The Journal of International Medical Sciences Academy
2021; (October-December); Vol 34; No. 4

ORIGINAL ARTICLE

Establishing a Pediatric Orthopedic Centre: Why Human Resource is the Key?

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Abstract

Introduction: Establishing a paediatric orthopaedics subspeciality in a tertiary care hospital is labour intensive process. It requires a huge manpower and inventory management. In this article, we present our experience establishing a new subspeciality and challenges faced managing paediatric aged group patients.

Method: A retrospective analysis was done to study the impact of availability of paediatric orthopaedic surgeon in the management of paediatric age group of patients (0-14 years) in terms surgical and non-surgical outcomes over a period of 12 months. Data of first 6 months were compared with next 6 months. Medcalc calculator was used for statistical analysis.

Result: In the children referred for conditions other than trauma, 62.4% were referred by the general orthopaedic surgeons, 28.6% by pediatricians and the remaining self-reported to the general OPD from where they were referred. Total of 1488 children were seen in the Pediatric Orthopaedic OPD (average 28.62/week). The commonest indication for OPD consultation was acute trauma or follow up after initial management of trauma (n=656, 44.08%). The increase in the number of children operated is highly significant statistically (p=0.0014) with almost twice the number of children operated in the second 6 months of the study period.

Conclusion: There is a considerable pediatric Orthopaedic load in the referral tertiary care hospitals and availability of trained specialists is the key to establishing a sub specialty centre.

Keywords: Paediatric orthopaedics subspeciality, Paediatric orthopaedician, Referral, Tertiary care hospital, Work load

Introduction

Establishing a new centre in any tertiary care hospital usually involves the whole procedure of obtaining sanctions, budget allocation etc entailing huge amount of documentation. There is however a relatively recent situation seen in most tertiary care hospitals where specialists for training in niche subspecialties and on their return try to establish the subspecialty centre in their parent organization.

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Received: 23 January 2021
Accepted: 10 September 2021

While many such subspecialties are equipment intensive and require trained supporting staff, it is often the enthusiasm and keen interest of the involved personnel which becomes instrumental in the laying down of foundation stone of a subspecialty in any tertiary care hospital.

Setting up Pediatric Orthopedics in a tertiary care hospital within a well-established super specialty orthopedic unit posed certain unique challenges. Pediatric Orthopedic patients include a unique gamut of children with fractures due to trauma, various congenital and acquired bony anomalies and musculoskeletal deformities as brought out by previous studies from other Pediatric Orthopedics centres [1,2]. Therefore, we designed this retrospective study to determine the clinical profile of children reporting to the Pediatric Orthopedics OPD and to the accident &

emergency department, management offered both operative and otherwise and their outcomes.

Methods

This is a retrospective analysis of clinical profile of all children 0-14 years of age reporting to the Pediatric Orthopedics OPD and to the accident & emergency department from 01st January 2019 to 31st December 2019. We reviewed the records for the referring physician/ surgeon, clinical profile of these children, number of children requiring surgical correction and type of surgery required. All children underwent investigations and were thereafter managed as per standard guidelines and followed up for outcomes and complications. The specific implants required for surgery in children were procured through hospital medical stores. Two days per week were designated as the Pediatric Orthopaedic OPD and we reviewed the records of children reporting to this for their mean age of presentation, presenting complaints and diagnosis.To study the impact of availability of Pediatric Orthopedic Surgeon in a tertiary care hospital, we reviewed the number of children seen in the Pediatric Orthopedic OPD and the number of children operated upon for pediatric orthopedic conditions other than trauma in the1st 6 months ie 1st January to 30thJune 2019 to that in the 2nd half of the year ie from 1st July to 31st December 2019. Medcalc calculator was used for statistical analysis.

Results

In the children referred for conditions other than trauma, 62.4% were referred by the general orthopaedic surgeons, 28.6% by pediatricians and the remaining self-reported to the general OPD from where they were referred.

Total of 1488 children were seen in the Pediatric Orthopaedic OPD (average 28.62/week).These children were from new born period upto 14 years of age with mean age being 7.72 $\pm$3.38 years. The diagnoses of these children areas summarised in table 1. The commonest indication for OPD consultation was acute trauma or follow up after initial management of trauma (n=656, 44.08%).

253 children required operative procedures. Their mean age was 11.64 $\pm$ 2.84 years with range between 3 months to14 years. 142 (56.12%) were males. The most common indication for surgery was children presenting with appendicular trauma, n=133(52.56%). Supracondylar fracture humerus and fracture both bones forearm were the two commonest indications requiring surgery. Surgeries done in trauma patients are listed in Table 2.

We also had 2 children with polytrauma having multiple fractures and abdominal/pelvic injury. They were managed in conjunction with the pediatric surgery in case 1 and urology in case 2.120 children underwent various corrective surgeries for indications other than trauma with cerebral palsy (n=44, 32.5%) and various other congenital and acquired anomalies (n=76, 42.5%) constituting a large proportion of this number. The surgeries carried out in these children are as tabulated in table 3.

Table 1: Cases seen in the Pediatric Orthopaedics OPD in last 1 year

S. No.	Diagnosis
1	Acute Trauma and follow up
2	Cerebral palsy
3	CTEV
4	DDH
5	Septic arthritis sequelae
6	Perthe's Disease
7	Cubitus Varus
8	Coxa Vara
9	Genu varum
10	Genu Valgum
11	Bone tumours
12	Congenital Patella Dislocation
13	Charcot Mary Tooth Disease with B/L Cavo Varus deformity
14	Congenital vertical talus
15	Adolescent Tibia Vara
16	Pes planus
17	Acute & chronic osteomyelitis
18	Fibrous Dysplasia
19	Simple bone cyst
20	Aneurysmal bone cyst
21	Arthrogryposis multiplex congenital
22	Radial club hand
23	Tibial Hemimelia
24	Sprengel shoulder
25	Congenital muscular torticollis

Single event multiple level resection (SEMLR) was done in children with Cerebral Palsy for correction of deformities and improving locomotion. The total corrective surgeries for various congenital anomalies and those due to cerebral palsy, sequel of septic arthritis and for benign bone tumours in the 1st half of the year were 38 (6.13 per month) whereas 82 patients (13.67 per month) were operated in the next half of the year. The increase in the number of children operated is highly significant statistically (p = 0.0014) with almost twice the number of children operated in the second 6 months of the study period. Figure 1-4 demonstrates successful outcomes of a few challenging sub-speciality specific procedures.

Discussion

Our study aimed to present a snapshot of the workload of a newly established Paediatric Orthopaedic centre in a busy Orthopaedic unit of a tertiary care hospital. Our study brings forth that despite the initial hiccups and challenges, there

Table 2: Operative Procedures performed in children reporting to OPD/Emergency with trauma

S. No	Diagnosis	Number of children	Management
1	Fracture shaft humerus	1	CRIF with TENS
2	Fracture lateral condyle humerus	2	Arthrogram+ CRIF with CCS
3	Supracondylar fracture Humerus	12	CR+ cast
4	Supracondylar fracture Humerus	33	CRIF with K wire
5	Fracture distal Humerus with Intercondylar extension	3	ORIF with Plating
6	Non-union fracture lateral condyle humerus with Cubitus Valgus	01	ORIF with CCS + Dome osteotomy
7	Neglected radial head fracture with stiff elbow	01	Excision of radial head + Arthrolysis
8	Hume's Fracture Olecranon	01	ORIF with TBW
9	Fracture distal end radius	17	CR+cast
10	Fracture distal end radius	01	JESS application
11	Fracture distal end radius	15	CRIF with K wires
12	Fracture distal end radius	01	Implant removal
13	Fracture both bones forearm	10	CRIF with TENS
14	Fracture both bones forearm	10	CR + cast
15	Fracture proximal Femur(Delbet type 2 and 3)	03	CRIF with CCS
16	Fracture shaft Femur	07	CRIF with TENS
17	Fracture shaft Femur	01	CR + Hip Spica application
18	Fracture shaft Femur	04	ORIF with plating
19	Septic arthritis knee	04	Open debridement
20	Fracture shaft Tibia	05	CRIF with TENS
21	Open fracture shaft Tibia	01	Debridement + JESS application

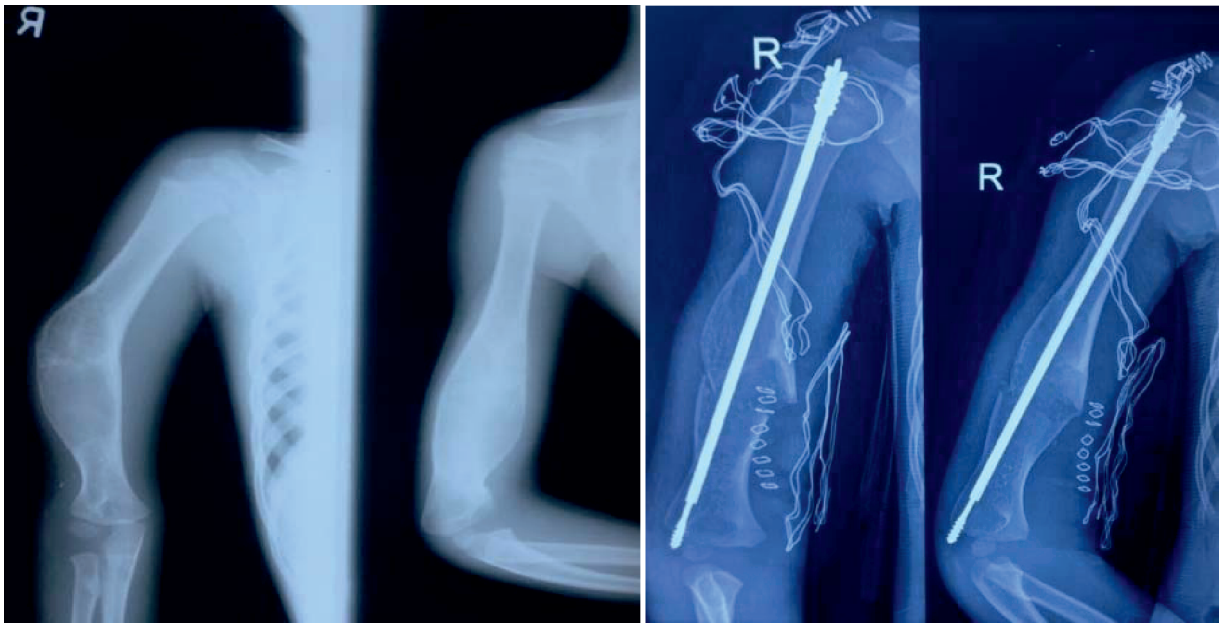

Fig 1A (Pre Op) **Fig 1B (Post Op)**

Figure 1: (A and B) shows 8 yrs old male with fibrous dysplasia humerus with varus deformity managed with corrective osteotomy and telescopic nail insertion

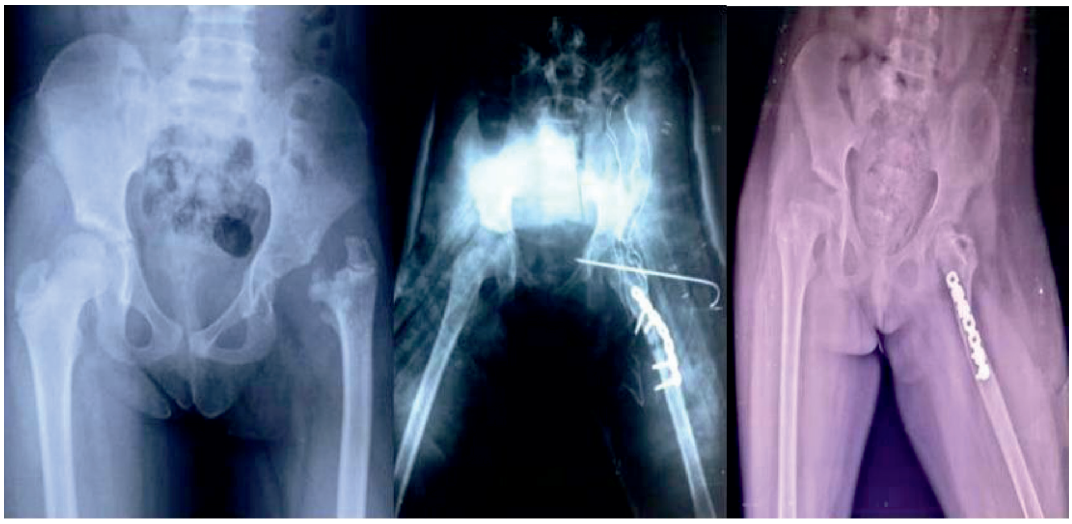

Fig 2A: Pre op **Fig 2B: Post op** **Fig 2C: 3 months post op**

Figure 2. A, B and C shows plain radiographs of a 9 year old child with sequelae of septic arthritis hip with complete resorption of head and neck of femur treated with trochanteric arthroplasty and proximal femur varus osteotomy

Figure 2D: Clinical photographs of follow up (3 months post op) of patient of sequelae septic arthritis hip

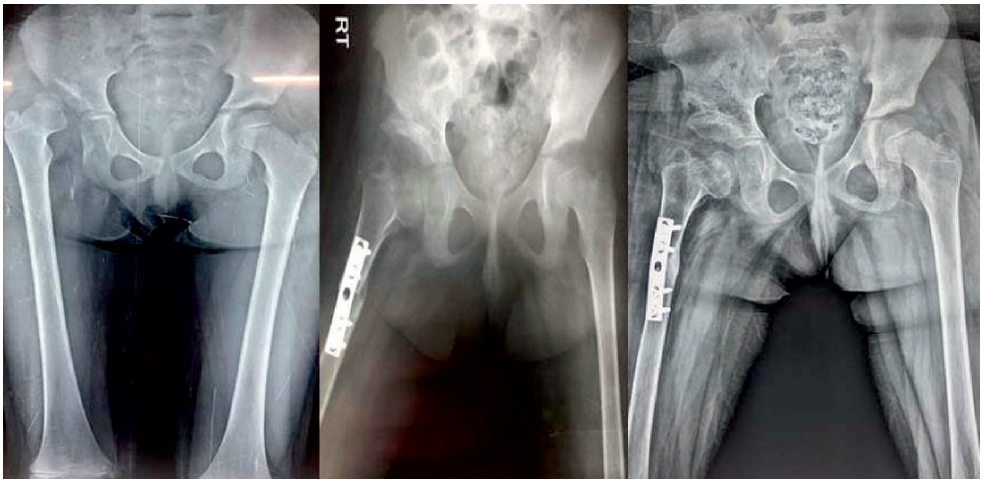

Fig 3A: Pre OP **Fig 3B: 6 weeks Post OP** **Fig 3C: 3 months Post OP**

Figure 3 (A-C): Shows plain radiographs of 6 yrs old female child with DDH, managed with open reduction, proximal femur varus derotation osteotomy and pemberton acetabuloplasty.

Fig 4A: Pre OP **Fig 4B: 1 month Post OP** **Fig 4C: 3 month Post OP**

Figure 4 (A-C):Shows plain radiographs and clinical photographs of a 7 yrs old male child of polytrauma with fracture bilateral proximal femur (Delbet type 3), managed with closed reduction internal fixation using CCS.

was an overwhelming patient response and we were able to offer treatment as per standard guidelines. This was chiefly as a well-established Orthopaedic unit already has all necessary equipment and the additional requirement for a Paediatric Orthopaedic Centre is trained manpower along with specific implants.

In the children referred for conditions other than trauma, 62.4% were referred by the general orthopaedic surgeons and the rest mostly by paediatricians. A previous study reported that the maximum referrals to Paediatric Orthopaedic OPD were by paediatricians but it appears that in their referral system, the Paediatric orthopaedic cases were referred directly to the Paediatric Orthopaedic surgeons and not to the general orthopaedic surgeon[3,4]. In our study there was a slight male preponderance among the children requiring surgery n=142(56.12%).This has been noted in previous studies also [1,5]. This has been hypothesised chiefly due to greater indulgence of male children in outdoor activities and sports and therefore higher incidence of trauma. Of all children requiring surgery for appendicular trauma, upper limb trauma remains the commonest with large number of children brought with supracondylar fracture humerus(n=44,33.08%) and fracture both bones forearm(n=26,19.5%). This has been reported in previous studies also [5,6]. Polytrauma in children is rare but potentially life threatening. Its two most common causes are falls from height and motor vehicle accidents. The orthopaedic injuries in these patients may not pose risk to life by themselves but can result in significant long-term impairment. The general principle in the management of these children is early transfer after initial stabilization to a well - equipped trauma centre hospital [7,8]. Among the non-trauma orthopaedic problems in children, musculoskeletal conditions have been reported to be common [2]. This was seen in our study also with where they constituted almost a third of all children operated for indications other than trauma. Cerebral Palsy (CP) is the most common acquired condition in children with a whole spectrum of bony and musculoskeletal deformities of the lower limb requiring operative correction [9]. SEMLS is the recommended surgical technique in these children which has been shown to yield good results [10]. We operated 44 children in this period using the same principle and all children had satisfactory post-operative outcomes. Rarely upper limb deformities in children with Cerebral Palsy may also need surgery [11]. We also performed SEMLS in 7 children with contractures in upper limb.

Congenital Talipes Equino Varus (CTEV) also known as clubfoot is a common but complex congenital anomaly. Ponseti casting technique has become the standard recommendation for its treatment which includes serial corrective manipulation and application of plaster cast supported by percutaneous Achilles tenotomy in children with residual equinus deformity [12,13]. At our institute we did serial casting as per Ponseti technique in 22 children of whom 16 children required percutaneous Achilles tenotomy. 11 children also required Posterior soft tissue release +/- medial/lateral mid foot release/osteotomy.

The increase in number of paediatric Orthopaedic cases over next 6 months of the year in which the trained surgeon started specialised surgeries for non-trauma musculoskeletal deformities in children was highly significant. The outcomes in these children were also highly satisfactory in terms of improvement in the limb function or preservation of function.

We did not encounter any major post-op complications or infections. 2 children had wound dehiscence after deformity correction in the foot (1 child had CVT and other child had

Table 3 : Children requiring elective surgeries (Non-traumatic)

S.No	Diagnosis	Number of children	Remarks	
1	Cerebral palsy			
	Supracondylar extension osteotomy femur with patellar Tendon plication	07	Crouch correction	
	Grice green arthrodesis	04		
	Triple arthrodesis	06		
	Derotation osteotomy femur	03		
	Muscular recession including injection Botox	24		
2	Anterior and lateral transfer of tibialis posterior	02	Charcot Marie Tooth disease wthcavovarus feet(B/L)	
3	Tumors			
	Corrective osteotomy humerus with Telescopic nail insertion	01	Fibrous dysplasia humerus with varus	Figure 1a and 1b
	CRIF + TENS	01	Simple bone cyst Humerus with pathological fracture	
	Curettage + InjPolydocinol	01	Aneurysmal bone cyst Humerus	
4	CTEV			
	Ponsetti casting	22		
	Posterior soft tissue release +/- medial/lateral midfoot release/osteotomy	11		
5	Open reduction+varusderotation of femur +/- Pemberton acetabuloplasty	11	Developmental dysplasia of hip	
6	Genu valgum			
	Growth modulation with 8 plate for distal femur	06		
	Medial closing wedge osteotomy distal femur	02		
7	Double osteotomy proximal tibia	01	Adolescent Tibia vara	
8	Perthe's disease			
	Proximal femur varusosteotomy+Trochantericepiphysiodesis	05		
	Adductor tenotomy+ Distal transfer of GT	01	Old healed Perthe's with coxa vara and breva	
9	Cubitusvarus			
	Lateral closing wedge osteotomy distal humerus	06		
10	Corrective osteotomy proximal ulna with open reduction of radial head with reconstruction of annular ligament	01	Neglected monteggia fracture dislocation	
11	Trochanteric arthroplasty with proximal femur varus osteotomy	01	Sequelae of septic arthritis of hip with absorption of head and neck(Choi type 4c)	Figure 2a-e
12	Lateral release + medial plication with relocation of patella(Langenskiold procedure)	01	Congenital dislocation of patella with Down syndrome	
13	Proximal femur valgus osteotomy	01	Coxa vara	
14	Open reduction Talo Navicular joint	02	Congenital vertical Talus	

undergone triple arthrodesis for planovalgoid deformity in the foot due to cerebral palsy) and 2 children had implant failure requiring repeat surgery.1 child with cerebral palsy with fracture shaft femur developed pneumonia in the post-operative period and despite supportive management as per standard protocol in the Paediatric Intensive Care Unit (PICU) succumbed to the illness. This highlights the need for support of PICU as the underlying diseases in many of these children make them susceptible to complications in the post -operative period [14] and high risk for general anaesthesia.

Our study therefore elegantly brings out the patient load of a niche super specialty ie Paediatric Orthopaedics and highlights the pivotal role of trained specialist in laying the foundation of such a centre within a busy Orthopaedic unit of a tertiary care hospital.

Conclusion

There is a considerable paediatric Orthopaedic load in the referral tertiary care hospitals and availability of trained specialists is the key to establishing a sub specialty centre.

Conflict of interest:	All authors declare no COI
Ethics:	There is no ethical violation as it is based on voluntary anonymous interviews
Funding:	No external funding
Guarantor:	Lt. Col. Ponnaian Prabhakar R. will act as guarantor of this article on behalf of all co-authors.

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