



IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals

ISSN 2349-7203



Human Journals

Research Article


August 2020 Vol.:19, Issue:1

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Drug Utilization Evaluation of Anesthetics in Tertiary Care Hospital



IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals



ISSN 2349-7203

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Submission: 27 July 2020
Accepted: 02 August 2020
Published: 30 August 2020



HUMAN JOURNALS

www.ijppr.humanjournals.com

Keywords: Anesthetics, bupivacaine, drug utilization, drug wastage, general anesthesia, local anesthesia, side effects

ABSTRACT

Introduction: Anesthesia is a state of temporary induced loss of sensation which is used during surgeries. **Aim:** The main aim of the study is to evaluate the drug utilization pattern of anesthetics in a tertiary care hospital. **Methodology:** The study design is a Prospective Observational study which was carried out for six months. The patients were selected based on the inclusion and exclusion criteria. A total of 230 cases were collected in which anesthetics were administered for surgical procedures. In this study, the type of anesthetics mostly administered to patients whether single or in combination were evaluated. The gender, age of the patient, type of anesthetic, bupivacaine drug wasted was reported. The results were analyzed and evaluated. **Results:** A total of 230 anesthetic cases were collected. Of these 148(64%) were regional anesthesia (subarachnoid block - SAB), 72(31%) were of General anesthesia and 10(5%) were of Local anesthesia (Nerve blockade). Among the 230 cases, males were 142 (62%) and females were 82(38%) underwent surgery which involved anesthetic usage. Among General anesthetics, Propofol, Sevoflurane, Midazolam, Thiopentone, Glycopyrrolate, Vecuronium were used in combination. Among Local Anesthetics, Bupivacaine, Lignocaine, Chloroprocaine were used in combination or single. A total of 166.6ml (0.5%) and 10ml (0.25%) was wasted that accounts to 2,913.9 rupees. Side effects associated with anesthetic administration were hypotension, bradycardia, postoperative nausea and vomiting (PONV), Postoperative delirium, Hypertension, Chills, and shivering (hypothermia). **Conclusion:** The study showed that the most common anesthetic procedure performed using local anesthetic agents is subarachnoid block and the most common agent used is bupivacaine which was frequently employed at the dose range of 3-4 ml. Evaluation of utilization of anesthetics and the implementation of effective strategies can greatly aid in improving the quality use of anesthetics.

INTRODUCTION:

Anesthesia is a state of controlled, temporary loss of sensation or awareness that is induced for medical purposes. It may include analgesia, muscle relaxation, amnesia, or unconsciousness. A patient under the effects of anesthetic drugs is referred to as being anesthetized. An anesthetic is a drug to prevent pain during surgery, completely blocking any feeling as opposed to an analgesic. A wide variety of drugs are used in modern anesthetic practice. Many are rarely used outside anesthesia, although others are used commonly by all disciplines. Four types of anesthesia may be employed alone or in combination: Local Anesthesia, Sedation (minimal, moderate or deep), Regional Anesthesia, General Anesthesia. Possible side effects of anesthesia - General Anesthesia causes to lose consciousness. This type of anesthesia, while very safe, is the type most likely to cause side effects. Side effects of general anesthesia can include nausea and vomiting, sore throat, postoperative delirium, muscle aches, itching, chills, and shivering (hypothermia), postoperative delirium or cognitive dysfunction, malignant hyperthermia. Side effects of Local anesthesia this type of anesthesia is least likely to cause side effects, and any side effects that do occur are usually minor.

Drug use evaluation (DUE) is a system of ongoing, systematic, criteria-based evaluation of drug use that will help ensure that medicines are used appropriately (at the individual patient level). If therapy is deemed to be inappropriate, interventions with providers or patients will be necessary to optimize drug therapy.

The goal of a DUE is to promote optimal medication therapy and ensure that drug therapy meets current standards of care. Additional objectives may include - Creating guidelines (criteria) for appropriate drug utilization; Evaluating the effectiveness of medication therapy; Enhancing responsibility/accountability in the medication use process; Controlling medicine cost; Preventing medication-related problems, for example, adverse drug reactions, treatment failures, over-use, under-use, incorrect doses, and non-formulary medicine use; Identifying areas in which further information and education may be needed by health-care providers.

Drug wastage means the drug amount that is discarded and not administered to any patient. Generally, two types of vials are used they are –

- Single-use vials are a vial of medication intended for administration by injection or infusion that is meant for use in a single patient for a single procedure. These vials are labeled as a single dose or single vial by the manufacturer and typically do not contain a preservative.
- Multi-dose vials are a vial of medication intended for administration by injection or infusion that contains more than one dose of medication. These vials are labeled as multi-dose by the manufacturer and typically contain an antimicrobial preservative to help prevent the growth of bacteria.

Cost analysis is defined as the act of breaking down a cost summary into its constituents and studying and reporting on each factor. Comparison of cost purpose of disclosing and reporting on conditions subjective improvement. Cost analysis in the wastage is done through the drug which is left in vials. The amount of drug left is taken in quantity (ml) according to (ml) left in vial cost is analyzed.

According to one of a recent study conducted by Lakshmi Ravalitha Gajjala (2019)^[1] observed that maximum of subjects undergone surgeries being Adults within the age group of 20-49. Local Anesthesia of which Spinal and Blocks were employed in most of the surgeries and General Anesthesia in few. Bupivacaine was most commonly prescribed for spinal. Propofol is most commonly prescribed drug for induction of anaesthesia followed by as maintenance of anaesthesia. Hence, this study was conducted to determine the drug utilization pattern of anesthetics and it is an attempt to evaluate the choice or decision of particular anaesthetic agent, which includes defined rules of administration and monitoring of unfavourable outcomes.

MATERIALS AND METHODS:

All the relevant and necessary data was collected from Patients case reports, Anesthesia reports, Laboratory reports, Interviewing patients or patient caretakers, Interviewing Healthcare Professionals. The study period was planned from the timeline of September 2018 to February 2019. The data collection for this study was done in the following hospital: Malla Reddy Narayana Multi-speciality Hospital, Suraram, Telangana.

A Prospective observational study was carried out in the patients undergoing surgery. The patients were identified during ward rounds and by regular Case record reviews during the study period. The enrolled patients were followed from the day of surgery till two days after

the surgery and the relevant study data including Pre-anesthetic assessment (such as Clinical examination, BP, Temperature, BT, CT, Drug sensitivity, Social history, Comorbidities, Previous surgical procedures), Type of Anesthesia, Anesthetic used, Dose, Side effects, Cost of anesthetic, Anesthetic drug wastage was documented in Case record form. The data observed was analyzed for the commonly used anesthetic and anesthetic drug wastage and was calculated based on the Anesthetic drug administered during surgery. Data about the side effects associated with an anesthetic administered were collected from case sheets, physician guidance, patients.

Study criteria:

Inclusion criteria:

- Patient population undergoing surgery
- Post-operative hospital stay expected to be at least 1 night
- Patients of either gender

Exclusion criteria:

- Greater or equal to 18yrs years of age
- Alcohol or drug abuse on the day of surgery
- Lack of adequate medical records including preoperative history and exam, anesthetic record, and postoperative follow-up and studies
- Patients who are not willing to consent.

Study duration:

The study was conducted for 6 months, starting from September 2018 till the end of February 2019.

RESULTS

A total of 250 cases were examined to have undergone surgery during the study period, of which 230 cases were enrolled based on Inclusion and Exclusion criteria.

1. Gender wise distribution

The enrolled 230 subjects based on their gender were classed and analyzed. There were 142 male patients and 88 female patients enrolled for the study project.

2. Age-wise distribution

Of the enrolled 230 patients, recording the age-wise distribution of subjects with a class size of 10 years, it was seen that majority of subjects belonging to the age group of 31-40 years and the mean age value was found to be 41.53.

3. Educational status

Out of 230 subjects, most of the subjects were illiterate 120 (52.17%) followed by primary 40 (17.39%), then secondary 46 (20%) and UG 24 (10.4%).

4. Knowledge on anesthesia

Out of 230 subjects, most of the subjects (143) know anesthesia. The patient unaware of anesthesia were counseled about anesthesia in brief before their surgery.

5. Distribution of subjects based on departments

Out of 230 subjects, most of the subjects are from surgery department 162, followed by orthopedics 44, gynecology 24.

6. Type of anesthetic given to the subjects

Out of 230 subjects, most of the subjects were administered with regional anesthesia 148 followed by general anesthesia 72 and local anesthesia 10. (Table 1, Figure 1).

7. Distribution of subjects based on therapy

Out of 230 subjects, monotherapy was given for 104 subjects followed by combination therapy (2), combination therapy (+3).

8. Distribution of subjects based on anesthetic

Out of 230 cases, the most commonly used anesthetic was bupivacaine (98) followed by combination therapy of bupivacaine and fentanyl (56) and the rest of them are summarized in the table. (Table 2, Figure 2).

9. Bupivacaine (0.5%) drug wastage and Bupivacaine (0.25%) drug wastage

Out of 230 subjects, Bupivacaine (0.5%) was used for 150 subjects. A total of 464.4ml was used and 166.6ml of bupivacaine was wasted. Bupivacaine (0.25%) was used for 4 subjects. A total of 22ml was used and 10ml of bupivacaine was wasted. (Table 3, Figure 3,4).

10. Side effects of anesthesia

Out of 230 subjects, the most common side effect was hypotension followed by bradycardia, Postoperative nausea and vomiting (PONV), hypertension, Postoperative delirium and Chills, and shivering (hypothermia). (Table 4, Figure 5).

DISCUSSION

The types of anesthetics used are categorized into single anesthetic and combination usage. 122 subjects were given combination anesthetics and 104 subjects were given a single anesthetic. Therefore, the combination of anesthetics usage was preferred over single anesthetic administration. Similar results were found when compared to Rejitha Thomas et al., Bangalore.^[2]

Anesthetic administration was higher in the age group 31-40years (24%) followed by 21-30years (23%), 61-70 (18%), 41-50years (15%), 11-20years(11%) and the least in 51-60years (4%) and 71-80 (5%) age groups. A maximum number of anesthetics were administered in the age group of 31-40 years (33.6%) and the least in 0-10 (1.6%) and 71-80 (1.6%) age groups when compared to Rejitha Thomas et al., Bangalore.^[2]

In Monotherapy drugs utilized are, bupivacaine of 98 units, chlorprocaine of 2 units, propofol of 4 units. From the total, 76 units of two combinational treatment, bupivacaine+fentanyl were 56units, midazolam+fentanyl were 12 units, chlorprocaine+fentanyl were 4 units, ketamine+midazolam were 2 units, lignocaine+fentanyl were 2 units. The rest 50 units were used as (+3) combinational treatment. When compared to

Ch. Deepthi Reddy, et al., Hyderabad^[3] monotherapy drugs utilized are bupivacaine of 79 units, ketamine of 25 units, propofol of 2 units, vecuronium of 1 unit, and lidocaine of 3 units. From the total, 14 units of two combinational treatments, propofol+vecuronium used were 5 units, propofol+ketamine were 8 units and thiopentone+nitrous oxide was 1 unit. Rest 25 units were used as (+3) combinational treatment.

The type of anesthesia includes General, Regional and Local anesthesia. Of Regional anesthesia majorly observed techniques were spinal and nerve blocks of Local anesthesia. 138(60%) subjects were administered with spinal anesthesia, 20(9%) subjects were administered local anesthesia – nerve block. Remaining 72(21%) subjects were given general anesthesia. During the administration of anesthesia to the subject, a small amount of drug has been leftover in ampules and vials, in the findings we have found bupivacaine wastage. The bupivacaine (0.5%) used was 74%. Remaining 26% was left unused. Bupivacaine (0.25%) used was 69%, the remaining 31% was left unused. Of total bupivacaine, 73% was used and 27% of bupivacaine was wasted. When compared to Dr. Ch. Deepthi Reddy et al., Hyderabad^[3] the bupivacaine remained is 50% from the total of 4ml i.e., only 2ml was used and 2ml was left unused.

According to the amount of drug left in containers, the cost analysis was done. The drug left of bupivacaine was 27% in 154 subjects and its cost of drug left was 2,913.9rps. Whereas when compared to the Dr. Ch. Deepthi Reddy et al., Hyderabad^[3]. The drug left of bupivacaine was 50% in 79 cases and its cost of drug left was 876.85rps.

The anesthetics administration was found to be higher in males (62%) than females (38%) when compared to Dr. Rejanigandha et al., South Kerala,^[4] the anesthetics administered to male population was 70.3% and for the female population was 29.3%.

Out of 230 subjects, 162 (71%) from General Surgery and 44(19%) from Orthopedics, 24(10%) were from the Department of Obstetrics and Gynecology. When compared to Deeptangshu Ganguly et al., Karnataka, India,^[5] depicts that almost equal no. of surgeries are performed in OBG (35%), Orthopedics (32%) and General Surgery (33%) departments using local anesthetic agents.

Side effect associated with anaesthesia usage was hypotension(29%), bradycardia(19%), Postoperative nausea and vomiting (19%), hypertension(17%), postoperative delirium(10%) and hypothermia(6%). According to G. Gomathi, et al.^[6] side effects observed includes

hypotension (7.27%), bradycardia (6.36%), hypertension (3.63%) and postoperative nausea and vomiting (2.72%).

Table No. 1: Type of Anesthesia

TYPE OF ANESTHESIA	NUMBER OF SUBJECTS
General	72
Regional /SAB	148
Local/Nerve blockade	10

Table No. 2: Distribution of Subjects Based on Anesthetic Used

CATEGORY	GENERIC NAME	UNITS	TOTAL
MONOTHERAPY	Bupivacaine	98	104
	Chlorprocaine	2	
	Propofol	4	
COMBINATION(2)	Bupivacaine + fentanyl	56	76
	Midazolam + fentanyl	12	
	Chlorprocaine + fentanyl	4	
	Ketamine + midazolam	2	
	Lignocaine + fentanyl	2	
COMBINATION(+3)	Fentanyl	50	50
	Propofol		
	Glycopyrrolate		
	Vecuronium		
	Thiopentone		
	Midazolam		
	Sevoflurane		

Table No. 3: Bupivacaine Drug Wastage

Anesthetic drug	Drug used	Drug wasted
1. BUPIVACAINE HEAVY (0.5%) Standard dose (4ml)	464.4ml	166.6ml
2. BUPIVACAINE HEAVY (0.25%) Standard dose (4ml)	22ml	10ml

Table No. 4: Side Effects of Anesthesia

Side effects	Number of subjects
Postoperative nausea and vomiting (PONV)	09
Hypotension	14
Postoperative delirium	05
Hypertension	08
Bradycardia	09
Chills and shivering (hypothermia)	03

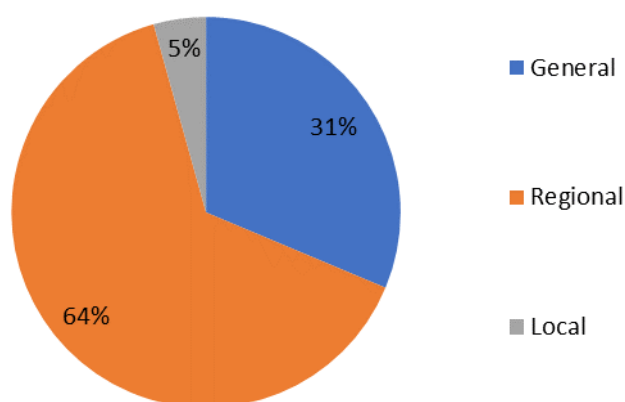


Figure No. 1: Pictorial Representation of Type of Anesthesia Used

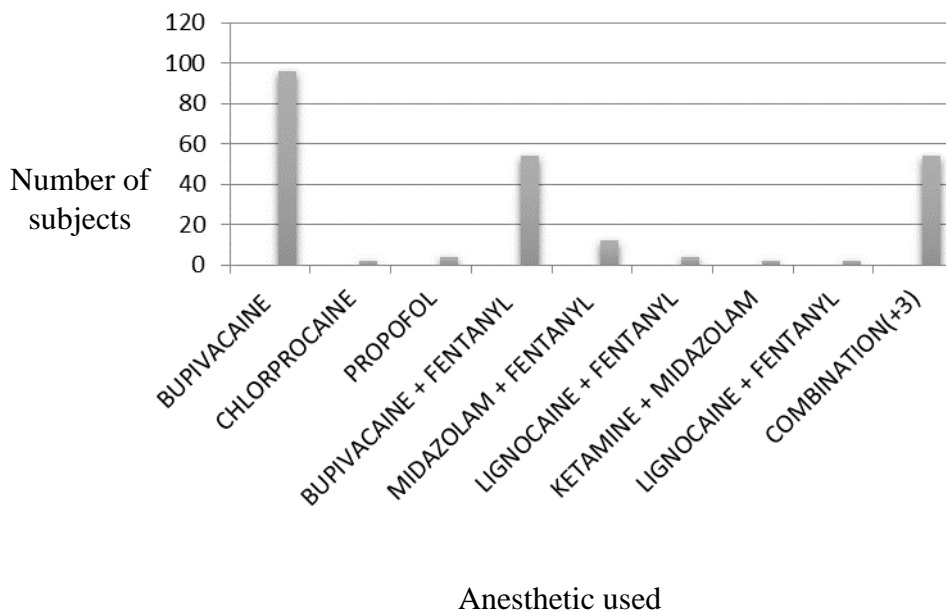


Figure No. 2: Graphical Representation of Distribution of Subjects Based on Anesthetic Used

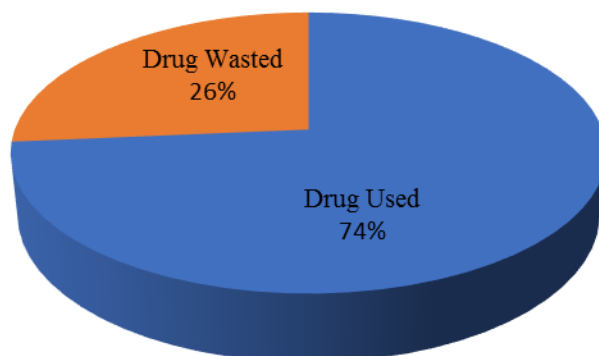


Figure No. 3: Pictorial Representation of Bupivacaine Drug Wastage (0.5%)

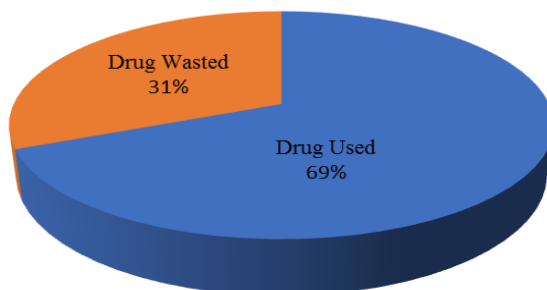


Figure No. 4: Pictorial Representation of Bupivacaine Drug Wastage (0.25%)

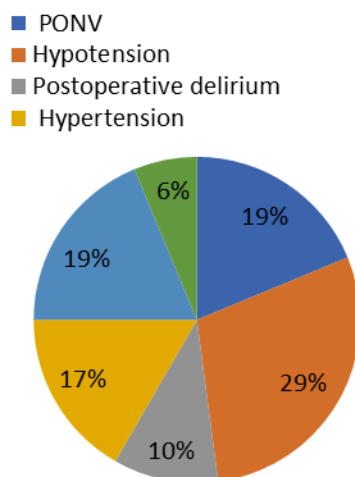


Figure No. 5: Pictorial Representation of Side Effects Associated with Anesthesia Usage

CONCLUSION:

The prospective study revealed the most common anesthetic used is Bupivacaine which was frequently employed at the dose range of 2-3.5 ml. The study concluded that spinal anesthesia was mostly adopted by anesthesiologists and anesthesia administered was mostly seen in the age group of 31-40 years. Study shows poly aesthetic administration of anesthetics was more preferred. In the hospital, bupivacaine 4ml ampules were used. A total of 166.6ml (0.5%) and 10ml (0.25%) was wasted that accounts to 2,913.9rps, so instead of that bupivacaine 2ml ampules can be used which are available in the market.

Acknowledgment:

This study was approved by Institutional ethics committee (IEC) at Malla Reddy Medical College for Women. This study was supported and guided by an Institutional guide at Malla Reddy Institute of Pharmaceutical Science and Hospital guides at Malla Reddy Narayana Multi-speciality Hospital.

CONFLICT OF INTEREST:

Conflicts of interest declared none.



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