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Efficacy of Sulbactam vs Ceftriaxone for Treatment of Skeletal Infections in Children: An Observational Comparative Study

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ABSTRACT

Infections in a child's bones, knees, or tissues are possible. These disorders, which are usually referred to as "deep" infections are considerably such as osteomyelitis, septic arthritis, pyomyositis and other soft tissue disorders. Bacteria that are commonly found in our everyday living environment are what most often cause infections.After receiving appropriate care, the majority of kids with serious infections will truly heal. They are unlikely to procure the same infection once more. Children typically experience no further issues and resume all of their interests. Children usually turn out better when the infection is discovered sooner. When the illness is soon realised and treated, there is a higher likelihood of full recovery. For 6 months, the study was carried out in a tertiary care facility in Vadodara. Analysis of the data revealed that soft tissue disorders were more prevalent, and Staphylococcus aureus is the most frequent bacterium to cause bone, joint, or muscle infections in kids. Compared to ceftriaxone's response rate of 95%, sulbactam had a reliability of 100%.

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INTRODUCTION

Children's acute skeletal infections (BJIs) may manifest clinically as septic arthritis or osteomyelitis (OM) (SA). BJIs typically show clinical symptoms within two weeks of the start of the disease [1]. In primary care, a combination of both diseases is present in one-third of cases, and it can happen in up to 75% of neonatal cases [2]. BJIs are often brought on by the haematogenous spread of septic emboli transported to the terminal blood arteries of bone and joints during temporary bacteremia from distant infectious processes. Direct inoculation caused by open fractures or invasive operations, as well as extension from concurrent diseases such cellulitis and sinusitis, are less frequent infection pathways. BJI can be categorized as acute, subacute, or chronic depending on how long it lasts: 2 weeks, 3 months, or more from the time it first manifests. Different surgical techniques must be taken into consideration since chronic infections in pediatric patients are very uncommon illnesses that might be brought on by the development of biofilm [3]. In high-income nations, the average yearly incidence of BJI is 8 per 100,000 children [4, 5]. Despite the significant variation across reports, an upward trend has been seen over the past few decades, most likely as a result of improved diagnostic efficiency. In the same pediatric hospital, Gafur et al. found that within 20 years, the annualized per capita incidence of OM increased 2.8-fold [4]. A greater incidence was seen in children under the age of 5, who made up half of all cases [6]. Although rare, BJI in

children should not be disregarded since systemic and local problems can lead to serious impairments and life-threatening illnesses. If the infection is not quickly diagnosed and managed, it may spread to fatty tissue and result in sepsis and pyomyositis, particularly in small babies [7]. Due to the presence of the epiphysis, local advancement may occur in subperiosteal or intraosseous abscesses, pathological fractures, and aberrant bone development [8–10]. In children over the age more than 8 years, venous thrombosis and septic embolism are also possible [11, 12].

The key to effectively managing BJI is early diagnosis, but this is still difficult for pediatricians, in part because of the vague clinical manifestations of the disease and the low likelihood of the laboratories and imaging first-line tests that are accessible in emergency rooms. Furthermore, conventional blood cultures sometimes fail to provide a microbiological diagnosis, and additional research need invasive techniques. There is ongoing discussion on the appropriateness and efficacy of existing screening testing. A proper treatment strategy is further complicated by the common etiological drugs' pattern of resistance and antibiotics' limited bone penetration. Therefore, the aim of this narrative review is to provide the most recent evidence-based recommendations on appropriate anti-infective therapy in BJI in children.

Antibiotic Therapy

As soon as BJI is clinically suspected, empiric anti-infective therapy should be initiated. Based on the patient's age, immunization status, underlying condition, and other clinical and epidemiological factors, such as the regional incidence of MRSA, the decision of empiric antibiotic treatment is made. Additionally, bone penetration and antibiotic bioavailability need to be taken into account [13]. The results of the antibiograms acquired from the microbiological examinations carried out before to beginning antibiotic medication then serve as a reference for management [14].

Neonatals under 2 months of age should get oxacillin or cefazolin and gentamicin as an empirical therapy to prevent BJI from S. agalactiae and other gram-negative bacteria, which are major causes of BJI in this age group [15, 16]. Children should be treated with anti-staphylococcal penicillin or a cephalosporin such as cefazolin or cefuroxime if they have MSSA, S. pneumoniae, GABHS, or K. kingae [17]. Flucloxacillin should be chosen among the anti-staphylococcal penicillins since it is well handled and has high bone penetration, despite the fact that it is difficult to use for the type of preparation.

In areas where the local incidence of MRSA is greater than 10%, it is advisable to utilize empirical medications that are efficient against these germs [17]. In these cases, the first-choice medicines are clindamycin, vancomycin, or linezolid [18]. The evidence based use of clindamycin in areas with a recurrence of MRSA above 10% and a clindamycin sensitivity rate below 10%, or vancomycin in areas with a frequency of MRSA over 10% and a clindamycin sensitivity rate over 10%, was advised by Peltola et al. as the second alternative to linezolid [19]. Children with BJI caused by MRSA appear to respond effectively to with one dose of dalbavancin [20, 21]. A longer half-life and a lower possibility for dosage requirements are two advantages of dalbavancin over other MRSA-fighting antibiotics now available in the market [22]. If first-line antibiotics are unsuccessful, daptomycin may be given [23, 24]. When PVL SA involvement is probable in challenging, serious cases, antimicrobial therapy should concentrate on minimizing toxin production. In these cases, the first line of therapy is protein synthesis inhibitors such as clindamycin, linezolid, and rifampicin [25, 26]. Salmonella spp. is among the less common bacteria that often causes BJI and should be addressed with a third-generation cephalosporin or fluoroquinolone in people with sickle cell anemia and those who live in underdeveloped nations [5]. Most isolates of Candida spp. are seen in cases of spondylodiscitis and call for prolonged antifungal treatment and surgical debridement [5].

In the literature, there is a lot of debate on how long antibiotic therapy should last overall. OM frequently receives care for 3-6 weeks, and SA frequently receives care for 2-4 weeks, as is customary for BJIs, which are typically treated with substantial intravenous treatment regimens and prolonged hospital stays. According to research by Peltola et al. [27], even just 10 days of therapy are sufficient for SA. In addition, a current French article has shown that 15 days of therapy are frequently sufficient [28]. A second prospective French study on 70 patients found no treatment failures with an intravenous regimen prolonged for up to 8 days [25]. Positive findings came from a retrospective study of 607 Spanish children who underwent intravenous therapy for a mean of 12.9 days [20]. In a multicenter randomised experiment conducted in Finland, 252 children were randomly assigned to one of two therapy groups. After a typical short cycle of 2-4 days of intravenous antibiotics, both groups received a similar shorter cycle of oral clindamycin or a high-dose first-generation cephalosporin for 20

or 30 days, respectively. Given that the authors discovered no appreciable differences between the two groups, shorter treatment times may be effective [29]. However, the absence of PVL-SA or MRSA-related incidents limited the scope of this investigation. When spondylodiscitis develops, it is still indicated to give intravenous therapy for 1-3 weeks [29]. In a parallel observational research conducted in the United States, excellent results were demonstrated with an early transition to oral antibiotics within 4 days. The treatment failure rate was not significantly different from prolonged IV regimens, according to the researchers [30]. Only those who have infection due to PVL-SA are advised to undergo comprehensive antimicrobial therapy and several surgical procedures because these infections are typically made worse by abscesses and venous thrombosis [27].

When to switch from an intravenous to an oral regimen is a topic of much debate. Clinical criteria include apyrexia, compliance to oral antibiotics, pain alleviation, and advances in both general and local pathologic features. Clinical conditions should become better when inflammatory markers including CRP, ESR, and WBC count decrease. Numerous cut-offs have been suggested for the evaluation of laboratory indicators. Some authors prefer to wait until the CRP has fully stabilized before adjusting the antibiotic treatment [31]. Faust et al. [14] considered a CRP level of 20 mg/L or at least a reduction of 2/3 of its peak to be appropriate. Oral treatment shouldn't be started until the patient shows signs of recovery in their clinical condition, has been free of a fever for at least 24 hours, and the ESPID guidelines have been met, which call for a fall of 30 to 50 percent from the CRP peak point. The suggestions suggested maintaining the IV regimen, nevertheless, in the event that more dangerous or resistant bacteria are found [32].

In the greater part of epidemiological data and randomized clinical trials, high-dose cephalosporin or clindamycin are the foundations of oral therapy [33–35]. Trials undertaken by Peltola et al. during follow-up demonstrated a probability of failure little less than 1% [27].

Trimethoprim/sulfamethoxazole (TMP/SMX) has been used successfully as an oral treatment for BJI in children [36–38]. Simple BJIs are routinely treated orally for 3–4 weeks while maintaining continual management of inflammatory markers and drug tolerance [14]. Although medication may proceed at home, this permits the individual to be discharged and then receive aftercare follow-up.

METHODOLOGY

Aim of the Study

To estimate the efficacy of Sulbactam Vs Ceftriaxone for Treatment of Skeletal Infections in Children.

Objectives

To evaluate the patterns of skeletal diseases in pediatric patients

1. To evaluate the isolated organisms in skeletal diseases.
2. To estimate efficacy of Sulbactam Vs Ceftriaxone for the Treatment of Skeletal Infections.

Study Place

A tertiary care hospital, Vadodara, Gujarat, India.

Study Design

An observational comparative study.

Study Population

65 patients.

Study Period

6 months.

Inclusive Criteria

1. Children between the age group 5 to 15 both male and female having skeletal infections.
2. Subject representatives who are interested in taking part in the research.
3. Subjects receiving ceftriaxone & sulbactam as a part of their treatment.

Exclusive Criteria

1. Patient's representatives who refuse to engage in the research.
2. Children below the age group 5 and above 15.
3. Children not having any skeletal diseases.

Method of Study

Prior to starting the study, children with bone illnesses between the ages of 5 and 15 were enrolled, with the approval of their representation. separating the children taking Ceftriaxone & Sulbactam into different categories. After classifying them, monitor them until they are well enough to gauge the effectiveness of ceftriaxone vs. sulbactam under the guidance of a licensed physician.

Statistical Analysis

Depending on demographic characteristics, the participants were divided into groups, and the frequency distributions were calculated along with the percentages. Additionally, all necessary data was sorted and shown in tables or figures using frequencies and percentages.

RESULTS AND DISCUSSION

Patients' categorized based on age were given in Figure 1. Patients' categorized based on gender were represented in Figure 2. The patterns of skeletal diseases in pediatric patients and based on drug therapy were given in Table 1 and Figure 3 respectively. Drug therapy includes parenterally given ceftriaxone and sulbactam. Organisms isolated from blood cultures were represented in Figure 4. The response rate of drug therapy comparatively was represented in Figure 5.

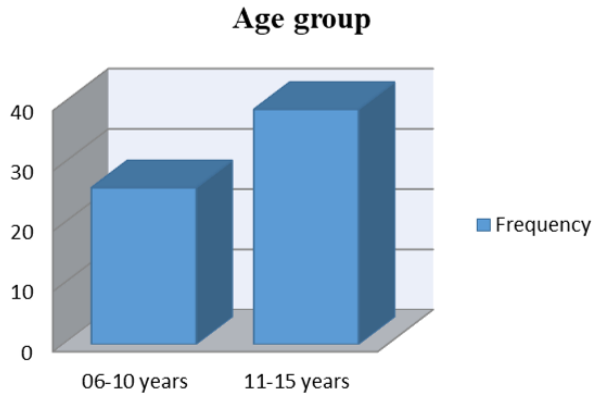

Figure 1: Categorization of Patients Based on Age

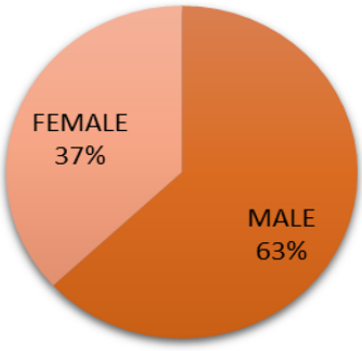

Figure 2: Categorization of Patients Based on Gender

After conducting the study, the response rate was noted to be 100% for sulbactam and 95% for ceftriaxone. Delayed response was noted to be 5% for

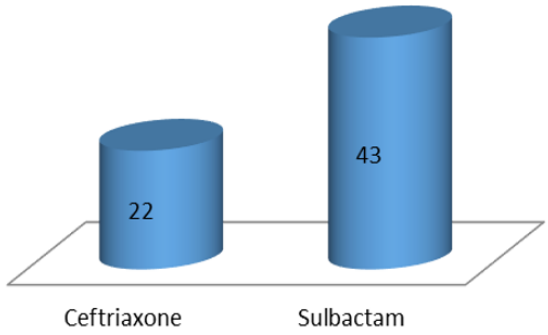

Figure 3: Categorization of Patients Based on Drug Therapy

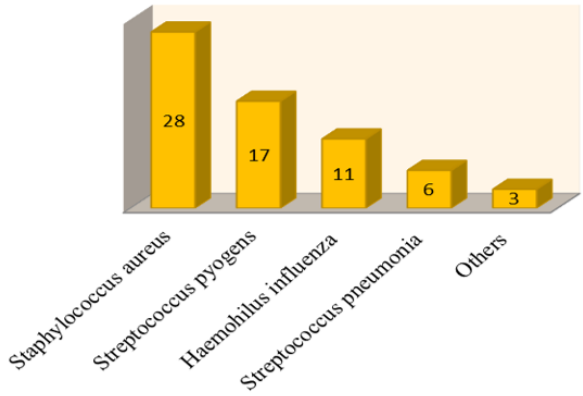

Figure 4: Organisms Isolated from Blood Cultures

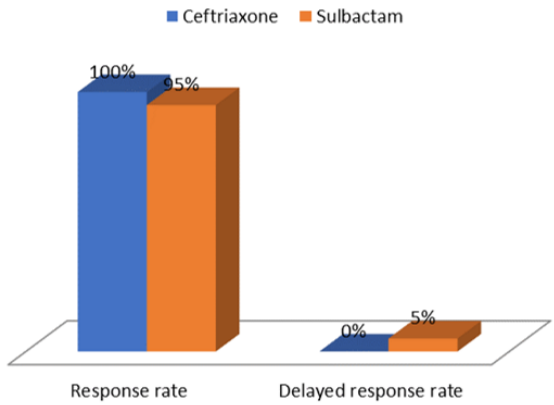

Figure 5: Response Rate of Drug Therapy

ceftriaxone they need to treat with cloaxacillin. So, sulbactam was considered to be effective than compared to ceftriaxone.

Children frequently graze or cut themselves during slips and mishaps, making them especially vulnerable to skin and soft tissue diseases. Additionally, infections of the skin, underlying tissues, and bones can arise from puncture wounds. Since severe infections can cause deformity, bone infections in chil-

Table 1: Patterns of Skeletal Diseases in Children

S. No	Skeletal Diseases	Frequency	Percentage
1.	Soft tissue infection	37	56.92%
2.	Suppurative arthritis	17	26.15%
3.	Osteomyelitis	11	16.92%

dren can be hazardous if not treated adequately. Immune deficiencies or infections that follow bacteremia can lead to serious infections. The use of ampicillin/sulbactam in diverse skin, soft tissue, and skeletal infections has been examined in numerous researches. In prospective comparison research, ampicillin/sulbactam 100–200/15–30 mg/kg per day, four times per day, or ceftriaxone 50–75 mg/kg per day, twice per day were given intravenously to 105 children with SSTIs (suppurative arthritis, osteomyelitis, or cellulitis) [39]. Therapy for cellulitis lasted two days, for suppurative arthritis seven days, and for osteomyelitis seven to ten days. Therapeutic healing and bacteriologic clearance were seen in 38/41 (93%) and 84/84 (100%) of the patients treated with ceftriaxone, respectively.

Due to its outstanding tolerability profile, which is comparable to that of ampicillin used alone, ampicillin/sulbactam has become a first-line treatment for many childhood infections. In a meta-analysis, Lees et al. [40] noted that eight of 66 (12%) kids who underwent multiple-dose therapy experienced negative side effects. Pain at the injection site (6% of reactions) and skin conditions were the most frequent ones (3 percent).

Limitations of the Study

The limitations of the study were

1. The sample size was low.
2. ADR patterns need to be evaluated.

CONCLUSION

Children frequently graze or cut themselves during slips and mishaps, making them especially vulnerable to skin and soft tissue diseases. Additionally, diseases of the skin, subcutaneous tissue, and bones can arise from bruises and cuts. Since severe infections can cause deformity, bone infections in children can be hazardous if not treated adequately. Finally, it was determined that soft tissue disorders were more prevalent and that Staphylococcus aureus is the most common bacterium that causes bone, joint, or muscle infections in kids. Compared to ceftriaxone's response rate of 95%, sulbactam had a response rate of 100%. Sulbactam was therefore thought to be more efficacious than ceftriaxone.

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Conflict of Interest

The authors declare that there is no conflict of interest.

REFERENCES

[1] G Islam, J Tomlinson, T Darton, and R Townsend. Bone and Joint Infections, 2020. Accessed on: 28 July 2020.

[2] M H Perlman, M J Patzakis, P J Kumar, and P Holtom. The incidence of joint involvement with adjacent osteomyelitis in pediatric patients. *Journal of Pediatric Orthopaedics*, 20(1):40–43, 2000.

[3] M Rousset, M Walle, L Cambou, M Mansour, A Samba, B Pereira, and F Canavese. Chronic infection and infected non-union of the long bones in paediatric patients: Preliminary results of bone versus beta-tricalcium phosphate grafting after induced membrane formation. *International Orthopaedics*, 42(2):385–393, 2018.

[4] O A Gafur, L A Copley, S T Hollmig, R H Browne, L A Thornton, and S E Crawford. The impact of the current epidemiology of pediatric musculoskeletal infection on evaluation and treatment guidelines. *Journal of Pediatric Orthopaedics*, 28(7):777–785, 2008.

[5] L Castellazzi, M Mantero, and S Esposito. Update on the management of pediatric acute osteomyelitis and septic arthritis. *International journal of molecular sciences*, 17(6):855, 2016.

[6] K Gutierrez. Bone and joint infections in children. *Pediatric Clinics*, 52(3):779–794, 2005.

[7] P S Pannaraj, K G Hulten, B E Gonzalez, E O Mason, and S L Kaplan. Infective pyomyositis and myositis in children in the era

of community-acquired, methicillin-resistant Staphylococcus aureus infection. *Clinical infectious diseases*, 43(8):953–960, 2006.

[8] M V Belthur, S B Birchansky, A A Verdugo, E O Mason, K G Hulten, S L Kaplan, and J Weinberg. Pathologic fractures in children with acute Staphylococcus aureus osteomyelitis. *JBJS*, 94(1):34–42, 2012.

[9] W Peters, J Irving, and M Letts. Long-term effects of neonatal bone and joint infection on adjacent growth plates. *Journal of pediatric orthopedics*, 12(6):806–810, 1992.

[10] A M M El-Sayed. Treatment of early septic arthritis of the hip in children: comparison of results of open arthrotomy versus arthroscopic drainage. *Journal of children's orthopaedics*, 2(3):229–237, 2008.

[11] E Mantadakis, E Plessa, E K Vouloumanou, L Michailidis, A Chatzimichael, and M E Falagas. Deep venous thrombosis in children with musculoskeletal infections: the clinical evidence. *International Journal of Infectious Diseases*, 16(4):236–243, 2012.

[12] B E Gonzalez, J Teruya, D H Mahoney, K G Hulten, R Edwards, L B Lamberth, and S L Kaplan. Venous thrombosis associated with staphylococcal osteomyelitis in children. *Pediatrics*, 117(5):1673–1679, 2006.

[13] E Chiappini, C Camposampiero, S Lazzeri, G Indolfi, M De Martino, and L Galli. Epidemiology and management of acute haematogenous osteomyelitis in a tertiary paediatric center. *International journal of environmental research and public health*, 14(5), 2017.

[14] S N Faust, J Clark, A Pallett, and N M Clarke. Managing bone and joint infection in children. *Archives of disease in childhood*, 97(6):545–553, 2012.

[15] N S Harik and M S Smeltzer. Management of acute hematogenous osteomyelitis in children. *Expert review of anti-infective therapy*, 8(2):175–181, 2010.

[16] A K Thabit, D F Fatani, M S Bamakhrama, O A Barnawi, L O Basudan, and S F Alhejaili. Antibiotic penetration into bone and joints: an updated review. *International journal of infectious diseases*, 81:128–136, 2019.

[17] J Saavedra-Lozano, O Falup-Pecurariu, S N Faust, H Girschick, N Hartwig, S Kaplan, and A Lemair. Bone and joint infections. *The Pediatric infectious disease journal*, 36(8):788–799, 2017.

[18] A R Howard-Jones and D Isaacs. Systematic review of duration and choice of systemic antibiotic therapy for acute haematogenous bacterial osteomyelitis in children. *Journal of paediatrics and child health*, 49(9):760–768, 2013.

[19] M Pääkkönen and H Peltola. Bone and joint infections. *Pediatric Clinics*, 60(2):425–436, 2013.

[20] S Wunsch, R Krause, T Valentin, J Prattes, O Janata, A Lenger, and I Zollner-Schwetz. Multicenter clinical experience of real life Dalbavancin use in gram-positive infections. *International Journal of Infectious Diseases*, 81:210–214, 2019.

[21] J S Bradley, S Puttagunta, C M Rubino, J L Blumer, M Dunne, and J E Sullivan. Pharmacokinetics, safety and tolerability of single dose dalbavancin in children 12-17 years of age. *The Pediatric infectious disease journal*, 34(7):748–752, 2015.

[22] S Esposito and S Bianchini. Dalbavancin for the treatment of paediatric infectious diseases. *European Journal of Clinical Microbiology and Infectious Diseases*, 35(12):1895–1901, 2016.

[23] K J Deronde, J E Girotto, and D P Nicolau. Management of pediatric acute hematogenous osteomyelitis, Part II: a focus on methicillin-resistant Staphylococcus aureus, current and emerging therapies. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, 38(10):1021–1037, 2018.

[24] J C McNeil, S L Kaplan, and J G Vallejo. The influence of the route of antibiotic administration, methicillin-susceptibility, vancomycin duration and serum trough concentration on outcomes of pediatric Staphylococcus aureus bacteremic osteoarticular infection. *The Pediatric infectious disease journal*, 36(6):572, 2017.

[25] B A Diep, A Afasizheva, H N Le, O Kajikawa, G Matute-Bello, C Tkaczyk, and H F Chambers. Effects of linezolid on suppressing in vivo production of staphylococcal toxins and improving survival outcomes in a rabbit model of methicillin-resistant Staphylococcus aureus necrotizing pneumonia. *The Journal of infectious diseases*, 208(1):75–82, 2013.

[26] P Rojo, M Barrios, A Palacios, C Gomez, and F Chaves. Community-associated Staphylococcus aureus infections in children. *Expert Review of Anti-infective Therapy*, 8(5):541–554, 2010.

[27] H Peltola, M Pääkkönen, P Kallio, and M J

Kallio. Short-versus long-term antimicrobial treatment for acute hematogenous osteomyelitis of childhood: prospective, randomized trial on 131 culture-positive cases. *The Pediatric infectious disease journal*, 29(12):1123–1128, 2010.

[28] A Filleron, M E Laurens, G Marin, H Marchandin, O Prodhomme, F Alkar, and E Jeziorski. Short-course antibiotic treatment of bone and joint infections in children: a retrospective study at Montpellier University Hospital from 2009 to 2013. *Journal of Antimicrobial Chemotherapy*, 74(12):3579–3587, 2019.

[29] P M De Moraes Barros Fucs, R Meves, and H H Yamada. Spinal infections in children: a review. *International orthopaedics*, 36(2):387–395, 2012.

[30] S Islam, N Biary, and B Wrotniak. Favorable outcomes with early transition to oral antibiotics for pediatric osteoarticular infections. *Clinical Pediatrics*, 58(6):696–699, 2019.

[31] M Street, R Puna, M Huang, and H Crawford. Pediatric acute hematogenous osteomyelitis. *Journal of Pediatric Orthopaedics*, 35(6):634–639, 2015.

[32] M Wong, D Isaacs, R Howman-Giles, and R Uren. Clinical and diagnostic features of osteomyelitis occurring in the first three months of life. *The Pediatric infectious disease journal*, 14(12):1047–1053, 1995.

[33] E Chiappini, A Krzysztofiak, E Bozzola, C Gabiano, S Esposito, A Lo Vecchio, and L Galli. Risk factors associated with complications/sequelae of acute and subacute haematogenous osteomyelitis: an Italian multicenter study. *Expert Review of Anti-infective Therapy*, 16(4):351–358, 2018.

[34] R Keren, S S Shah, R Srivastava, S Rangel, M Bendel-Stenzel, and N Harik. Comparative effectiveness of intravenous vs oral antibiotics for postdischarge treatment of acute osteomyelitis in children. *JAMA pediatrics*, 169(2):120–128, 2015.

[35] P Sánchez-Moreno, A V Ardanuy-Pizarro, L Navarro, M Melón, M D Falcón-Neyra, and M Camacho-Lovillo. Acute osteoarticular infections in children in a tertiary hospital: Our experience across 5 years. *Ann. Rheum. Dis*, 74:1233–1233, 2015.

[36] E Chiappini, E Serrano, L Galli, A Villani, and A Krzysztofiak. Practical issues in early switching from intravenous to Oral antibiotic therapy in children with uncomplicated acute Hematogenous osteomyelitis: results from an Italian survey. *International Journal of Environmental Research and Public Health*, 16(19):3557, 2019.

[37] M N Al-Hasan and H Rac. Transition from intravenous to oral antimicrobial therapy in patients with uncomplicated and complicated bloodstream infections. *Clinical Microbiology and Infection*, 26(3):299–306, 2020.

[38] L Deconinck, A Dinh, C Nich, T Tritz, M Matt, O Senard, and B Davido. Efficacy of cotrimoxazole (Sulfamethoxazole-Trimethoprim) as a salvage therapy for the treatment of bone and joint infections (BJIs). *PloS one*, 14(10), 2019.

[39] J Kulhanjian, M G Dunphy, S Hamstra, K Levernier, M Rankin, and A Petru. Randomized comparative study of ampicillin/sulbactam vs. ceftriaxone for treatment of soft tissue and skeletal infections in children. *Pediatr Infect Dis J*, 8:605–610, 1989.

[40] P Raillard, C Feiner, V Ott, G Treadway, and Y Wang. Worldwide pediatric experience with low-dose sultamicillin oral suspension. *Current therapeutic research*, 55(5):601–613, 1994.

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