patients in 6 months duration in 2019 and 2020: 1) Laryngoscopy and Intubation 2) Laryngeal mask airway 3) Arterial and central line cannulations and 4) Spinal, Epidural, Other Regional blocks.

Results: A total of 8458 and 3561 elective procedures were performed in the six-month period in 2019 and 2020 respectively, reflecting a 57.9% reduction due to lockdown. There was a proportionate reduction in the adult and pediatric procedures, operating room and non-operating room procedures, and surgeries performed under general anesthesia and monitored anesthesia care. There was a significant increase in the number of surgeries performed under regional anesthesia (486%). Epidurals blocks and other regional blocks also showed a proportionate reduction respectively. Although the total number of video-laryngoscopy assisted intubations show an absolute reduction, when compared to the total number of cases performed in the respective years, we found an increase (2.06% in 2019 vs 3.8% in 2020). The arterial cannulations reduced by 43.29% but the central line cannulations reduced by only 12.28%.

Conclusion: There was a significant reduction in both the anesthesia management opportunities and in the total number of associated procedural skills due to COVID-19 lockdown which could adversely affect the learning of core clinical competencies of postgraduate trainees.

Keywords: Anesthesia, clinical competencies, COVID-19, procedural skills, trainees

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Introduction

The impact of COVID-19 pandemic has been wide spread on medical education leading to possible unforeseeable effects on the medical education of postgraduate trainees.^[1,2] As the direct result of the lockdown announced in India from 23rd March 2020, hospital and state guidelines restricted all elective surgeries. Only emergency and urgent surgeries continued. The scenario continued nearly six months after lockdown announcement, with very cautious resumption of elective workload. Anesthesia personnel were diverted to COVID-19 clinics and patient care in COVID-19 wards and intensive care units. Also, there was a loss in working days of anesthesia personnel including postgraduate (PG) trainees due to need for quarantine after working in COVID-19 setups, COVID-19 infection amongst the personnel and elective restrictions on total number of working days.^[3] This prolonged loss of anesthesia case management and associated procedural skills could adversely affect the learning of the core clinical competencies of the PG trainees.

We aim to assess and compare the loss of elective cases requiring anesthesia management and associated procedural skills in six months (23rd March – 22nd September 2020) since lockdown as compared to the same duration in 2019, in a tertiary care cancer institute.

Material and Methods

Ethics Committee approval (project no 3600, dated 23 November 2020) was obtained and the study was registered with Clinical Trial Registry of India (CTRI/2020/12/29887).

There are twenty-four main operating rooms (OR) in our Institute, where the postgraduate trainees are rotated. Apart from these main ORs, anesthesia services are provided at numerous peripheral locations which include minor ORs, interventional radiology suite, magnetic resonance imaging suite, bone marrow aspiration room, endoscopy rooms, radiotherapy/brachytherapy suites. All the peripheral locations for the purpose of this study were clubbed together as non-operating room anesthesia (NORA). The data of all the elective surgical procedures requiring anesthesia services, conducted for six months duration from 23 March to 22 September in the years 2019 and 2020 was collected. Both adult and pediatric patients (< 12 years) were included. All surgeries performed under general anesthesia, regional anesthesia and monitored anesthesia care (MAC) were included. Emergency surgeries and surgeries performed under local anesthesia were excluded.

The duration of the anesthesiology residency for MD course is three years. Six months (one semester) counts as a significant portion of this postgraduate course. Therefore, we chose a convenience sampling technique of six months duration.

We obtained the list of all the elective surgeries performed during the above-mentioned periods from the hospital information management system. This data was cross checked with the manual entry from the OR/NORA registers maintained by the nursing staff. The intraoperative anesthesia notes were accessed from the electronic medical records of each of the patients and data collected for the following core clinical competencies: 1) Intubation technique: Direct laryngoscopy, video-laryngoscopy, flexible bronchoscopy, retrograde intubation, intubating LMA and others (through micro-laryngoscope or tracheostoma), 2) Intubation route/tube: oral, nasal, double lumen tube/bronchial blocker and others such as armoured tube, tracheostomy tube (*in situ* or tracheostomy done at start of the surgery) 3) Laryngeal mask airway (LMA) 4) Spinal, epidural and other regional blocks and 5) Arterial and central line cannulations. The other regional blocks included were truncal blocks such as rectus sheath block, transversus abdominis plane (TAP) block, subcostal TAP block, quadratus lumborum block, paravertebral block, erector spinae block, brachial plexus block at interscalene, perivascular subclavian or axillary block; lower limb blocks such as femoral or sciatic block; intercostal block, transtracheal block, scalp block, etc.

All the data was collected in Microsoft Excel Sheet and transferred to SPSS version 25 for analysis. The reduction percentage was calculated for all groups.

Results

We included 8458 and 3561 elective procedures performed in the six-month period in 2019 and 2020 respectively, for analysis. [Figure 1] There was a 57.9% reduction in the total number of elective surgeries during the six months of COVID-19 lockdown. The month-wise distribution revealed a similar proportion of reduction for the first five months. The data from the month of September showed a narrowing gap in the conduct of elective procedures as compared to previous year. [Table 1] There was a similar proportion of reduction in the adult (57.69%) and pediatric (58.51%) procedures, as also in operating room (57.38%) and non-operating room (58.75%) procedures in 2020. [Figure 2] Although the reduction in surgeries performed under general anesthesia and monitored anesthesia care revealed a similar reduction (59.3% each), there was a significant increase in the number of surgeries performed under regional anesthesia (486%),

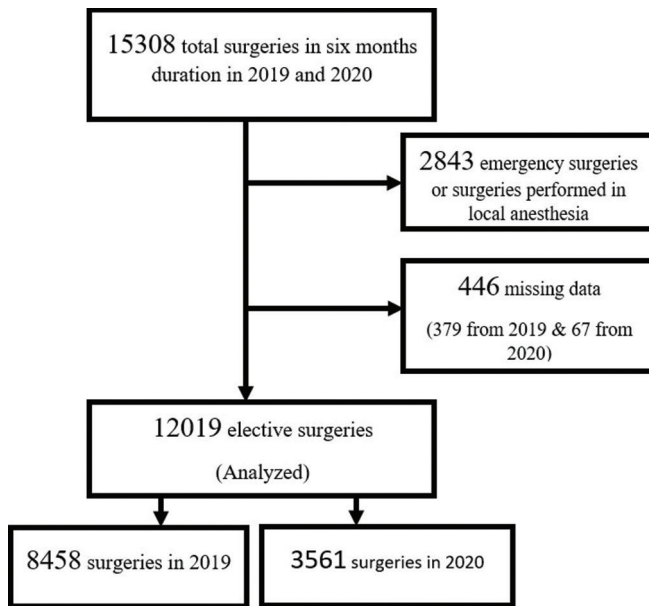


Figure 1: Flow diagram of data inclusion

specifically spinal anesthesia.[Figure 3] Epidurals blocks and other regional blocks also showed a proportionate reduction (47.49% and 66.29%) respectively [Table 2].

Airway management procedures also reduced substantially, as seen from the table. Although the total number of video-laryngoscopy assisted intubations show an absolute reduction, when compared to the total number of cases performed in the respective years, we found an increase (2.06% in 2019 vs 3.8% in 2020). There was an absolute reduction in the use of single lumen tubes (both orally and nasally), double lumen tube/bronchial blocker and others (armoured tubes through tracheostoma or tracheostomy). The arterial cannulations reduced by 43.29% but the central line cannulations reduced by only 12.28%.

Discussion

Onco-surgeries are time-sensitive in nature. In spite of a state and hospital mandated restriction, the total elective surgeries performed under anesthesia services from 23rd March 2020 for the next six months, was a little more than halved (57.9%) as compared to the same duration in 2019. The month-wise analysis reveals a cautious resumption of elective surgeries from September onwards. An Italian study found a dramatic reduction in uro-surgical workload (78%) conducted in thirty-three regional centres in Italy, in the first four weeks after COVID-19 restrictions. The reduction in oncological surgeries was 35.9% as compared to non-oncological surgeries (89%).^[4] During the first four weeks following COVID-19 restrictions, an academic orthopedic surgery department observed a loss of surgical cases both elective

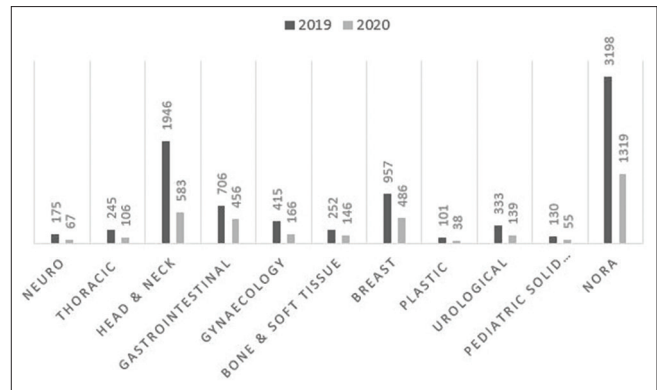


Figure 2: Department-wise distribution of elective surgeries

and emergencies, by 88% and 51% respectively.^[5] Another study when collating the information across eight neurosurgical residency programs in USA found that the operative volumes of elective spine and emergent surgeries substantially decreased in March and April 2020 as compared to previous year.^[6] There was a 50% to 100% decrease in elective neurosurgical workload across various Southeast Asian countries in the month of May 2020.^[7]

The total reduction in elective surgical volume in the OR in various departments in our study were 57.38%, with the maximum reduction in head and neck oncological surgeries (70%) and minimum in gastrointestinal surgeries (35.41%). The NORA procedures showed an overall reduction of 58.75%. This indirectly reflects on the potential loss of the anesthesia management opportunities and skills associated with the particular surgery. Surgeries performed under regional anesthesia specifically spinal anesthesia show a dramatic increase in our study. Regional anesthesia was preferred as compared to general anesthesia due to lesser potential for aerosol generating procedures. The total number of spinal anesthesia procedures performed were 24 in 2019 and 132 in 2020 but total number of surgeries conducted under only regional anesthesia were 22 in 2019 and 129 in 2020. This discrepancy is explained by the fact that in two surgeries in 2019 and in three surgeries in 2020, spinal anesthesia had to be converted to general anesthesia either due to extended surgical time or failure of spinal block. A study recorded an increase in preference of spinal anesthesia for caesarean section over general anesthesia by 96% with a low regional to general anesthesia conversion rates at the peak of COVID-19 pandemic in a cross sectional analysis of six hospitals.^[8]

Almost all the other associated anesthesia procedures showed a reduction commensurate with the reduction in the total number of cases, with the highest reduction recorded in use of LMA (70.62%). Although the total number of

intubations have reduced, the use of video-laryngoscopy has increased in 2020. All of the above observations are in line with the recommendations for practice during COVID-19 pandemic.^[3] Intubation was preferred in lieu of LMA in view of higher risk of displacement or leak around the cuff. Video-laryngoscope for intubation was recommended to avoid direct exposure to patient airway as encountered with direct laryngoscope. Mindful of all personnel safety in the OR, it was recommended that the most experienced practitioner would swiftly perform the aerosol generating procedures for airway management including intubation, LMA insertion etc., thus further reducing the trainees' exposure to the anaesthesia procedural skills.^[3]

The reduction in head and neck oncological surgeries in 2020 resulted in reduction in airway management procedures including flexible bronchoscopic intubation, retrograde intubation and nasotracheal intubations. Similarly, reduction in double lumen tube/bronchial blocker insertion mirrors the reduction in thoracic onco-surgical volume. The reduction in the total number of epidurals, other regional blocks and arterial cannulations also reflects the reduced gastrointestinal,

gynaecological, urosurgical and thoracic departmental workload.

The only aberration is the reduction in central line insertions, which is only 12.28%. This may be attributed to the fact that in our institute central line catheters are inserted only for hepatobiliary and HIPEC (hyperthermic intraperitoneal chemotherapy) surgeries and gastrointestinal surgeries (which included both the above-mentioned surgeries) showed the least reduction in volume.

There are no studies which have documented the deficit in various procedural skills till date. In response to the lockdown, medical teaching promptly shifted to the online virtual platforms. Literature search on impact of COVID-19 on medical education reveals mainly editorial and narrative reviews on the possible effects on undergraduate and postgraduate residency, the residents' mental health, feedback regarding sudden shift to online teaching learning methods and work schedule of COVID-19 and emergency duties,

Table 1: Month-wise distribution of elective surgeries

	2019	2020	Reduction (%)
23 rd March onwards	387	173	55.3
April	1341	582	56.6
May	1474	473	67.9
June	1320	554	58
July	1533	601	60.8
August	1423	550	61.35
Till 22 nd September	980	628	35.92

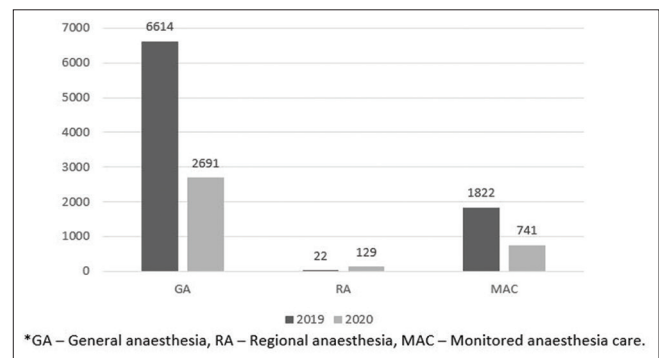


Figure 3: Type of anaesthesia

Table 2: List of procedures

Anaesthesia procedures	2019	2020	Reduction (%)		
Airway	Intubation technique	Direct Laryngoscopy	3116	1709	45.15
		Video Laryngoscopy	175	137	21.71
		Flexible Bronchoscopy	89	34	61.8
		Retrograde intubation	10	0	100
		Intubating LMA	5	1	80
		Others*	5	2	60
		Intubation route/tube	Oral Single lumen tube	2635	1487
	Nasal		677	357	47.27
	DLT/BB [†]		78	37	52.56
	Neuraxial block	Spinal anaesthesia	Others [‡]	85	38
LMA			1964	577	70.62
Epidural anaesthesia			678	356	47.49
Other regional blocks	175	59	66.29		
Arterial line	529	300	43.29		
Central line	57	50	12.28		

*Others - intubation through micro-laryngoscope or tracheostoma, [†]DLT – Double lumen tube and BB – Bronchial blocker, [‡]Others – armoured tube, tracheostomy tube (in situ or tracheostomy done at start of the surgery)

etc.^[1,7,9-11] Surveys amongst various residency programs such as anesthesiology, plastic, neurosurgical have only enquired from the PG trainees regarding decline in surgical workload.^[12-14] Data on quantitative losses of clinical management skills and procedural skills from various clinical subjects is scarce.

One of the limitations of this study are the exclusion of the emergency surgeries and the procedures performed in the intensive care units, both COVID-19 and otherwise. We also could not calculate per student loss of procedures since our electronic medical records do not capture the data on the name or designation of the anesthesiologist performing the said procedure.

Competency-based medical education is a cornerstone of postgraduate medical training. With COVID-19 pandemic on vane, there has been a cautious resumption of elective surgeries. Although the anesthesia management opportunities and procedural skills for PG trainees may show an upward trend in the coming months, it may affect the progression of the trainees on the Dreyfus model of skill acquisition. This model plots the progression of an individual through five levels of skill acquisition from novice, advanced beginner, competent, proficient to expert.

Apart from the anesthesia management opportunities and the procedural skills, it also affects the soft skills requisite of a clinician. COVID-19 crisis has indeed changed the educational landscape of the residents, bringing the medical education system all over the world on the brink of a crisis. It has affected all the domains of learning- cognitive, affective and psychomotor skills.

Although it has brought various virtual pedagogical innovations to the fore, in the form of various online platforms for imparting medical knowledge, its application in acquiring the communicative and procedural skills is limited. Various authors recommend viewing of surgical videos under senior supervision, digitized patients, virtual reality simulators, etc.^[13,15,16] The use of simulators and mannikin based learning is still limited by the need for social distancing and frequent sanitization, as also the availability of such simulators or high-fidelity mannikins. High quality videos may be accessed from video libraries maintained by anesthesiology societies or Institutes but access to them may be expensive.

Eventually, clinical teachings are best learnt with a 'live' patient. It is not just the acquisition of anesthesia management and procedural skills, but the exposure to patient interaction, communicating and counseling, obtaining consent are also an important component of the core clinical competency desired in a fully qualified anesthesiologist.

Conclusion

COVID-19 pandemic has indeed affected the learning of anesthesia management by the postgraduate trainees to a significant extent. Apart from spinal anaesthesia, all other anaesthesia procedural skills have significantly reduced after the announcement of lockdown in India due COVID-19 pandemic which has reduced the hands-on opportunity given to the postgraduate trainees.

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Conflicts of interest

There are no conflicts of interest.

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