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Are primary care referrals to the paediatric orthopaedic specialty clinic always clinically indicated?

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INTRODUCTION

Musculoskeletal conditions are increasingly prevalent in the primary care setting, comprising up to 20% of visits to primary care physicians (PCPs).[1-3] There is also more children presenting with such complaints to PCPs, making up a third of the total population.[3] This has led to an increase in primary care referrals to paediatric orthopaedic surgeons.[4]

Based on current literature, up to 95% of referrals were for common musculoskeletal conditions or normal variants manageable at the primary care setting.[5] Majority of referred conditions do not warrant surgery either, with surgical rates ranging between 3% to 10% only.[5] Also, increasing referrals on top of a stretched paediatric orthopaedic workforce leads to longer waiting times which may affect those requiring an earlier review or intervention.[6]

The American Academy of Pediatrics (AAP) Surgical Advisory Panel (SAP) has published a set of guidelines attempting to identify diagnoses that should be referred to paediatric orthopaedic surgeons.[7] However, these guidelines listed conditions requiring a paediatric orthopaedic specialist referral, but not general orthopaedic management. Therefore, to include conditions requiring the latter, the American Board of Pediatrics (ABP) referral criteria is utilized as well to delineate between conditions that can be managed at the primary care setting versus those requiring a general or paediatric orthopaedic specialist review.[8] However, even with such guidelines in place, only 35% to 53% of referrals made to the paediatric orthopaedic surgeons were considered appropriate.[2,9,10]

In our population, there is a lack of guidelines to determine appropriateness of referrals to paediatric orthopaedic specialty clinics by PCPs. As such, there is concern regarding an increasing number of inappropriate referrals made. The primary aim of this study is to determine how many referral cases seen by the paediatric orthopaedic surgeons in our outpatient clinics are manageable

by PCPs based on the AAP SAP and ABP guidelines. The secondary aim of this study is to identify commonly referred conditions by PCPs to the specialists to identify potential knowledge gaps.

METHODS

A retrospective review of the clinical data for successive first-visit paediatric patients (aged 18 years and younger) referred to our paediatric orthopaedic specialist clinics during the period of January 2018 to June 2018 was conducted. Only patients referred from PCPs to the specialist clinics were included in the study. Patients referred from the children's emergency department or from overseas physicians were excluded. This study was approved by our local Institutional Review Board.

To determine if a condition referred to the paediatric orthopaedic specialist was considered a paediatric and/or general orthopaedic condition, we utilised the AAP SAP and ABP guidelines.[7,8] The list of conditions under the AAP SAP guidelines includes malignant and benign bone tumours, congenital deformities of the upper extremity, limb malformations, metabolic bone disease, hip dysplasia, bone and joint infections, slipped capital femoral epiphysis, scoliosis, complex fractures and dislocations, and growth arrest. Examples of conditions under the ABP guidelines includes long cast application of upper or lower extremity fractures, treatment of displaced fractures, scaphoid fractures, compartment syndrome, presence of a nerve or vascular injury and lesions, developmental anomalies or any condition requiring advanced diagnostic evaluation, complex reduction or surgical treatment.[7-9] A condition was considered a primary care problem if it is not included in either guidelines.

Data entry was performed using a spreadsheet application (Excel 2003, Microsoft Corp., Redmond, WA). Frequency tables and descriptive statistics (mean, standard deviation, or median

where appropriate) were presented for all variables. Categorical variables were presented as proportions and continuous variables were presented as mean. Chi-square test and Fisher's exact test were used for comparison between categorical variables. Statistical significance was set at $p \leq 0.05$ and data analysis was performed using SPSS (SPSS Inc., Chicago, IL, Version 16). Univariate and multivariate logistical regression was used to analyse significance between age groups and various factors.

RESULTS

A total of 522 first-visit paediatric patients aged 18 years and younger were referred to our paediatric orthopaedic specialty clinic by PCPs during the period of January 2018 to June 2018. 305 out of 522 (58.4%) patients were male. 510 (97.7%) patients were subsidised patients and 12 (2.3%) were private patients. 106 (20.3%) patients referred from PCPs were discharged from the specialist clinic after their first visit.

357 out of 522 (68.4%) patients referred had an accompanying referral diagnosis, whereas 165 (31.6%) patients did not have any. Out of these 357 patients with an established referral, 122 (34.2%) had an inappropriate referring diagnosis when compared to the final paediatric orthopaedic specialist diagnosis. The most common group of conditions leading to an inappropriate referring diagnosis involves those affecting the hip, knee, and leg (40 out of 122 patients; 32.8%). Out of the 165 patients who did not have any referring diagnosis, most of the conditions were those involving the foot and ankle (49 out of 165 patients; 29.7%). Table I demonstrates the breakdown of inappropriate primary care referrals based on the group of conditions for those who had a referring diagnosis, and Table II for those who did not have any. There was no significant difference in inappropriate referral diagnosis or whether a referring

diagnosis was made or otherwise when compared against the patients' age, gender or paying category.

Out of the 522 patients reviewed, only 24 (4.6%) required advanced diagnostic investigation in the form of imaging (computed tomography scans or magnetic resonance imaging) before a final diagnosis was reached. A further 7 (1.3%) patients were scheduled for advanced diagnostic imaging but defaulted follow up. The remaining 491 (94.1%) patients did not require further diagnostic evaluation before a final diagnosis was reached.

The appropriateness of referral was evaluated based on the AAP SAP and ABP guidelines.[7,8] 58 (11.1%) and 75 (14.4%) patients were deemed to have been referred appropriately based on the AAP SAP and ABP guidelines respectively. In total, only 133 (25.5%) patients out of the 522 referred from PCPs were deemed appropriate whereas the remaining 389 (74.5%) patients had conditions that can be managed at the primary care setting. The most common diagnosis for referral based on the AAP SAP and ABP guidelines was for scoliosis (14 out of 58 patients; 24.1%) and ganglions (12 out of 75 patients; 16%) respectively. The list of appropriate referral diagnoses by the PCPs as per the AAP SAP and ABP guidelines are reflected individually in Table III and Table IV. There was no significant difference between the appropriateness of referral when compared to the patients' age, gender, or paying category.

Interestingly, 389 (74.5%) patients could have been managed by PCPs (Table V). The most common primary care condition referred falls under the umbrella of ligamentous and soft tissue injuries (145 out of 389 patients; 37.3%), mostly those affecting the hip, knee and leg (66 out of 145 patients; 45.5%). Sprains and strains form the bulk of the diagnosis under ligamentous and soft tissue injuries (59 out of 145 patients; 40.7%). Table VI demonstrates the breakdown of the various ligamentous and soft tissue injuries based on anatomical groupings. Other commonly

referred conditions include non-displaced/angulated fractures (52 out of 389 patients; 13.4%) and flexible pes planus (48 out of 389 patients; 12.3%). None of the inappropriately referred patients were referred back to PCPs.

Only 36 (6.9%) patients were offered surgery, with 27 patients out of the 36 (75%) ultimately undergoing a procedure, whereas the remaining 9 (25%) defaulted follow-up. The remaining 486 out of 522 (93.1%) patients were managed conservatively. Table VII demonstrates the list of conditions for which patients were offered surgery.

DISCUSSION

Based on the existing literature, most referred conditions from PCPs to paediatric orthopaedic specialists can be managed at the primary care setting.[2,5,9] Increasing referrals on top of a stretched paediatric orthopaedic workforce leads to longer waiting times which may affect those requiring an earlier review or intervention.[6] Therefore, the aim of this study is to determine how many referral cases seen by the paediatric orthopaedic surgeons in our outpatient clinics can actually be managed by PCPs based on the AAP SAP and ABP guidelines. The secondary aim of this study is to identify commonly referred conditions by PCPs to determine potential knowledge gaps.

Out of the 522 patients referred from PCPs to the paediatric orthopaedic specialist, 389 (74.5%) cases were considered inappropriate based on the AAP SAP and ABP guidelines. This is much higher that what is known in the literature. In Hsu et al's study, he found that 47% of the patients referred to the paediatric orthopaedic specialist had in fact primary care conditions.[9] Reeder et al also found that 41.6% of referrals were inappropriate based on the referral diagnosis.[2] In the latest 2019 study by Balazs et al, he found that 48% of referrals made were inappropriate even within a closed healthcare system where physicians are protected from malpractice liability,

patients do not have to pay for subspecialty care, and surgeons are paid a constant salary regardless of productivity.[10] A plausible reason why our population has a much higher rate of inappropriate referrals may be due to a lack of local guidelines for reference. Hsu et al's and Reeder et al's study population were from the United States of America, where physicians may be more aware of the AAP SAP and ABP guidelines. Other potential reasons could be inadequate knowledge by referring physicians or parental insistence. In a study by Fallatah et al, they found that 87.3% of their sampled participants consisting of paediatricians and general practitioners had inadequate knowledge of common paediatric orthopaedic conditions. The majority of physicians also tend to refer cases when there is parental insistence.[11] Our study however did not look at these potential factors. We hope that a set of local guidelines as well as targeted education sessions for PCPs may reduce the rate of inappropriate referrals.

In this study, 122 out of 357 (34.2%) patients who were referred to the paediatric orthopaedic specialist with a referring diagnosis came with an inappropriate one when compared with the final paediatric orthopaedic specialist diagnosis. Most of the conditions that were referred inappropriately involved those affecting the hip, knee and leg (40 out of 122 patients; 32.8%). For those without a referring diagnosis, most of the conditions were related to the foot and ankle (49 out of 165 patients; 29.7%). While it is reassuring that our PCPs were able to identify most cases that require specialist review and provide an appropriate referral diagnosis (235 out of 357 patients; 65.8%), barriers should be identified for improvement and to reduce the number of referrals without a referring diagnosis. There are no studies available which demonstrates the potential knowledge gaps faced by PCPs in dealing with musculoskeletal conditions. In our study, we found that conditions surrounding the lower limb in general leads to either an inappropriate referring diagnosis, or none attempted at all. By identifying these knowledge gaps, we can then tailor future

musculoskeletal teaching programs for PCPs to focus more on conditions that they may not be familiar with and increase their confidence in managing these conditions. Paediatric orthopaedic specialists and PCPs should also work together to improve the primary healthcare landscape.

Interestingly, we found that 39 out of 287 (13.5%) patients who were referred with the wrong diagnosis or none made at all, had normal physiological variants. For these patients to be referred, they must have been viewed as pathological by the PCPs especially if a wrong diagnosis was made. PCPs should be aware of physiological variants in the developing child to avoid unnecessary referrals to the specialists and causing anxiety to the patients and family members. Roberts et al in his study found that more than half of referrals made to the paediatric orthopaedic specialist clinic consisted of either normal or benign conditions.[12] To avoid making inappropriate referrals for physiological variants, PCPs should keep themselves updated of such knowledge. Continuing medical education seminars can be conducted to reinforce this. At the same time, a review of the Orthopaedic education for Family Medicine residency training may be required as well. PCPs should also be able to allay parental concerns rather than referring these patients to the specialists, which places unnecessary stress on the parents as well as the healthcare system.

Only 36 out of 522 (1 out of 15 new patients; 6.9%) patients were offered surgery with 27 patients out of the 36 (75%) ultimately undergoing a procedure, whereas the remaining 9 (25%) patients defaulted follow-up. The remaining 486 out of 522 (93.1%) patients were managed conservatively. Our low percent of patients undergoing surgery is consistent with what is known in the literature.[5] The Paediatric Orthopaedic Society Of North America Practice Management Committee found that paediatric orthopaedic surgeons saw 13 patients for every 1 scheduled surgery, compared to adult orthopaedic surgeons (2.7 patients), general surgery (4.1 patients) and neurosurgery (3.2 patients).[5] This demonstrates that the majority of cases seen by paediatric

orthopaedic surgeons are in truth, primary care problems. To lessen the burden on our paediatric orthopaedic specialists in managing primary care musculoskeletal conditions, the PCPs should be empowered to manage simple musculoskeletal conditions such as undisplaced fractures. Our PCPs are mostly equipped with modalities such as X-Rays and cast equipment, yet up to 30% of referred cases (Table V) involve undisplaced fractures of the upper and lower limb, radius buckle fractures and non-displaced/angulated phalanx fractures which could have been managed at the primary care setting. Greater change may be instituted at the ministry level and by the Academy of Medicine to introduce courses and certification to empower PCPs to manage such primary care orthopaedic conditions. Another potential solution to reduce the burden on specialist clinic as demonstrated successfully by Belthur et al, is the creation of physiotherapy clinics to review patients with non-urgent musculoskeletal conditions.[13]

This study has limitations. The list of specialist conditions reflected in the ABP and AAP SAP is not exhaustive, although they are the only guidelines available and used previously in other literature. We thus had to assume that any cases not reflected in either guidelines were considered manageable by PCPs. We did not evaluate for the PCPs' capacity and credentials in managing paediatric musculoskeletal conditions, as we only wanted to identify primary care orthopaedic conditions. In addition, we were not able to sieve out data regarding other potential factors for referral such as parental request or previous litigation against the PCPs causing them to have a lower threshold in referring patients. However, this study does give us an idea of our local referring practice as well as potential knowledge gaps that can be addressed.

In conclusion, we found that 74.5% of patients referred to our paediatric orthopaedic specialists from PCPs were considered inappropriate, a rate much higher than what is available in the literature. Lower limb conditions were often referred with either a wrong or lack of diagnosis.

PCPs should be empowered to deal with simple musculoskeletal conditions and receive support by the ministry and Academy of Medicine in the form of courses and certification. This will not only address potential knowledge gaps, but also instilling confidence in patients and parents to allow continuity of care at the primary healthcare setting.

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Table I: Inappropriate primary care referrals based on group of conditions for patients with a referring diagnosis.

Diagnosis Groups	n = 122 (%)
Infection	4 (3.3)
Tumour	1 (0.8)
Spine Conditions	10 (8.2)
Shoulder and Elbow Conditions	8 (6.6)
Hand Conditions	7 (5.7)
Hip, Knee and Leg Conditions	40 (32.8)
Foot and Ankle Conditions	29 (23.8)
Physiological Variants	23 (18.9)

Table II: Inappropriate primary care referrals based on group of conditions for patients without a referring diagnosis.

Diagnosis Groups	n = 165 (%)
Infection	2 (1.2)
Tumour	2 (1.2)
Spine Conditions	10 (6.1)
Shoulder and Elbow Conditions	14 (8.5)
Hand Conditions	25 (15.2)
Hip, Knee and Leg Conditions	47 (28.5)
Foot and Ankle Conditions	49 (29.7)
Physiological Variants	16 (9.7)

Table III: Appropriate diagnoses based on the American Academy of Pediatrics Surgery Advisory Panel guidelines.

Diagnoses	n = 58 (%)
Scoliosis	14 (24.1)
Complex fracture dislocation	9 (15.5)
Developmental dysplasia of the hip	7 (12.1)
Benign bone tumours	7 (12.1)
Congenital deformity of the upper limb	2 (3.4)
Limb malformations	13 (22.4)
Spinal anomalies	2 (3.4)
Other	4 (6.9)

Other conditions, 1 each (1.7%): slipped capital femoral epiphysis, malignant bone tumour, growth arrest and kyphosis.

Table IV: Appropriate diagnoses based on the American Board of Pediatrics referral criteria.

Diagnoses	n = 75 (%)
Displaced single upper limb fracture	2 (2.7)
Displaced lower limb fractures	2 (2.7)
Torticollis	5 (6.7)
Bilateral pathological genu varum	3 (12.1)
Tight heel cord	5 (6.7)
Knee injury (patella dislocation)	8 (10.7)
Osteochondritis dissecans (talus)	4 (5.3)
Ankle injury (anterior talofibular ligament tear)	6 (8)
Medial plica syndrome	9 (12)
Hallux valgus	2 (2.7)
Ganglion	12 (16)
Other	16 (21.3)

Other conditions, 1 each (1.3%): displaced both upper limb fractures, neurovascular injury, intramuscular haemangioma, pathological internal tibial torsion, synostosis, knee cyst, syndactyly, fibular hemimelia, arterio-venous malformation of the hand, congenital talipes equinovarus, bilateral tibia vara, subluxable ulna, under-riding 5th toe, knee injury (anterior cruciate ligament tear), Scheurmann's disease, partial gastrocnemius tear.

Table V: Conditions that can be managed by primary care physicians.

Diagnoses	n = 389 (%)
Pes planus (flexible)	48 (12.3)
Non-displaced/angulated phalanx fractures	52 (13.4)
Femoral anteversion	2 (0.5)
Chronic low back pain	11 (2.8)
Non-displaced single bone fracture (upper limb)	26 (6.7)
Radius buckle fracture	29 (7.5)
Normal exam	28 (7.2)
Physiological torsion or angular deformity	8 (2.1)
Ligamentous and soft tissue injuries	145 (37.3)
In-grown toenail	11 (2.8)
Viral wart (foot)	5 (1.3)
Sebaceous cyst	3 (0.8)
Undisplaced lower limb fracture	8 (2.1)
Paronychia	2 (0.5)
Coccydonia	3 (0.8)
Accessory navicular	3 (0.8)
Subungual hematoma	2 (0.5)

Other conditions, 1 each (0.3%): pes planus (rigid), callus, mallet finger.

Table VI: Breakdown of ligamentous and soft tissue injuries based on anatomical groups.

Diagnoses	n = 145 (%)
1) Spine	
a) Strain/sprain	10 (6.9)
2) Shoulder and Elbow	
a) Contusions	2 (1.4)
b) Strain/sprain	8 (5.5)
c) Tendinitis	6 (4.1)
3) Hand	
a) Contusion	6 (4.1)
b) Strain/sprain	5 (3.4)
4) Hip, Knee and Leg	
a) Osgood Schlatter Disease	8 (5.5)
b) Anterior knee pain syndrome	11 (7.6)
c) Contusion	22 (15.2)
d) Strain/sprain	12 (8.3)
e) Tendinitis	10 (6.9)
f) Shin Splint	3 (2.1)
5) Foot and Ankle	
a) Strain/sprain	24 (16.6)
b) Tendinitis	17 (11.7)
c) Tight tendoachilles tendon	2 (1.4)

Table VII: Conditions offered surgical treatment.

Diagnoses	n = 36 (%)
Osteochondral lesion	2 (5.6)
Medial patellofemoral ligament disruption	3 (8.3)
Sebaceous cyst	2 (5.6)
Gastrocnemius and tendoachilles tightness	2 (5.6)
Ingrown toenails	3 (8.3)
Angulated phalanx fractures	3 (8.3)
Medial plica	4 (11.1)
Medial meniscus tear	2 (5.6)
Bilateral pathological genu varum	2 (5.6)
Others	13 (36.1)

Other conditions, 1 each (2.7%): slipped capital femoral epiphysis, tumour, anterior talofibular ligament tear, anterior cruciate ligament tear, pes planus (rigid), pathological genu varum, arteriovenous malformation of the hand, prolapsed intervertebral disc, synostosis, calcaneonavicular coalition, syndactyly, ulna subluxation, ganglion.