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Journey of a standalone paediatric orthopedic day-care surgical center catering wide variety of cases judiciously: a review of 300 surgeries

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ABSTRACT

Background: In spite of known advantages of day care surgery (DCS) in children, multiple ambulatory surgical centres (ASCs) in different subspecialities of orthopedics, enhanced recovery after surgery (ERAS) protocol and advancement of paediatric anesthesia with guidelines, we see limited popularity of standalone day care paediatric orthopaedic facilities. We also do not have definite paediatric orthopaedic case guidelines for day care surgery unlike pediatric anesthesia and paediatric surgery. Purpose of this study to determine the possibility of various types of child orthopaedic surgery in a standalone day care set up in a safe, comfortable environment with cost minimisation.
Methods: A retrospective review of cases in a standalone private paediatric orthopaedic day care centre involving its first 300 surgeries over a span of two years. Wide variety of paediatric orthopaedic surgeries were performed in spite of having a long exclusion criteria list. Adverse reaction, cost minimisation and comfortable nature of this pathway were assessed.
Results: A total of 300 day-care surgeries between 17th August 2023 and 4th July 2025 in our centre. We broadly divided our surgeries into 12 categories like trauma, infection, benign tumour, osteotomy, cerebral palsy, removal of Implant, clubfoot etc. We selected our surgeries after 22 long exclusion criteria. We segregated our surgeries depending on duration of surgery, mode of anaesthesia, bodyweight of patient, age of patients. We had overall 8 adverse events, for an overall 2.6%. Our average surgical cost was USD $564 per surgery. No child suffered psychological disturbances requiring medical intervention.
Conclusions: DCS in paediatric orthopaedics in a standalone setup can be performed if we choose our patients judicially and follow appropriate pathways.

Keywords: Day care surgery, Deformity correction, Out-patient surgery, Paediatric orthopaedics, Standalone setup

INTRODUCTION

Day care surgery (DCS) in orthopaedics is not uncommon nowadays and many standalone day care centers or ambulatory surgical centres (ASCs) are present in different subspecialities of orthopedics like hand surgery, arthroscopy, arthroplasty etc but it is not that popular for Paediatric orthopedics as standalone day care centers.[1] However, for many years daycare procedures in children have been known to have beneficial effects like reduced adverse effects including cross infection, cost minimisation, reduced hospital bed and staff utilisation, high turnover rate, reduced disruption to family routine of the child, reduction of stress to the patient and family.[2] With enhanced recovery after surgery (ERAS) approach and development of paediatric anaesthesia, we see the same effort in ASCs in paediatric surgery.[3-5] But we rarely see dedicated effort in paediatric orthopedics as standalone day care surgical centers. Unlike paediatric anaesthesia and paediatric surgery guidelines, we do not possess standard guidelines of case selection of pediatric orthopedics as day care cases or even we do not have clear

idea whether we can take varieties of painful procedure like corrective osteotomies, reconstructive soft tissue surgeries in children as day care or not. To create a certain number of beds, a standalone daycare setup needs less manpower, space and budget allocation unlike a full-fledged hospital and paediatric orthopedic setup needs a completely different set of dedicated manpower, instruments and arrangements unlike other subspecialities of orthopedics.[6] There is a need to manage huge burdens of child orthopedics in a cost-effective way with limited resources. The results and analysis of this study will show some light on the possibility of paediatric orthopaedic surgery in a dedicated standalone day care centre.

METHODS

A retrospective review of cases performed in our paediatric orthopaedics standalone day-care centre (private set up) of our first 300 surgeries. This centre is dedicated to paediatric orthopaedics exclusively. We performed those 300 cases in the last 2 years (17th August 2023 to 4th July 2025). Microsoft excel was used for basic data analysis. Ethical clearance was obtained for this study from competent authority. There were 177 male and 123 female patients, with age groups from 1 month to 16.5 years, bodyweight distribution from 2.8 kgs to 83 kgs. This centre has only one Paediatric Orthopaedic consultant, one fellow paediatric orthopaedic surgeon and 2 anaesthesiologists.

Primary surgeon initially selected surgical cases and screened the patient with reports. If any abnormalities were found in the reports or clinically, then pre anaesthesia checkup (PAC) was done by the anaesthesiologist prior to surgery. Otherwise, all PACs were done on the day of surgery by anaesthesiologist. Authors followed strict timing to maintain the NPM (Nothing per mouth) protocol (6 hours for any food or formula milk, 4 hours for breastfeeding, 2 hours for clear water).[5]

Depending on the caseload of the particular day, we generally started our surgery at 9 am in the morning. So, the admission procedure started around 8 am for the first patient with adequate spacing subsequently. Before the surgery, we allowed the caregiver to accompany the child into the ward and OT during induction of anaesthesia.[5] US guided peripheral nerve blocks (PNB) were used in expected painful surgeries like osteotomies, deformity correction surgeries etc.[7] All US guided PNBs were given after general anaesthesia (GA) to the child.

Most patients operated with PNBs were discharged with a plaster slab (not cylindrical cast) for both upper and lower limbs due to the type of surgeries which helped to protect the operated limb during postoperative full recovery from nerve block after discharge.

Prophylactic fasciotomies were performed in osteotomies like forearm and leg in case of PNBs.[8] Dexamethasone and/or dexmedetomidine were used along with bupivacaine at all PNBs to increase pain free period. Lipid emulsion bottles were kept in inventory to counter local anaesthetic systemic toxicity (LAST).[9]

We usually scheduled 1-3 surgeries per day. We generally finished surgeries by 10 am to 12 pm depending on the number of surgeries posted and started the discharge process after 5 hours of observation and finished the discharge process over the next 1 hour. After the surgeries patients were kept in the ward with monitored beds along with their caregivers. Authors allowed water to the child on demand after surgery provided the child was fully awake.[10] Semi solid food was given as per anaesthesiologist order, around 2 hours after surgery, provided the child was fully awake.[10]

Authors ensured at least score 12 as per new fast track score (modification of modified Aldrete scoring system), normal capillary refill of operated limb digits, the passage of urine of all patients before discharge.[11,12] Ibuprofen was used in all painful surgeries in three divided doses (8 am, 2 pm, 10 pm) for 3 days and paracetamol was given in four divided doses (6 am, 12 pm, 6 pm, 12 am) for 5 days so that patients were covered with analgesic all over the period. In other cases, only paracetamol was prescribed for 3-5 days.

Authors ensured that all patients must stay (either home or hotel) within 30 minutes travel time to our health set up at the night of the surgery after discharge except those CTEV patients who were treated with percutaneous tendo-achilles tenotomy under local anaesthesia.[12,13]

Authors asked patients who were treated with either caudal, spinal or peripheral nerve block to come to the clinic the next day at 12 noon for a physical check-up. For the rest of the patients, we contacted them over telephone on the day following surgery and asked to come back for a follow up physical visit after 1-2 weeks depending on case types.

This centre has official tie up with one mother and child care hospital with a PICU set up situated at a distance of 2.5 km in case of need of overnight admission or other immediate post operative unmanaged adverse reaction. But no patient required this service till date.

Authors have followed the following exclusion and inclusion criteria for our daycare centre.

Exclusion criteria

Expected duration of surgery more than 2 hours, polytrauma, open fracture. Surgery with more than 2 osteotomies. Surgery where hip spica procedure along with more than 1 osteotomy. Pink/ pale pulseless supracondylar fracture humerus or any other vascular injury. Intramedullary nailing at long bones of lower limb, malignant bone tumour, spinal deformity correction, soft tissue surgery in AMC (Arthrogryposis Multiplex

Congenita) patient. Any convulsion within 1 year. Active infection with sick child. Preterm / Low Birth Weight baby, coagulopathies. metabolic abnormalities. Any disease with sensory deficit like meningomyelocele, muscular dystrophy, surgery requiring multiple surgical departments. Bed bound patient with scoliosis /compromised lung, ASA 4 type patients. Abnormal Echocardiogram report. Parents not willing to take discharge their child on the same day.

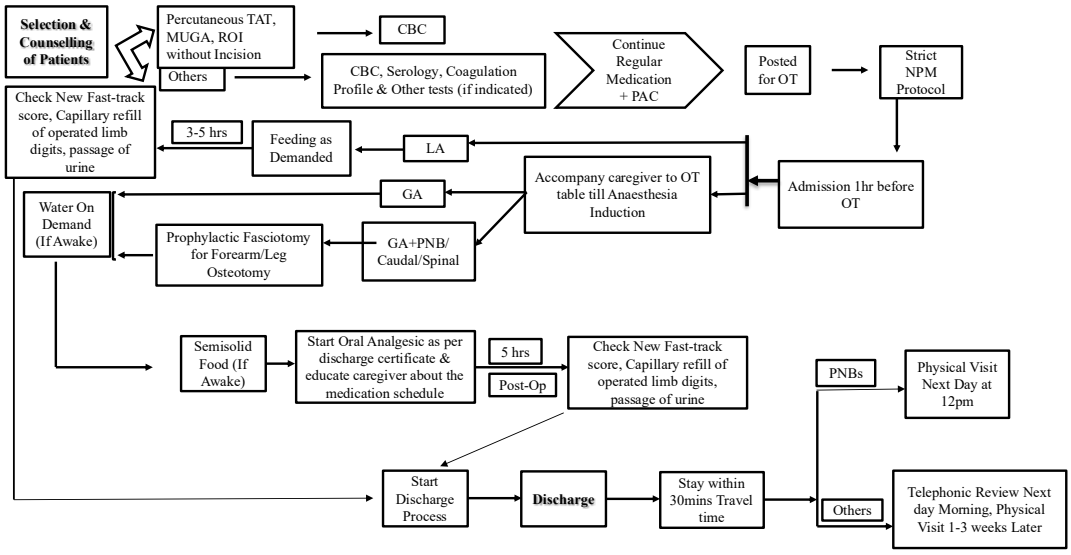

Figure 1: Process in our day care centre.

Inclusion criteria

Paediatric orthopaedic patients with age between term newborn to 18 years, but not in our exclusion criteria are included in the study.

RESULTS

Authors have broadly divided our cases as following orders. Authors have divided the patient population with respect to gender and bodyweight. Authors have divided our duration of surgery into four groups. Here authors found that 43% of our cases lie in the 16-30 minutes zone, 34% lie in the 0-15 minutes zone, 17% lie in 31-60 minutes zone and only 6% lie in 61-120 minutes zone. Authors have divided mode of anaesthesia into following groups.

Authors found that only GA was given to 46% patients, LA to 24%, GA along with ultrasonography guided PNB was given to 22% patients, GA along with Caudal block was given to 7% patients and SA was given to only 1% of patients. Regional anaesthesia with adjuvants were used in all 29 osteotomies and other surgeries with expected significant painful postoperative period.

Types of peripheral nerve blocks used

Total 87 US guided peripheral nerve blocks were performed over 65 patients. For operation at knee and below knee region, usually tourniquets were used and both femoral and sciatic nerve blocks were given. For operation around the upper and middle thigh and hip, target zone was femoral nerve, obturator and lateral femoral cutaneous nerve of thigh.

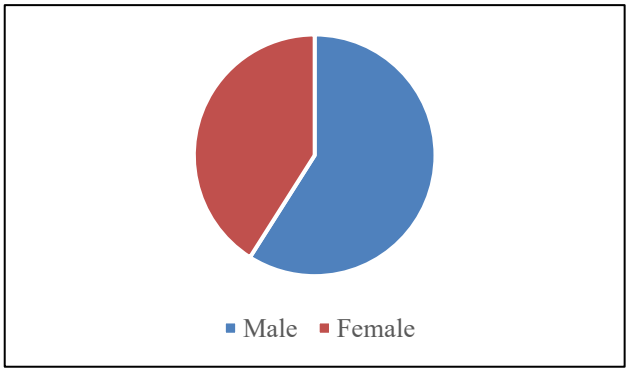

Figure 2: Gender distribution.

For upper limb brachial plexus, medial, radial, ulnar nerve block was used depending on surgery. Transeversalis fascial plane block was used in one patient for iliac crest bone graft. All of them had undisturbed sleep on the night of surgeries except 2 patients where pain sensation returned middle of the night. No incidence of LAST happened.

The nerve blocks we used in our setup for 65 patients, 43% of those were sciatic nerve block, 37% were femoral, LFCN 5%, brachial plexus block 6%, obturator 1% and

others 8%. Out of 300 surgeries we performed one surgery per day for 103 days, 2 surgeries per day for 52 days and 3 surgeries per day for 31 days, Overall, 1.61 surgeries per day.

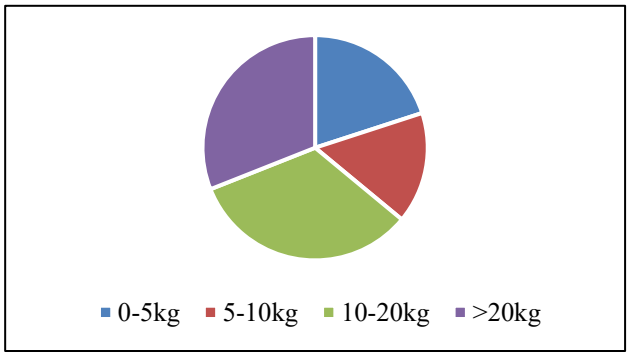

Figure 3: Bodyweight distribution.

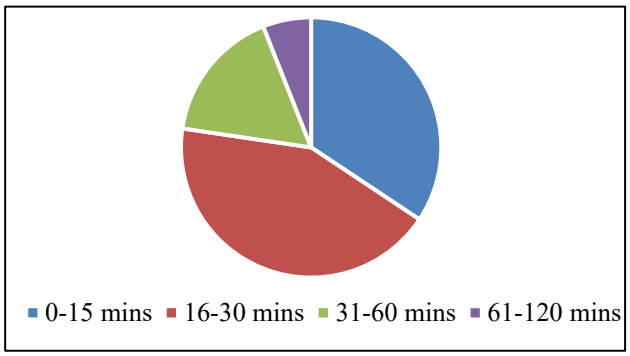

Figure 4: Duration of surgery.

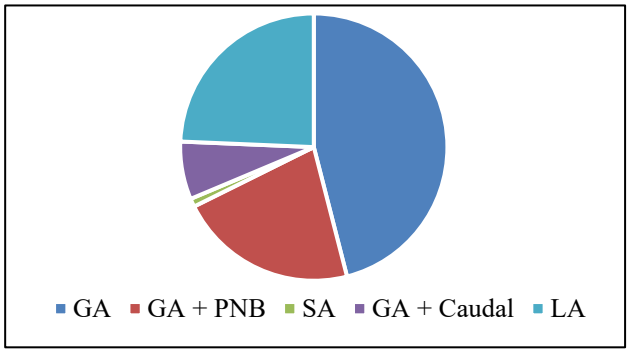

Figure 5: Modes of anesthesia.

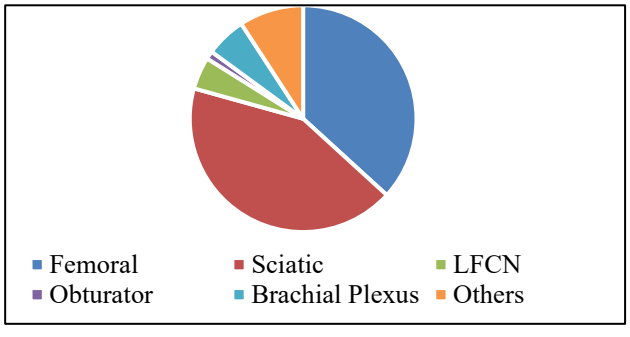

Figure 6: Types of PNB.

Rescheduled/cancelled cases

From 300 cases scheduled, no surgery got cancelled due to any reason. But 3 surgeries got rescheduled.

Adverse events

8 adverse events were found in 300 patients, for an overall 2.6%. No death was reported in this series. There was only 1 infection noted out of 300 cases. It was a pin tract infection which needed debridement. We noted 1 case of urinary retention as the patient received GA with caudal block. Authors noted 3 cases of PONV from the 300 cases. We noted that these 3 patients received pentazocine during the intraoperative period. All suspected painful cases were treated with US guided blocks with adjuvants. 2 patients suffered breakthrough pain on post operative day 1 which was treated successfully by oral medication subsequently.

Authors encountered only 1 case of ulnar nerve neuropraxia which was recovered fully. No patient developed any bleeding related complications like hematoma formation which needed repeat surgery. There were no cases noted of retained foreign objects, medication error, wrong site surgical procedure, plaster related complication like compartment syndrome, perioperative respiratory adverse events and hospitalization for overnight stay or other unmanaged immediate postoperative adverse reaction.[14]

Table 1: Process in our day care centre.

Trauma	71
Clubfoot (Tenotomy under LA)	73
Clubfoot (under GA soft tissue surgery)	27
Clubfoot (soft tissue surgery+osteotomy)	16
Benign bone tumour	7
Infection	3
Cerebral palsy (Bony Procedure)	2
Cerebral Palsy (Soft tissue procedure)	12
Hemiepiphysiodesis	10
Removal of implant	44
Osteotomy (like genu varum, genu valgum, perthes, cubitus varus etc)	11
Trigger thumb	13
others	11

DISCUSSION

Day care surgical procedure is an emerging trend in modern days. It is well established in many branches of orthopaedics unlike paediatric orthopaedics. Authors are yet to have any established guideline in paediatric orthopaedics for selection of day care cases. Moreover, we found paucity of articles in support of standalone paediatric orthopaedics day care centres. We gradually developed our own exclusion criteria and subsequently extended to cover more cases with careful planning. Due to delays in administrative issues, we started our center

without an ultrasonography (US) machine at the operation theatre. With the arrival of the US machine, we started US guided peripheral nerve blocks with adjuvants, which helped to include more painful procedures like osteotomies in children as day care cases. Finally, we could cover a wide variety of paediatric orthopaedics cases as day care in spite of our 22 exclusion criteria.

In the standalone paediatric orthopaedic day care surgical centre, we performed only paediatric orthopaedics cases. As we did not have any definite guidelines, we tried to consolidate with minimum variables. Only one paediatric orthopaedic consultant operated here and maintained all support and administrative staff throughout our journey. It helped to get better coordinated services, proper maintenance of inventory, reduced unforced error and ultimately increased satisfaction of patients with parents. We operated 1.61 surgeries per day at an average which gave enough time to look for all the crucial checkpoints and smooth transition from admission to discharge of patients.

Authors travelled the journey quite safely. The overall complication rate was 2.6%, which is at per standard as described in an article which is 3.92% overall.[15] The infection rate, PONV, urinary retention, readmission, pain control and all other morbidities were within standard rates. Authors had only 3 cases of PONV at our initial days who were treated with opioids. At a later stage we shifted to opioid free anaesthesia and analgesia which helped us to allow oral fluids after surgery early and quicker recovery. The urinary retention event happened in patients with caudal block. After the arrival of the US machine at our centre we preferred peripheral nerve blocks over spinal / caudal blocks which completely erased complications of urinary retention. In our initial days of US guided peripheral nerve blocks we had two cases of breakthrough pain on the next post operative day and administered rescue analgesia. We were not vigilant to start early analgesic after surgery as the patient did not complain of any pain after US guided peripheral nerve blocks. Later we asked to procure all discharge medication immediately after surgery and nurse started analgesic schedule as per discharge certificate immediately after the first semi solid food after surgery. It removed breakthrough pain complications and helped the caregiver to understand with enough time before discharge about the entire post operative medications schedule from the nurse and reduced further management confusion.

Cost is a growing concern due to gradual increase in health care expenditure. Decreased hospital stays not only reduced out of pocket expenditure but also minimized working day loss of parents and other relatives. Cost of surgery varies according to location, type of procedure and many other factors. There is a paucity of articles supporting cost structure in the region. One article shows the average cost of total knee surgery in a private set up is USD $2,461 and average non implant cost is 76.8%.[16] Which is significantly higher than the average cost of surgery of USD $564 at the centre. Insurance companies in India now cover all day-care procedures which need more than 2 hours of hospitalization but do not cover external congenital anomalies.[17] The majority of our pediatric orthopedics non traumatic surgeries (like recurrence clubfoot, hip dysplasia, cerebral palsy etc) fall under external congenital anomalies. So, there is a need to address these huge patient loads in a cost-effective way, within the limitations of our resources.

Children are usually surrounded by many known persons including parents, relatives, friends etc. It is difficult to offer that friendly environment in the hospital. So early discharge from hospital will ensure not only to get relief from the world of needles and syringes but also to return to their known world which ultimately reduces anxiety to both patients and parents and reduces postoperative issues.[18,19] We did not encounter any patients with postoperative psychological disturbances requiring medical attention.

Limitation

There are many limitations to our study. It is a short period study and depends on only one paediatric orthopaedic consultant. The volume of data is also not higher. This study has no data regarding Race and Ethnicity.

CONCLUSION

A wide variety of paediatric orthopaedic surgeries can be performed in a dedicated standalone day care centre safely, effectively and comfortably. There are huge unattended paediatric orthopaedic birth defects in India which are not covered by insurance companies. So, these patients can be addressed with limited resources in a cost-effective way in a private set up by building multiple standalone dedicated paediatric orthopaedic day care centres which can also treat those patients covered with insurance.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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