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One-Year Prospective Audit of Truncal Blocks Using Regional Anesthesia Database App

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Abstract

Aims and Objectives: Truncal blocks like chest and abdominal wall peripheral nerve blocks have been reported to be an effective method of providing analgesia for surgeries on the chest wall and the abdomen. We present results of a prospective audit of the practice and outcomes of these techniques using a novel mobile app and web-based e-audit tool (RAD app and national database ®) to identify safety and quality with description of newer blocks.

Design: Prospective single centre audit over a 1-year period using e-clinical audit tool (RAD app and national database®)

Setting: 210 bedded NABH accredited multi-speciality Private hospital.

Patients: All patients who had Peripheral nerve blocks for chest and abdominal surgeries

Measurements: Data on practice, clinical and patient related outcome measures were prospectively entered in the mobile app and web-entries. Data analysis is automated and summary statistics with comparison to national data is presented here.

Results: Data analysis is automated and summary statistics with comparison to national data is presented. 147patients received 199 blocks between 3rd July 2017 to 2nd July 2018. Youngest patient was 1 year old and oldest being 84 years of age. 40% of patients were males and 15.4% of surgeries were for emergency reasons. Few new blocks were added into our practice during this year including the erector spinae plane block, quadratus lumborum block and serratus plane block. The overall quality and safety of these new blocks are comparable to Indian national benchmark and available literature. A number of differences in practice compared to national sample data is identified including greater use of ultrasound in our practice(70% vs 31.6% nationally), significantly, more blocks are done pre-operatively (75% compared to 50% nationally). Outcomes in terms of success rates and post-operative analgesia, opioid consumption are comparable. 40% of our patients had opioid free surgery and 85% of the patients had no analgesic requirement in their recovery period. Quality assurance audit data shows that only 63.3% of the patients had correct site check/block specific time-out done. Ultrasound probe cover was not used in 95% of the cases. Patient related outcome measures are reported for the first time showing high rates of satisfaction and likelihood of having regional anaesthesia/analgesia again.

Conclusions: This is the first reported audit of peripheral nerve blocks of chest and abdomen in India. This audit was enabled by an e-audit tool (RAD app and database®) which removed many barriers in doing clinical audit in busy day-to-day practice. The audit was done with minimal effort using smart entry system and automated analysis of graphs and charts. The project is ongoing and data from 1st year is reported to identify practice and outcomes of our regional anaesthesia practice. A number of practice changing recommendations are identified to further improve quality and safety of our regional anaesthesia practice.

Recommendations: 1. Correct site check and timeout before block to be 100%. STOP before block to be ensured in 100% of patients

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2. Ultrasound Probe cover to ensure sterility is maintained should be achieved in 100%
3. Ensure more than 90% complete data collection to measure the Patient related outcome measures as accurately as possible

Keywords: Peripheral nerve blocks, Audit, Regional Anaesthesia, Truncal blocks, chest and abdominal wall blocks, Database

Figure 1: RAD app and Indian National database architecture. Each data record screen has smart entry system which minimises data entry efforts

Introduction

The widespread availability of ultrasound (US) and familiarity with regional anesthesia techniques using US techniques has led to a reinvigorated interest in the field of regional anesthesia [1]. Analgesia for chest and abdominal procedures has traditionally revolved around epidural techniques with its own inherent risks [2]. Surgical advancement of minimally invasive techniques like laparoscopic procedures has resulted in decreasing use of epidural technique. We have been using truncal blocks for the abdomen and chest wall to provide somatic analgesia and realized that there is a need to look into practice and outcomes of these techniques in our practice.

Challenges and barriers

Anesthetists work in constrained environments and are unable to apportion adequate time for clinical audits due to vagaries of time and staffing. In India, quality assurance activities like clinical audits are required to be done by hospitals and departments to maintain their accreditation by quality assurance boards like National Accreditation Board for Hospital and Healthcare Providers (NABH). Electronic medical records and national databases do not exist in India and are still fairly far off in the future. Anesthetists are also obligated to undertake safety assurance initiatives to maintain currency in the domain of patient-centered

Table 1: Demographic data, safety aspects and Practice pattern of blocks

Characteristics	Our data n	National data N
Total Number Of patients Recorded	147	1099
Total Number of patients With Complete Data	120	892
Total Number Of chest and Abdominal Blocks Done	199	1308
Demography	**Our data**	**National data**
Age (year,mean±SD),Min, Max	44±17 , 1 , 84	38±18 , 1 , 88
Weight (kg,mean±SD),Min, Max	61±14 , 10 , 97	60±16 , 7 , 148
Gender (M/F) %	40 / 60	34 / 66
Emergency cases (%)	15.70%	23%
ASA I/II/III/IV (%)	55.8/21.1/21.8/1.3	44.8/39.1/13/7/2.4
Safety Features	**Our data n (%)**	**Country data N (%)**
Standard monitoring during block	147, 100%	1008, 99.90%
Resuscitation equipment available	147, 100%	1006, 99.70%
Lipid rescue available	136, 95.52%	837, 82.95%
Time Out/Correct Side Check done	93, 63.27%	777, 77.01%
Block Purpose	**n, % of Total Blocks**	
Sole anaesthetic	23, 11.56%	149, 11.39%
Only for analgesia	176, 88.44%	1159, 88.61%
Block Timing	**n, % of Total Blocks**	
Pre-operative (prior to incision)	110, 74.83%	495, 49.06%
Post-operative	37, 25.17%	514, 50.94%

Table 2: Local anesthetic stats (mean ± SD)

Local anesthetic	Our data mean ± SD	Country data mean ± SD
Ropivacaine	1.75±0.67	1.75±1.29
Bupivacaine	0.00±0.00	1.50±0.57
Levobupivacaine	0.00±0.00	1.49±0.79
Lignocaine	0.00±0.00	4.78±1.08
Lignocaine w/adrenaline	0.00±0.00	4.17±0.00

Table 3: Intraoperative IV analgesia

IV analgesia	Our data % of cases	Country data % of cases
Opioids	59.15	51.46
Multimodal analgesia	66.9	71.24
IV adjuvants	26.76	31.03

Table 4: Complications

Acute complications	Our data % of total blocks	National data % of total blocks
None	99.5	98.39
Severe pain on injection	0.5	0.92
Vascular puncture	0	0.46
LA toxicity	0	0
Visceral injury	0	0
Other including technical problems	4.02	3.6

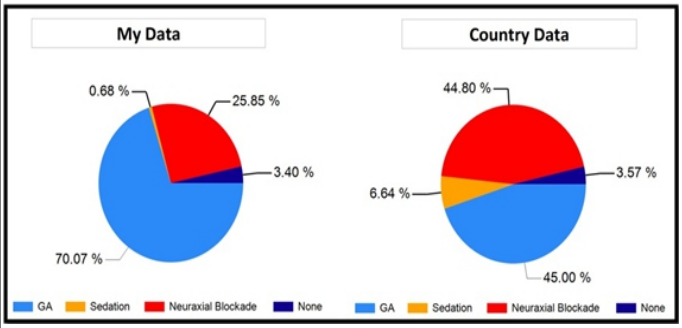

Figure 2: Type of anaesthesia provided for surgeries

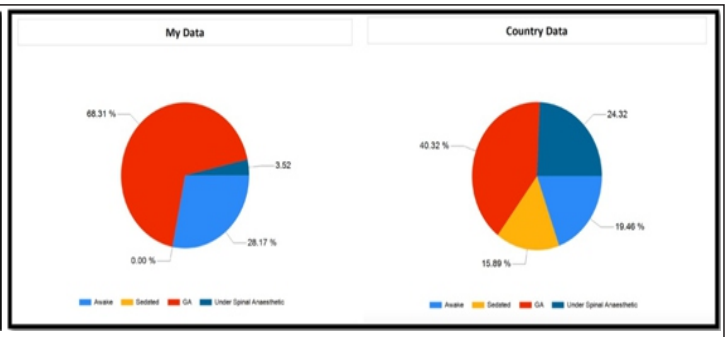

Figure 3: Patient status during block

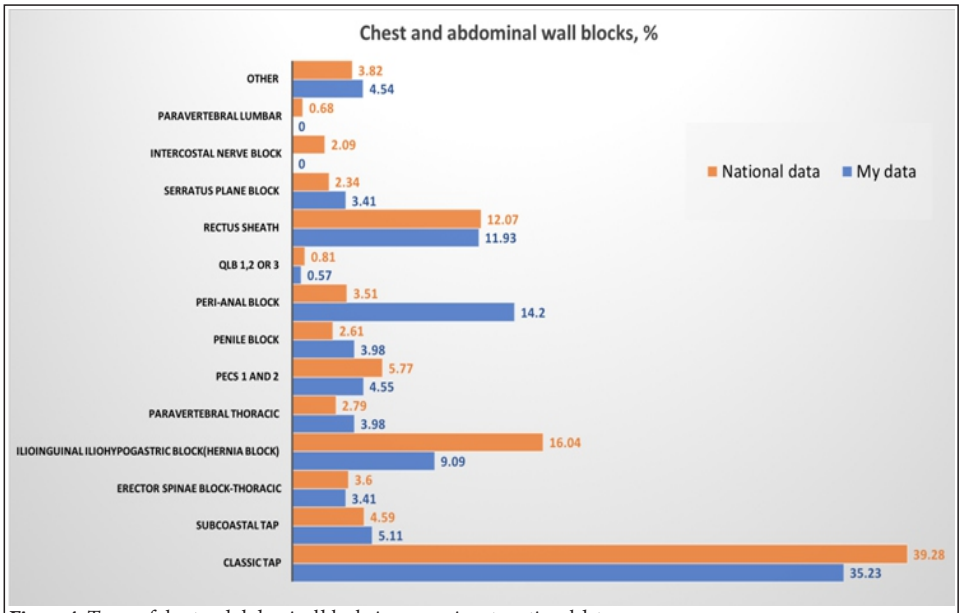

Figure 4: Types of chest and abdominal blocks in comparison to national data

care and continuous quality improvement. Having a paper or web-based data entry is a feasible solution, but it is labor intensive, prone for errors and has poor participation. Doctors tend to lose interest very quickly in a system that does not provide real-time feedback on quality of care and safety. Moreover, there is significant confusion, barriers, and difficulty in establishing clinical audits in real-world practice.

Aims

The aims of this study were as follows:

1. To identify our current practice and outcomes of the truncal blocks involving the chest and abdomen.
2. Compare our results with standards of practice and benchmarks for quality improvement.

Methods

We incorporated an innovative mobile app (RAD app and database®) to eliminate many barriers in clinical audit, improve participation, and increase accuracy in entering data at patient bedside. Ours is a 210-bedded NABH accredited multispecialty hospital with five operating theaters and about 3000 surgeries are done per year. RAD app and database® are developed, copyrighted, and maintained by Medusys, a company registered with Government of India. We obtained license through secure process and user agreements. The basic architecture of the database is shown in Fig. 1.

Briefly, the key features of the RAD app and database® include:

1. Ability to enter complete perioperative data at patient bedside using iOS, Android apps, or web-based entries. Fig. 1 explains the basic architecture of data entry system which includes five data entry systems.
2. The system generates a unique identifier number for each patient record and is used for patient follow-up.
3. Patient identifiable data are not recorded or stored in the database. The hospital and user information are encrypted and obfuscated.
4. The database environment has tight monitoring controls to assure patient privacy is kept secure while eliminating the risk of attacks from cyber hackers.
5. Data analysis is automated, continuous and real-time with basic descriptive statistics. Filters were applied in the results to obtain specific information on chest and abdominal blocks.
6. Data are audited by central database administrator and The Anaesthetic society (TAS) -India quality initiative team.

This audit was considered as negligible risk and the care received by the patient was not

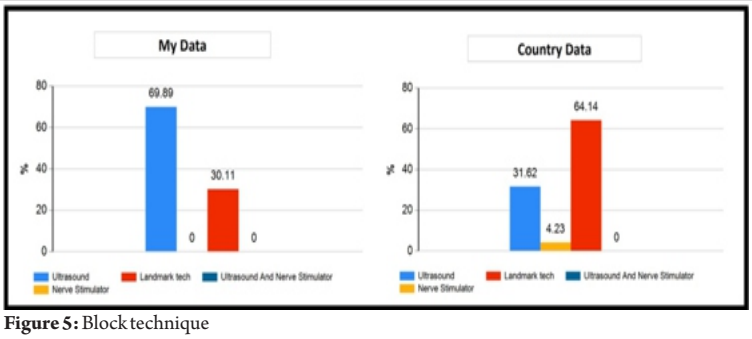

Figure 5: Block technique

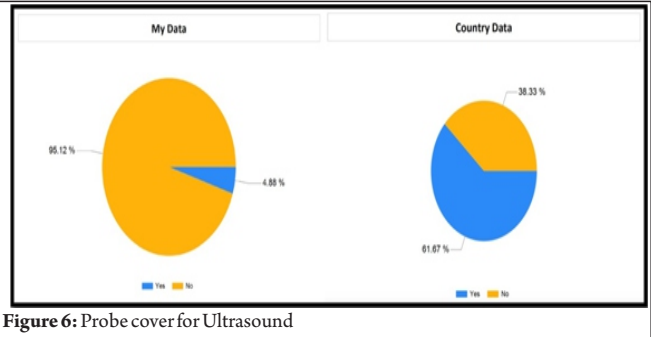

Figure 6: Probe cover for Ultrasound

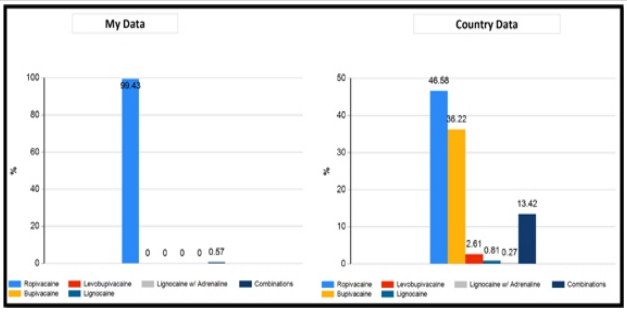

Figure 7: Local anaesthetic used

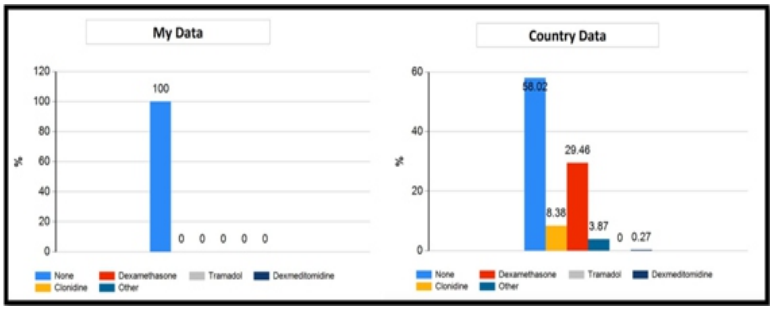

Figure 8: Adjuvant use with Local anaesthetics

affected by data collection. For the above reasons, we felt that patient consent was not required and this audit has approval by the Hospital Ethics Committee. The study period for this current audit is between July 3, 2017, and July 2, 2018. Initial entry of patient followed pre-operative assessment and block details were entered by the anesthetist initiating the block. The recovery details were entered by the nurses and follow-up and feedback were obtained by the anesthetist.

Results

We present summary statistics of the safety and effectiveness of chest and abdominal blocks in our practice. We also demonstrate areas of improvement which can potentially help us to improve our practice.
We compare these results with Indian national database as benchmark.

Basic demography

Demographic data which include age, gender, weight, and ASA classification were comparable and unremarkable (Table 1).

Safety

Safety aspects of peripheral nerve blocks are recorded for all cases include standard monitoring, availability of resuscitation equipment including lipid rescue and time-out or correct side check (Table 1).
Time-out/correct side check is specific for the peripheral nerve blocks and declared before doing the block irrespective of surgical time-outs

Practice

Our practice of chest and abdominal blocks covered many specialties including General surgery (46.9%), Obstetrics and Gynaecology (24.5%) and Urology (9.5%) were among the top three. Most blocks are done for analgesia purposes and our results are comparable with national data. Our practice of doing blocks prior to incision is quite in contrast to the national practice. The effect of this on the outcome is unknown but some studies shows beneficial effects of this form of preventive analgesia. 10 (Table 1). 11.56% of the blocks were intended as sole anaesthetic but only 4.08% of the cases ended with either sedation or no other form of anaesthesia. 7.48% of the patients needed GA for other reasons. There were no cases of block failure leading to conversion to GA.(Figure 2) More than 2/3rds of our patients received blocks under general anaesthetic and about 20% more than the national data (figure 3) Various types of blocks are performed in the chest and abdominal wall region. The top four being classic TAP blocks, Peri-anal blocks and Rectus sheath blocks followed by Ilio-inguinal Ilio-hypogastric blocks (Hernia blocks). (Figure 4) There are different ways of conducting these peripheral nerve blocks broadly classified into landmark technique, ultrasound (US), peripheral nerve stimulation (PNS) and a combination of US and PNS.The comparison of our technique versus the national data is shown in Figure 5. We also audited the use of Ultrasound probe cover as part of safety and quality in our techniques shown in Figure 6. The choice and doses of local anaesthetics is shown in Figures 7 and table 2. Use of adjuvant with local anaesthetics was also audited shown in Figure 8.

Outcome and quality

Quality and safety indicators that were audited include:

1. Success rates: (defined by the anesthetist) (Fig. 9)

a. Complete success defined as successful puncture and injection of local anesthetic, development of block characteristics along with post-operative pain, and opioid requirement being nil or minimal.

b. Partial success: Defined as successful puncture and injection of local anesthetic, development of some characteristics of block but requiring supplementation by local anesthetics, opioids, ketamine, or other agents. Post-operative pain and opioid requirements being moderate.

c. Failure: Partial or fully failed block which either needed conversion to GA or large doses of opioids, ketamine, and other analgesic supplementation. Post-operative pain and opioid requirements being high.

d. Unable to assess: Intubated patients, language barriers, and extremely sedated

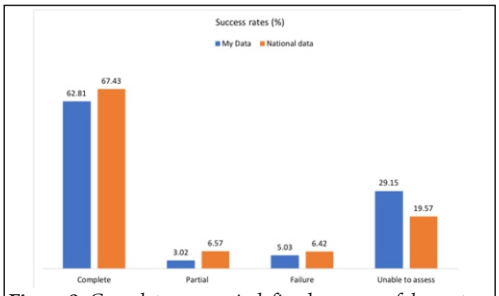

Figure 9: Complete success is defined as successful puncture and injection of local anaesthetic, development of block characteristics along with post-op pain and opioid requirement being nil or minimal.

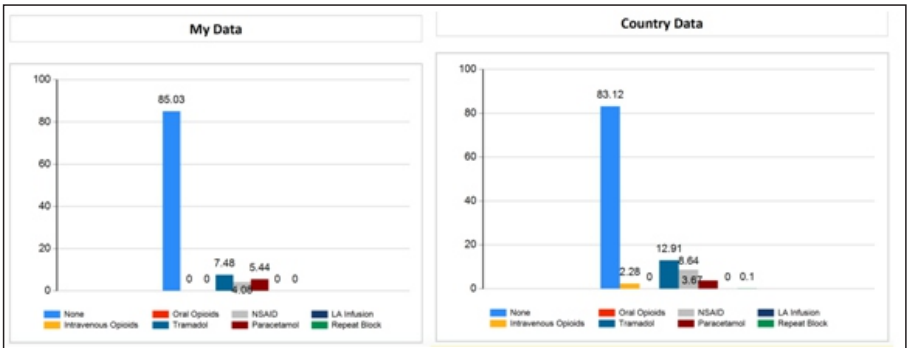

Figure 10: Recovery analgesia

patients where the above criteria could not be applied.
2. Intraoperative analgesia (Table 3) and post-operative pain and opioid requirements (Figure 10).
3. Presence of immediate and delayed complications (Table 4).
4. Long-term complications.

Patient-related experience measures (PREMs)

All patients in our audit were followed up by direct interview in the immediate post-operative period and until discharge. The outcomes that were audited are Patient satisfaction, patient likely to have regional anaesthesia again and if patient was happy with information provided on regional anaesthesia.
A simple scoring system of numerical scale 1-10 is used for patient satisfaction. 10 being most satisfied and 1 as least satisfied with peri-operative analgesia.
- High satisfaction scores: 7-10: 89.26%
- Mid satisfaction scores: 4-6: 8.26%
- Low satisfaction scores: 1-3: 2.48%

10% of our patients did not prefer to have these nerve blocks again. We haven't audited the reasons for this and will be included as part of our next audit cycle.
96% of our patients were happy with the information that we provided regarding regional anaesthesia compared to 87.6% in national data.

Discussion

There are several barriers while conducting a clinical audit in real-life practice [6]. They include issues related to lack of resources, lack of expertise, lack of sound advice on study methodology and analyses, and lack of funding and executive support for undertaking quality assurance projects [9]. There is a growing concern among hospitals about accreditation by quality assurance boards such as NABH and Healthcare Providers in India since 2007, which requires many measures including clinical audit. However, there is general lack of awareness and lack of resources. The introduction of the e-clinical audit app (RAD app) and TAS Indian database has eliminated most of these barriers and enabled us to start a prospective audit of regional anesthesia in our practice. A national benchmark had never been available in our practice until this national database was established. An audit with benchmarking is considered as the gold standard for quality improvement in health care [16]. According to our knowledge, this is the first reported audit on chest and abdominal wall blocks in India giving valuable insight into practice and outcomes of regional anesthesia. There are some differences in our practice, safety and outcome measures compared to national data. One in four blocks of ours is done preoperatively before skin incision compared to one in two of the national practice. There is increasing evidence to prove blocks done before skin incision may have reduced intraoperative opioid requirements and prolonged analgesia acting as preventive analgesic technique [10]. Significantly greater numbers of blocks are done under GA and more number of patients under our care receives GA as primary anesthetic. Our practice on these blocks is quite different from the national data. We prefer to use US to localize the site of injection of local anesthetics, whereas the rest of India prefer landmark technique. These differences in practice are quite common in the subcontinent with cost and legislative issues around the use of US (Fig. 5). US has shown to be safer and easier to perform in these blocks, but evidence is equivocal [13]. Our lack of use of US probe cover is of concern, but no untoward events having been recorded (Fig. 6). The site of injection is often away from the site of probe placement (non-touch technique) in US-guided blocks, and we believe that this may have been the reluctance to use probe covers as part of cost savings. Our practice has always been to use ropivacaine and no adjuvants (Figs. 7 & 8 and Table 2). Among the long-acting local anesthetics, ropivacaine and levobupivacaine have shown to be safer than bupivacaine, but availability and cost of newer agents across all centers in India may be the reason for this difference. Overall, the dosages have remained within the recommended safe limits. Despite the differences in techniques, the outcome and quality of care remain very comparable. Our success rates are shown in Fig. 9 and are comparable to the national data. Success rates of chest and abdominal plane blocks have always been difficult to assess because of a number of reasons. Low concentration of local anesthetics in these planes rarely produce a sensory/motor characteristics of the blocks and visceral pain carried by the autonomic system is not targeted which can be 40–50% of pain from visceral surgeries. The value of optimal pain management is well known, but it still continues to pose challenges, and studies report that inadequate post-operative pain relief remains common [14]. This may be related to lack of understanding of multimodal analgesia, timing of appropriate drug therapies including the peripheral nerve blocks, opioids, and other intravenous adjuvants and lack of understanding of various pain pathways. An optimal analgesic technique would block all noxious stimuli that result from surgical insult, including parietal and visceral components [15]. Post-operative analgesic requirements remain extremely low in our practice. About 40% of our patients had opioid-free surgery (Table 3), 85% of our patients did not require any analgesia in recovery (Figure 10), indicating the efficacy of the blocks and combined use of multimodal analgesia and intravenous analgesic adjuvants to target visceral pain. Such data have never been reported in our hospital and to our knowledge in any Indian subcontinent set up. Amid opioid crisis in rest of the world and lack of availability of opioids in India, the efficacy of such peripheral nerve blocks plays an important role in our practice. The audit results on post-procedure acute complications show that these blocks are very safe and results are comparable to national benchmark (Table 4). Long-term follow-ups were not done, but there are no self-reported complications. PREMs are rarely captured in our practice and we are unaware any such data in Indian subcontinent. This app and database enable us to capture this data. More than 90% of our patients are satisfied and likely to have block again showcasing the quality of blocks and feedback from patients. This has improved the awareness of pain management and regional anesthesia in our patient population and our profile as anesthetists caring for patient care has improved significantly.

Recommendations to practice

1. Correct site check and time-out before block to be 100%. STOP before block to be ensured in 100% of patients.
2. US probe cover to ensure sterility is maintained should be achieved in 100%.
3. Ensure more than 90% complete data collection to measure the patient-related outcome measures as accurately as possible.

We aim to improve our practice by educating of all members of the anesthesia and post-operative care team.

Limitations

There are several limitations in this audit. The app and database have been adopted by only few clinicians interested in the project and may not be a true reflection of national data. We hope that by engaging more anesthetists in data collection can improve the quality of national data. Safety and outcome standards in peripheral nerve blocks have not been established in India by any accredited body. We are hopeful that the national data will be used to implement standards of practice for benchmarking.

Many abdominal surgeries have significant pain from visceral component which is often not covered by these blocks. A significant number of patients are not very well educated or trained to provide accurate pain scores or analgesic requirements. Add to this is cultural influences and fear. Therefore, assessment of success and opioid use is limited as an objective measure of block success. Regardless, we feel that an education and training of staff in perioperative pain management processes may result in improvements in clinical care. A further limitation is that these results are purely based on our personal goal toward improvement in quality and safety. No external governance has been applied yet.

Conclusion

Clinical audits should be integral part of our patient care programs. Unfortunately, in the real-world situation, practitioners face many difficulties to implement audits in their busy day-to-day activity. This innovation has helped us to conduct clinical audit for the 1st time with minimal effort in data collection and analysis. It has helped us provide real-world data to national database and has potential to improve safety and quality of regional anesthesia practice.

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Conflict of Interest: One of the co authors Gurunath Murthy is The Anaesthetic society (TAS-India) RAD app database administrator. He is also a co-founder of Medusys technologies which built the RAD app and database and are IT-support for TAS India Regional Anaesthesia registry database. His contribution in this project has not influenced in the study and outcome

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