MUSCULOSKELETAL DISORDERS

Introduction

Musculoskeletal disorders are common in children and often debilitating.[1] This section includes juvenile idiopathic arthritis, juvenile osteochondroses and scoliosis.

Juvenile idiopathic arthritis (JIA) is the most common paediatric rheumatologic disease.[2] The term JIA describes all forms of arthritis that have an onset before age 16 years with joint inflammation that lasts more than 6 weeks and exclusion of other known conditions.[2-4] Children with specific subtypes of JIA can have additional symptoms or conditions including: fever, tiredness, rash, loss of appetite and weight loss. The arthritis that occurs as a manifestation of the skin condition psoriasis is also included as a subtype of JIA.[4] JIA has significant morbidity and can be painful, disable a child, limit quality of life, add to the financial stress of families, and have a substantial societal cost.[1,5] Children with arthritis that involves five or more joints have a particularly refractory disease course and are at higher risk of poorer functional outcomes compared to those with involvement of fewer joints.[2,6] Inadequately controlled disease may lead to abnormalities of growth such as short stature, localized bone overgrowth or premature fusion, and alteration of limb length.[3] Patients with JIA are less likely than healthy peers to engage in physical activity.[7] Important differential diagnoses include rheumatic fever, systemic lupus erythematosus, and orthopedic problems. Some children with inflammatory bowel disease (IBD) may have a peripheral arthritis before or after the bowel problems become obvious.[1] Fatigue and uveitis are common comorbidities; other comorbidities include allergic rhinitis, migraine and atopic dermatitis and heart problems such as pericarditis.[8-10]

The term juvenile osteochondrosis describes a group of disorders that affect patients with an immature skeleton. The usual presentation is pain and limited mobility of the affected joint.[5] Joints commonly affected are the hip, knee, elbow and back. Osteochondrosis occurs as a result of abnormal growth, injury, or overuse of the developing bone growth plate.[5] Symptoms may be intermittent, and may be associated with athletic activity.[11] The association of symptoms with athletic activity means that osteochondrosis is sometimes classified as sports-related overuse injury.[12] Osteochondrosis at different body sites has traditionally been considered as separate diseases, often with eponymous titles (e.g. osteochondrosis of the knee is known as Osgood-Schlatter disease) although the disease process is similar wherever it occurs in the body.[5,11,12]

Scoliosis is a lateral deviation of the spine and is one of the most common paediatric spinal deformities. Most cases, especially if diagnosed after infancy, are 'idiopathic' or not associated with any known cause. Congenital scoliosis has a high association with other congenital anomalies arising at the same period of fetal development.[13] Juvenile scoliosis also occurs in the setting of neuromuscular disorders such as cerebral palsy and muscular dystrophy, or as part of genetic syndromes and conditions such as Marfan syndrome and neurofibromatosis.[13-15]

Data sources and methods

Indicators

Rates of chronic musculoskeletal diseases among 0–24 year olds

Definition

Hospitalisations of 0–24 year olds with a chronic musculoskeletal disease per 100,000 population

Data sources

Numerator:	National Minimum Dataset
Denominator:	Statistics New Zealand Estimated Resident Population (with linear extrapolation being used to calculate denominators between Census years)

Additional information

A chronic musculoskeletal disease was the principal diagnosis or was documented as one of the first 15 diagnoses. Chronic musculoskeletal diseases comprises juvenile arthritis, juvenile osteochondrosis, and scoliosis.
Codes used for identifying cases are documented in Error! Reference source not found..

National trends and distribution

There were less than five deaths of 0–24 year olds where a chronic musculoskeletal disease was the underlying cause of death in New Zealand between 2009 and 2013, as documented within the National Mortality Collection.

The number of 0–24 year olds hospitalised with chronic musculoskeletal diseases during 2011 to 2015 is presented in **Table 1**. It also presents the number of hospital discharges in which chronic musculoskeletal diseases were documented as the primary diagnosis or as any diagnosis.

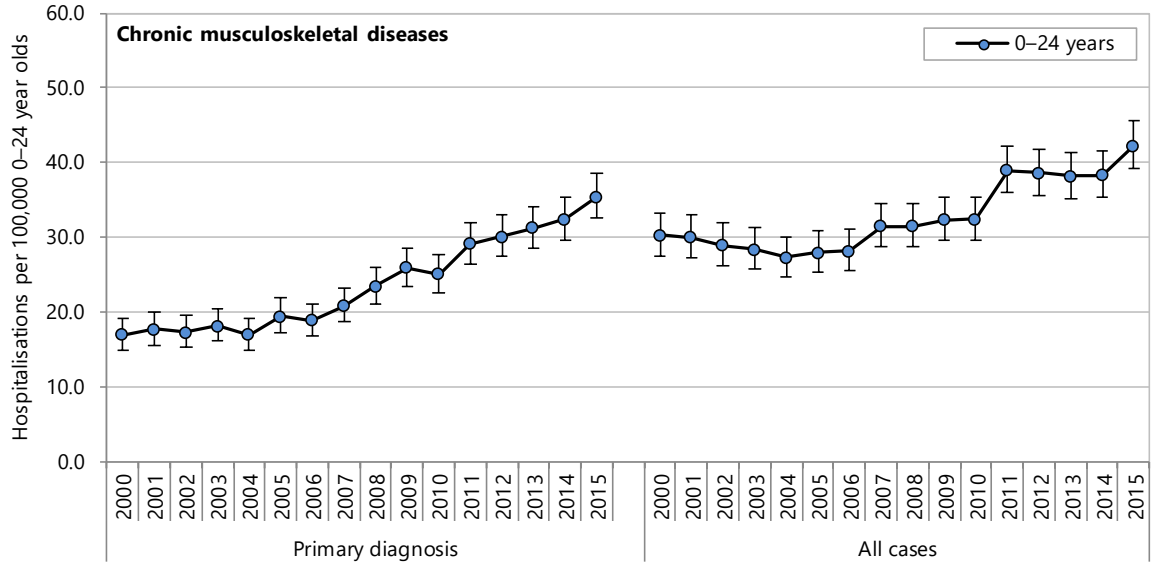
The rate of hospitalisations where a chronic musculoskeletal disease was the primary diagnosis has increased since 2000 (**Figure 1**).

Table 1. Individuals aged 0–24 years hospitalised with chronic musculoskeletal diseases using primary diagnosis compared to all cases, New Zealand 2011–2015

	Unique individuals *(n)*	Hospitalisations *(n)*		Ratio All:Primary
		Primary diagnosis	All cases	
Chronic musculoskeletal diseases				
Hospitalisation				
0–24 years	1,506	2,431	3,016	1.24
0–14 years	962	1,595	1,968	1.23
15–24 years	578	836	1,048	1.25
Chronic musculoskeletal diseases in 0–24 year olds				
Juvenile arthritis	377	1,269	1,494	1.18
Juvenile osteochondrosis	415	444	541	1.22
Scoliosis	720	718	982	1.37

Source: National Minimum Dataset. 'All cases' corresponds to hospitalisations with chronic musculoskeletal diseases listed in any of the first 15 diagnoses; The sum of the age groups may total to more than the 0–24 year old total

Figure 1. Hospitalisations for chronic musculoskeletal diseases in 0–24 year olds, New Zealand 2000–2015



Numerator: National Minimum Dataset, Denominator: Statistics NZ Estimated Resident Population. 'All cases' corresponds to hospitalisations with chronic musculoskeletal diseases listed in any of the first 15 diagnoses

Demographic distribution

Table 2 presents the demographic distribution of individuals with chronic musculoskeletal diseases in New Zealand between 2011 and 2015. Chronic musculoskeletal diseases were significantly lower among males, and among 0–4 year olds compared to 15–24 year olds, and significantly higher among 5–14 year olds. There was no significant difference by deprivation score. The majority of individuals with chronic musculoskeletal diseases were of European/Other ethnicities.

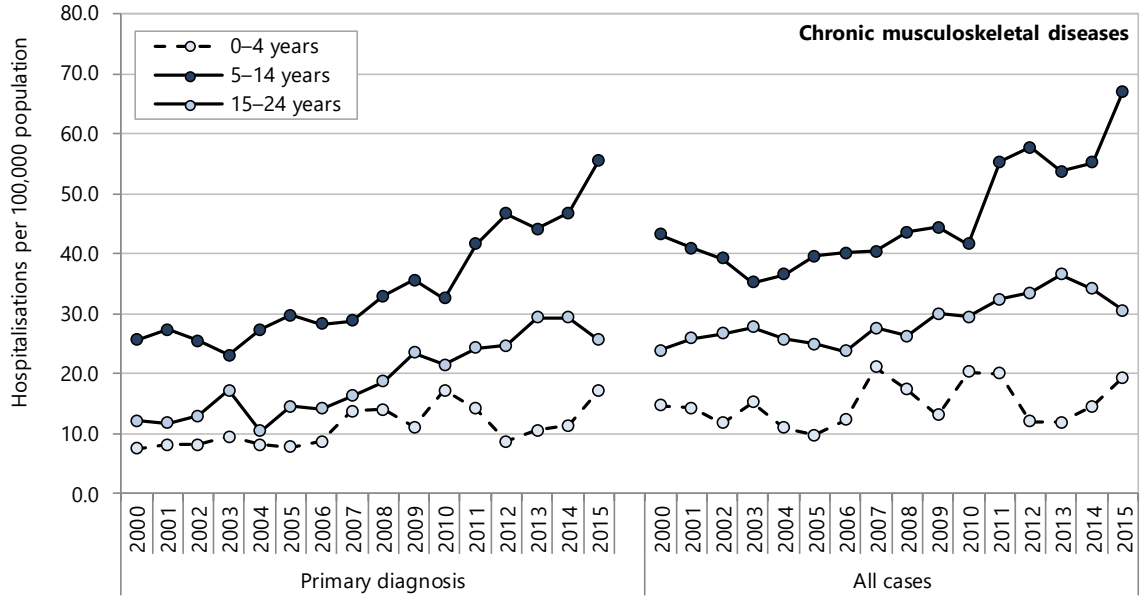
Table 2. Individuals aged 0–24 years hospitalised with chronic musculoskeletal diseases, by demographic factor, New Zealand 2011–2015

Variable	Unique individuals 2011–2015 *(n)*	Rate per 100,000 population	Rate ratio	95% CI
Chronic musculoskeletal diseases* in 0–24 year olds				
New Zealand				
NZ Deprivation Index quintile				
Deciles 1–2	308	21.70	1.00	
Deciles 3–4	286	21.39	0.99	0.84–1.16
Deciles 5–6	287	19.91	0.92	0.78–1.08
Deciles 7–8	315	19.39	0.89	0.76–1.05
Deciles 9–10	371	19.97	0.92	0.79–1.07
Prioritised ethnicity				
Māori	248	13.75	0.54	0.47–0.62
Pacific	95	13.41	0.53	0.43–0.65
Asian/Indian	89	9.28	0.36	0.29–0.45
MELAA	19	18.84	0.74	0.47–1.16
European/Other	1,049	25.53	1.00	
Gender				
Female	875	23.31	1.00	
Male	631	16.07	0.69	0.62–0.76
Age group (years)				
0–4	137	8.78	0.48	0.40–0.57
5–14	860	28.82	1.56	1.41–1.74
15–24	578	18.42	1.00	

Numerator: National Minimum Dataset, Denominator: Statistics NZ Estimated Resident Population. * Chronic musculoskeletal diseases in any of the first 15 diagnoses; Rate per 100,000 age-specific population; Rate ratios are unadjusted; Ethnicity is Level 1 prioritised; Decile is NZDep2013

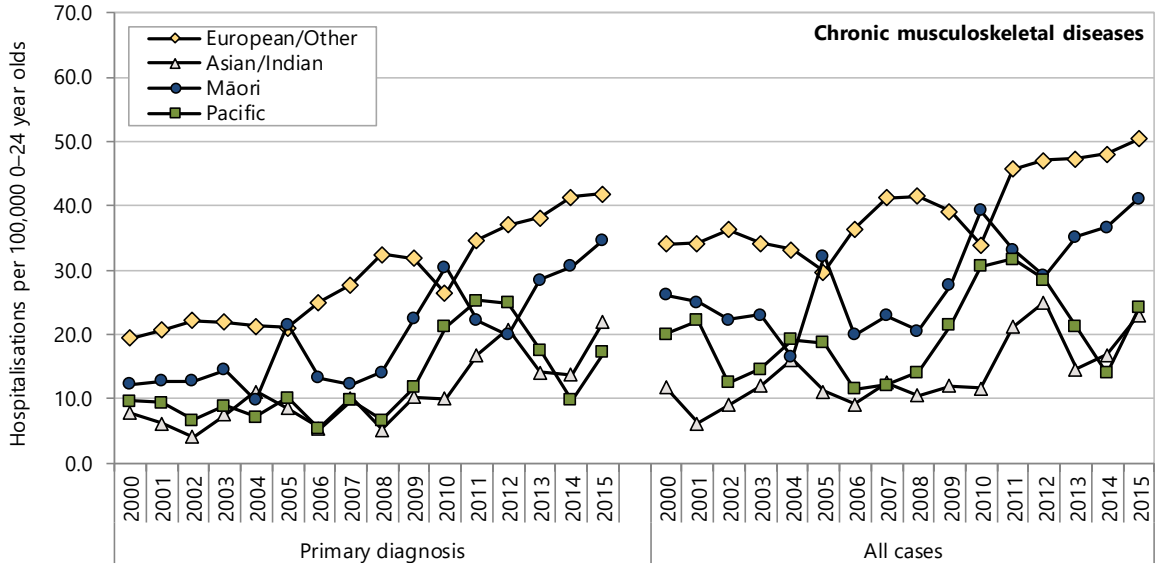
Hospitalisations for chronic musculoskeletal diseases had increased for the three age groups since 2000, and most notably for the 0–4 year olds (**Figure 2**). Over the same period, the hospitalisation rate had gradually increased for each ethnic group, although European/Other had a consistently higher hospitalisation rate than the other ethnic groups (**Figure 3**).

Figure 2. Hospitalisations involving chronic musculoskeletal diseases in 0–24 year olds, by age group, New Zealand 2000–2015



Numerator: National Minimum Dataset, Denominator: Statistics NZ Estimated Resident Population. 'All cases' corresponds to hospitalisations with chronic musculoskeletal diseases listed in any of the first 15 diagnoses

Figure 3. Hospitalisations involving chronic musculoskeletal diseases in 0–24 year olds, by ethnicity, New Zealand 2000–2015



Numerator: National Minimum Dataset, Denominator: Statistics NZ Estimated Resident Population. 'All cases' corresponds to hospitalisations with chronic musculoskeletal diseases listed in any of the first 15 diagnoses

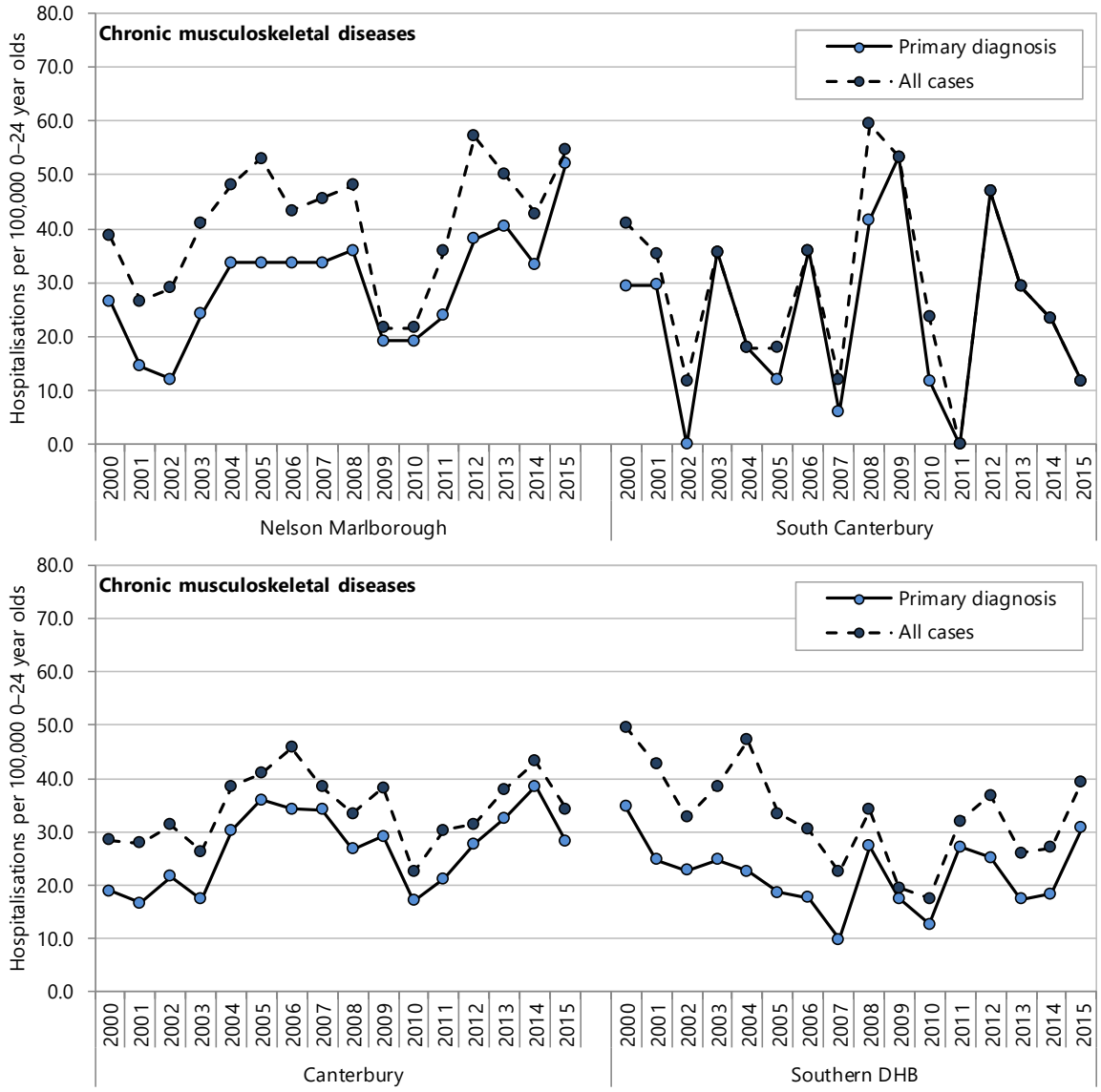
Regional trends and distribution

Table 3 presents the number of individuals resident in each district health board that had a chronic musculoskeletal disease diagnosis during 2011 to 2015. It also presents the number of hospital discharges in which a chronic musculoskeletal disease was documented as the primary diagnosis or any diagnosis.

The All:Primary diagnosis ratio reflects the extent to which hospitalisations of 0–24 year olds with chronic musculoskeletal conditions occur when one of these conditions condition is not the primary diagnosis and it provides an indication of the extent to which using only the primary diagnosis undercounts chronic musculoskeletal disease related hospitalisations. A high ratio may be associated with more thorough documentation and it may also indicate that children with chronic musculoskeletal diseases are often hospitalised for other conditions. For chronic musculoskeletal diseases the All:Primary diagnosis ratio was higher than the national ratio in Nelson Marlborough, and Southern DHBs. Ratios were lower than the national ratio in South Canterbury, Canterbury, and West Coast DHBs (**Table 3**).

Since 2000, there was year-on-year variability in the hospitalisation rate for a chronic musculoskeletal disease among the South Island DHBs, however, the hospitalisation rate generally increased in Nelson Marlborough and Canterbury DHBs, and largely decreased in Southern DHB (**Figure 4**). For West Coast DHB there was 18 hospitalisations where a chronic musculoskeletal disease was the primary diagnosis since 2000 and 30 hospitalisations where it was a contributory (any) diagnosis.

Figure 4. Hospitalisations for chronic musculoskeletal diseases in 0–24 year olds, South Island DHBs 2000–2015



Numerator: National Minimum Dataset, Denominator: Statistics NZ Estimated Resident Population. 'All cases' corresponds to hospitalisations with chronic musculoskeletal diseases listed in any of the first 15 diagnoses; Caution rates suppressed for the West Coast and subject to small number variability in South Canterbury

Table 3. Hospitalisations for chronic musculoskeletal diseases in 0–24 year olds, South Island DHBs vs New Zealand 2011–2015

DHB	Unique individuals *(n)*	Hospitalisations *(n)*		Ratio All:Primary
		Principal diagnosis	All cases	
Chronic musculoskeletal diseases in 0–24 year olds				
Nelson Marlborough	39	79	101	1.28
South Canterbury	16	19	19	1.00
Canterbury	155	246	294	1.20
West Coast	6	6	7	1.17
Southern	113	123	167	1.36
New Zealand	1,506	2,431	3,016	1.24

Source: National Minimum Dataset. 'All cases' corresponds to hospitalisations with chronic musculoskeletal diseases listed in any of the first 15 diagnoses

Evidence for good practice

Possibilities for prevention

The causes of juvenile idiopathic arthritis (JIA) are unknown but include complex interactions between genetic makeup and environmental exposures.[16] The causes of osteochondrosis are also complex and involve vascular, traumatic, microtraumatic factors.[12] Most cases (80%) of scoliosis are also idiopathic.[13] For all of these conditions the focus is on prompt diagnosis and treatment that is consistent with best practice. There is a lack of evidence for or against population screening for scoliosis, although school programmes exist in many US States.[13] Every clinician involved in the care of children and young people ought to competent in the examination of the musculoskeletal system, and musculoskeletal examination results should be documented in all paediatric hospitalisation records.[1]

Evidence-based health care for children and young people with juvenile idiopathic arthritis

The goal of therapy is to target the underlying inflammation and prevent complications associated with the condition. Early accurate diagnosis is important to allow early aggressive treatment of juvenile idiopathic arthritis (JIA) and optimal prognosis.[1,6] Uveitis is a common and often asymptomatic comorbidity of JIA which can lead to blindness if untreated.[4] Initial screening for uveitis is recommended within a month of JIA diagnosis.[17] Commonly used therapies for JIA include nonsteroidal anti-inflammatory drugs (NSAIDs), disease-modifying antirheumatic drugs (DMARDs), and biologic agents such as the tumour necrosis factor (TNF-α) inhibitors.[3] Flares affecting one or more joints are common after the disease becomes inactive. Clinical decision-making needs to balance the risk of flare if treatment is discontinued with the risks and inconveniences of continuing treatment.[18] Markers of early atherosclerosis are present more often in patients with JIA patients than in their healthy peers, and, in relation to later overt cardiovascular disease, this is likely to be part of a slowly-developing, multifaceted process which may be amenable to preventive measures. A broader management approach to JIA will include promotion of a healthy lifestyle so that patients gain full benefit of effective anti-inflammatory treatment and secure a healthy life in adulthood.[19] Physical activity can both increase and decrease inflammatory effects for patients with JIA depending on duration and intensity of exercise and personal training.[20]

Juvenile osteochondrosis usually comes to attention only when it is symptomatic.[11] Symptoms are usually self-limiting and respond well to activity modification and anti-inflammatory drug treatment. Surgery may be required for older children and young people with mature skeletons who continue to have disabling symptoms.[5]

Surgery for adolescent idiopathic scoliosis can prevent curve progression and lessen deformity, with statistically and clinically significant improvement in self-image.[21] Surgery is also associated with positive outcomes for children with neuromuscular or genetic conditions.[14,15] A plethora of non-surgical interventions is used for scoliosis including bracing, scoliosis-specific exercises, manual therapy and electrical stimulation. The methodological quality of systematic reviews for such interventions is generally low, and findings from higher quality reviews have not found sufficient evidence to make an informed judgment about the effectiveness of non-surgical interventions in adolescents with idiopathic scoliosis.[22]

International guidelines

- National Institute for Health and Care Excellence. 2016. Musculoskeletal conditions pathway. https://pathways.nice.org.uk/pathways/musculoskeletal-conditions
- Ringold S, Weiss PF, Beukelman T, et al. 2013. 2013 update of the 2011 American College of Rheumatology recommendations for the treatment of juvenile idiopathic arthritis: Recommendations for the medical therapy of children with systemic juvenile idiopathic arthritis and tuberculosis screening among children receiving biologic medications. *Arthritis & Rheumatism*, 65(10) 2499-512. http://dx.doi.org/10.1002/art.38092
- Cincinnati Children's Hospital Medical Center. 2012. Best evidence statement (BESt). Screening for uveitis in children with juvenile idiopathic arthritis (JIA). Cincinnati: Cincinnati Children's Hospital Medical Center. http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/best.htm
- Valovich McLeod TC, Decoster LC, Loud KJ, et al. 2011. National athletic trainers' association position statement: Prevention of pediatric overuse injuries. *Journal of Athletic Training*, 46(2) 206-20. http://dx.doi.org/10.4085/1062-6050–46.2.206

Evidence-based medicine reviews

- Płaszewski M & Bettany-Saltikov J. 2014. Non-surgical interventions for adolescents with idiopathic scoliosis: An overview of systematic reviews. *PLoS ONE*, 9(10). http://dx.doi.org/10.1371/journal.pone.0110254

Other relevant publications

- Launay F. 2015. Sports-related overuse injuries in children. *Orthopaedics and traumatology: Surgery and Research*, 101(1) S139-S47. http://dx.doi.org/10.1016/j.otsr.2014.06.030

Websites

- Kids with arthritis New Zealand http://www.kidswitharthritis.org.nz/
- Arthritis New Zealand http://www.arthritis.org.nz/information/children-with-arthritis/

References

1. Spencer CH, Patwardhan A. 2015. Pediatric rheumatology for the primary care clinicians-recognizing patterns of disease. *Current Problems in Pediatric and Adolescent Health Care*, 45(7) 185-206. http://dx.doi.org/10.1016/j.cppeds.2015.04.002
2. Ringold S, Weiss PF, Beukelman T, et al. 2013. 2013 update of the 2011 American College of Rheumatology recommendations for the treatment of juvenile idiopathic arthritis: Recommendations for the medical therapy of children with systemic juvenile idiopathic arthritis and tuberculosis screening among children receiving biologic medications. *Arthritis & Rheumatology*, 65(10) 2499-512. http://dx.doi.org/10.1002/art.38092
3. Canadian Agency for Drugs and Technologies in Health. 2014. Common drug review: Clinical review report for tocilizumab (Actemra, intravenous) for the treatment of signs and symptoms of active polyarticular juvenile idiopathic arthritis Canadian Agency for Drugs and Technologies in Health. http://onlinelibrary.wiley.com/o/cochrane/cldare/articles/DARE-12014069044/frame.html
4. National Institute for Health and Care Excellence. 2015. Abatacept, adalimumab, etanercept and tocilizumab for treating juvenile idiopathic arthritis https://www.nice.org.uk/guidance/ta373 accessed September, 2016.
5. Atanda A, Shah SA, O'Brien K. 2011. Osteochondrosis: Common causes of pain in growing bones. *American Family Physician*, 83(3) 285-91. http://www.aafp.org/afp/2011/0201/p285.html
6. van Dijkhuizen EHP, Wulffraat NM. 2015. Early predictors of prognosis in juvenile idiopathic arthritis: a systematic literature review. *Annals of the Rheumatic Diseases*, 74(11) 1996-2005. http://dx.doi.org/10.1136/annrheumdis-2014-205265
7. Cavallo S, April KT, Grandpierre V, et al. 2014. Leisure in children and adolescents with juvenile idiopathic arthritis: A systematic review. *PLoS ONE*, 9(10) e104642. http://dx.doi.org/10.1371/journal.pone.0104642
8. Armbrust W, Siers NE, Lelieveld OTHM, et al. 2016. Fatigue in patients with juvenile idiopathic arthritis: A systematic review of the literature. *Seminars in Arthritis and Rheumatism*, 45(5) 587-95. http://dx.doi.org/10.1016/j.semarthrit.2015.10.008
9. Raab A, Sengler C, Niewerth M, et al. 2013. Comorbidity profiles among adult patients with juvenile idiopathic arthritis: results of a biologic register. *Clinical and Experimental Rheumatology*, 31(5) 796-802.
10. Koca B, Sahin S, Adrovic A, et al. 2016. Cardiac involvement in juvenile idiopathic arthritis. *Rheumatology International*, 37(1) 137-42. http://dx.doi.org/10.1007/s00296-016-3534-z
11. McCoy AM, Toth F, Dolvik NI, et al. 2013. Articular osteochondrosis: A comparison of naturally-occurring human and animal disease. *Osteoarthritis and Cartilage*, 21(11) 1638-47. http://dx.doi.org/10.1016/j.joca.2013.08.011
12. Launay F. 2015. Sports-related overuse injuries in children. *Orthopaedics and Traumatology: Surgery and Research*, 101(1) S139-S47. http://dx.doi.org/10.1016/j.otsr.2014.06.030
13. Horan MP, Milbrandt TA. 2009. Scoliosis in pediatric patients: Comorbid disorders and screening. *Pediatric Health*, 3(5) 451-56. http://dx.doi.org/10.2217/phe.09.48
14. Harvey A, Baker L, Williams K. 2014. Non-surgical prevention and management of scoliosis for children with Duchenne muscular dystrophy: what is the evidence? (Provisional abstract). *Journal of Paediatrics and Child Health*, 50(10) E3-e9. http://dx.doi.org/10.1111/jpc.12177
15. Legg J, Davies E, Raich AL, et al. 2014. Surgical correction of scoliosis in children with spastic quadriplegia: Benefits, adverse effects, and patient selection. *Evidence-Based Spine-Care Journal*, 5(1) 38-51. http://dx.doi.org/10.1055/s-0034-1370898

16. Moncrieffe H, Prahalad S, Thompson SD. 2014. Genetics of juvenile idiopathic arthritis: new tools bring new approaches. *Current Opinion in Rheumatology*, 26(5) 579-84. http://dx.doi.org/10.1097/bor.0000000000000094
17. Cincinnati Children's Hospital Medical Center. 2012. Best evidence statement (BESt). Screening for uveitis in children with juvenile idiopathic arthritis (JIA). Cincinnati: Cincinnati Children's Hospital Medical Center. http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/best.htm
18. Guzman J, Oen K, Huber AM, et al. 2016. The risk and nature of flares in juvenile idiopathic arthritis: Results from the ReACCh-Out cohort. *Annals of the Rheumatic Diseases*, 75(6) 1092-98. http://dx.doi.org/10.1136/annrheumdis-2014-207164
19. Bohr A-H, Fuhlbrigge RC, Pedersen FK, et al. 2016. Premature subclinical atherosclerosis in children and young adults with juvenile idiopathic arthritis. A review considering preventive measures. *Pediatric Rheumatology Online Journal*, 14(1) 3. http://dx.doi.org/10.1186/s12969-015-0061-5
20. Rochette E, Duché P, Merlin E. 2015. Juvenile idiopathic arthritis and physical activity: Possible inflammatory and immune modulation and tracks for interventions in young populations. *Autoimmunity Reviews*, 14(8) 726-34. http://dx.doi.org/10.1016/j.autrev.2015.04.007
21. Rushton PR, Grevitt MP. 2013. What is the effect of surgery on the quality of life of the adolescent with adolescent idiopathic scoliosis? A review and statistical analysis of the literature. *Spine*, 38(9) 786-94. http://dx.doi.org/10.1097/BRS.0b013e3182837c95
22. Płaszewski M, Bettany-Saltikov J. 2014. Non-surgical interventions for adolescents with idiopathic scoliosis: An overview of systematic reviews. *PLoS ONE*, 9(10) http://dx.doi.org/10.1371/journal.pone.0110254