In Clinical Practice

Janet E. McDonagh
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Adolescent and Young Adult Rheumatology In Clinical Practice

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In Clinical Practice

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Adolescent and Young Adult Rheumatology In Clinical Practice

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Foreword

The Barbara Ansell National Network for Adolescent Rheumatology (BANNAR, www.bannar.org.uk) is a UK-wide network which promotes research and clinical care in adolescent and young adult rheumatology. BANNAR has a facilitated and funded youth advisory panel called YOUR RHEUM (http://yourrheum.org). This group advises on research from priorities and inception through study design, recruitment, completion and dissemination. Many of the contributors to this book are members of BANNAR including some members of the youth panel. We would like to dedicate this book to the young people and their families who have taught us, and continue to teach us, so much about what it is like to grow up in today's world with a long-term rheumatic condition. They regularly remind us that their main concern is how they will live their lives with such conditions. We hope that by providing such a handbook, professionals involved in delivering the care for such young people will always take their lives outside the clinic setting into account.

Preface

Young people are usually not a priority in either children's services or adult services. As a result, adolescent and young adult care can be invisible and under-researched, and young people can suffer. Rheumatic and musculoskeletal diseases with onset in childhood are often lifelong conditions; their management in adolescence and young adulthood is key, particularly as both health-promoting and health-risky behaviours are established during this life stage. We have edited this book to provide a focus on these diseases in the specific developmental stages of adolescence and young adulthood to help rheumatology professionals in both paediatric and adult care settings to provide tailored, developmentally appropriate and young person-friendly care.

Manchester, UK — Janet E. McDonagh
Sheffield, UK — Rachel S. Tattersall

Contents

Introduction: Young People Have Their Say

Contributors:

- Niamh Adams, University student with an interest in pursuing a career in journalism, UK, 18 years
- Beth, 18 years
- Danny, 16 years
- Phoebe, 22 years
- Simon, 24 years
- Sophia, 22 years

Introduction

Within this chapter we discuss:

- Young people's experiences of living with a rheumatic and musculoskeletal disease (RMD)
- What young people feel rheumatology health professionals should know about being young and living with a chronic condition
- What makes a good rheumatology health service for adolescents and young adults (AYA) as defined by young people themselves
- How young people would like to get involved in developing AYA rheumatology health services

Most importantly, this chapter has been written by young people with RMD. It includes the thoughts and opinions of individuals who have something in common. However, it is

important to remember that everyone is different; we have different experiences, values and ideas about what works for us as individuals.

What It's Like to Be Young and to Live with RMD

A common misconception is that when you have problems with your joints, it is automatically associated with being an "old person's" problem, when young people who suffer from RMD know, only too well, that it's not. This misconception can make young people feel isolated and affect who we tell about our condition. For example, a Physical Education (PE) teacher may suggest to a young person with an RMD that they just have "tennis elbow". A common thought in society is that young people don't get sick. But what some people may not understand is that sickness doesn't discriminate and anyone at any time can become ill. There needs to be more information about musculoskeletal diseases and greater awareness of adolescents and young adults (AYA) who live with such conditions. In particular teachers and similar professionals who work and engage with young people would benefit most from additional information and training. The stigma associated with young people and sickness needs to change and will require a national effort, in order for us to feel accepted and understood. "Living with what is often perceived as a condition of old age can be particularly challenging for young people, even though the public misunderstanding of arthritis is slowly beginning to change" (*Simon*).

Living with RMD has a massive impact on the everyday life of a young person, especially with regard to education, social life and ability to work. Attendance at school can be low, and the likelihood to do full days in school can be slim. Socially we can't do everything our friends do, and prioritising what we do becomes necessary. There are fears amongst young people with chronic conditions about their ability to

work in the future and what will happen to their condition as they get older. It feels there is a constant fear of being left behind.

Along with this fear of "being left behind", young people with chronic conditions also just want to "fit in". We want to lead a normal life: going out with our friends, attending school and later on being able to have a job as Beth points out: "I think the most important issue for professionals to understand is we want to fit in and not let our condition prevent us from doing the things we want to do." We are able to achieve everything our peers do; however, it may take a lot more preparation, a lot more thinking and possibly a bit more help. "It can sometimes feel like everyone is going on without you and you have to think about everything ten times more in order to achieve it" (*Beth*).

It is important for health professionals to understand that having a health condition is only a small part of our lives and this should be recognised by health professionals during appointments as discussed by Sophia: "Arthritis is a small part of my life and so that is how we treat it even in my clinic appointments." There should be time in which the patient and doctor can discuss the young persons' activities outside of having an illness, for example, education and/or work, social life and ambitions. We should be encouraged to live as normal a life as possible. "It's about minimising its presence day to day and being able to achieve all that I want in life without having to ask the question 'But can I do it with JIA?'" (*Sophia*).

However, for some young people, their condition is their main concern or worry, especially when you are first diagnosed. Receiving as much information as possible and being able to have the opportunity to ask a rheumatology health professional questions is important. Some people want to learn more about their condition, and others want to try and minimise it and not think about it.

> Having arthritis is not something that can vanish, it can be a constant part of life. (*Danny*)

Box 1 summarises experiences of AYA with RMD.

Box 1 Remember
- We can do normal everyday life activities.
- Our condition doesn't define us.
- We have a lot going on and to think about.
- Misconceptions can make us feel more isolated.
- Every young person is different.

Rheumatology Health Services We Want

The word "hospital" is normally met with negative connotations. However, young people who have RMD attend many hospital appointments and can learn that clinic can be a place that is friendly (see Chap. 20). Having a good team around you that knows you well is essential. For example, as Niamh highlights "I have had the same physiotherapist for two years who works closely with my rheumatologist and with their combined efforts I have come on more than I could imagine. Equally being in a clinic that is dedicated to young people is amazing as I have received care that is dedicated to my age and has supported me through situations which wouldn't necessarily be thought about in paediatrics or adult care." Communication between patient and doctor, rather than doctor and parents, should be encouraged. This approach can make the young person feel more accepted, relaxed and happier when doctors talk to them directly.

It is key for there to be a good communication between health professionals (see Chap. 4). Good communication will improve young people's experiences in clinic and improve their views. The negative connotations that are associated within the stereotype of a hospital can sometimes be true. Clinics have been described as disjointed and scary. Occasionally there is also a fear of being ignored due to a previous bad experience with a doctor. Table 1 details some challenges and possible solutions.

Table 1 Clinic challenges with suggested solutions

Challenge	Solution
Anxiety surrounding appointments	Leaflets that could tell young people what to expect
Disjointed clinics	Everything that is needed for a rheumatology clinic to be available in one part of the hospital
The feeling of being ignored and devalued	Doctors to investigate any health complaint (e.g. pain but no obvious symptoms) and explain clearly to the young person how/why they came to their conclusion

An important point to make is that everyone is different. Just because one person's hypermobility causes dislocations and subluxations doesn't necessarily mean the next person with hypermobility will experience dislocations. Therefore treatment plans should be different. Young people with RMD shouldn't be compared or grouped as the same – we are individuals. "At the start of my whole experience I was placed in a class with other teenagers with hypermobility where we had to do a gym workout. Theoretically, strengthening our joints should solve the problem, while some thrived I really struggled. I used to pass out and be sick throughout these classes which we later learnt was because I was a bit more complex than just having hypermobile joints"(*Niamh*). (Chapter 11 covers this in more detail.) The point being, every patient should be treated as an individual as it will only benefit the young person and make them feel more accepted.

Health professionals should take a holistic approach when talking to the young person and thinking about treatment. Psychosocial support (Chaps. 2 and 3) should be offered along the more conventional treatments. Doctors should not be reductionist and just look at the sore and swollen joints. They should also look at the person and consider every aspect of their lives and how having a chronic condition is impacting them, as highlighted by Phoebe and Simon: "The only thing I think is missing from services now is more psy-

chosocial support around receiving a chronic diagnosis and medication side effects e.g. weight gain, hair loss and low mood. During adolescence, these can be particularly difficult to deal with due to the physical, mental and social changes you are already going through. It is something can that be overlooked when initially trying to manage a chronic disease" (*Phoebe*).

> The physical and psychosocial health and wellbeing of individuals should be regarded as one entity, facilitated by efficient and effective communication between different professionals and young people. (*Simon*)

Transitioning from paediatric to adult rheumatology services can be overwhelming (see Chap. 21). Services should be in a friendly environment, inclusive and age appropriate. Doctors should talk to the young person directly and break information down and teach the young person how to look after themselves. In terms of transitioning, there should be continuity up until the age of 19 because by then most people are out of full-time education within a school setting and are progressing towards a career. Beth states, "Transitioning around 16–18 is a hard time to transition. So much is changing personally, socially and academically and transitioning at this point is a bit overwhelming. It would be better to have more continuity around this time and more support from people who know you and understand." There is also a possibility of a more middle-ground service which would benefit many teenagers and address problems which are age appropriate: "It's important to look at issues particular to young people which don't fall within either paediatrics or adults and perhaps a more middle ground service that isn't strictly paediatrics or adults would be beneficial. For instance; learning to drive, socialising, arrangements for exams and the move to a more independent life." (*Beth*). (Chapter 21 will cover this in more detail).

Isolation is a common feeling amongst young people with a chronic condition; it is important to reduce this by coordinating events or places in which young people can meet. What medical professionals don't necessarily highlight is that there is a lot of support through social media. Facebook

groups are good, and there is a whole community on Instagram where young people share their stories and connect with others. Friendships are made through these mechanisms, but young people have to find these support networks and communities by themselves. Equally charities no longer exists provide opportunities to meet other young people and provide support education on how to look after yourself. This can help make us feel better understood and accepted and reduce isolation. All of this information should be relayed in clinics and when particularly young people are first diagnosed.

Box 2 summarises what AYA with RMD think professionals should consider in their service.

Box 2 Top Five Key Points: What Makes a Good AYA Rheumatology Clinic

1. A friendly, inclusive atmosphere
2. Health professionals who don't treat you like a child, but don't treat you like an adult either
3. A good support system within the hospital setting
4. Consistency with the health professionals the young person sees
5. Information surrounding problems that are age group specific

How We Can Get Involved

Here are our suggestions on how young people can get involved in research and developing AYA-specific rheumatology health services:

- Workshops and meetings
- Collect information and ideas when attending clinic appointments
- Via young persons' advisory groups (e.g. Your Rheum http://yourrheum.org)

Involving young people should be encouraged across all hospitals as it has so many benefits to patients and will ultimately benefit the hospital.

> I have been involved in developing rheumatology service as a patient representative on an advisory board and also during focus groups with other patients. These enabled me to find positives from my experiences and benefit future care for myself and other patients. (*Phoebe*)

> For young people to be able to air their thoughts and experiences together and cumulatively bring different ideas of what the future of rheumatology should look like for young people is the best way to learn and more forward. (*Sophia*)

> I think that workshops should be encouraged, and talking to young people while they are at the hospital is a great way to relay information, as they won't be preoccupied with anything else. (*Danny*)

Summary

In summary, young people want to feel more included and catered for within hospitals, whether it is through specific clinics for young people or that they are involved in an advisory group. Equally young people with RMD want to be like everyone else and want medical professionals to understand that there is so much more to their lives than just having an RMD. Finally, it is expressed that young people would benefit from meeting others with RMDs and in some cases having additional psychosocial support.

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Part I
Implications of AYA Development to Clinical Practice

Chapter 1
Impact of Rheumatic Musculoskeletal Disease on Biological and Neurocognitive Development in Adolescents and Young Adults

Damien McKay and Kate Steinbeck

Introduction

The physical event in adolescence is puberty, with its dramatic impact on height, weight and body composition, bone mass and reproductive capacity. Chronic physical illness may have

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an impact on puberty growth and development dependent on its severity, inflammatory status, remission and exacerbation patterns, and medication prescribed for the chronic illness [1]. Rheumatic musculoskeletal disease (RMD) in adolescents and young adults (AYA) is no exception.

Normal Growth at Puberty

Growth during puberty is characterised by significant linear growth, increased weight and changes in body composition under the influence of the gonadal hormones testosterone and oestradiol (see below), and growth hormone (GH) and insulin-like growth factor-1 (IGF-1) [2]. Changes in body composition are characterised by changes in lean mass (muscle, organs and bone) and fat mass proportions [3], together with a change in body fat distributions patterns: females depositing fat on breasts, hips and thighs, while males tend to deposit deep visceral fat. The gonadal hormones enhance the stimulation of growth hormone from the anterior pituitary, which acts synergistically with these hormones to promote the pubertal height growth spurt. Growth hormone activity is expressed by the generation of growth factors, IGF-1 from the liver and a variety of growth factors produced at local tissue level. The growth spurt in females occurs in early puberty and in late puberty in males. For both sexes, height growth is halted by closure of the epiphyses or the growth plate of bone. Normal pubertal growth results in 15–20 centimetre and kilogram gains in females and 25–30 centimetre and kilogram gains in males. Gonadal hormones have a major role in the acquisition of bone mass during adolescence and *into* the third decade where bone mass peaks (see Chap. 16).

Normal Secondary Sexual Development at Puberty

Pubertal onset is signaled by a rise above childhood testosterone and oestradiol levels, which are primarily responsible for secondary sexual development. This is clinically detected by

an increase in testicular volume above 3 ml in males, and the appearance of the breast bud in females. The hormone production pathways and organs necessary for puberty are present at birth. The neurons responsible for the production of gonadotropin releasing hormone (GnRH) migrate in utero to the hypothalamus, where their activity is kept in check by peptides from the arcuate nucleus, including MKRN3 and dynorphin [4]. This brake will ultimately be lifted with increasing production of kisspeptin and neurokinin B peptides allowing the initiation of puberty (ibid). GnRH stimulates the pituitary in both sexes to produce luteinising hormone (LH) and follicle stimulating hormone (FSH). In males LH stimulates Leydig cell production of testosterone in the testes and FSH is responsible for the development of sperm forming tissue which makes up the main volume of the testes. In females FSH is responsible for the stimulation of oestradiol production from the ovarian follicles. LH is responsible for triggering ovulation under the positive feedback of rising oestradiol levels, and the production of progesterone and androgens, including testosterone, from the ovarian stroma.

Puberty typically commences between the ages of 8 and 13 in females and 9 and 14 in males, and is considered delayed if there is no sign of physical puberty at 13 or 14 years in females and males respectively [3]. Menarche is considered delayed if not present by 16 years.

Growth and Pubertal Delay in Chronic RMD

The delayed onset and progress of puberty is commonly seen in AYA with chronic RMD together with growth failure [5, 6]. In chronic RMD the aetiology may be complex and multifactorial, with chronic inflammatory cytokines affecting both GH effect and central appetite control through an anorectic effect, and inflammation may be exacerbated by failure to adhere to treatment regimens (see Chap. 19). Low body weight may inhibit the onset of pubertal gonadotropin release in both sexes. Low body weight may be due to inadequate nutrition, especially protein, to accommodate the

major increase in height and weight during the pubertal spurt. Inadequate nutrition may be exacerbated by oral or gastrointestinal involvement that impairs intake, co-existent inflammatory bowel disease and malabsorption, and the development of disordered eating patterns or food aversions as part of a complex psychosocial response to chronic illness. In older adolescents or young adults the positive response of others to lean and slight builds may promote unhealthy restrictive eating practices in females [7]. In males the use of supplements and anabolic steroids to enhance muscle mass may be a result of perceived or real inadequate muscle bulk [8].

Thus growth and pubertal failure in RMD occurs particularly in AYA with severe and multiple joint involvement, systemic inflammatory disease, suboptimal nutrition, or a history of glucocorticoid therapy [1]. With modern treatments, the effect of RMD on growth may be less than previously reported [9].

The pattern of growth disturbance due to active disease in Juvenile Idiopathic Arthritis (JIA) can be localised or systemic and varies with disease subtype. Inflammatory cytokines act directly on growth cartilage causing premature fusion of the epiphyses. TNF–α inhibits local growth through its influence on growth plate chondrocyte dynamics/apoptosis [10], resulting in limb or digit length discrepancy, or micrognathia. Micrognathia may become apparent with rapid pubertal growth, and affect self-image (see Chap. 2). Severe polyarticular or systemic JIA is associated with generalized growth impairment due to GH and IGF-1 resistance/insufficiency, and with IGF-1 binding protein abnormalities [11]. High levels of IL-1β results in general growth retardation through accelerated degradation of IGF-1 and development of phosphorylated IGF-binding protein (IGFBP1), which prevents IGF binding to its receptor, [12]. IL-6 has a systemic effect on growth retardation through accelerated degradation of IGF-1 and alteration of growth hormone secretion. Effective control of inflammation with TNF-α antagonist therapy or IL-6 inhibition [13] results in catch up growth and normalisation of IGF- 1 levels. Data on the efficacy of more

intensive GH therapy regimens and of immunomodulators, together with reduction of glucocorticoid therapy to improve final adult height, are limited and generally in younger children [14]. Furthermore unless nutrition is improved and inflammatory processes controlled endogenous or exogenous GH may have little impact.

In the presence of malnutrition, inflammation and corticosteroid at non physiological doses GnRH activity reduces along with a reduction in both LH and FSH, and oestradiol and testosterone levels. This causes pubertal delay or failure to progress in the younger adolescent. In the older adolescent and young adult this hormonal profile causes bone loss and a reduction of energy and wellbeing which may be falsely attributed to the disease process alone. In females oligo- or amenorrhoea (infrequent or absent periods) and in males loss of muscle strength and reduced libido are common effects of low gonadal hormones. Young males are unlikely to volunteer symptoms of erectile dysfunction. Replacement of gonadal hormones under the supervision of an endocrinologist may treat some of these issues but again will not improve bone health unless accompanied by adequate nutritional intake and other supportive therapy for bone health [15].

In contrast to inflammatory disease states, non-rheumatic musculoskeletal conditions may be influenced by normal growth and maturation during adolescence. The increase in height velocity associated with early to mid puberty appears to increase the risk of progression of spondylolisthesis [16]. Despite such specific examples of the influence of growth on non rheumatic MSK disease the current evidence is at high risk of bias, and impedes our ability to establish whether biological maturity and growth are independent risk factors for musculoskeletal conditions [17].

Glucocorticoids

Glucocorticoids have other profound effects than on growth [18]. Gonadal hormone production is reduced through suppression of GnRH and LH and FSH production, and in

young adults contributes to infertility. Glucocorticoids induce metabolic disturbances in glucose and fat metabolism with subsequent insulin resistance. Normal growth hormone production during normal puberty produces transient insulin resistance which does not generally impair glucose metabolism [19]. Glucocorticoids, obesity, a family history of Type 2 diabetes and high dose GH therapy may all contribute to glucose dysmetabolism [20], and monitoring of both glucose and HbA1c levels should be considered.

Sexual and Reproductive Health in AYA Females

A regular, ovulatory menstrual cycle reflects wellness and disease control. A high prevalence of menstrual disturbance is reported in JSLE, varying from irregular menses and prolonged long cycle length to post-menarche amenorrhoea [12]. Periods may be present but not necessarily ovulatory if oestradiol levels fail to elevate to a level that triggers positive feedback to initiate the pre-ovulatory LH surge. This situation is often seen with falling or persistent low body weight. The use of NSAIDs impairs ovulation through inhibition of COX-2 which is the rate limiting step for prostaglandin formation. This inhibition is thought to cause luteinised unruptured follicle (LUF) syndrome, which may not be detected on routine endocrinology testing [21]. LUF should be considered in discussions around fertility. There is no published evidence of catamenial (peri-menstrual) exacerbation of disease effects in AYA with RMD, although it is reported with other chronic illnesses such as diabetes and epilepsy [22]. Such effects are attributed to the rapid fall in oestradiol and progesterone levels prior to menstruation.

Contraception and Fertility

Young women with chronic RMD need careful counseling around contraceptive options. As with all young people, male and female, safe sex practices should be advocated

i.e. condoms to avoid sexually transmitted infections and the importance of consent in sexual encounters reinforced. Care should be given during counselling in the use of gender neutral language as adolescent development also includes the development of sexual identity [23]. A key aspect of this guidance is ensuring the young person knows where to go for confidential sexual health advice.

The combined oral contraceptive pill (COCP) generally contains both synthetic oestrogen and progestagen compounds. COCPs increase the risk of venous thromboembolic phenomena (VTE) [24]. The COCP is absolutely contraindicated with a personal history of VTE or severe migraine with aura and/or paralysis [25] and should not be used in AYA with anti-phospholipid antibodies or other syndromes associated with chronic RMD that increase VTE risk [26]. Long acting reversible contraceptive agents, either the subcutaneous rod or the intra-uterine system which contain progestagen only, are an option in these situations. Unlike the older intramuscular depot medroxyprogesterone acetate [27] the rod does not appear to impair bone formation.

Maximum ovarian follicle number is present at birth and follicles are primarily lost over the reproductive life span through apoptosis, rather than ovulation [28]. Anti-Mullerian hormone (AMH) is secreted by the granulosa cells of the ovary and AMH levels in plasma are a marker of ovarian reserve and are relatively stable throughout the menstrual cycle [29] making it useful as a clinical indicator of reserve. Henes et al. [30] have shown that women in their third and fourth decades with a number of chronic inflammatory rheumatic diseases have reduced AMH compared to healthy controls. Reduced follicular reserve has firstly direct implications for cytotoxic therapy, which may further decrease reserve. Secondly, reduced follicular reserve has implications for pregnancy planning. Ostensen [31] provides an excellent review of sexual and reproductive health in chronic RMD. Methotrexate is a known teratogen associated with an increased risk of major birth defects and spontaneous abortion at dosages used in treatment of RMD [32]. Cyclophosphamide may be indicated for treating major organ involvement in SLE, vasculitis and systemic sclerosis, and can be associated with reduced fertility [33].

Sexual and Reproductive Health in AYA Males

Male sexual and reproductive health has received less attention than females, which may reflect the lower prevalence of chronic RMD and potentially lower ascertainment of partial hypogonadal states. These states and physical limitations of their condition may have an effect on libido and sexual performance and directed history taking is important (see Chaps. 2 and 4). Methotrexate has received the most attention in the literature. With respect to male fertility, Gutierrez and Hwang [34] concluded that the evidence base for methotrexate was weak, despite its frequent use in males of reproductive age. The general instruction is to cease methotrexate 3 months (taking into account the 90 day cycle of spermatogenesis) before attempting conception due to its general cytotoxic effect although the evidence that this effect exists appears negligible and based on old literature [35]. AYA males should be counselled about safe sex practices and offered specific consultation around fertility preservation where relevant.

Normal Brain Development

The dramatic brain development in AYAs is second only to that in early childhood and is reflected in changes in brain structure and function. Risk taking behaviours, a drive for autonomy, and increasing cognitive maturity are characteristic [36] (Fig. 1.1). These developmental changes begin in early adolescence and are not complete until after the second decade of life. In early adolescence there is a rapid increase in synapse formation, followed by synaptic pruning and increased long tract myelination, which produce more efficient and effective neural pathways. Although physical and hormonal markers of puberty have been linked with changes in brain structure, the evidence base linking pubertal-related changes in brain structure with behavioral correlates is still being developed [37].

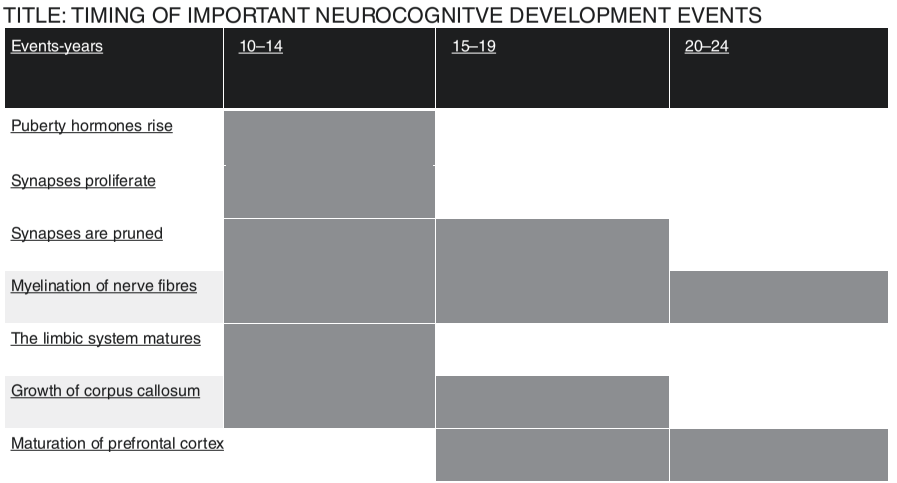

FIGURE 1.1 Brain development. (Compiled from the literature by K Steinbeck)

The later developmental brain changes of adolescence are most pronounced in the pre-frontal cortex, the area responsible for executive function, abstract and long-term reasoning, decision making and assessment of risk [38]. Risk taking is a characteristic of mid to late adolescence. It should not always be perceived as negative, as taking some risks has positive influences on development of autonomy and independence. Risk taking is contributed to by adolescent hyper-emotionality and sensation seeking driven by other brain areas, including the amygdala and hippocampus [38]. Impulsivity and risk taking are moderated by increasing maturity of the pre-frontal cortex, but there are other moderators of risk behaviours. In adolescents these include performance based incentives and social context such as the presence or absence of peers [38], as well as inherent impulsivity. Forward planning ability and an understanding of consequences and complexity of events are cognitive functions not fully developed until adulthood, an aspect of cognitive development which is highly relevant to the self-management of chronic illness (see Chap. 18).

The Impact of RMD on Neurocognitive Development

The critical cognitive maturation period from late childhood through adolescence and into young adulthood coincides with the paediatric age spike for JSLE onset and may also reflect a period of exceptional vulnerability of the central nervous system. As a result AYA are at particular risk for delays and impairments in cognitive development especially processing speed response inhibition and working memory [39].

The literature on neurocognition in AYAs with CRD is limited. There are potential temporary effects on neurocognitive function as a result of systemic inflammation in acute exacerbations of disease, or with high dose glucocorticoid use. The possibility of sleep disturbances and the potential effects

of this on behaviour and cognitive performance has been proposed, but to date has not been investigated further in AYA with RMD.

Sleep in AYA

Delayed sleep onset is a recognised developmental phenomenon of mid adolescence [40]. This is maximal in later puberty and may reflect brain development stage, rather than a direct gonadal hormone effect. Adolescents want to go to sleep later and wake up later. Because this pattern does not fit with school hours, adolescents tend to oversleep on weekends to make up their sleep deficit. In young adults, sleep deprivation is more likely due to exogenous factors including study and social activities. Sleep is essential to health and wellbeing as sleep deprivation lowers mood, increases impulsivity and unintentional injury and has a negative impact on academic performance [41]. A sleep history should always be taken in AYAs with chronic inflammatory joint disease, as they will have additional risks for poor sleep hygiene: increased depression and anxiety (more common in chronic illness), inadequately treated pain, sleep disordered breathing due to malformation of upper airways and glucocorticoid induced insomnia, in addition to risk factors for poor sleep common to all AYA, such as use of caffeine (including energy drinks) and small screen use.

Disease and Management Issues in AYA

RMD has different incidence, prevalence and clinical phenotypes during adolescence. The influence of disease and treatment on physical, sexual, social and neurocognitive development can be profound and should be considered and addressed. Developmental assessment of AYA is core to the initial assessment of young people presenting with RMD [42].

The presence of chronic illness may have an impact on the attainment of normal adolescent developmental milestones. Delayed pubertal development and growth can cause significant concern for both adolescents and their parents. Timely assessment and specialist referral where necessary is important to ensure windows of opportunity to treat pubertal delay and growth failure do not close, and that any psychosocial impact is minimised. Timing of normal adolescent neurocognitive development influences self-management of chronic illness. Parents need to identify and come to terms with their changing role and support AYAs' transition to self-management.

Key Management Points

1. The dramatic biological and neurocognitive developments in AYAs have an impact on disease management.
2. Age does not always reflect developmental stage.
3. Delayed pubertal development and partial hypogonadal states should be addressed. Close monitoring of growth and maturation is important in managing both the physical and psychosocial effects of chronic RMD.
4. There is a lack of knowledge on how chronic inflammatory processes impact on normal neurocognitive development. Further research is warranted in this area.

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Chapter 2
Impact of Rheumatic Musculoskeletal Disease on Psychological Development in Adolescents and Young Adults

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AYA Psychological Development

Psychological development in AYAs encompasses cognitive (see Chap. 1), emotional, and behavioural maturation [1]. A key process initiated by these psychological changes is the need to acquire a self-concept, which is how an individual perceives and thinks about the "self". It involves exploring and committing to identity-defining roles and values in a variety of life domains. Physical and hormonal changes during

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puberty also promote the development of a body image and a sexual identity. As a result, social (see Chap. 3) and physical components of the self-concept are of utmost importance during adolescence and have profound impacts on AYA psychological functioning [2].

Body image is based on a combination of one's own evaluation and the perception of others' attitudes towards one's physical characteristics [3]. A healthy body image means that the AYA accepts and appreciates his/her body and is generally satisfied with his/her appearance. Conversely, a negative body image occurs when there is a discourse between how the body is currently perceived and what the individual's preferences are.

Adolescence is also a time for discovering one's own sexual identity and for developing an interest in seeking intimate relationships. A sexual identity comprises of cognitive and emotional understandings that individuals have about the meaning and significance of their sexual attractions, behaviours, and relationships, as well as how they value and adopt certain gender roles [4]. Social interaction with peers is essential for acquiring important milestones to developing a sexual identity and forming healthy romantic relationships in the future, such as increased dating competence, subjective awareness of sexual orientation, and exploratory sexual experiences.

AYA self-concepts are relatively fluid due to dramatic physical and psychosocial changes, and they may develop multiple, conflicting self-representations [2]. Not being able to integrate opposing identities into one consistent and resilient self-concept can decrease self-esteem, which is how we evaluate and value our self-worth. For example, body dissatisfaction can be high among adolescents as they are more influenced than adults by external feedback and tend to compare themselves to cultural and societal standards. This can contribute to feelings of inferiority and low self-esteem, which can render AYAs more vulnerable to psychological problems [5]. Indeed, mild psychological problems affect about 40% of AYAs worldwide at some point in their lives [6].

Factors Influencing Psychological Wellbeing in AYAs

Whether or not AYAs experience psychological issues depends on the balance of risk and protective factors [7, 8]. Negative life events that cause chronic, prolonged stress, such as the consequences of RMD, are significant risk factors for AYA wellbeing [9]. One major issue is that the condition and its treatments can cause skin problems, delayed puberty, weight gain or loss, and shorter stature than healthy peers [10, 11]. The pain, fatigue, and mobility restrictions associated with RMD may also cause perceived physical weakness and poor fitness [12]. As a result, AYAs with RMD might compare themselves negatively to their peers, feel ashamed for being "different", and may even be concerned about experiencing stigmatisation [13]. Since AYAs of both genders can be equally concerned and self-critical about appearance [14], a negative body image can lead to low self-esteem and social withdrawal in all adolescents and can be a precursor to developing anxiety and depression [15].

Managing RMD can also restrict educational, social, and leisure participation, which can limit opportunities for psychosexual development that is often attained through interactions with peers [16, 17]. Moreover, physical limitations of RMD can interfere with an individual's ability to meet gender role demands. This may be particularly detrimental for boys, as small stature and thinness may be a significant source of sexual and gender-role anxiety due to embarrassment and fear of humiliation [18, 19].

In addition, being uncertain about whether or not they can achieve their full potential in personal and vocational endeavours despite the RMD is another major source of stress for AYAs [17]. The unpredictable nature of physical symptoms means that they need to accept the possibility of future flares or illness deterioration, and to continue a complicated treatment regimen (see Chap. 19) [17]. This can lead to guilt about potential dependency on intimate partners, which complicates the development of intimate relationships [20]. Many

AYAs also worry that their illness will compromise employment opportunities, which exacerbates the primary source of stress among all adolescents [17].

In order to prevent the escalation of chronic stress to psychological problems, AYAs should be equipped with skills and resources to cope with these challenging situations [7, 8]. HCPs can play an important role in providing AYAs with important protective factors, such as identifying maladaptive thought processes, providing social support, and promoting self-efficacy and autonomy [21, 22].

Psychological Support in Routine Practice

Primary Prevention: Coping Strategies

One of the most important protective factors from experiencing mental health difficulties is developing resilience, which is the ability to employ adaptive coping strategies. Coping can be viewed as the effort to regulate psychological and physiological processes, such as emotions, behaviours, and cognition, in response to stressful situations [23]. In the realm of managing chronic illness in adolescence, three subtypes of coping have been identified (see Fig. 2.1) [24]:

- **Active:** efforts to directly influence the stressor
- **Accommodative:** efforts to adapt to the stressor
- **Disengagement:** efforts to deny the stressor

Active and accommodative coping were found to increase resilience to stress, resulting in positive emotional and behavioural outcomes, whereas disengagement coping was associated with negative psychological adjustments [25].

Cognitive Distortions

The underlying principles of leading psychological therapies for AYAs are identifying and modifying cognitive distortions

FIGURE 2.1 Proposed relationships between cognitive processes, basic psychological needs, coping strategies, and mental health

in order to promote adaptive coping strategies [26, 27]. Two common distortions among AYAs are:

- **Catastrophizing**: having an overly negative and pessimistic perception about how long symptoms will last and the consequences of illness.
- **Mental filters:** paying attention to and drawing conclusions from only one type of evidence, such as comparing oneself negatively to others by only focusing on personal failures and other people's successes.

HCPs can help AYAs recognise and challenge these irrational thinking styles by encouraging alternative ways of thinking or reassessing the situation in a more positive and realistic way (see Chap. 4) [26, 27]. For example, AYA can be asked to consider all the evidence for and against their beliefs and assumptions, and to identify potential benefits from negative situations [28]. It might also be helpful to reassure AYAs that everyone has stress and worries and that they shouldn't be ashamed for how they feel. Normalising and validating negative feelings can encourage AYAs to be more accepting of certain stressors. Instead of exerting energy on denying their feelings and problems, this attention can be refocused on learning to thrive despite limitations by developing personal values and interests [27]. Particularly for stressors that are outside of one's immediate control, such as managing unpredictable symptoms and outcomes of RMD, this type of accommodative coping was consistently found to lower levels of anxiety and depression [29].

Psychological Needs

Resilience in AYAs can also be promoted through satisfying three innate psychological needs [21, 22]:

1. **relatedness**; the need to feel connected to and cared for by others, satisfied through building relationships that are based on mutual trust and respect.
2. **competence**; the need to experience efficacy and mastery, such as having the skill to accomplish a goal

3. **autonomy**; the need to make choices and take initiative for one's own decisions and behaviours.

Relatedness could be increased by developing an understanding and trusting relationship between AYAs and HCPs (see Chap. 4). It is important to be aware of the widespread impact of RMD on the young person's everyday life and avoid the application of adult values when assessing the impact of a potential stressor. For example, attributes affected by RMD, such as physical appearance, sexual identity, and relationships, have greater impacts on AYAs' than adults' self-esteem [30, 31], and should be recognised and taken seriously. Especially in cases where an adolescent's pubertal development is affected by their RMD or treatment, HCPs should ensure that the adolescent's sexual anxieties are addressed and not ignored. By establishing a strong AYA-HCP relationship, young people will more likely adopt active coping by seeking help and working together with the healthcare team to manage their RMD.

Another essential predictor of psychological wellbeing in AYAs is the feeling of competency or self-efficacy, which is how confident someone is in their abilities to achieve a goal [32]. Low self-efficacy creates feelings of helplessness and a tendency to avoid problems instead of adopting more positive coping techniques. One way to improve sense of competency is to establish realistic goals for treatment and management. For example, if AYAs expect to find a cure for their condition, they may develop low self-efficacy due to hopelessness. However, if the goal is more achievable, such as adapting to RMD by improving quality of life despite their symptoms, then this may enhance a sense of accomplishment and encourage better adjustment. High self-efficacy may also help AYAs reappraise the situation by viewing the stressor as a challenge and opportunity to grow instead of a threat.

Self-efficacy in other life domains are extremely valuable as well, as participation in extracurricular activities increases AYAs' wellbeing, even after controlling for disease severity [33, 34]. This is especially true for activities that provide opportunities for developing new skills and relationships.

Fostering internal qualities can reduce anxieties for some RMD-related issues by keeping their importance in perspective, such as decreasing the impact of physical appearance on self-esteem. Moreover, regular interactions with same-aged peers can help AYAs acquire social skills necessary for psychosexual development. It is thus critical to help AYAs identify, and encourage sustained participation in, hobbies such as sports and music.

In addition to feeling competent in achieving a goal, AYAs also need to have the autonomy to choose what goals to pursue and how they are achieved. HCPs can increase autonomy by integrating AYAs' needs into treatment plans and allowing AYAs to make informed decisions regarding their health. Being actively involved in the decision-making process can help AYAs develop problem-solving strategies and empower them to take ownership of their wellbeing (see Chap. 4). HCPs may also need to educate parents about the benefits of giving adolescents the freedom to participate in activities independently and of making lifestyle-related decisions. Control over treatment and lifestyle-related activities can help AYAs acquire skills needed for active coping, such as how to seek relevant information, generate possible solutions, and weigh the pros and cons of an option.

Secondary Prevention: Identifying Psychological Problems

Early Detection and Regular Screening

Even when efforts to prevent mental health problems in AYAs are an integral part of care, guilt, rage, and hopelessness can arise at various stages due to the uncertain and chronic nature of RMD. Thus, early detection and management of emotional issues are vital in preventing further deterioration and encouraging rapid recovery. However, the difficulty of distinguishing normal emotional variabilities during adolescence and young adulthood from true psychological problems can often lead to late detection, and sometimes complete disregard, of mental health issues.

Normal AYA angst is transient, confined to a single setting such as home or school, and does not cause significant impairments. In contrast, mental health disorders persist over time, with symptoms presenting in various environments, negatively impacting important areas of life, and sometimes resulting in physical symptoms such as weight fluctuations, headaches, and sleep problems [7, 8]. Additionally, AYAs who are exposed to risk factors such as academic problems, abuse, issues with peers, bereavement, and family conflict, have higher psychological vulnerabilities. HCPs should thus be vigilant in routine assessments for these stressful life events and for deteriorations in academic/work performance and relationship quality, as well as for physical symptoms not readily explained by RMD.

There is a growing interest in the use of patient-reported outcome measures (PROM) in daily practice to monitor psychological wellbeing. Regular screenings can also create a more accessible environment where AYAs feel comfortable disclosing psychological problems, even when they are seeking treatment for a physical illness (see Chap. 4). PROMs such as the Centre for Epidemiological Studies Depression Scale and the Patient Health Questionnaire are brief (<10 min), free to use, and allow for longitudinal assessments in both adolescents and adults [35, 36]. However, PROMs are not all-encompassing and AYAs may underreport negative feelings due to fear of mental health stigmatisation or by using denial as a coping strategy [37]. PROMs should therefore not substitute for thoughtful face-to-face assessments (see Chap. 4).

Management and Referrals to Psychological Therapies

Decisions for psychological referrals depend on the type of problem, duration, and severity. Emotional disorders, such as mild depression, can often remit spontaneously in AYAs and a period of "watchful waiting" whilst providing general support for adaptive coping skills can be sufficient [38]. It is essential to approach the situation sensitively by speaking with AYAs on their own before involving others, such as parents, friends, or teachers. Although help from others can

be beneficial, it is important to respect adolescents' wishes and explore with them various ways in which they can receive social support. In addition, AYAs should be signposted to youth-friendly web-based resources around issues of mental health and organisations they can contact for confidential support. Information about how and where to obtain these resources should be readily available on the centre's website or advertised in waiting areas.

If emotional problems persist and severely impair functioning, then HCPs should consider referring AYA to psychological services. In these situations, ensure that psychological support is introduced as part of the multidisciplinary approach for managing RMD, and that it will only supplement, not replace, medical support. Even if a psychological referral has been made, it is essential to continue reviewing AYAs' emotional state at each RMD appointment to reassure the young person that their psychological wellbeing is as important as their physical health.

Key Management Points

1. Encourage active and accommodative coping by recognising and modifying cognitive distortions and by increasing levels of relatedness, competence, and autonomy.
2. Acknowledge AYAs' concerns. Stressors that may seem trivial to adults could be challenging for AYAs as they value different attributes and are still developing cognitive and regulatory abilities.
3. Provide information for, and signpost them to web-based resources and support for, managing RMD and psychosocial challenges. These resources should be AYA-appropriate, reliable, and displayed in places where AYAs can easily see and access.
4. Support participation in extra-curricular activities that won't aggravate RMDs but are still enjoyable, to help AYAs develop new skills, social relationships, and a more positive outlook.

5. Ask AYAs about their opinions and preferences and help them make informed decisions about their treatments/management in order to promote autonomy and problem-solving skills.
6. Be aware of physical and behavioural changes, as well as of negative life events that AYAs are experiencing, and encourage conversations around issues of mental health to help with early detection of psychological distress.

Conclusion

Adolescence and young adulthood is an exciting and challenging phase of life, but it is also a period of heightened vulnerability. Being aware of the interplay between RMD and multifactorial sources of risks for psychological problems is central to the complete management of AYAs. Although psychological issues can be complex and difficult to manage, disregarding them can have profound, negative impacts on AYAs' current and future quality of life [5]. Acknowledgement of the importance of good psychological health should thus be the responsibility of the healthcare team as a whole. This chapter has hopefully provided practical tools to help HCPs improve psychological resilience and address AYAs' emotional needs during routine practice.

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Chapter 3
Impact of Rheumatic Disease on Social Development in Adolescents and Young Adults

Hema Chaplin and Alice Cai

Social Development of AYA and the Influence of RMD

As discussed (see Chaps. 1 and 2), biological changes during adolescence interact with psychosocial development to set up a range of new behaviours not seen in childhood or often

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dealt with in paediatric care [1]. These biopsychosocial interactions include puberty, neurological maturation, abstract thought, self-identity, peer identification and autonomy [2]. The main factors of typical adolescent social development can be broadly categorised as 'independence', 'emotional adjustment' and 'identity formation' [3]. By late adolescence and early adulthood, several developmental tasks should be in progress or achieved [2–4]:

- Emergence of autonomous behaviour and social independence
- Intimate relationships and secure friendships
- Experimentation with personal and sexual identity
- Self-development
- Emotional skills development
- Vocational capability, including financial independence

Chronic childhood-onset conditions often disrupt young peoples' sense of normality and impair their capacity for social participation [5]. This results in delayed social maturation leading to knock-on effects into adolescence and young adulthood, as AYA with RMD can feel misunderstood and stigmatised from an early age. The physical and psychosocial challenges experienced with RMD are particularly salient and difficult for AYAs compared to children and adults, because of peer pressure to 'fit in', cultural associations between youth and health, exposure to social stigmas around disability and limited experience in adjusting to adversity [4, 6]. Some AYA with RMD can be at risk of experiencing social difficulties, due to physical and psychological effects of disease and its treatment, including disruptions and restrictions to daily life [7].

Social functioning has been ranked as a top area impacted by RMD in those aged 16–25, with this effect on their lives more important than pain/stiffness and functional impairments [8]. Table 3.1 shows the range of social impacts due to RMD, meaning opportunities available for healthy peers can be missed in AYA. These negative social consequences occur during any point of the fluctuating disease course, even during disease inactivity, as a result of affected quality of life from symptomatology not directly

Table 3.1 Effects of RMD, including disability and/or medications on typical social development in AYAs [4, 7, 9–17]

Hindered development of independence, including delayed independent living
Reduced self-esteem
Affected self-confidence and heightened self-consciousness, resulting from side effects of medications impacting body image (e.g. weight gain and hair loss)
Forced locus of control to be external, rather than internal
Less opportunities for participation in social activities and consolidation of social skills, due to impact of pain, fatigue and reduced mobility
Medication impeding daily activities, such as side effects, medication times, administration, storage or restrictions due to interactions (e.g. alcohol intake and methotrexate)
Transport issues, e.g. relying on parents for transport when friends can use public transport self-sufficiently
Feeling isolated and potentially bullied causing social anxiety, especially if experiencing long or multiple absences from school/university/work caused by ill health or healthcare utilisation
Overprotective family and/or peers imposing restrictions
Problematic relationships with friends, family and professionals
Difficulties with intimate relationships, potentially due to additional pressure or guilt of having someone be concerned and caring for you
Educational difficulties and subsequent greater problems with vocation, either in finding employment or experiencing discrimination
Struggles with identity, as misrepresented self being defined by disease
Restricted major life decisions, such as narrowed career options, threat to parenthood and/or travelling considerations
Unable to be as spontaneous or experimental as peers, with disease-related anxiety caused by unpredictability of disease and side effects of treatment

driven by inflammation [18, 19]. AYAs with RMD are often unable to achieve the same level of autonomy as healthy peers, as the shift in balance of independence is affected [2]. There can be a reliance on parents for involvement in their treatment that is either driven by the young person not feeling confident in self-management or due to parents not letting go.

Childhood illness may influence a typical child–parent interaction (see Chap. 5) and parenting styles particularly in regard to fostering autonomy and independence [9]. Parents' and close others' concerns can restrict activities and overprotect AYAs [20]. This overprotection can have detrimental effects on achieving autonomy and hindering experimentation that results in completion of social development tasks.

The main challenge for AYAs with RMD is achieving an identity not defined by their illness. This involves developing their ability to accomplish desired activities, experience positive relationships [6], manage pain, use social support and live one day at a time [10]. Otherwise AYAs can resent the restrictive impact of disease on limiting physical and social capacities, career opportunities and parenthood goals [11]. Adapting, planning and pacing activities are required to maintain social involvement and prevent additional pain and fatigue from exerting excessive energy when attempting to keep up with peers [21]. Positive emotions and self-esteem can be maintained through acceptance of their abilities and limitations. HCPs should encourage a discussion on realistic goal setting, e.g. SMART goals (Specific, Measurable, Attainable, Relevant, Time-bound). Despite the numerous barriers mentioned in this section, most AYAs with RMD are socially competent and comparable to healthy counterparts on social functioning, acceptance and behaviour [4, 7, 9], adjusting and coping quite well with the psychological and social sequelae of their RMD over time [21].

Social Aspects of Health Behaviours, Disease Course and HCP Management Strategies for AYA with RMD

During the AYA developmental stage, independent health behaviours begin and can be established as lifelong habits [22]. Adolescent social development can lead to egocentric behaviour and a disregard for the consequences of their behaviour on others [2]. This change in attitude and hindered forward planning, due to delayed neurological development (see Chap. 1), can increase risk-taking health behaviour. The extent to which typical adolescent issues affect illness management and control will depend on how AYA balances competing priorities [16]. For example, the need for social support and acceptance can tempt AYAs to give into peer pressure by undertaking exploratory behaviours [23] that can put RMD management at risk. These risky health behaviours can include chaotic, nutritionally poor eating habits, smoking, alcohol, drug use and sexual risk-taking [16].

Conversely, some AYAs report being able to use their condition or medications as a convenient excuse not to participate in behaviours they don't want to [23], with peer pressure lessened when the adverse effects were explained to peers. Treatment can be seen as both an opportunity for living a 'normal' life and also a threat to achieving this [24].

Rheumatology HCPs have the unique, ongoing opportunity to assess social, mental and emotional functioning, in addition to physical outcomes, and intervene early in a non-psychiatric environment [9, 25]. This should start once RMD diagnosis is confirmed with an initial comprehensive psychosocial assessment (see Chap. 2 for other areas to monitor). During routine clinic visits, some patients may benefit from a more unstructured opportunity to express their illness experience, but following a structured psychosocial screen such as HEEADSSS (see Chap. 4) is useful for AYA and HCP alike.

The Importance of Peer Support for AYA with RMD

Peer support through strong peer relations is vital during adolescence to promote typical social development [3, 10, 26], since friendships nurture self-development separate from familial identity. Peers offer practical, emotional and social support [17] and can facilitate adjustment to chronic disease, coping with pain/illness and adherence by reducing general and illness-related stress [23]. They can increase optimism and alleviate feelings of social isolation, which can assist the adoption of healthy behaviours, disease management skills [25] and acceptance of help with disease management [27]. Conversely problematic unsupportive relationships lead to increased distress and disease activity [26, 28], by being oppressive, underestimating the disease and not providing useful advice [29]. Regardless of social network size, AYA primarily discloses their illness to family members and only to a few peers.

Good support from peers is key to adjustment, whereas support from the wider network (e.g. teachers, employers and nurses) becomes more important when family functioning is less positive [27]. Reasons for withholding and not seeking support can include fear of rejection, pity, perceptions of being seen as vulnerable or different, dismissal of their problems/concerns as unimportant or alternatively overreactions and limiting of social activities/involvement. Sometimes others do not perceive these AYAs as chronically ill [7] in part due to the fluctuating and invisible nature of disease or not understanding the emotional impact of coping with daily pain and taking medications [25]. Disclosure can be influenced by [26, 30]:

- Perceived trust and familiarity
- Shared experience with illness/disability
- Visibility of the condition and practical needs
- Recipient's anticipated response
- Decision that disclosure is justified

It is important that appropriate information regarding RMD, and the specific impact it has on that young person including pain and mood, is shared with peers, school and work to enable appropriate support [25, 31]. Greater support beyond educational attainment is needed [12, 13], such as focusing on finding and keeping employment. AYAs and parents can be supported to disclose information in an appropriate and stepwise manner depending on their preferences and needs. For example, with the YPs' consent, the school nurse or university doctor should be fully notified, whereas teachers or employers could be given information on supporting the young person during absences or coping with critical events [16, 25]. The healthcare team are in a position of authority and can facilitate this disclosure by examining how the organisation (school, university or work) and the content of the treatment can be modified according to the AYA's lifestyle, suggesting dialogue for the young person to say or providing supporting clinical letters of recommendation to schools or local authorities.

Peer support from other AYAs with similar RMDs can provide meaningful emotional and social support due to a shared understanding of living with a chronic unpredictable disease, reducing isolation and negating the problems in support from friends without a RMD diagnosis [32]. This support can involve discussions around acknowledging and overcoming concerns for the future (education, occupation or relationships), strategies around taking medication and developing positive lifestyles in terms of physical activity and psychological wellbeing through goal setting and action planning [33]. This can be disease specific or regarding areas indirectly impacted such as school/work and social life. Support groups, peer mentorship, residential weekends and virtual forums provide opportunities for peer networking, sharing inner thoughts to strengthen self-development and self-management confidence [10, 17, 32]. Moreover, many AYAs are more open to recommendations from near-peer mentors versus adult mentors or professionals and may see other young adults coping successfully with a similar diagnosis as a sign of hope, which increases motivation and confidence that they too can manage their illness [32].

Summary

It is extremely positive that many AYAs are doing well with regard to psychosocial adjustment and are comparable to peers in several areas. However those at risk need to be identified and intervention measures introduced as early as possible [7, 9], as impact on behaviour and management of disease can still be profound. Therefore regular screening/discussions to assess the psychosocial burden impacting quality of life are important to personalise treatment [28]. It is imperative to match the needs and preferences of the young person with the support provided [26], with HCPs providing a flexible and youth-friendly approach.

Key Management Points

- Explore social functioning and support, screen for social issues and identify areas needing support and appropriate referral, e.g. nurse or psychologist:
  - Follow HEEADSSS psychosocial interview [34] to assess social issues and changes to a patient's social situations that might impact wellbeing.
  - Use brief screening questionnaires in clinic such as the Work and Social Adjustment Scale [35] to quickly assess impact of illness on functioning by assessing work, home management, leisure activities and family/relationships, to highlight areas needing discussion and support.
  - Allow time for unstructured discussion, and encourage questions to gain further understanding of their perceptions of impact and distress.
  - Decide whether to escalate beyond patient education and whether to refer to psychology, particularly if disease is active or severe.

- Ensure the young person has routine access to a key worker (such as a clinical nurse specialist, special educational need co-ordinator or social worker), to develop appropriate education, health and care plans to support continued engagement with activities and/or return to school or work.
- Signpost AYAs to further information and support from charities and other organisations for general information about living with RMD and further resources and support.
- Enable peer-to-peer support with other AYAs with RMD, and help the young person make connections through charities and organisations.
- Encourage parents, family members and/or partners to be supportive in helping the young person gain independence and social contacts in line with typical AYA social development.
- Engage AYAs in shared decision-making regarding treatment options, including seeing the young person alone for a portion of the consultation, to encourage independence from parents and promote self-management.

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Chapter 4
Engaging Young People: Consultation Skills

Rachel S. Tattersall

Introduction

Healthcare professionals (HCP) frequently report that communicating with adolescents and young adults (AYA) is problematic. They often attribute the difficulties to the AYA themselves, while AYA report that the responsibility to facilitate communication effectively with young people lies with the adult [1]. Young people (YP) repeatedly express the value of engagement in their own healthcare and their struggle to ensure their voices are heard [2]. These difficulties are multifactorial but are likely to stem from lack of training on the part of healthcare professionals, neurobiological development of young people, the development of identity/autonomy, parental style/support and the structure of healthcare

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consultations. This chapter reviews the factors affecting successful engagement with young people and offers suggestions for improving communication in clinical consultations.

Factors Affecting Successful Communication with Young People

Advances in neuroscience (see Chap. 1) show that the challenges in communicating with young people may, at least in part, result from changes in the AYA brain related to social communication [3], decision-making and threat perception [4]. Young people may have difficulty in reading facial expressions and some find it difficult to express emotion. Language is a key issue; within peer groups, specific language may evolve as a marker of unity and identity. It is important for healthcare professionals not to try and use such language but to take an open, inquisitive and non-judgemental approach, actively asking about language or terms that YP use, which they don't understand.

Adolescence and young adulthood is a time of great challenge and change for young people (see Chaps. 1, 2 and 3) as neurocognitive development proceeds and AYA identity and autonomy evolve. Risky behaviours are both normal and necessary to this unique developmental stage and a psychosocial history is therefore key in consultations with young people. This must cover both risks that may affect YP but also identify the resilience factors that help them to withstand such risks and protect themselves and their health (see Chap. 3). The latter in particular can inform strategies and interventions to support management eg adherence. A psychosocial screening tool such as HEEADSSS [5] can be used in different ways depending on the context of the consultation [6]. It can be explored fully when there are concerns or known risky behaviours or used in an abbreviated form to give an important message that you are there to talk about those things should someone wish to discuss them at a later date. Either way, it is also a useful tool to engage the young person

and get to know more about the context of their lives. As with all ages, it is important to remember they have a right not to answer!

AYA with long-term conditions want to be active participants in their own health care but the evidence suggests they are often 'bystanders' in clinical consultations. Triadic consultations – where parents, young people and healthcare professionals engage together – can lead to young people's voices being unheard [7]. These consultations are likely to generate tensions and differences of opinions and often health professionals control the turn taking and agenda, while parents control their child's participation. Dyadic consultations where young people engage on a one-to-one basis with healthcare professionals enable young people to have a voice, but need to be introduced and managed carefully. This is particularly important where young people may have learning disability or cognitive impairment, where strategies to ensure maximal engagement are key.

A practical approach to developing both youth-friendly communication skills and strategies for clinical consultations that promote young people's participation include:

- 'ice-breaking' or 'problem-free talk' openers to consultations
- establishing how young people like to be addressed and what they can call you
- explanations about confidentiality and seeing young people routinely alone later in the consultation (dyadic or split consultations)
- motivational interviewing
- using aids to encourage YP to set the agenda in consultations

Evidence shows that effective communication with YP can be learned and sustained [8] and results in improved attendance, treatment adherence (see Chap. 19) and overall health.

Young people are more likely to engage with and return for care when they are assured of confidentiality [9]. Structuring consultations on the split model where young

people are seen alone for some of their consultation with assured confidentiality, but which their parents are also part of, enables conversations that address key psychosocial and medical concerns [10]. Health care professionals often worry about confidentiality but a concept of conditional confidentiality can be helpful to reduce blocks to addressing this in consultations [1]. Here the conversation with young people centres on the concept that a HCP will respect their confidentiality *unless* young people want disclosure to their parents or there is a risk that what is disclosed could harm the patient or another person. Sometimes young people want clinicians to help them tell their parents important information and a consultation with a clinician that is based on trust and good communication can facilitate this. The key issue is to explore with the young person, while they are alone, what information they wish to be shared and with whom (see Table 4.1).

Table 4.1 Key points on confidentiality in consultations with young people

YP have a right to confidentiality, even if they lack capacity
Confidentiality is conditional: information will always be kept confidential unless the YP wants to share it or when not sharing would cause them or someone else harm
YP should be informed if information is to be shared, with whom and the justification for the decision to share
Confidentiality should not be kept if YP disclose significant issues that threaten their safety or that of others: examples of such disclosures include suicidal or homicidal ideation or significant self harm
Questions to use in discussing confidentiality 'During our discussion I am going to ask you some personal questions…' 'What do you understand by confidentiality?' 'Whatever you say will be kept private between us; I won't tell anyone else unless you give me permission but there are three occasions I would have to tell someone else – if you were seriously harming yourself, if someone was harming you or if you said you were going to harm someone else'

Practical Approaches to Improve Engagement with Young People in Clinical Consultations

It can be helpful to set up consultations to recognise the 'critical first two minutes' of a young person centred consultation:

- Arrange seating so that the young person is in the prime position to enable communication
- Introduce yourself first to the young person (my name is X, you can call me Y)
- Ask the YP what they prefer to be called and who they have brought with them
- Open the consultation with some 'ice-breaking' 'problem-free talk' – talk to the YP first and then their parents/carer. Eg other than your arthritis, how have you been? This enables you to begin to establish the developmental level at which the YP is operating and to frame your approach accordingly. It also begins the process of establishing trust and rapport and begins to show what skills and resilience a YP possesses
- Explain what will happen in the consultation and that it is routine for you to split the clinic time to spend some time alone with the YP later in the consultation. At this point you can discuss confidentiality.
- If parent in room: Agenda setting – first I will let you (the young person) tell me your story, then I will ask you (the care giver) to add anything else……

Specific communication techniques that may help in a young person centred consultation include motivational interviewing, agenda setting tools such as question prompt lists, psychosocial screening tools, engaging with parents and wrapping up a consultation; a practical approach to these is given next.

Motivational interviewing (MI) is a patient-centred communication skills approach. It works on engaging the patient's intrinsic motivation and readiness to change, helping YP to recognise and do something about their current or potential problems [11]. Clinicians using MI are actively pursuing a

strategy in consultations working towards change whilst recognising that there are different stages of motivation and readiness to change (eg precontemplation, contemplation, preparation, action and maintenance). MI is a collaborative, evocative, empathic and explicitly recognises patient autonomy. Critical principles include clinicians expressing early empathy and using open ended questions and agenda setting techniques (see below). Questions and discussion are aimed at recognising and developing discrepancies that YP raise, rolling with resistance and supporting self-efficacy. Rather than a didactic approach of giving advice and directing treatment, an MI approach involves asking permission to offer advice while actively discussing and raising change on the assumption that YP are autonomous and self efficacious. MI can improve adherence, symptom severity and quality of life in adolescents [12].

Examples of questions include

- **Looking for resources and resilience rather than problems**: ask about times when YP have taken positive steps to address and control their health. Find out how they did this, what resources they used and how they might do it again. Positive reinforcement of their skills is likely to promote similar engagement in the future
- **Discussing expert advice in a collaborative rather than didactic way:** here the HCP is a conduit for good information rather than telling a patient what to do. Giving YP choices in their health care improves their engagement. An open discussion is more likely to enable YP to ask questions that are important to them

Question prompt lists (QPL) are lists of topics either generated by healthcare teams or patients or both used just before a consultation to enable patients to select priority areas they wish to discuss. There is evidence that such aids may increase patients question asking and lead HCPs to offer more information [13]. There is emerging evidence that QPLs in conjunction with web-based video educational information are particularly effective in helping engage YP [14].

Psychosocial screening; this addresses all aspects of YPs lives and helps to understand what factors might put them at risk and which characteristics they possess which make them resilient, able to withstand challenge and change and ultimately protect themselves (see Chap. 3). HEEADSSS is a validated screen which is easy to use in clinical consultations [4, 5]. Questions are asked with the YP alone and in the positive, open, empathic, respectful and resilience-seeking approaches described above. HEEADSSS covers the following domains:

Home	'Who lives with you at home?'
Education	'Are you at school, college or at work?'
Eating	'How is your appetite?' 'is your weight stable' 'do you ever struggle with food?'
Activity	'What kinds of things do you like to do outside school/work?' 'who do you do those things with?' 'How much physical activity do you do?'
Drugs (including alcohol and tobacco)	'Do your friends drink alcohol – do you drink alcohol?' 'if so when and how much do you drink?' 'Do your friends smoke?' 'Do you?' 'Just tobacco or anything else?'
Sexuality, sexual and reproductive health	'Do you have a partner?' 'If are you sexually active?' 'Are you having sex?' 'If so do you know about safe sex?' 'What does that mean to you?' 'Can we talk about using condoms?'
Suicide/low mood	'How are you in yourself?' 'do you ever feel stressed or distressed?' 'have those feelings been so bad you worried you might not cope?' 'have you ever harmed yourself – anything from pinching or punching yourself to cutting?' 'have you thought about taking your own life?'
Safety (including social media)	'Which social media platforms do you use?' 'have you ever been uncomfortable with what others have posted about you or been bullied online?' 'what did you do about that?' 'How would you ask for help if you felt you were in a dangerous situation?'
Training app	https://app.appinstitute.com/heeadsss

For some HCP a barrier to psychosocial screening is the worry that YP answers to some questions may be challenging and that the HCP won't know the answer or be able to help. A key approach in young-person friendly services is the 'no wrong door approach' meaning that HCPs are able to signpost YP correctly. For example if a young person discloses they are sexually active, then signposting to local sexual health services for contraceptive and safe sex advice is crucial. Having readily available, locally applicable signposting information gives several important messages to YP that are likely to improve their engagement; that your service is knowledgeable, you care, can be trusted and that you are interested in all aspects of their life.

It is also important to remember that you are unlikely to be able, in a single consultation, to cover all psychosocial aspects in detail. Flexibility of approach and the ability to uncover and adapt to the YP priorities on the day are key to ensuring that the necessary work is done and the scene set for future consultations. Once the standard is set that psychosocial screening is a routine part of clinical care this helps YP trust and understand healthcare services and empowers them to access and use such services effectively.

There are increasing reports of the potential of digital technology in this area including tools which enable psychosocial screening based on HEEADSSS to be collected before the clinical consultation which help with agenda setting and pitching the consultation at the right level to match the young person on a particular day [15].

Engaging with parents: once you have seen YP alone you may then bring parents back into the room. Parents and carers have often had to coordinate and navigate care for their young people and need help to detach from them and help their YP become empowered to manage their own health care. This process, and the parents' trust in you and your service, will be helped if you actively listen to and support parents whilst being clear that the YP is your primary focus. A useful strategy with parents anxious that their son/daughter will forget to tell you something is to suggest they prepare a

list of questions together the night before their appointment and decide who will ask what. If the young person is seen alone, prepare them to tell the parent the management plan when they join the consultation at the end. That way you can assess their understanding of what you have discussed and also demonstrates to the parent their developing competency in negotiating consultations independently.

Wrapping up the consultation: having completed the consultation and while with the YP alone it is important to sum up the information you have discussed and reflect this back. Firstly this ensures you have understood the YP correctly and secondly it enables a focus on both the positive factors and resilience factors you have discussed as well as the difficulties and medical issues.

It is also important to confirm what information you will share and with whom, especially if you are going to see the YP again with their parents as part of the consultation. Check that the YP has someone they can confide in and they have the contact details for your team in case they have further questions. Confirm the date of the next appointment and if possible offer the YP some choice in timing. Remind YP that your clinical correspondence will be copied to them and ensure that letters you write are comprehensible and as jargon-free as possible. Encourage them to keep them together in a file or folder so it becomes a "patient-held record".

Summary

Engaging with young people requires health care professionals to recognise the kinds of understanding of the world that YP have, the pressures and priorities they experience and the different ways in which they think. Taking time to address communication skills and strategies and embracing a positive, respectful and open approach to consultations over time enables good communication with YP. This communication is an essential part of good quality, young person-friendly care.

Key Management Points

1. Ensure consultations are young person centred (whilst listening to parents and carers and supporting their roles) and developmentally appropriate
2. Ensure the consultation is set up and the clinician has the right communication and listening skills to enable trust and rapport
3. Encourage young people to speak and ensure clinicians listen
4. Ensure neither the medical nor parental agenda is dominant
5. Ensure that young people are seen alone for some or all of the consultation (dyadic consultation)
6. Conditional confidentiality should be discussed and assured
7. Taking a psychosocial history is key in consultation with AYA and should address resilience factors as well as risk

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Chapter 5
Adolescents, Young Adults and Their Parents

Helena Fonseca and Filipa Oliveira Ramos

Introduction

Although the concept of family has evolved over time, there is evidence that parents remain their child's first role model. Parenting involves the care and guidance that enable young people to grow, develop and make appropriate choices. In recent years, there has been an increasing interest in promoting parental involvement in the lives of Adolescents and

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Young Adults within a resilience perspective. Tips for parents in the process of raising adolescents have been developed by several authors to address these resilience factors. When appropriate, some of them can be used in the clinical setting in order to facilitate parental adaptation to this life cycle stage and to their AYA living with a RMD (Table 5.1) [1].

Table 5.1 Ten golden rules for parents raising adolescents

Ten top tips for parents of adolescents
1. Listen to your adolescent. Always be available to talk and listen.
2. Be kind. Don't be inhibited when showing affection, provided that you do not embarrass your adolescent before friends.
3. Get involved in your adolescent's life and follow his/her academic performance. Your involvement is as important if not more so than during childhood.
4. Make an effort to get to know your adolescent's friends. That is the only way you can have to better understand his/her behavior.
5. Be firm. Set up limits and establish clear and adequate rules.
6. Avoid too much control and don't be too bossy. Autonomy is essential for an adolescent to grow up well. Provide him/her with enough room to learn how to be self-confident and to make decisions without looking for your constant advice.
7. Guide your adolescent on the most difficult decisions. He/she may not be ready or mature enough to plan, set up priorities, organize thoughts, manage impulses, and/or be thoughtful about every consequence of his/her own actions.
8. Have positive and realistic expectations about your adolescent. But be realistic: your expectations should be neither too high nor too low.
9. Help your adolescent to become a sensible and responsible citizen. Help him/her to improve his/her respect for everyone, regardless of race, gender, status, or religion.
10. Love your adolescent unconditionally.

Adapted from Fonseca [1]

Steinberg defined four main styles of parenting: authoritative (warm and firm); authoritarian (firm but not warm); indulgent (warm but not firm); and neglectful (neither warm nor firm). He found that AYA raised in authoritative households are more psychosocially competent, more successful in school, and less prone to internalizing or externalizing problems than their peers who have been raised in other styles [2]. AYA with RMD are no exception and their parents have to deal not only with the normal developmental challenges of adolescence (see Chaps. 1, 2 and 3) but also with their AYA's chronic condition.

RMD has a significant impact on families because the ongoing care and management rests primarily with the AYA and their family [3]. Many healthcare professionals and especially adult providers have not been sufficiently trained to assess the developmental and psychosocial challenges faced by AYA and their families with chronic conditions. The Family Adjustment and Adaptation Response Model developed by McCubbin and Patterson [4] is especially useful for examining the impact of the condition on the family as well as which resources and coping behaviors inside the family may facilitate a successful adaptation of the family unit to AYA with RMD. Throughout the life cycle of the family, the unit (like all social systems) attempts to maintain balanced functioning by using its capabilities (resources and coping behaviors) to meet its demands (stressors and strains). The seriousness and chronicity of the AYA's illness will influence the intensity of the demand and how much it interferes with the family's homeostatic state.

A variety of theoretical models dealing with a systems perspective on the family have been developed. Olson's circumplex model was developed as an attempt to bridge the gap between theory and practice. It is basically based in two dimensions (adaptability and cohesion) with a third dimension (communication) considered as a facilitating dimension [5].

- **Cohesion** is the emotional bonding that family members have toward one another. Four levels of cohesion have been defined, ranging from disengaged (very low) to enmeshed (very high) with both of these extreme levels potentially being problematic.

Optimal functioning, comprising 'low to moderate' (separated) and 'moderate to high' (connected) levels of cohesion, means achieving a balance of togetherness and separateness. Family members are connected yet separate. The hypothesis is that too much or too little cohesion will lead to problems in the long term.

- **Adaptability/flexibility** is the ability of the family system to change in response to situational and developmental stresses. The rigid dominant pattern of family functioning is characterized by a very low level of adaptability, authoritarian leadership, with roles seldom changing, strict discipline and too little change. In the other extreme, the chaotic dominant pattern is characterized by lack of leadership, dramatic role shifts, erratic discipline, too much change. Structured and flexible levels of adaptability are those at the center, more conductive to healthy family functioning.

  Optimal family functioning involves a balance of stability and change. Both are necessary.
- **Communication** is the third dimension, which facilitates a family's ability to change its levels of cohesion or flexibility. The hypothesis is that communication skills make it possible for families to change in response to situational stressors and developmental transitions.

The model serves as a typology to distinguish different types of families, falling into three categories: (i) balanced; (ii) midrange; and (iii) extreme or unbalanced, as follows:

(i) Types of balanced families: flexibly connected, flexibly cohesive, structurally connected, and structurally cohesive.
(ii) Types of midrange families that are balanced on one dimension and extreme on the other. The types are chaotically connected, chaotically cohesive, flexibly enmeshed, structurally enmeshed, rigidly cohesive, rigidly connected, structurally disengaged, and flexibly disengaged.
(iii) Types of extreme or unbalanced families: chaotically disengaged, chaotically enmeshed, rigidly enmeshed, and rigidly disengaged.

A double balance of togetherness/separateness and of stability/change, portray the most protective scenario. Extreme levels of family functioning, were associated with poor medication adherence, for example, in the treatment of juvenile arthritis [6], which is consistent with the findings concerning families with children who live with other conditions, such as diabetes.

Family dynamics highly influence the way AYA with RMD and their parents interact, with a significant impact on the AYA autonomy and identity construct.

There is a wide spectrum of family typologies (traditional, single, divorced, reconstructed, same-sex), coming from different cultures and backgrounds. The roles of their caregivers, however, do not differ much. A combination of a warm and firm (being able to set limits and define rules in a consistent way) style of parenting; a family functioning balanced between stability and change, togetherness and separateness, are key components of a successful parenting in all sorts of families and irrespective of having a AYA living with a chronic condition.

Case Report 1

DS, currently 21 years old, presented at age 15 with systemic lupus erythematosus (SLE) and lupus nephritis treated with corticosteroids, hydroxychloroquine, mycophenolate mofetil and enalapril with good effect. At age 17 DS became depressed, addicted to computer games and had progressive weight gain. He was in denial and began missing his treatment. He was an only child living alone with his mother (his father with alcohol dependence was living abroad). His mother, was always very supportive and concerned, but felt she had no control over him. DS lost 1 year at school and had a relapse of his SLE with cerebral vasculitis. The depression worsened, and he had suicidal ideation. He was treated with cyclophosphamide and antidepressants with good adherence this time, as he became scared about the severity of his SLE.

The transition process to adult care had been initiated 2 years before but delayed until the disease was controlled. Currently, he is proceeding with his studies, never misses a clinical appointment, comes by himself and has good adherence to treatment.

The psychosocial impact of SLE on an adolescent like DS is significant (see Chaps. 1, 2, 3 and 8). His personal and family history, deeply influenced his experience. When he first came to the Clinic his mother was feeling alone, despaired, concerned about DS lack of a male role model and clearly asking for external support. DS was at risk of dropping out from health care and he ultimately shared with us that he was fed up with having to come to the Clinic so often, as well as with his mum controlling him all the time. Although the tension between them was high and communication quite difficult, he readily identified his mother as the "trusted and significant other" in his life, feeling a strong sense of support from her and perceived she was someone with whom he could share his problems.

For the team managing DS, risk factors were seen to outweigh protective factors in his life, so they decided to reinforce the protective factors by providing support, relationships, experiences, and opportunities to promote positive outcomes.

The team acknowledged the mother's difficulty in allowing her son to take control of his own healthcare management, and in facilitating his autonomy to negotiate treatment plans. A family intervention was started based on:

- supporting DS and his mother in clarifying their respective demands
- modulation of empathy towards DS and his mum
- raising questions in a non-judgemental and open way
- enabling and empowering each of them to express themselves.

DS and his mother benefited from a patient and family centered care treatment plan, acknowledging that a progressive transition from parental management to self-management should happen throughout adolescence.

Because communication was difficult/damaged, some systemic therapy techniques were applied:

(i) Neutrality: health professional's neutrality has to be preserved at all cost, by challenging everyone and everything while siding with no one.
(ii) Turn-taking: involving each family member in turn, avoiding questions that invite yes/no responses, checking back with each participant and ask how they see something that others have commented on.
(iii) Circular questioning to see clearly what the definition of the problem is for each family member; for example *"What do you think X will say the problem is? … Who agrees with him? … Who disagrees? … How would you put it? … In what way is this problem a problem? … What makes the problem a problem? … How is it a problem for you? … Who is it most a problem for?"*
(iv) Problem solving: by asking each member *"If you could change one thing … what would it be?"*, negotiation can be facilitated. Ideally, the adolescent/family create the solution, but if not, the health professional can make a proposal for discussion.

Case Report 2

JG, a 12 year old girl was diagnosed with polyarticular Juvenile Idiopathic Arthritis (JIA), and treated with methotrexate with a very good response. She experienced nausea on the day of her methotrexate injection and started refusing treatment at 13 years of age. The arthritis got worse and her life at school became quite difficult. Her teachers were asked to give her extra time for work, but her classmates did not understand this allowance and started bullying her. She lived with her parents and with her younger brother and sister. Her parents were very engaged in helping her cope with treatment. They invited friends over on the day of the injection and this positive distraction worked well with no more resistance to treatment and complete remission one year later.

At school JG was asked to tell a story to the class and her parents encouraged her to present the story of an adolescent with JIA. Her classmates were very understanding, and the bullying stopped. She is now 15 years old, doing very well at school and in complete remission with a very good knowledge about her condition and management.

JG's family style of parenting could be defined as authoritative and her parents were quite involved and warm, but simultaneously able to set rules and define limits. The family was characterized by moderate to high levels of cohesion, and positive communication skills, including empathy, reflective listening, supportive interaction, maximizing the ability of family members to share their feelings with high levels of adaptability. They were able to facilitate the process of adherence to treatment such as inviting friends over and helping JG develop coping strategies. Family interaction with the school was crucial for a better understanding of the impact of JIA on her ability to partake in education and involvement with peers.

Parents often lack support in the difficult and complex task of supporting their AYA living with RMD as well as going through their own transition of relative detachment. Unmet parental needs include lack of tools to deal with difficulties related to autonomy and issues around relative attribution to disease versus normal adolescent development (e.g. parents of AYA with RMD suffering from psychosocial difficulties may be more inclined to relate these problems to their RMD) [7].

The struggle for autonomy can be stressful both for AYA and their parents and may be exacerbated by the limits implied by their RMD, and the specific medical care while longing for normality comparable to that of their peers [8].

Parents experiencing high levels of anxiety concerning 'letting go', tend to overprotect their AYA, making the road to autonomy more difficult to travel. This should be identified and supported by healthcare professionals. Peer-to-peer support should be considered for parents and in more severe cases referral to psychology services should take place [9].

In summary, AYA living with RMD should be viewed as any other AYA in the context of their parent relationships, acknowledging not only that they change during the course of adolescence and young adulthood but also the potential impact of RMD on these relationships.

Key Management Points

1. There is evidence that being raised in authoritative (warm and firm) households, leads to more psychosocially competent AYA, less prone to internalizing or externalizing problems.
2. Optimal family functioning involves a balance of stability and change, as well as a balance of togetherness and separateness. Both are necessary.
3. Parenting interventions are an unmet need and should address medical, psychosocial and vocational needs.
4. Parents could benefit from peer-parent support groups to better support the autonomy development of their AYA and facilitate the inclusion of parents' personal experiences in the proposed plans.

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Chapter 6
Principles of Assessment in Adolescent and Young Adult Rheumatology Practice

Helen Foster and Sharmila Jandial

Introduction

Musculoskeletal (MSK) presentations are common, ranking highly in the self-reported health problems amongst adolescents [7], and result from a spectrum of causes (Table 6.1), which is different to adults. In many cases the course is self-limiting, but it is important to consider potentially life-threatening 'red flag' conditions (e.g. malignancy, sepsis, vasculitis) or MSK associations with chronic conditions (e.g. inflammatory

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Table 6.1 Differential diagnosis of musculoskeletal pain

Differential diagnosis of joint pain
Life-threatening conditions
Malignancy (leukaemia, lymphoma, bone tumour)
Sepsis (septic arthritis, osteomyelitis)
Nonaccidental injury
Joint pain with no joint swelling
Hypermobility syndromes (patients sometimes report transient swelling)
Complex regional pain syndromes (localized or widespread)
Orthopaedic syndromes (e.g. slipped upper femoral epiphysis, Perthes' disease)
Metabolic (e.g. hypothyroidism, lysosomal storage diseases)
Referred pain from extra-articular causes (e.g. testicular torsion, inguinal hernia, urine infection, spinal tumour and nerve irritation)
Joint pain with joint swelling
JIA
Trauma (haemarthrosis)
Infection
Septic arthritis and osteomyelitis (viral, bacterial [including Lyme disease], mycobacterial)
Reactive arthritis (post-enteric, sexually acquired)
Infection-related (rheumatic fever, vaccination-related)
Inflammatory bowel disease (Crohn's disease, ulcerative colitis)
Autoimmune rheumatic disease (systemic lupus erythematosus, scleroderma, dermatomyositis)
– Joint swelling may be minimal (arthralgia > arthritis)
Sarcoidosis
Metabolic (e.g. osteomalacia [rickets], cystic fibrosis, mucopolysaccharidoses)
Haematological (haemophilia, haemoglobinopathy)
Tumour (benign/malignant)
Developmental/congenital (e.g. spondylo-epiphyseal dysplasia)
Chromosomal (e.g. Down's-related arthritis)

bowel disease, cystic fibrosis, psoriasis). The evidence-based approach to paediatric MSK clinical examination includes a basic examination (pGALS) [4] and a more detailed regional MSK examination (pREMS) [3]. The MSK assessment must be interpreted in the context of general assessment, suspected 'red flags' and systemic enquiry (Table 6.2). The important issues to highlight are described below and further illustrated with clinical cases.

The Impact of Growth

Normal variants (of age-related growth) in early childhood remain relevant to the AYA as persistent changes beyond accepted age ranges may present with functional problems (e.g. gait abnormality). Orthopaedic conditions (at the hip in particular) need to be excluded, e.g. persistent femoral anteversion presenting with in-toeing, tarsal coalition and the painful nonmobile flat foot. Joint hypermobility is common and may associate with non-specific MSK pain (see Chap. 11).

Localized growth abnormalities also occur and may indeed become more severe in adolescence, e.g. scoliosis from a primary defect in the spine or secondary to leg malalignment from leg length inequality and valgus deformity at the knee (from chronic untreated arthritis), micrognathia and shortened digits.

Pattern Recognition

The spectrum of MSK pathology varies with age, such as causes of limp (Table 6.3). The differential diagnosis of the acute limp must include orthopaedic conditions; slipped upper femoral epiphysis is more common in adolescents (especially if overweight). Chronic limp may result from missed developmental dysplasia of the hip, chronic untreated

Table 6.2 General examination in the context of musculoskeletal disease

	Features	Context and comments
General observations	Overall impression of Well-being Appearance, demeanour and interaction with parent or carer Features of dysmorphism (including faces and limbs/trunk/limb proportions) Height and weight plotted on a growth chart Pubertal status	An unwell AYA will require prompt admission and assessment for malignancy or sepsis Local safeguarding policies should be followed if concerned about nonaccidental injury or neglect Faltering growth may be a sign of systemic or chronic disease Short stature or localized growth problems are features of chronic untreated disease or dwarfism syndromes; abnormal trunk and limb proportions may not be apparent until final skeletal height is achieved (e.g. marfanoid syndromes)
Skin inspection	Look for rashes including scalp and hair Overall feel of the skin, including colour and texture	Skin psoriasis – Extensor surfaces, natal cleft Skin elasticity and scars suggestive of heritable collagen disorders If low mood, evidence of self-harming behaviour especially upper, non-dominant arms and thighs Malar butterfly rash – JSLE or JDMS Violaceous heliotrope rash or Gottron's papules on the hands – JDMS Evanescent macular salmon pink rash may be seen in systemic-onset JIA (often occurs with spikes of fever) and may demonstrate Koebner phenomenon Localized scleroderma may present with an isolated patch of pigmented skin (morphoea) – Systemic sclerosis is rare in childhood Vasculitis or livedo rash may occur in connective tissue disease (including JSLE or JDMS)

Nail examination	Nail pitting (psoriasis) Nail beds and capillaroscopy can be aided by magnification using a gel and ophthalmoscope or dermascope	Nail change of psoriasis may be subtle and the only manifestation of psoriasis Dilated, tortuous nail bed capillaries suggest active inflammation in the context of connective tissue disease
Ear, nose and throat examination	Cervical lymphadenopathy Oral mucosa, gums and teeth Ears and nose (bridge and mucosa) Parotid swelling if sicca features or suspicion of connective tissue disease or sarcoidosis	Significant cervical lymphadenopathy may occur in malignancy or multisystem disease Mouth ulcers – JSLE, inflammatory bowel disease and Bechet's disease. Perianal or genital examination may be required Sjögren's syndrome may be a feature within mixed connective tissue disease Poor dental hygiene is a concern, particularly in the immunosuppressed AYA, and may be more common in JIA with temporomandibular involvement or micrognathia ENT abnormalities are common in ANCA +ve vasculitis, e.g. saddle nose, sinusitis (granulomatosis with polyangiitis)
Cardiovascular	Blood pressure and pulses Presence of bruits Heart sounds	Hypertension in the context of rheumatic disease may signify renal involvement (e.g. vasculitic disease) Pericarditis is a feature of systemic-onset JIA and vasculitic disease Cardiac abnormalities are a feature of non-benign hypermobility syndromes (e.g. Marfan's and Ehlers–Danlos)
Respiratory	Lung fields Pulmonary function testing	Restrictive lung disease may be seen in connective tissue disease

(continued)

TABLE 6.2 (continued)

	Features	Context and comments
Abdominal	Presence of tenderness/guarding Bruits Hepatosplenomegaly	Multisystem disease, including vasculitis, malignancy or inflammatory bowel disease Inflammatory bowel disease may be indolent or suspected with NSAID intolerance
Neurological	Full neurological examination of the lower limbs is always indicated with back pain Cranial nerve assessment in the context of headache Peripheral nerve involvement muscle power	Abnormal neurological examination (such as altered sensation or hyper-reflexia) in back pain should lead to urgent imaging and expert assessment MRI ± angiography may be needed if cerebral vasculitis is suspected Reduced muscle strength is seen in JDMS and mixed connective tissue disease
Eye	Acute red eye Reduced visual acuity Fundoscopy Slit lamp examination	In the AYA with JIA, chronic anterior uveitis may be asymptomatic and only detected by eye screening. Acute anterior uveitis may present with photophobia and a painful red eye as a feature of HLA-B27-related JIA/ERA Multisystem disease (e.g. sarcoidosis, vasculitis) may manifest with ocular involvement
Renal	Blood pressure Urinalysis	Haematuria is a feature of renal disease associated with ANCA +ve vasculitis (i.e. Wegener's granulomatosis) JSLE-associated nephritis may present with hypertension and proteinuria Exclusion of UTI is important particularly if immunosuppressed

ANCA anti-neutrophil cytoplasmic antibodies, *ENT* ear, nose and throat, *JDMS* juvenile dermatomyositis, *JIA* juvenile idiopathic arthritis, *JSLE* juvenile systemic lupus erythematosus, *UTI* urinary tract infection

Table 6.3 Significant causes of limp

	4–10 years	11–16 years
Most common	Trauma Transient synovitis Perthes' disease	Trauma Osgood–Schlatter disease
Conditions requiring urgent intervention	Osteomyelitis Septic arthritis	Osteomyelitis Septic arthritis
	Nonaccidental injury Malignant disease (e.g. acute lymphocytic leukaemia)	Slipped upper femoral epiphysis Malignancy (e.g. bone tumours)
	Testicular torsion Appendicitis Inguinal hernia	
Other important conditions to consider at all ages	JIA Late presentation of developmental dysplasia of the hip Metabolic (e.g. rickets) Haematological disease (e.g. sickle cell anaemia) Reactive arthritis Lyme arthritis	

JIA or previous joint disease (e.g. Perthes). Patterns of joint involvement and extra-articular features in JIA for the AYA differ from both adult rheumatoid arthritis and the archetypal child with JIA (see Chap. 7).

The History and the Physical Examination

The systematic enquiry into family and past history may be helpful (see Tables 6.1 and 6.2). A recent travel history (e.g. to an endemic area for Lyme disease) may be informative,

and a sexual history is important in the adolescent with reactive arthritis and needs to be explored sensitively, acknowledging safeguarding concerns and the need for privacy and confidentiality. A medication history (e.g. response to NSAIDs, potential for drug-induced lupus), family history (e.g. autoimmune disease, muscle disease), social history and family dynamics may be also revealing. It is important to probe for symptoms suggestive of inflammatory joint or muscle disease (e.g. morning stiffness, gelling after rest, swelling) and discriminate against mechanical causes of pain (e.g. locking or giving way, pain worse on weight bearing or exercise). Conversely non-specific aches and pains are a feature of idiopathic pain syndromes (see Chap. 12).

Red flags (such as fever, malaise, anorexia, weight loss, bone pain, persistent night waking or raised inflammatory markers) are suggestive of serious potentially life-threatening conditions (e.g. sepsis or malignancy or multisystem disease), and a full general examination is needed. Additional clinical skills pending the clinical scenario include nailfold capillaroscopy or muscle strength testing (if connective tissue or muscle disease suspected, respectively).

MSK history-taking can be misleading, even when taken by experienced clinicians, as the history alone may not identify sites of joint involvement [5]. It is important, therefore, that in all cases where MSK disease is suspected, a basic joint examination (such as pGALS; see later) is needed, as a minimum, to assess all joints. In the examination of AYA with learning disabilities and complex medical needs, joint problems can easily be overlooked; there is an association of inflammatory joint disease with chromosomal disorders (such as Down's syndrome or DiGeorge syndrome), and many complex genetic conditions (such as mucopolysaccharidoses) may present with or develop joint problems that can be indolent in older children/AYA [2, 11].

pGALS and pREMS Musculoskeletal Examinations

The paediatric gait, arms, legs, spine (pGALS) assessment [4] is a simple, quick, evidence-based validated approach to MSK assessment in children based on the adult GALS (gait, arms, legs, spine) screen, with a series of simple manoeuvres. pGALS is useful to identify abnormal joints (e.g. inflammatory arthritis, orthopaedic problems at the hip, scoliosis). Following pGALS, the observer is directed to a more detailed examination of the relevant area(s) using the consensus approach to paediatric regional examination of the musculoskeletal system (called pREMS) [3]. This is based on the 'look, feel, move, function' principle similar to that of adult REMS for each joint or anatomical region, although there are differences reflecting pathologies from those observed in adults and the influence of growth and development; some tests (e.g. Schober's test for lumbosacral movement) are not reliable in younger adolescents; a history of inflammatory back symptoms in the presence of equivocal physical findings may necessitate imaging (MRI) of the spine and sacroiliac joints (Chap. 14).

There is no absolute age 'cut-off' as to when to use pGALS or GALS or indeed pREMS or REMS. However, we would recommend that pGALS and pREMS be used in the younger adolescents and for those with chronic disease that started in childhood, given the differences in patterns of joint involvement in JIA and spectrum of pathology in AYA compared to adults.

Along with general considerations in clinical consultations with AYA such as communication skills and respecting confidentiality (see Chap. 4), MSK clinical assessment also requires:

- An appropriate environment for AYA to be assessed. The appointment letter can explain that examination is important and suggest that appropriate clothing is brought to the appointment.
- Consideration of a chaperone (other than the accompanying parent/carer/friend/partner).

Full details of the examination techniques with video demonstrations are provided on the PMM website [12] and in Further Reading and Resources.

Training in Clinical Assessment of the AYA

Traditionally adult and paediatric clinical skills are taught independently, but it is important that all healthcare professionals have an appreciation of the additional complexity of the clinical assessment of AYA, as this group will present to primary care and either adult or paediatric services (see Chaps. 1, 2, 3, and 4). Acquisition of 'core' MSK clinical skills for paediatrics and adult practice [1, 6, 8–10] needs to start within undergraduate education as the foundation for further postgraduate training.

Clinical Scenario to Illustrate Key Differences from Paediatric and Adult Clinical Assessment

Javeen is a 15-year-old boy, born in the UK with parents from India. He attends with his adult sister as his parents are at work and presents with a sore left ankle and foot for 2–3 weeks. He initially ascribed his symptoms to soccer playing although he cannot recall a specific injury. In the last week, his pain is present in the mornings and also later as the day progresses. He is well in himself, more tired recently. There is no specific family history or past history of note. He has no history of red eyes.

On MSK examination he has difficulty on heel walking on the left side, and his left calf is slightly wasted. His lumbar spine appears restricted on forward flexion (he cannot reach his knees), and he has a nonmobile flat foot on the left, restricted midfoot movement and tenderness around the left heel. His spine has no tenderness, and he has a good range of movement with a normal Schober's measurement (15 cm

increasing to 21 cm). Joint examination is otherwise normal, and he has no enthesitis and tender points elsewhere, nor skin abnormality.

Diagnosis Javeen has enthesitis-related arthritis. He is HLA-B27 positive.

Learning Points

- With a pattern of oligo-JIA in adolescence, it is important to consider ERA.
  - Enquire about family history (spondyloarthropathy, inflammatory bowel disease) and acute uveitis and check for enthesitis.
  - The history of pain on heel walking suggests enthesopathy.
  - Consider inflammatory joint disease with a nonmobile painful flat foot.
- Muscle wasting suggests prolonged disease duration and a more chronic aetiology.
- Schober's test is not reliable as an indicator of sacroiliac joint disease in AYA, and further imaging (MRI) may be needed.

Key Management Points

1. Musculoskeletal presentations are common during adolescence and young adulthood.
2. The impact of growth, localised and generalised, should be considered during clinical assessment of adolescents
3. Pattern recognition for the AYA differs from both adult and archetypal paediatric diseases and should be considered in the context of the young person's developmental stage

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Further Reading and Resources

BSR eLearning modules – https://rheumatologylearning.com – modules on adult JIA targeting educational needs of adult Rheumatology healthcare professionals.

E-Learning for Healthcare. https://www.e-lfh.org.uk – modules on limp, normal Development and adolescent health issues.

EULAR/PReS Online course in Paediatric rheumatology https://www.eular.org/edu_online_course_paediatric.cfm.

EUTEACH – https://www.unil.ch/euteach/en/home.html – European Training in Effective Adolescent care and health.

Newcastle University short online courses – paediatric musculoskeletal modules – www.cpd.ncl.ac.uk.

Paediatric musculoskeletal matters[12] – www.pmmonline.org.

pGALS app – a free resource. Available through app stores and in multiple languages.

Part II
Specific Diseases

Chapter 7
Juvenile Idiopathic Arthritis in Adolescence and Young Adulthood

Kirsten Minden

Juvenile idiopathic arthritis (JIA) is the most common chronic inflammatory rheumatic disease of adolescence and young adulthood affecting approximately 1 out of 1000 adolescents [1].

Classification

All chronic arthritides of unknown occurring before the age of 16 are referred to as JIA according to the International League of Associations for Rheumatology criteria [2]. Chronic inflammatory arthritis in AYA with age at onset after 16 is classified according to adult criteria.

JIA is a heterogeneous condition and currently classified into seven different categories based on clinical and laboratory features (Table 7.1). The JIA category distribution in AYA is

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Table 7.1 JIA categories and their specifics in adolescence and young adulthood

JIA category	Estimated relative frequency (in %)	Clinical features	To be considered in adult rheumatology
Oligoarthritis	35–45	Persistent oligoarthritis: <5 joints affected Extended oligoarthritis: >4 joints affected Most frequently affected joints: knee, ankle, elbow Anterior asymptomatic uveitis in 15–20% of cases	ANA can persist with inactive disease Flares may occur after years of remission, uveitis activity may not correlate with arthritis activity Insidious uveitis developing de novo in AYA is rare, but uveitis may flare after stopping MTX or adalimumab Acute phase reactants are often normal in active disease
Polyarthritis, RF-negative	15–25	>4 joints affected, often symmetric involvement of large and small joints Anterior asymptomatic uveitis in about 10% of cases	Can flare as oligoarthritis Arthritis may present with increasing joint restrictions and without relevant swelling Acute phase reactants can be normal in active disease, ANA can persist, anti-CCP antibodies are negative in >70%

Enthesitis-related arthritis	15–25	Asymmetric oligoarthritis in 60–80% (especially of large joints of lower limb) and/or enthesitis in 50–70% [4, 26] HLA-B27-positivity in 50%–70% Acute (symptomatic) anterior uveitis in about 10% Inflammatory back pain and/or sacroiliac joint tenderness in about one-third of the cases in early disease	Axial disease and sacroiliitis are rare at disease onset, but progressively appear months to years after the onset (in more than half of the patients after at least 5 years of disease) [4] Radiological alterations usually do not appear during adolescence, but incidence of defined ankylosing SpA increases over time (12–42% after 3–5 years, 19–90% after 9–11 years) [27]

(continued)

Table 7.1 (continued)

JIA category	Estimated relative frequency (in %)	Clinical features	To be considered in adult rheumatology
Psoriatic arthritis (PsA)	5–10	Arthritis (involvement of small joints, including distal interphalangeal joints) and psoriasis, dactylitis, nail abnormalities Two different phenotypic subpopulations, depending on age at onset: (i) early-onset PsA (<6 years) similar to early-onset oligoarticular and polyarticular JIA; often with dactylitis and small joint involvement. (ii) later-onset PsA, resembling SpA Anterior asymptomatic uveitis in 5–10% of cases with early PsA onset, symptomatic uveitis in late-onset PsA Family history of psoriasis in first-degree relative	Psoriasis in only 50% of cases, rash may appear years after arthritis Variable joint involvement, often polyarticular disease in adulthood

Systemic JIA	3–7	Arthritis, fever, rash Other manifestations: serositis, hepatosplenomegaly, lymphadenopathy Macrophage activation syndrome (MAS) in 6–10% No uveitis	Systemic signs may be absent in adolescence/adulthood, a severe polyarthritis may then be present MAS can occur at any stage of disease and can be triggered by infection or drugs
Polyarthritis, RF- positive	2–5	>4 joints affected, often symmetric involvement (especially hands and feet, shoulders and hips) Presence of rheumatoid factor IgM, anti-CCP antibodies Mostly adolescent females No uveitis	High risk of progressive disease course and of relapse after DMARD withdrawal Represents early onset of rheumatoid arthritis
Other (undifferentiated) arthritis	2–5	Overlap between categories Family history of psoriasis in first-degree relative RF may be present Uveitis (mostly asymptomatic) in 5–10%	

RF Rheumatoid factor, *ANA* antinuclear antibodies, *DMARD* disease modifying anti-rheumatic drugs, *MTX* methotrexate

different from that in children, AYA are more likely to have polyarticular JIA and enthesitis-related-arthritis (ERA). ERA and psoriatic arthritis (PsA) subsets can also be regarded as juvenile SpA, these patients usually meet the ASAS (Assessment of Spondylarthritis International Society) criteria for peripheral SpA [3]. In contrast to the traditional concept of SpA behind the ASAS classification, reactive arthritis and enteropathic arthritis are excluded from JIA in general and from ERA in particular.

Many young people will have ongoing care in adult clinics. They continue to have JIA and should not be reclassified in adulthood as having RA, because clinical phenotypes (with the exception of cases with spondyloarthritis and RF-positive polyarthritis), genetic background, laboratory findings (e.g., autoantibodies, inflammatory parameters), treatment responses and outcomes in JIA are different from adult-onset arthritis.

Presentation

About a third of all JIA cases start in adolescence. ERA, rheumatoid factor (RF)-positive polyarthritis and late onset of PsA have disease onset peaks in adolescence (Fig. 7.1). Clinical features of the different JIA categories are shown in Table 7.1. The juvenile form of SpA differs from that of adults by a more peripheral pattern of arthritis with less frequent axial disease, at least at disease onset (Table 7.1) [4].

Two-thirds of AYA with JIA are female and females predominate in all JIA categories, except in systemic JIA and ERA. AYA with JIA have been ill on average for more than 5 years. Having JIA burdens AYA in many ways [5]. Even though more than half have no functional limitations according to the Childhood Health Assessment Questionnaire (C-HAQ) [6], AYA report numerous functional limitations with far reaching consequences (Fig. 7.2).

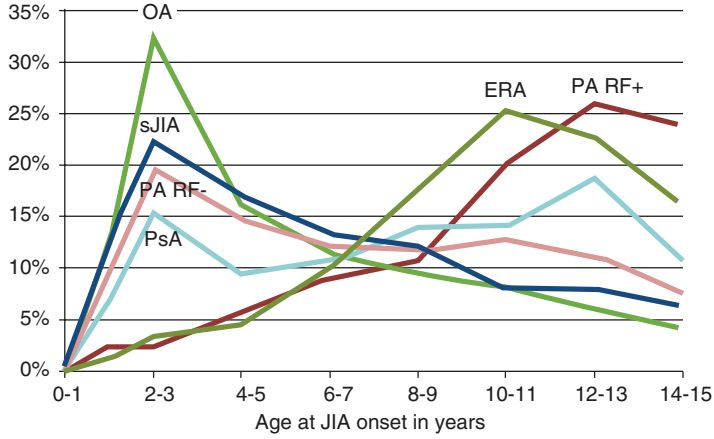

FIGURE 7.1 Age at onset of selected categories of juvenile idiopathic arthritis. Data were derived from 8935 patients with JIA recorded in the German paediatric rheumatologic database in 2016. ERA enthesitis-related arthritis, OA oligoarthritis, PA RF- rheumatoid factor-negative polyarthritis, PA RF+ rheumatoid factor-positive polyarthritis, sJIA systemic JIA, PsA psoriatic arthritis. (Figure modified according to Hochberg, Rheumatology, 7e – 2-volume set, Elsevier, Atlanta, USA, Copyright © 2018)

The inflammatory load of the disease often decreases over time. The vast majority of AYA in rheumatology care have low or no disease activity [6, 7].

Management

Specialised rheumatology multidisciplinary teams are integral to optimal management of JIA. Treatment includes drug therapy, physical therapy, occupational therapy and psychosocial support. Increasing evidence supports accelerated, early treatment pathways with a treatment goal of clinically inactive, or at least minimally active, disease.

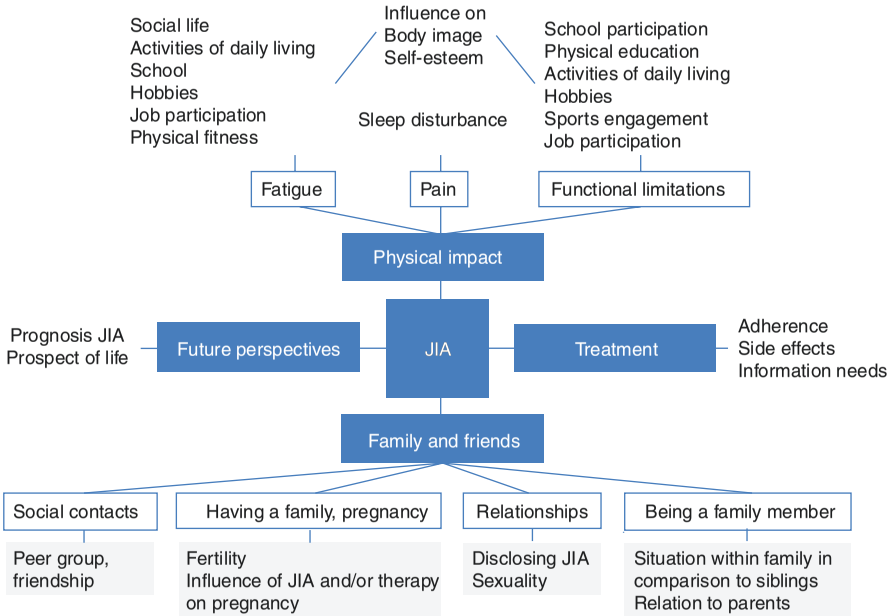

FIGURE 7.2 Areas of life on which JIA has a special impact from AYAs point of view (Eyckmans et al. [5], Fig. 1 adapted by permission from Springer Nature)

Such 'treat-to-target' approaches require standard evaluations of disease activity (see below).

Drug treatment is based on the use of non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, conventional synthetic (cs) and biological (b) disease modifying anti-rheumatic drugs (DMARDs). NSAIDs and intra-articular corticosteroids (IAC) are the mainstay of treatment for oligoarthritis and used in all JIA categories in addition to other therapies as needed. IACs are usually administered under general anesthesia in children; adolescents must gradually get used to injections under local or inhaled nitrous oxide anesthesia, which is adult practice. Systemic corticosteroid use has become uncommon and is limited to severe polyarticular disease for which a short course of steroids may be advisable as bridging therapy before DMARDs reach their full effect. Given the side effects of steroids and their possible negative effect on AYA's body image, a prolonged course of steroids should be avoided particularly in the peripubertal phase when such side effects are often worse.

Methotrexate (MTX) is the most commonly used csDMARD in JIA. AYAs that fail to respond to or are intolerant to csDMARDs are candidates for bDMARDs. For the various JIA categories, different bDMARDs have been available (Table 7.2). There are no clinical trials in AYA to demonstrate efficacy or inform choice of drug or response to treatment.

Specific points in the management of AYA with JIA are summarised in Fig. 7.3 and discussed further in Chaps. 18 and 19.

Age-specific instruments should be used to measure treatment response and outcomes. Information about subjectively-perceived health has to be collected from AYA as parent-proxy ratings differ from self-assessments of functionality, pain, and global well-being [8].

Table 7.2 Drug therapy for the various JIA categories and JIA-associated uveitis

	Oligoarthritis	Polyarthritis (RF negative or positive)	Enthesitis-related arthritis	Psoriatic arthritis	Systemic arthritis	JIA-associated uveitis
First-line	NSAIDs ± intraarticular corticosteroids					Cortico-steroids locally (systemic)
		MTX	Polyarticular disease: cs DMARD (sulfasalazine, MTX)		IL-1- or IL-6-inhibitor or csDMARD	
Second-line	MTX	TNF-inhibitor IL-6-inhibitor	TNF-inhibitor	TNF-inhibitor	bDMARD change	MTX
Third-line	bDMARD: TNF-inhibitor IL-6 inhibitor	bDMARD change: TNF-inhibitor IL-6-inhibitor T cell co-stimulatory signal blocker	bDMARD change: TNF-inhibitor	bDMARD change: TNF-inhibitor IL-12/23-inhibitor	bDMARD change	Monoclonal anti-TNF antibody: adalimumab (infliximab, golimumab)

TNF-inhibitor (e.g., etanercept, adalimumab, golimumab, infliximab), IL-1 inhibitor (e.g., canakinumab, anakinra), IL-6 inhibitor (e.g., tocilizumab), IL-12/23- inhibitor (e.g., ustekinumab), T cell co-stimulatory signal blocker (e.g., abatacept) bDMARDs are often given in combination with MTX

• Provide developmentally appropriate care and empower young people with JIA by embedding health education and health promotion in consultations
• Be alert to flares (arthritis, uveitis) with breaks of treatment or after pregnancy, stop DMARDs only after about two years of clinically inactive disease
• Be aware of possible co-morbidities, regularly assess, treat, if necessary, and avoid future cardiovascular risk factors by giving advice on a healthy lifestyle (e.g., sports, healthy eating, avoiding nicotine and overweight)
• Provide anticipatory guidance, check vaccination status
• Provide counseling in regard to contraception and parenting
• Provide a planned, coordinated transitional care and transfer to a developmentally appropriate, proactive (e.g., explorative, appointment reminiscent) service provision in adult rheumatology

FIGURE 7.3 Key points in the management of AYA with JIA

Disease Status and Damage Measures

Core parameters to assess treatment response and disease activity include:

- Physician global assessment of disease activity (PGA, by visual analogue scale [VAS], numerical rating scale [NRS])
- Patient global assessment of well-being (by VAS, NRS)
- Functional ability up to the age of 17 by C-HAQ, from 18 years on by HAQ
- Active joint count (71-joint count)
- Restricted joint count
- Laboratory parameters (erythrocyte sedimentation rate [ESR], C-reactive protein)

Due to the specific joint involvement, disease activity in young people should be assessed by the juvenile arthritis disease activity score (JADAS) instead of the DAS-28. The use of DAS-28 instead of JADAS can lead to underestimation of disease activity and thus to under-treatment [9]. The JADAS is a simple sum score and includes four measures: PGA; patient global assessment of well-being; ESR, normalized to a 0–10 scale; and a count of active joints (10, 27 or 71, resulting in three JADAS-versions) [10]. A simplified three-variable version is available that does not include the acute-phase reactant (clinical JADAS [cJADAS]). For AYAs with ERA, in addition the Juvenile Spondyloarthritis Disease Activity Index (JSpADA) and Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) are evaluated tools for disease activity assessment.

Damage or permanent alterations in joint structures or extra-articular organ/systems as a result of JIA or its treatment can be evaluated by the juvenile arthritis damage index

Table 7.3 Instruments for assessing AYA-reported outcomes

Patient-reported outcomes	Examples of instruments
Health-related quality of life (HRQoL)	Ages 10–17 years: Pediatric Quality of Life Inventory (PedsQL) Generic Core Module and PedsQL Rheumatology Module Child Health Questionnaire (CHQ) Quality of My Life Questionnaire (QoMLQ) Paediatric Rheumatology Quality of Life Scale (PRQL) Juvenile Arthritis Quality of Life Questionnaire (JAQQ) Age > 17 years: Medical Outcomes Short-Form 36 (SF-36)
Overall well-being	VAS/NRS
Pain	VAS/NRS
Fatigue	PedsQL Multidimensional Fatigue Scale (ages 10–18 years)
Multidimensional outcome	Juvenile Arthritis Multidimensional Assessment Report (JAMAR) (ages 10–18 years)

(JADI). Instruments for assessing patient-reported outcomes are shown in Table 7.3.

AYA report more frequently about pain than children with JIA, but less often than patients with adult inflammatory joint disease. Approximately half of AYA with JIA report about pain, approximately 40% have functional limitations by HAQ [6, 11].

Morbidity and Extra Articular Manifestations of JIA

Anterior uveitis is the most frequent extra-articular manifestation of JIA. AYA with early onset of oligoarthritis, RF-negative polyarthritis and PsA and ANA (antinuclear antibody) positivity are at particular risk during the first 4 years of JIA. In these AYAs, asymptomatic uveitis flares may even occur in adolescence/young adulthood. AYAs with ERA and late-onset PsA may experience an acute (symptomatic) anterior uveitis.

Other extra-articular manifestations of ERA include inflammatory bowel disease, cardiac (e.g., aortic insufficiency or conduction disorders) and pulmonary manifestations (e.g., upper lobe fibrosis), of which the last two are very rare [12]. In RF-positive polyarthritis, less severe extra-articular manifestations (e.g., rheumatoid nodules) and severe (e.g., vasculitis, interstitial lung disease) may occur.

Altogether, AYA with JIA are more likely to develop depressive symptoms and anxieties than their peers without a chronic illness [13]. In addition, they are at increased risk of premature atherosclerosis and early-onset cardiovascular disease [14] and thus require anticipatory guidance to promote cardiovascular health (see Fig. 7.3).

Sexuality, Fertility and Pregnancy

Individuals with JIA show similar attitude to sexual activity, contraception, and wish for children [15, 16].

Fertility is not impaired in females with JIA, but fecundity was found to be reduced.

Women with JIA have higher rates of instrumental delivery and are at higher risks for adverse pregnancy and neonatal outcomes, such as preterm delivery, preeclampsia, and small for gestational age (SGA) infants [17]. Quiescent or minimal active JIA is not reactivated by pregnancy [18] and active disease at conception ameliorates in about 60% in pregnancy [19]. Within a few weeks after delivery, disease activity increases or DMARD treatment is required in approximately as many cases as were treated before pregnancy [20]. Developmentally appropriate counseling regarding contraception and pregnancy monitoring by an obstetrician and rheumatologist is important for AYA with JIA.

Prognosis

After 10 years of disease, less than 50% of patients have achieved a drug-free remission [20]. The probability of drug-free remission varies significantly with disease-onset type, being best for oligoarticular JIA and worst for polyarticular JIA (Table 7.4).

Apart from drug-free remission, all other clinical outcomes have dramatically improved in the biologic treatment era. Most AYA have a good functional capacity. Articular damage (most often in hip, wrist, and temporomandibular joints) is the most important component of global damage. However, an arthroplasty is rarely needed in young adulthood (<2%).

The most frequent extra-articular damage components are

- ocular damage
- growth failure (linear growth failure in up to 10% and localized growth abnormalities, such as limb length discrepancies and micrognathia)
- muscle atrophy and decreased bone mass.

Table 7.4 Long-term (≥7 years) outcomes of various JIA categories [6, 11, 28]

JIA category	No drug-free remission, %	Functional limitations[a], %	Damage[b], %	Other possible adverse outcomes
Oligoarthritis, persistent	20–50	15–30	15	Persisting active uveitis, ocular sequelae, leg-length inequality
Oligoarthritis, extended	50–80	40–50	35	Persisting active uveitis, ocular sequelae, leg-length inequality
Polyarthritis, RF- negative	50–85	40–60	15–30	Linear growth failure, mandibular dysfunction, decreased bone mass
Enthesitis-related arthritis	50–85	20–50	20–30	Ankylosing spondylitis, hip damage
Psoriatic arthritis (PsA)	45–80	30–50	10–50	Poorer physical health than oligo- or polyarthritis
Systemic JIA	20–30	25–60	25–40	Decreased bone mass, Linear growth failure, Hip damage, Cardiovascular risk factors
Polyarthritis, RF- positive	70–100	50–70	30–100	Severe joint destruction

[a]Health Assessment Questionnaire >0
[b]Juvenile Arthritis Damage Index >0

Ocular sequelae mainly develop as consequences of uveitis (in at least one-fifth of affected patients) [21]. Complications most frequently include band keratopathy, cataract, posterior synechiae, maculopathy, and ocular hypertension [22]. A significant visual loss results in 10–30% of patients. Blindness due to uveitis still occurs.

Reduced muscle mass and force contribute to bone loss. Abnormalities in body composition, i.e. a decreased lean body mass, an increased fat mass, and a reduced bone mineral density have been documented in AYA with JIA [23] (see Chap. 16).

AYA's academic achievement is comparable to that of the general population. Conflicting data on employment rates exist, from transitioning into employment at an earlier age than peers without arthritis [24] to lower employment rates due to unemployment, longer training periods or early retirement. Young people with JIA judge their quality of life still lower than age- and sex-matched controls, but in recent studies this is usually limited to physical health [25].

Summary

JIA in adolescence and young adulthood is characterised by specific clinical manifestations and requires a specific assessment and management. Rheumatologists need to be aware of the wide range of issues, including transitional care, sexual health and pregnancy, education and employment, potential adverse JIA outcomes and long-term comorbidities. A holistic life course approach to care for AYA is important to set the course for the future.

Key Management Points

1. Juvenile Idiopathic arthritis is the most common chronic inflammatory rheumatic disease in adolescents and young adults
2. JIA is commonly a lifelong disease: lack of long term remission into adulthood is reported to vary between 20% and 100% of young people depending on category of JIA
3. JIA specific rather than adult disease specific activity scores should be used when available
4. Morbidity of JIA includes the impact the disease has on psychological, social, educational and vocational adolescent and young adult development

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Chapter 8
Systemic Lupus Erythematosus in Adolescence and Young Adulthood

Lori B. Tucker

Introduction

In this chapter, specific issues relating to SLE in adolescence and young adulthood (AYA) are discussed rather than the general clinical features, diagnosis, investigation, and treatment of SLE which are readily available elsewhere in several excellent reviews [1, 2]. European-based general recommendations for treatment of childhood-onset SLE (cSLE) [3] provide useful general principles. In addition, international quality indicators [4] provide a framework for a recommended holistic approach to management.

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Epidemiology

Approximately 20% of patients with SLE have disease beginning before age 18 years, with the majority of those being adolescents (between ages 12 and 18 years) [2]. The highest reported incidence of cSLE is in girls aged 15–19 years, and in all cases, lupus was far more common in non-white children and adolescents [5].

Diagnosis of Lupus in Adolescence and Young Adulthood

Diagnosis of SLE may be delayed due to lack of awareness of the variety of presentations in young people. The differential diagnosis for an adolescent/young adult (AYA) presenting with arthritis, fatigue, weight loss, and headaches is broad but includes SLE. In practice, the ACR classification criteria [6] are often used as diagnostic criteria, although this is not technically correct. More recently, the Systemic Lupus International Collaborating Clinics (SLICC) group published a revision of these criteria [7], which perform better and are more sensitive than the ACR criteria, although less specific.

Impact of SLE on AYA

Coming to terms with the diagnosis of a serious chronic disease of any sort is a challenge for adolescents (see Chaps. 2 and 3). SLE provides additional challenges based on the severity of the condition, uncertainty of outcome, and significant side effects of treatments. AYAs with SLE are found to have lower health-related quality of life, with fatigue, pain, low mood, and anxiety as contributors to this [8]. Impaired identity, low self-image and increased self-consciousness, restriction on major life decisions, worry about future parenthood, and resentment of long-term treatment and its burdens have all been identified as key aspects of the impact of SLE

from the perspective of the young person with SLE. Young people with SLE report concern about their long-term outcomes, as well as needing age and culturally appropriate information, which are difficult to find. They desire independence whilst acknowledging the need to depend on family, friends, as well as trusted physicians [9].

Treatment Considerations

A detailed discussion of treatment modalities for cSLE is beyond the scope of this chapter, and further detail can be found in several reviews [1, 10]. European-based general recommendations for treatment of cSLE [3] provide useful general principles. In addition, international quality indicators [4] provide a framework for a recommended holistic approach to management.

General Management Considerations for SLE in AYA

In addition to issues addressed as part of a developmentally appropriate assessment (see Chap. 4), there are a number of general health issues requiring specific attention in AYAs with SLE.

Adherence to a medication regimen that is chronic and can be complex (see Chap. 19) is one of the major challenges in treating adolescents with SLE. Adherence to medications can be as low as 50%; one study found only 32% of adolescents with lupus were sufficiently adherent to hydroxychloroquine [11]. When an AYA develops a flare of SLE, one needs to consider the possibility that they are not taking their medications. Text messaging has been reported to increase visit adherence but not adherence to medication [11]. Significant improvement in adherence to hydroxychloroquine was seen directly after participation in an online social media forum on a self-management website designed specifically for AYA

with SLE, providing some evidence that this intervention may have positive influence on adherence [12].

Education regarding sun avoidance needs to be provided and followed up regularly.

Vaccinations

AYAs with SLE are recommended to have annual influenza vaccines, as well as vaccination against pneumococcus, meningococcus, and *Haemophilus influenzae*, as they may be at particular risk for these infections. Non-live vaccines have been shown to be safe in SLE [13]. Vaccination against human papilloma virus (HPV) is particularly important, as there is an increased risk of persistent HPV infection, as well as precancerous cervical abnormalities in women with SLE [13]. If AYAs have not completed standard vaccine schedules, there is a need to facilitate "catch-up" of these.

Sexual and Reproductive Health

Avoidance of unplanned pregnancy is important. Pregnancy risks such as prematurity, preeclampsia, and other obstetric and foetal complications are higher in SLE, as well as risk of disease flare during and after pregnancy. Teratogenicity from medications commonly used in SLE is also a concern. Furthermore, mycophenolate is associated with increased miscarriage risk.

Healthcare professionals should discuss the need to avoid exposure to sexually transmitted diseases through the routine use of condoms with all sexual encounters.

Combined oral contraceptive use is safe in relatively stable disease [14] but not if hypertensive, taking oral steroids, or with evidence of anti-phospholipid antibodies. Based on the potential risk of venous thromboembolism or stroke in women who take combined oral contraceptives, it is reasonable to screen for presence of anti-phospholipid antibodies

prior to recommending a contraceptive choice. The combined risk of anti-phospholipid antibodies and combined oral contraceptives for thromboembolism is not known, but one would consider a different form of contraception for those women. In addition, young women with a history of thrombosis should not take oral contraceptive pills containing oestrogen.

Although progestin-only containing pills have less thrombotic risk, these pills need to be taken very carefully at the same time each day to ensure effectiveness. There is a higher rate of breakthrough menstrual bleeding which may lead to discontinuation.

Implantable contraceptive methods, such as depot medroxyprogesterone acetate, may be an excellent choice in SLE as it is progestin-only. However, there is a risk of decreased bone mineral density with prolonged use [15]. Intrauterine devices (IUDs) may be a good contraceptive choice for some AYAs with SLE as they are effective and can be reversed. Newer hormone-releasing IUDs, such as the levonorgestrel-releasing device (Mirena), may be particularly appealing, with low risk of infection and benefit of menstrual cycle control; however, studies demonstrating safety and efficacy in the SLE population are not available to date.

Finally there are fertility concerns with cyclophosphamide therapy though this is age dependent, and under the age of 25, there is less risk of permanent infertility than older women. Risk is dose dependant, so repeated courses of cyclophosphamide may increase that risk. Use of gonadotropin-releasing hormone agonists during cyclophosphamide treatment as ovarian protection has been demonstrated to be safe in this population [16].

Bone Health in AYA with SLE

Potential negative consequences of SLE and its treatments on bone health for AYAs include osteoporosis (see Chap. 16) and avascular necrosis.

Avascular necrosis (AVN) results from ischaemic injury to the bone causing subchondral necrosis, with a prevalence of 3–30% in SLE [17]. Corticosteroid treatment either current or past is a predisposing factor for the development of AVN; it is important to note that AVN is seen in patients with SLE who never received corticosteroids. AVN most frequently affects the femoral head, but AYAs with SLE may have any bone affected or multisite AVN. Clinicians should have a high index of suspicion for AVN in AYAs with SLE who have persistent joint or bone pain. If routine radiographs are normal, an MRI should be done to further investigate.

Cardiovascular Health in AYA with SLE

Cardiovascular disease is a leading cause of morbidity and mortality in adults with SLE [18]. AYAs with childhood/adolescent onset of SLE may be at particular risk, as they have a longer disease duration, more renal disease, and more corticosteroid exposure. Dyslipidaemia has been found in the majority of AYAs with SLE [19]. Signs of early subclinical atherosclerosis were found in cSLE [20], with risk factors including longer lupus duration, minority status, higher BMI, male sex, and abnormality in renal parameters. Clinicians caring for AYAs with SLE should pay attention to modifiable risk factors for cardiovascular disease, such as weight loss, lipid control, control of renal disease and hypertension, and avoidance of smoking.

Neuropsychiatric SLE in AYA

Diagnosis of neuropsychiatric (NP) SLE is challenging. Patients may have serologically inactive SLE yet still have serious NP SLE. Testing for NP SLE may include imaging, lumbar puncture to evaluate cerebrospinal fluid, and neuropsychological testing, depending on the clinical situation.

Standard MRI is frequently performed, as it is readily available in most centres. Of note, nearly 60% of a cohort of youth with definite clinical NP SLE had no MRI abnormalities [21].

NP SLE affects between 30% and 95% of patients with cSLE. There is a wide range of NP manifestations, affecting both the central and peripheral nervous systems [22, 23]. Objective NP manifestations such as stroke, neuropathies, seizures, chorea, or transverse myelitis are relatively easy to recognize clinically. In contrast, headache, cognitive impairment, and mood disorders definitively attributable to SLE can be extremely difficult to diagnose, particularly in the adolescent population. Mood disorder can be difficult to fully attribute to SLE in AYAs.

Similarly, establishment of cognitive dysfunction attributable to SLE can be challenging in adolescents. Many adolescents have periods of struggling with academic performance or may describe difficulty with memory or other cognitive functions. The gold standard for diagnosis of neurocognitive abnormality is formal neurocognitive testing; however, these testing panels are extensive and often unavailable in routine clinical settings. In many clinical situations, school academic performance is a reasonable proxy for cognitive difficulties.

Disease Outcomes

With improved treatments for SLE, outcomes have also improved, with a 10- and 15-year survival for patients with childhood-onset SLE greater than 85% in most centres [2]. Ethnic background influences outcomes, with patients with non-white, Afro-American/Afro-Caribbean, or Hispanic backgrounds having worse outcomes, both in mortality and long-term damage [24]. In addition, compared with adults with SLE, patients with childhood-onset SLE accrue damage faster, with higher damage scores seen [25].

Educational achievement in AYA with lupus is equal or better than peers; however small studies suggest that these

patients are less likely to be employed [26]. Health-related quality of life is poorer in children and youth with lupus compared to healthy children [27], which is similar to what is seen in adults with SLE. One cohort study showed children and youth with SLE who were obese secondary to treatments had particularly poor quality of life in all domains compared to SLE patients who were nonobese [28].

Youth with SLE could be at increased risk for malignancy either due to exposure to chemotherapeutic treatments or due to the disease itself. In a large North American paediatric registry-based study, there was a small increased risk of cancer, with 14 invasive cancers reported (standardized incidence ratio 4.13), and 3 of these being lymphomas (SIR 4.68) [29]. The small number of cases makes it difficult to ascertain drug effects, and longer follow-up and larger cohorts are needed to further study this issue.

Transition to Adulthood

Finally, health transitions may be particularly complex for adolescents with SLE, who may have a complicated medical treatment regimen, and involvement of a number of healthcare specialities if they have multisystem disease (see Chap. 21). Early planning and coordination are key for such young people.

Key Management Points

1. Systemic lupus begins in adolescence in 20% of cases.
2. Diagnosis of SLE should be considered in AYA who have a multisystem disease.
3. Treatment of AYAs with SLE can be complicated by challenges with adherence.

4. A holistic treatment approach includes prescribing and monitoring medications, as well as attention to general health issues such as the impact of SLE on sexual health, vaccinations, and mood.
5. SLE and its treatments can lead to impairments in the bone, cardiovascular system, or neurologic system; careful attention should be paid to these areas.

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Chapter 9
Juvenile Dermatomyositis in Adolescents and Young Adults

Christina Ann Boros

Introduction

Juvenile dermatomyositis (JDM) is a systemic vasculopathy primarily affecting the skin and muscles, causing classic signs of rash and proximal muscle weakness. The incidence is approximately 3–4 per million children under the age of 18 with a female predominance: estimated female/male ratio of 2–5:1 [1].

It is difficult to assess the incidence and prevalence of idiopathic inflammatory myopathy (IIM) in adolescents and young adults (AYA) due to the paucity of specific published data, but US and UK data report 7% [2] and 10.5% [3], respectively, were aged between 13 and 16 years at disease onset. A summary of the key differences between paediatric and adult disease is detailed in Table 9.1 [3–5].

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Table 9.1 Differences between paediatric and adult idiopathic inflammatory myopathies (IIMs)

Feature	Childhood IIM	Adult IIM
Rash	Anywhere on the body, more likely to be ulcerative	Distinctive skin rash in adult dermatomyositis; polymyositis may have no skin manifestations
Muscle enzymes	Creatine kinase – less likely to be elevated in childhood IIM, so testing of other muscle enzymes (i.e. LDH and AST) is needed	Creatine kinase more likely to be elevated
Interstitial lung disease	Less common although 40% of children with IIM have asymptomatic pulmonary function test abnormalities	More common in adults with myositis and associated with poorer prognosis
Calcinosis	More common particularly in younger children; more typically a later sign associated with delayed diagnosis, a chronic course and/or inadequate treatment. May be subcutaneous plaques, nodules or large masses in muscle groups	Very uncommon
Major organ vasculopathy	More common	Less common

Table 9.1 (continued)

Feature	Childhood IIM	Adult IIM
Association with malignancy	No clear association. Important to emphasise during disease education with the young person	DM is considered to be a paraneoplastic syndrome in adults and associated with triple the risk of all types of cancer reported compared to the general population. Frequent association with presence of anti-TIF1γ Ab not seen in JDM
Polymyositis/ amyopathic phenotype	Less common	More common

Calcinosis

Additional risk factors include NXP2 and PM-Scl Ab, higher initial levels of CK and prolonged elevation of muscle enzymes and African American ethnicity [6]. Pathogenesis is uncertain but is thought to involve local tissue trauma, active inflammation and dysregulation of proteins involved in calcium metabolism with calcium deposits occurring at sites of localised trauma or chronic mechanical stress. Calcinosis is particularly problematic when bridging joints and limiting movement or if ulcerating through overlying skin. Treatment is difficult, and no specific therapy has been proven to be universally effective. In addition, published data regarding treatment strategies are very limited.

Serology

Myositis-specific antibodies (MSAs) in general tend to be associated with similar disease manifestations in childhood and adult IIMs, although with differing frequencies. However, children with anti-synthetase antibodies are more likely to have overlap myositis, to present with falls and muscle atrophy and less likely to have ILD, mechanics' hands and Raynaud's phenomenon compared to adults with myositis. Children with anti-Mi-2 antibodies are more likely to exhibit V- or shawl-sign rashes and have more cuticular overgrowth, whereas adults have a higher incidence of carpal tunnel syndrome [7].

Anti-NXP2 is found in 11–23% of children with myositis but in only 1.6% of adult IIM patients. In JDM, anti-NXP2 antibody is strongly associated with the development of calcinosis, and a more severe disease course, with persistent disease activity and poor functional status [1, 2]. The anti-MDA 5 antibody is associated with relatively mild muscle disease but more rash and a higher risk of ILD in children [8].

Pathophysiology

Although disease pathogenesis and genetic susceptibility are similar in adult and paediatric disease, childhood myositis is associated with more prevalent vasculopathy.

An internationally agreed standardised histopathological scoring system to assess severity on muscle biopsy has enabled a more robust comparison of the pathophysiology between cases [9], and interestingly the data scored on biopsy, in combination with MSA status, has recently been shown to be predictive of outcome [10].

Management of JDM

Medical Treatment

The goals of treatment in IIM are to treat inflammation, restore function and ensure growth and development are as

normal as possible. Outcomes are improved with multidisciplinary care: the ideal team consists of a paediatric rheumatologist during childhood, rheumatology nurse, specialist physiotherapist and occupational therapist. In addition, because of other potential organ system involvement, multiple specialty clinics may also be involved in care.

Early diagnosis and appropriate treatment lead to better disease control and quality of life, with the intensity of treatment determined by disease severity.

Consensus-derived treatment pathways have now been developed by two main groups – the Childhood Arthritis and Rheumatology Research Alliance in North America (CARRA) [11–14] and the Single Hub and Access Point for Paediatric Rheumatology in Europe (SHARE) consortium. SHARE published consensus-based recommendations regarding diagnosis and treatment for various juvenile rheumatic diseases, including JDM [15].

Treatment recommendations included induction with high dose oral or intravenous corticosteroids combined with methotrexate, that the addition of methotrexate or cyclosporine A leads to better disease control than prednisolone alone and that the use of B cell depletion can be considered as adjunctive therapy for refractory disease. The use of cyclophosphamide in severe JDM [16] has greatest effect on global disease activity and skin involvement at 12 months after commencement, indicating sustained benefit.

Steroid-sparing agents such as mycophenolate mofetil, azathioprine, hydroxychloroquine, tacrolimus, cyclosporine and intravenous immunoglobulin (IVIG) have also been used in refractory disease.

Other biologics which have been used successfully to treat refractory myositis include anti-TNF agents, e.g. infliximab and adalimumab in JDM [17], tocilizumab in overlap syndrome [18] and abatacept in polymyositis [19]. In addition, there is increasing interest in the potential of Janus kinase (JAK) inhibitors in refractory disease, particularly since JDM is now known to be an interferonopathy and that excess IFN expression may drive the endothelial injury [20] which occurs in JDM.

Other Management Strategies

Adjunctive treatment The importance of exercise training, even in the setting of active disease is also now well recognised. It has been found to be safe and facilitates a significant increase in aerobic fitness, muscle function and functional ability.

Trigger avoidance Sun exposure is associated with disease flare, and care should be taken throughout the disease course with sun exposure as well as medications causing photosensitivity.

Disease activity and damage recording A consensus optimal dataset has recently been developed which includes 12 items to be completed at the initial visit, 56 to be competed at every clinic visit and 55 to be completed at baseline and every 12 months thereafter [21].

Transitional care and planning As with all young people with chronic disease, AYAs with JDM need effective transitional care (see Chap. 21) particularly in view of the different disciplines involved.

Outcomes

Previous studies have suggested that only one-third of children with IIM have a chronic disease course, but more recent evidence seems to contradict this with increasing evidence that JDM is a chronic disease in 40–60%. The largest outcome study to date [22] which included 490 children with JDM and young people from 27 European and South American centres seen 2–25 years after diagnosis found that most participants reported good quality of life with few exhibiting severe muscle weakness or physical disability, but, nonetheless, 40–60% had persistently active disease.

Mortality rates, though overall much reduced with modern treatment, are increased in JDM for those with overlap

myositis and anti-synthetase Abs. A standardised mortality ratio (SMR) in JDM of 2.64 was reported in a US paediatric rheumatic disease registry, and in a US juvenile myositis cohort, a SMR of 14.4 (17 deaths) was reported for the entire cohort and of 8.3 (8 deaths) for JDM [23].

Cardiovascular Health

Idiopathic inflammatory myopathies have been shown to be associated with an increased risk of cardiac involvement and atherosclerosis across the lifespan. The mechanisms thought to be causative of cardiac involvement are atherosclerosis and myocarditis [24]. Pericarditis has been reported in 12–15% of patients with JDM throughout the disease course [24]. Increased endothelial damage has been reported in JDM with high circulating levels of microparticles (causing risk of vaso-occlusive disease) and increased arterial stiffness during active disease [25]. These factors, combined with traditional risk factors, exposure to corticosteroids and chronic inflammation, could well be contributors to early-onset atherosclerosis in the patient group.

In view of the above, anticipatory, developmentally appropriate guidance to promote cardiovascular health with respect to avoidance of nicotine, weight management, physical activity and dietary advice with respect to lipids is an important aspect of care for AYAs with JDM.

Sexual and Reproductive Health

There are no published data describing sexual health and fertility in adolescents and young adults (AYA) with JDM. Anticipatory guidance regarding contraception and safe sex practices is of particular importance for those taking teratogenic medication. Chen et al. described pregnancy outcomes in women with rare autoimmune diseases including polymyositis/dermatomyositis (DM) [26]. The entire cohort

included 409 births to 293 women with a median age of 33 years (range 16.7–45.9 years). Although most delivered healthy infants, they were at increased risk of adverse maternal and neonatal outcomes compared to healthy controls. Women with JDM should be monitored closely during pregnancy.

Vocational Outcomes

In a recent study investigating patient-reported long-term outcomes in IIM ($n = 84$), among respondents at school or in higher education, 13 out of 29 (44.8%) reported that their academic results were adversely affected by myositis, and that time missed, muscle weakness and fatigue were all significant contributors. Around two-thirds of respondents found that myositis had made it difficult to study. Fourteen of 50 (28%) reported career compromise caused by myositis; of these, 10/37 (27%) were employed, and 4/13 (30.8%) were unemployed. Among 47 AYAs aged 18–24, there were 21 (44.7%) who were employed; AYAs in this study were twice as likely to be unemployed compared to the corresponding age group in the UK population ($p = 0.001$, OR 0.456, 95% CI 0.24, 0.84) [3].

Conclusion

JDM in AYAs is rare, but recent studies demonstrate that chronic disease into adulthood is more common than previously recognised. JDM exhibits several important differences from adult-onset disease in that it has a lower SMR, a better response to treatment and no known association with malignancy. However, skin disease is often worse, and calcinosis and vasculopathy affecting other organ systems are more common in childhood. As with childhood-onset SLE, increased cardiovascular risk has been demonstrated, and so disease monitoring should include regular CV risk assessment and counselling. Sun exposure should be limited with the careful use of

photosensitising medications in order to prevent disease flare. AYAs with JDM need careful and thorough transition plans with involvement of adult physicians in the process. Pregnancy in AYAs with JDM also needs more intensive surveillance because of a higher incidence of adverse maternal and neonatal outcomes. More research is needed and is supported by the evolving, multinational cohorts of patients using harmonised

Key Management Points

1. JDM is a rare disease which still requires vigilance to recognise early in the disease course.
2. AYA with JDM should be managed in centres where multidisciplinary care can be provided.
3. JDM is more often persistently active in the longer term than previously recognised with significant associated organ-based and psychosocial morbidity.
4. Better understanding of disease phenotypes will provide the ability to personalise treatment and improve outcomes.

datasets, so that we can improve treatment and thus outcomes for these young people.

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Chapter 10
Systemic Vasculitis in Adolescence and Young Adulthood

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Key Management Points

1. Systemic vasculitides are a group of disorders, characterized by inflammation of vessel walls.
2. Some type of vasculitides are more common or more severe in adolescence and young adulthood.
3. For professionals caring for AYA with vasculitis, stage and developmental considerations of adolescence and young adulthood must be considered.
4. Effective transition programs are needed for AYA with vasculitides for a better transfer of AYAs to adult clinics.

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Introduction

Systemic vasculitides are a group of disorders, characterized by inflammation of vessel walls. The estimated incidence of pediatric vasculitis is approximately 50 cases per 100,000 children per year [1]. However, the incidence and prevalence of vasculitis among adolescents are unknown.

Adolescence is a unique period of life (see Chaps. 1, 2 and 3) and poor health status during adolescence may lead to lifelong persistent effects [2]. Since vasculitides have chronic and devastating features, it is important to be aware of the problems to be anticipated at adolescence and take a multidisciplinary approach with an AYA perspective in caring for AYA with vasculitis.

Definitions and Classifications

The vasculitides are mainly classified according to predominant size of involved vessels. In 2012, the International Chapel Hill Consensus Conference (CHCC 2012) updated the definition of vasculitides (Fig. 10.1) [3]. Pediatricians have established the *Ankara* classification criteria which includes criteria for the main vasculitides of childhood and was endorsed by EULAR/PReS/PRINTO [4, 5] (Table 10.1).

Clinical and Laboratory Findings of Systemic Vasculitides

Clinical features of the systemic vasculitides may vary according to predominant size of involved vessels. Constitutional symptoms such as malaise, fever, weight loss, myalgia, and arthralgia may accompany their course.

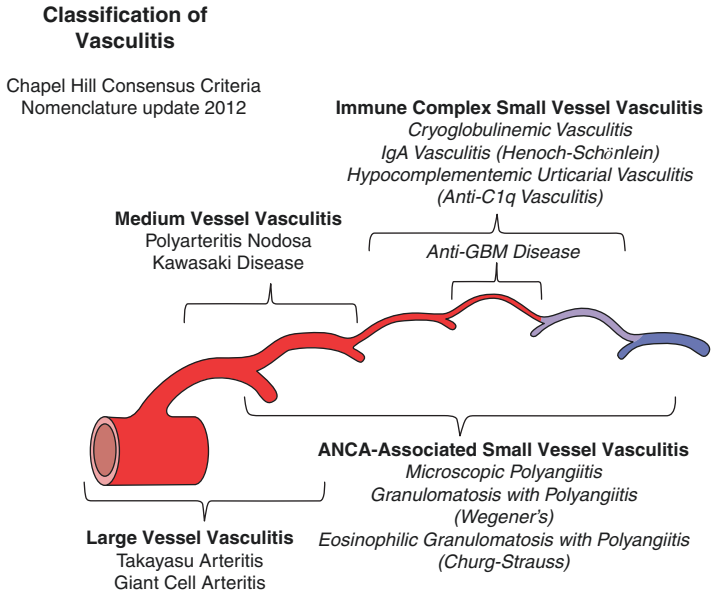

FIGURE 10.1 Chapel Hill Consensus Conferences 2012 classification criteria for systemic vasculitis [3]

There is no diagnostic laboratory test for vasculitides except for Antineutrophil cytoplasmic antibody (ANCA – see below). Elevated acute phase reactants such as C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) are common. Urinalysis and renal function tests should be performed to monitor renal involvement routinely. Renal and liver function tests, echocardiogram, slit lamp examination of eyes and appropriate evaluation of the lung should also be a part of the work-up in the assessment of vasculitis (Fig. 10.2).

The main features and treatment approaches for vasculitides will be summarized, emphasizing issues related to adolescence and young adulthood.

Table 10.1 Ankara 2008 criteria [4, 5]*

IgA vasculitis	Purpura or petechia (mandatory) with lower limb predominance plus 1 of 4: Abdominal pain Histopathology (predominant IgA deposit in a biopsy) Arthritis or arthralgia Renal involvement
Polyarteritis nodosa	Histopathology or angiographic abnormalities (mandatory) plus 1 of 5: Skin involvement Myalgia/muscle tenderness Hypertension Peripheral neuropathy Renal involvement
Granulomatous polyangiitis	At least 3 of 6 Histopathology (granulomatous inflammation) Upper airway involvement Laryngo-tracheo-bronchial stenosis Pulmonary involvement (chest X-ray or CT showing the Presence of nodules, cavities, or fixed infiltrates) ANCA positivity Renal involvement
Takayasu arteritis	Angiography (conventional, CT or MRI) of the aorta or its major branches and pulmonary arteries showing aneurysm/dilatation, narrowing, occlusion or thickened arterial wall (mandatory) plus 1 of 5: Pulse deficit or claudication Four limbs blood pressure discrepancy >10 mmHg Bruits Hypertension (>95 percentile for height) Elevated acute phase reactants

*Adapted from European League Against Rheumatism, Paediatric Rheumatology International Trials Organization and Paediatric Rheumatology European Society (EULAR/PRINTO/PRES) Ankara 2008 criteria.

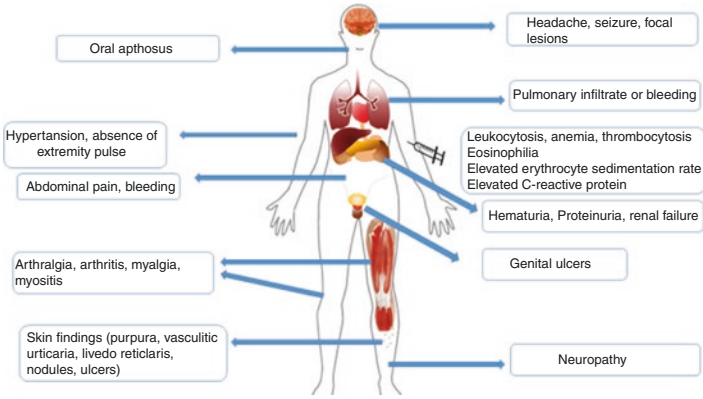

FIGURE 10.2 Clinical and laboratory finds that suggest a systemic vasculitis

Predominantly Small Vessel Disease

Immunoglobulin A Vasculitis (IgAV)/ Henoch-Schönlein Purpura (HSP)

Immunoglobulin A vasculitis (IgAV)/Henoch-Schönlein purpura (HSP) is the one of the most common vasculitides during childhood with an annual incidence of 13–20/100,000 [1]. It occurs most frequently between the age of 3 and 15 with a male predominance [1].

In adolescent male patients the gastrointestinal involvement is more severe; furthermore previous studies have demonstrated that older children have a more severe course with worse renal outcomes and relapsing course than younger children [1].

There is no specific test for IgAV/HSP. Urinalysis should be performed to monitor renal involvement routinely for 1 year [1]. Ultrasound studies may help to detect specific gastrointestinal abnormalities in children with abdominal complaints such as dilated loops of bowel or intussusception.

The main therapy of IgAV/HSP depends on a conservative approach pain relief and hydration. Corticosteroids are used

for severe GI involvement. Routine steroid treatment does not protect from renal involvement. Whilst we lack high evidence data for the best management of renal involvement, corticosteroids combined with other immunosuppressive agents are often used [1].

Antineutrophil Cytoplasmic Antibody (ANCA) Associated Vasculitis (AAA)

Antineutrophil cytoplasmic antibody (ANCA) associated vasculitis (AAV) is a group of vasculitides, including granulomatosis with polyangiitis (GPA) (formerly known as Wegeners Granulomatosis), eosinophilic granulomatosis with polyangiitis (EGPA) (previously known as Churg-Strauss syndrome), microscopic polyangiitis (MPA), and single organ disease (renal-limited vasculitis). AAV mainly is characterized with predominantly small size vessels inflammation, and commonly the presence of ANCA [3].

Granulomatosis with polyangiitis (GPA) presents mainly with granulomatous inflammation of upper and lower respiratory tracts, necrotizing, pauci-immune glomerulonephritis, but may also present with multi-systemic involvements. In the pediatric population, GPA occurs around adolescence, with a median disease onset is 11.6 years old in pediatric age and an estimated incidence of 0.1 per 100,000 [6].

Meta-analysis data shows [7], about 69% of pediatric GPA patients were anti-PR3 ANCA (c-ANCA) positive, while presence of anti-MPO ANCA (p-ANCA) was approximately 21% among the pediatric GPA patients [7]. The characteristic histopathological findings are granulomatous inflammation of predominantly small vessels or pauci-immune glomerulonephritis [7]. Chest X-rays may show pulmonary nodules, infiltrations, cavitations, pleural effusions. High resonance computed tomography is more sensitive to detect pulmonary abnormalities, and magnetic resonance imaging is highly helpful to determine ENT involvement.

Microscopic polyangiitis (MPA) has limited epidemiological data in childhood and adolescent. A meta-analysis

in adults showed that 94% had renal involvement, 79% had systemic symptoms, 57% musculoskeletal involvement, 44% cutaneous findings, 37% pulmonary involvement (pulmonary hemorrhage), and 28% GI involvement [7]. Almost all of these adult patients were anti-MPO ANCA (93%) positive whereas only 5% patients were anti-PR3 ANCA positive [7].

Eosinophilic granulomatosis with polyangiitis (EGPA) formally known as Churg-Strauss syndrome, is a rare necrotizing vasculitis, characterized by severe asthma or allergic rhinitis, along with skin, cardiovascular, renal, nervous system, GI system involvements. EGPA is a very rare disease in children. There are no validated, standard classification criteria for pediatric EGPA patients. According to the American College of Rheumatology (ACR) criteria for classification of EGPA, patients can be classified as EGPA in presence of at least four of the following criteria: (1) asthma, (2) eosinophilia (eosinophil counts >10% of differential white blood cell count), (3) history of allergy, (4) mononeuropathy or polyneuropathy, (5) pulmonary infiltrates, (6) paranasal sinus abnormality, (7) extravascular eosinophilia [8].

Elevation of serum immunoglobulin E and peripheral blood eosinophilia are common. Approximately 25% of pediatric EGPA patients are MPO-ANCA positive [9]. The main findings in pathology specimens of EGPA patients are angiitis and extravascular necrotizing granulomas accompanied by eosinophilic infiltration.

The treatment of AAV includes remission induction and maintenance therapy. In case of new onset organ-threating or life-threating AAV, treatment with a combination of glucocorticoids and either cyclophosphamide or rituximab is recommended for the remission-induction. However, in patients with non-organ threating AAV, combination of glucocorticoids and either methotrexate or mycophenolate mofetil may be preferred for remission-induction [10]. Combination of low-dose glucocorticoids and either azathioprine, rituximab, methotrexate or mycophenolate mofetil are used as maintenance treatments [10].

Predominantly Medium Vessel Disease

Polyarteritis Nodosa (PAN)

Polyarteritis nodosa (PAN) is a primary systemic necrotizing vasculitis, characterized by inflammatory lesions of medium size vessels [11]. It is estimated to be the third most common vasculitis among the children [12].

According to largest multicenter study including 110 pediatric PAN patients (63 with systemic PAN), 74.5% had cutaneous lesions, 17.3% had GI involvement, 14.5% had nervous system symptoms, 11.8% had renal involvement, and 5.5% had cardiac findings [13]. Laboratory work-up usually reveals leukocytosis, thrombocytosis and elevated acute phase reactants. ANCA is negative. The typical histopathological finding in PAN is fibrinoid necrosis of the predominantly medium size arteries walls with an inflammatory response surrounding the vessel wall [11]. Characteristic features in angiography are aneurysms in renal, celiac, mesenteric, or other arteries. Although conventional angiography is accepted as a gold standard, computerized tomography angiography has emerged an alternative, non-invasive technique to detect vasculitic lesions [14].

Classic treatment of PAN is glucocorticoids and cyclophosphamide as remission induction and either azathioprine or methotrexate combination with low-dose steroid as maintenance treatment [15].

Kawasaki Disease (KD)

Kawasaki disease is an acute vasculitis of childhood, resulting in coronary artery aneurysms in around 25% of the untreated cases. It is predominantly a disease of young children and is very rare in adolescence, although it may have important cardiovascular sequelae for AYA (see below). A patient may be classified as having KD when they have fever for more than 5 days plus at least four following clinical findings: (1) bilateral conjunctival injection, (2) changes in oropharyngeal mucous (fissured lips, strawberry tongue, injected pharynx), (3)

changes in peripheral extremities (erythema, edema of hands and feet, desquamation), (4) polymorphous rash, (5) cervical lymphadenopathy. A single administration of 2 g/kg intravenous immunoglobulin (IVIG) plus acetylsalicylic acid (ASA) (with a total daily dose of 80–100 mg/kg/day in the United States and 30–50 mg/kg/day in Japan and Western Europe) is the still standard therapy of KD [16]. In the presence of coronary abnormalities, low dose ASA should be continued indefinitely [16]. In IVIG resistance cases, high-dose pulse steroids, infliximab, cyclosporine, and anakinra are indicated [16].

Predominantly Large Vessel Disease

Takayasu Arteritis (TA)

Takayasu arteritis (TA) is a chronic, granulomatous vasculitis of large vessels, involving aorta and its major branches. TA is rare in children and the incidence is unknown. TA is mostly seen among adolescents with a median age of diagnosis of 11.8 years among children [17].

The most common findings at diagnosis are arterial hypertension (82%), headache (31%), fever (29%), dyspnea (23%) and weight loss. Conventional angiography, MR angiography and CT angiography are used for diagnosis and assessing the extent of involvement.

Steroids are still the mainstay of therapy in TA. Immunosuppressive agents or biologics may be administered for remission induction and maintenance treatment may continue with lower dose of steroids and methotrexate [17, 18]. Surgical procedures may be required for treatment due to the destructive effect of the disease on the large vessels [19].

Variable Vessel Disease

Behçet's Disease (BD)

Behçet's disease (BD) was first described as a clinical triad of aphthous stomatitis, genital ulceration, and uveitis although it

is now known that BD is a variable vessel vasculitis, characterized by multi-system involvement. Roughly, 5–8% of BD patients have disease onset in childhood and the usual presentation is in adolescence [20, 21]. An international expert consensus group (the pediatric BD [PEDBD] group) has established a new set of classification criteria for pediatric Behçet's Disease (BD) [22]. By the PEDBD criteria patients are classified as having BD when they have three or more of the following criteria [22]:

1. oral aphthosis (≥3 attacks per year)
2. genital aphthosis (typical with scars)
3. skin involvement (necrotic folliculitis, acneiform lesions, erythema nodosum)
4. neurologic involvement (except isolated headaches)
5. ocular manifestations (anterior uveitis, posterior uveitis, retinal vasculitis)
6. vascular signs (venous thrombosis, arterial thrombosis, arterial aneurysms).

BD may affect all vessel sizes and involves both arteries and venules. Central nervous system, musculoskeletal, gastrointestinal, cardiac, pulmonary involvements, orchitis, renal vasculitis, and glomerulonephritis may accompany the disease [20, 23]. Angiography and magnetic resonance imaging are used to assess vascular and central nervous system involvement [20, 23].

Oral aphthosis is common in young people, the majority of whom who will not have BD. Furthermore, sexually transmitted infections should also be considered in the assessment of genital aphthosis in this age group (see below).

The treatment of BD usually depends on the site and severity of involvement. Mild oral or genital ulcers are usually treated with topical therapies (corticosteroid- or lidocaine-containing creams, sucralfate suspension) and colchicine. Azathioprine, interferon alfa, and TNF-α antagonists are recommended for refractory cases. Vascular involvement is a serious complication in BD. Corticosteroids and azathioprine, treatments are recommended for acute deep vein thrombosis, while cyclophosphamide and corticosteroids are

recommended for pulmonary and peripheral artery aneurysm. Corticosteroids, IFN-alpha, azathioprine, cyclophosphamide, methotrexate and anti-tumor necrosis factor-alpha may be used for central nervous system involvement [24].

Differential Diagnosis of Vasculitis in Adolescence and Young Adulthood

A number of diseases that mimic systemic vasculitides need to be excluded (Table 10.2) and in AYA it is important to consider and ask about substance use and sexually transmitted diseases (see Chap. 4).

Treatment and Follow-up of AYA with Systemic Vasculitis

Treatment goals are both to control disease, but also help AYA with vasculitis to achieve a good quality of life. Thus, patients should be evaluated not only for disease activity but also for the burden of the disease (see Chaps. 2 and 3) and

Table 10.2 The disorders in the differential diagnosis of systemic vasculitides [25]

Infections (human immunodeficiency virus, hepatitis B virus, cytomegalovirus, Epstein-Barr virus, parvo B19 virus, herpes zoster and varicella, tuberculosis, syphilis, typhus, rickettsia, endocarditis, etc.)
Malignancy (lymphoma, leukemia)
Substance use (cocaine, marijuana)
Systemic autoimmune/inflammatory diseases (systemic lupus erythematosus (may cause a secondary vasculitis), juvenile dermatomyositis, sarcoidosis)
Primary immune deficiency syndromes (Wiscott-Aldrich syndrome, interleukin-12 receptor beta-1 deficiency, recombination-activating 1 or 2 gene defects, etc.)

specific treatment side effects. Success in treatment mainly depends on the adherence to therapies which for AYA needs a multidisciplinary approach, including the psychologist (see Chap. 19).

Glucocorticoids remain the main treatment for remission induction and maintenance in systemic vasculitis. Patients, treated with long term corticosteroids, still are at risk of serious side effects such as Cushing syndrome, growth suppression, osteoporosis (see Chap. 16), metabolic effects, immunosuppression, glaucoma, hypertension, and mood disorders.

Gonadal toxicity is a common long-term consequence of cyclophosphamide. The risk of gonadal toxicity is increased after puberty. Administration of intravenous bolus cyclophosphamide has lower total cumulative dose than daily oral administration [26]. Luteinizing hormone–releasing hormones may protect the ovaries against cyclophosphamide-induced damage [27].

Kawasaki disease (KD) is the most common cause of acquired heart disease during childhood in developed countries. Furthermore, KD is becoming an important cause of myocardial ischemia in young adults. Patients should be followed by cardiologists routinely [16]. Apart from KD the association between CAD and vasculitis is scare in childhood, although adult studies have demonstrated an increased risk of coronary artery disease (CAD) among the patients with rheumatic disease.

Transition to the adult clinics is another sensitive issue to be dealt with in this period (see Chap. 21) and is often more complex for AYA with vasculitis in view of the number of different disciplines involved.

According to the World Health Organization (WHO) about 16 million girls aged 15–19 give birth every year, mostly those living in low- and middle-income countries. Chronic health problems such as vasculitis may further threaten the health of the baby and the mother. From adult studies, it is well known that pregnancy complications, including pregnancy loss and preterm birth, are higher among women with

vasculitis [28]. For those conditions with a thrombotic tendency eg BD, oestrogen containing contraceptives are contraindicated. Promotion of cardiovascular health is similarly important with advice and support regarding the importance of physical activity, weight management and avoidance or nicotine and/or other drug use is integral to the management of such young people.

Summary

In conclusion, certain vasculitides are more common or more severe in adolescence and young adulthood. The burden of the disease and side effects of treatment may have a more pronounced effect for AYA. An effective, multidisciplinary and interdisciplinary transition program is required for an effective and holistic transfer of adolescents to adult clinics.

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Chapter 11
Hypermobility in Adolescence and Young Adulthood

Ellie Potts

Introduction

Distinguishing potentially advantageous hypermobility from that which is troublesome to young people (problematic hypermobility causing pain and fatigue during or after activities) is often challenging. There is a broad spectrum of joint flexibility within the normal population [1, 2], and joints and soft tissues normally become less flexible with age. With the onset of puberty, hormonal changes have an impact upon joint flexibility and function of surrounding muscles (see Chap. 1). The tendency for young people to develop pain and fatigue with hypermobility may change throughout adolescence and young adulthood. This relates to growth and hormonal influences on the musculoskeletal system, as well as changing exercise patterns and demands of young people.

Pain has a reduced impact upon function in high performing athletes who combine flexibility with extreme strength and agility. Similarly, the overall aim in management of

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problematic hypermobility is to help the young person regain control over flexible joints and improve function despite pain. A goal-based practical approach helps young people to rehabilitate to better cope with physical challenges they may face. This chapter will discuss both assessment and rehabilitation.

Terminology

Problematic hypermobility may be referred to using several different terms. The most common of these are hypermobility syndrome, joint hypermobility syndrome, benign joint hypermobility syndrome (to distinguish from hypermobility due to an underlying connective tissue or genetic disorder), Ehlers-Danlos syndrome hypermobility type (EDS-HT), generalised joint laxity, generalised joint hypermobility and, most recently, hypermobility spectrum disorders [3]. For simplicity this chapter will use the umbrella term hypermobility (HM) to refer to all these conditions.

Diagnosis

Initially described in the 1960s using the Berlin nosology (1988) and latterly the Villefranche nosology (1998), the criteria for diagnosis of HM have evolved over time. In 2017 an updated EDS classification was proposed including HM [3]. Since then there has been a drive to make the old terminology obsolete and replace HM previously classified as non-genetically proven EDS-HT with the term hypermobility spectrum disorders [3].

It is important to differentiate HM from other hereditable connective tissue disorders which may present with hypermobile joints. These include the Ehlers-Danlos spectrum (classical and type 7), Marfan's syndrome, Stickler's syndrome, osteogenesis imperfecta, skeletal dysplasias, velocardiofacial syndrome, Loeys-Dietz syndrome and trisomy 21. These conditions have clinical features distinguishing them from HM,

and the majority are identified at an early age. Skeletal dysplasia is one potential exception in which isolated joint hypermobility can present in younger years, prior to progressing joint squaring with loss of range of movement (ROM), particularly at the hips, knees, shoulders, elbows and spine, during adolescence.

The fundamental distinction of problematic HM from increased joint flexibility is based upon:

- The presence of pain and/or fatigue during/after activity with relation to joint flexibility
- Intermittent joint swelling, lasting for only a few hours or days
- Poor muscular control around a flexible joint

Presenting symptoms of HM in AYA are frequently isolated to the knees, shoulders, back or hands. The incidence may rise around the transition from primary to secondary school and during the AYA years. These are typically periods of increased physical activity during daily life, through attendance at larger schools or work, as well as the demands of sports and physical education at a time when muscle strength and control are less developed and co-ordinated. Since the speed of bone growth exceeds that of muscle, there is typically a lag period in muscle lengthening, or muscles may tighten with overuse. This is commonly seen with knee and lumbar flexibility in AYA.

Muscles need to be strong and fit to carry out their roles of power, stability and endurance. Young people with HM often have muscle weakness [4], which may be associated with fatigue [5]. The presence of pain is linked to the severity of fatigue. These adversely impact upon health-related quality of life [6].

Flexibility reduces with age. A young person who is hypermobile at the beginning of puberty may lose flexibility with skeletal and muscular maturity. The growing young person can have fluctuating symptomatology linked to their joint range and muscular control during this period. Ongoing reassessment of the AYA's needs is pivotal in their rehabilitation, alongside reassurance by specific discussion of typical changes young people may experience.

Scoring Systems

The classification of HM is based upon several scoring systems (Table 11.1). Historically the main scoring system in clinical practice is the Beighton scale (1973) [7]. As with all classifications, there are some challenges and limitations.

Although the most widely used, there are shortcomings in the validity of the *Beighton scale* [7–9]. When tested in the paediatric population, scores did not correlate with post-activity pain, suggesting other factors may be at play [7]. The reproducibility of the test is modest with a kappa score of 0.75–0.8 at most joints, falling to 0.6 at the fifth finger and elbows [7]. Assessment is limited to the sagittal plane, and the score fails to assess other key joints including the shoulder, which is commonly associated with pain and/or instability in the hypermobile adolescent and adult. A self-reported Beighton scale has been validated in adults aged 20–66, although this has lower reproducibility and is yet to be validated in adolescents [8]. Despite these limitations, the score is clinically useful provided it is applied in a consistent manner using a cut-off ≥5/9 to diagnose HM.

The *Brighton criteria* were devised to further classify HM. It expands upon true joint-related flexibility to include the contribution from skin elasticity, arthralgia and extra-articular features [10]. This uses a lower Beighton cut-off than the current consensus (≥4/9), carrying a risk of overdiagnosis. Currently only validated in the adult population, it has good reliability and validity of the musculoskeletal manifestations. The skin signs are less clear (kappa = 0.63) [10].

Lower Limb Hypermobility Assessment Score (LLHAS) assesses the physiological and accessory ROM of hips, knees, ankles and feet. It has excellent intra- and inter-rater reliability in 5–16-year-olds using a cut-off ≥7/11, but variable sensitivity and specificity. The same has been shown in young adults (aged 20–30 years) with improved specificity and moderate sensitivity [11].

Like the LLHAS, the *Upper Limb Hypermobility Assessment Tool (ULHAT)* is relatively new but has been

Table 11.1 Scoring systems for hypermobility

Tool	Description	Advantages	Limitations
Beighton scale [7–10]	9-point ROM scale Hands (4 points) Knees (2 points) Elbows (2 points) Spine (1 point) Cut-off ≥5/9	Simplicity Widespread clinical use	Lacks clear, validated instructions Overlooks problem areas (hips, feet and shoulders)
Brighton criteria [10]	2 major criteria, 8 minor criteria 2 major criteria Or one major and ≥ 2–4 minor criteria	Validated in adults with good reliability	Skin criteria unreliable Not validated in adolescents or children
Lower limb hypermobility assessment score (LLHAS) [11]	Accessory and physiological ROM Hips Knees Ankles Feet Cut-off ≥ 7/11	Reliable in children and AYA	Variable sensitivity and specificity Small sample size
Upper limb hypermobility assessment tool (ULHAT) [12]	Accessory and physiological ROM Shoulders Elbows Hands Cut-off ≥ 7/12	Valid in later AYA population	Validated in predominantly Caucasian population Small sample size

shown to identify those with likely or known hypermobility. The recommended cut-off of ≥7/12 best distinguishes those with upper limb hypermobility from those without. It did not reach significance when correlating and discriminating between age and ethnicity, and further work is needed to validate in the younger adolescent population and wider ethnicities and assess inter-rater reliability [12].

Hypermobility Rehabilitation of the AYA

A functional and practical approach to symptom management is essential for young people with problematic HM. It is often helpful to list current problems and how best to address them, prior to discussing the concept of HM. Treatment should include interdisciplinary management looking at education (including nutrition); physical and occupational therapies to address functional, physical and fatigue-related issues; psychological intervention to facilitate pain and mood management; and in some cases surgical intervention with appropriate and timely rehabilitation.

Physical and Functional Management

To date there is limited specific evidence for the management of adolescents with musculoskeletal pain secondary to HM. However one can extrapolate evidence from the management of children, adults and sports training principles. Exercising into the hypermobile range reduces pain-related psychosocial factors with HM [6]. As with all RMD, it is important to consider bone mineral density development in adolescence (see Chap. 16), promoting weightbearing exercise.

Adolescents with increased hypermobility may have impaired balance particularly in the non-dominant leg and shorter hamstrings. Balance and functional movement control exercises should be part of an effective rehabilitation programme. This is a prelude to plyometrics and power-based dynamic balance work.

Muscle strengthening aims to provide the young person with sufficient strength and endurance to carry out activities they enjoy. Combining progressive muscle strengthening to maintain joint flexibility and function is essential. Current evidence supports a 6–8-week programme [6]. Pacing will gradually and effectively build up stamina to cope with everyday, as well as higher-demand activities and sports. Analysis and paced reintegration of functional activities with a stronger fitter body enable the AYA to positively approach both school and the workplace.

Even high-level sports, people who are hypermobile and well trained have an increased tendency to injury and reinjury, especially during competition. The frequency of training is key as there is a risk of overtraining increasing injury (see Chap. 15). This further highlights the need for young people with HM to carefully maintain their strength and stamina, even during periods of wellness.

Psychological Management

Evidence confirms a link between anxiety and mood in those with HM [13, 14]. The causative factors are unknown; however the impact of mood on musculoskeletal pain should not be underestimated. Holistic management is vital, especially in the complex AYA years. Goal setting, education and pain management are useful to support the young person achieve their targets. The use of activity and developmentally appropriate outcome measures are fundamental to determining effectiveness of treatment. Goal-based outcomes, where individuals identify the support they need to reach their goals, improve rehabilitation adherence [15]. Since AYA brain development continues into the mid-20s (see Chap. 1), it is essential that management in these years adapts as the young person and their needs develop.

Surgical Management

Surgery is generally not warranted in HM, with the exception of specific indications such as stabilisation of a recurrently

dislocating joint. It is important that surgical planning forms part of an MDT approach and that appropriate postsurgical rehabilitation is carried out to ensure the best outcomes [16].

Issues Specific to AYA

Studies looking at long-term disability in AYAs with HM-related disorders support multifaceted rehabilitation, but as yet provide limited insight into long-term prognostic factors [14]. The body goes through many changes between adolescence and young adulthood, and symptoms of HM in the early years may resolve or indeed evolve over time. Adolescent-specific issues tend to be complex, due to the effects of rapid transformation physically and psychologically.

Muscles hypertrophy without hyperplasia during adolescence, reaching normal adult cross-sectional muscle fibre area by the end of puberty. In young men testosterone causes an increase in muscle bulk and consequently strength, which can impact upon joint flexibility. These changes in muscle composition and fibre type lend boys towards strength and girls towards endurance activities. Females are more dependent upon training to improve power, thus influencing the type of treatment they may need to overcome the challenges of HM in adulthood.

There are many different risk factors for pain in HM postulated. A large population-based study of 6000 adolescents identified obesity to be a risk factor for pain in hypermobile girls but not when looking at those with a Beighton score $\geq 6/9$ [1]. Other studies suggest a potential link to those with a more sedentary lifestyles [14]. AYA change rapidly; hence further work is needed to tease this out.

Conclusion

Hypermobility-related problems are common. They require interdisciplinary, goal-orientated rehabilitation which focuses upon eventual self-management for the individual young person.

Key Management Points

- Problematic hypermobility may resolve or evolve through AYA.
- Strengthening, endurance and plyometrics are essential tools in rehabilitation.
- Functional activities and a goal-based approach offer the young person control over their treatment and provide useful steps to achieving their targets.
- Work towards self-management.

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Chapter 12
Chronic Musculoskeletal Pain in Adolescence and Young Adulthood

Jacqui Clinch

Pain is a normal sensation but becomes disabling when persistent and associated with suffering. In AYA, musculoskeletal pains account for up to 64% of all the pain presenting to medical setting [1]. Current evidence regarding epidemiology of pain in AYA is summarized in Table 12.1 and associated features of chronic pain in Table 12.2.

Clinical Features of Chronic Musculoskeletal Pain

General Features

It is not unusual for musculoskeletal pain to start in a localized area of the body before intensifying and radiating to other areas. AYA may be reluctant to mobilize, and avoid

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Table 12.1 Epidemiology of pain in AYA

Type of pain	Prevalence	Reference
Chronic widespread pain (CWP), significant proportion musculoskeletal, sometimes referred to as juvenile fibromyalgia or diffuse idiopathic pain	4.3% in 17-year-olds 14.3% in 18–25-year-olds	[1, 2]
Complex regional pain syndrome (CRPS)	Prevalence in adults is 26 per 100,000 person years. In AYA the incidence in a small cohort UK study is reported as 1.2/100,000	[3]
Chronic back pain	Low back, mid-back and neck pain are reported as problematic in AYA	See Chap. 14
Persistent joint pain following previous or controlled inflammation	In JIA persistent pain is a significant problem for many young people. A significant minority progress to develop musculoskeletal pain as young adults not directly related to control of their JIA	[4]; Also see Chap. 7
Musculoskeletal pain associated with joint laxity/hypermobility	Hypermobility, taking the Beighton Score cut off as 4, is present in 19.8% of the normal UK adolescent population. There is a relationship between localized knee pain and significant hypermobility (Beighton score 6 or above), but not CWP	[5, 6]; Also see Chap. 11

Table 12.2 Factors associated with chronic pain in AYA

Girls experience more musculoskeletal pain than boys
Adolescents and adults with physical disabilities have a higher prevalence of chronic musculoskeletal pain
Young people living in low-educated, low-income families have a 1.4-fold increase in the odds of having back pain
The incidence of chronic widespread musculoskeletal pain peaks in older adolescence
Multiple common symptoms (including joint pain, headaches, abdominal pain) in childhood are associated with a moderately increased risk of chronic widespread pain in adulthood

contact with, or use of, an area of the body affected and develop muscular spasms and abnormalities of posture and gait.

Associated Symptoms and Signs of Chronic Pain in AYA

- Hypervigilance and pain sensitivity that is greater than expected from a given physical trigger.
- Perceived thermodysregulation—more common in adolescent girls. Limbs may be cool and mottled.
- Autonomic dysfunction—pain is a powerful stressor and can heighten sympathetic system activity with tachycardia, hyperventilation (compounded with panic attacks), cold sweats, blurred vision, abdominal pain and extreme pallor.
- Musculoskeletal disequilibrium—these young people are often still growing, and musculoskeletal pain can have lasting effects on the final positioning. Proprioceptive signals from the joints are reduced and the limb held in a rigid, fixed position. As gait alters, the resultant asymmetry can

lead to other vulnerable sites (including lower lumbar, anterior knee and lateral aspect of pelvis) taking an altered load and causing further discomfort. Over time, affected limbs may adopt flexed positions, and tendons tighten, further exaggerating imbalance and pain.

Effect of AYA with Chronic Pain on the Family

Chronic musculoskeletal pain, irrespective of its trigger, can be associated with persistent and recurrent distress, disability, adult attention, widespread family disruption and a tendency to catastrophize. Young people with musculoskeletal chronic pain report sleep disturbance, disordered mood, appetite disruption, low feelings (depression is often masked in this population), social isolation and unwelcome dependency on parents. AYA with chronic pain report that they are less socially developed on virtually every metric than their peers [7].

Specific AYA Musculoskeletal Pain Conditions

Chronic Widespread Pain (CWP)/Juvenile Fibromyalgia

This describes generalized, widespread pain, often located over muscles and joints and with significant pain-associated disability. The onset of pain in CWP is often gradual. There may have been an initial insult or trauma but often there is no trigger. There may be areas of allodynia (profound hypersensitivity to light touch), but there is often an absence of the autonomic changes (including reduced cutaneous perfusion, localized swelling, shiny stretched appearance) seen in more localized pain conditions.

What is striking in the young people with diffuse pain is the associated fatigue, poor sleep pattern and extremely low mood. It is widely believed, however, that low mood in adolescents is reactive (to the pain-associated disability) rather than a primary depression. This is in contrast to adults with fibromyalgia where primary depression is frequently seen. Menstrual cycling has been shown to affect fibromyalgia-related symptoms in nearly 50% of adult patients, and this may be relevant in the adolescent female population.

Complex Regional Pain Syndrome (CRPS)

Rheumatologists frequently encounter patients presenting with CRPS, and the diagnosis and treatment continue to court controversy. The diagnosis of CRPS remains a clinical one. There may be precipitating trauma. In AYA the lower limb is much more commonly involved than the upper limb. The pain is usually out of proportion to the inciting event and accompanied by allodynia. AYA most often describe the pain as burning and describe sensations akin to dysaesthesia. Autonomic changes are present; these include swelling, reduced cutaneous perfusion and thermodynamic instability. As this is present on the background of a developing musculoskeletal system, limbs can become distorted and feet/hands held in seemingly fixed and often flexed positions. Cutaneous blood flow often reduces; the affected limb develops a purplish hue with other colour changes that can cause concern to the AYA and family. The skin takes on a shiny, stretched appearance, with coarse hairs developing in patches.

In adults the updated Budapest Criteria [8] are used to robustly diagnose CRPS. Whilst not validated in young people, these are useful in providing a guidance.

Whilst the pathophysiology remains poorly understood, many features suggest both peripheral and central nervous system involvement [9].

Early recognition and multidisciplinary management are critical in improving outcome and preventing resistant CRPS, but even young people with delayed diagnosis can still have complete functional restoration. Recurrence rates in the same or other locations appear higher than in adults (described in up to 30%), but response to re-initiation of treatment seems to be effective [10].

The Practical Approach to Chronic Pain in AYA

Diagnosis

The goals of history taking are to exclude serious possible causes of pain with main differential diagnoses being trauma, inflammation, infection and malignancy, and physical examination is key (see Chap. 6). Once these are excluded, the next steps are to identify key problems, build a trusting relationship with the young person (and family) and, if possible, identify a treatment plan. Assessment and treatment should be delivered by a multidisciplinary team and focus on rehabilitation and self-management [11].

Assessment of Chronic Pain

Musculoskeletal pain intensity in young people has long been measured using simple severity measurement tools, such as the visual analogue scale. These give a subjective measure of the pain intensity according to the AYA and/or pain perceived by their carer. While useful measures, they give no indication of the impact of pain on the young person. Recently developed multidisciplinary tools that have been validated in JIA-related chronic pain and the more general paediatric pain population include:

- The Bath Adolescent Pain Questionnaire (BAPQ) for measuring the impact of pain on (i) adolescents with chronic pain and (ii) Bath Adolescent Pain-Parental Impact Questionnaire (BAP-PIQ) [12].
- PEDsQL – short quality of life score to assess impact. This has adolescent and young adult versions [13].

Rehabilitation and Self-Management: Multidisciplinary Team Delivery of Physical, Psychological and Pharmacological Therapy and Education

The primary treatment approach to AYA with chronic musculoskeletal pain is one of symptom management and psychosocial rehabilitation [11]. A dedicated team that works consistently with the adolescent and family will facilitate communication, ensure effective delivery of therapy, reduce iatrogenic influences and enable goals to be reached earlier [14]. Most approaches to rehabilitation share common features that include education, symptom control, behavioural science and physical therapy. Early recognition and intervention in an outpatient or inpatient setting are key and, in most cases, lead to a more favourable outcome. Including parents and, where possible, tailoring interventions for them are important. Evaluating and supporting both parent behaviour and responses to their child's pain, further improves outcomes within the family and for the young person [15].

Education

A critical first step in rehabilitation is to offer, reoffer and reinforce an understanding of how one's body may be working to maintain pain. Education about pain may be difficult to grasp because there is a dominant cultural view of pain in

joints and muscles as a warning sign that a disease process or abnormality is present and there is often a need for the AYA and family (and physician) to identify a cause. Education can play a valuable role as a fear reduction strategy, providing information to counter beliefs that they have a unique medical complication or that their symptoms are related to an underlying mysterious disease. Rhetorical devices (metaphors, stories, examples, pictures) that counter the often rigid thinking can be helpful. Explaining the fascinating case of phantom limb experiences can also be helpful to introduce flexibility and challenge the idea that brain signals must signify peripheral damage.

Pharmacotherapy

Many analgesics, given in different modalities, have been used for young people with chronic musculoskeletal pain. Recent Cochrane reviews [16, 17] evaluating data on paracetamol, opioids, antidepressants and anticonvulsants concluded that there was insufficient data in all groups for meaningful analysis. Worryingly young people are turning to increasing amounts of over-the-counter medications and recreational substances to alleviate pain. When considering analgesia it is sensible to follow the WHO guidelines [18] and, if considering opiates, to use these with very frequent reviews as part of a multidisciplinary approach.

Psychological Therapies

Psychological interventions, often devised around a CBT model (with tailored variations), are shown to have a larger impact on function than any pharmacological interventions to date.

It is widely understood that, when directing the rehabilitation of AYA with chronic MSK pain, proactively including dedicated psychology is key.

Physical Therapies

In conditions such as CRPS, early intensive physiotherapy (including desensitization) with behavioural support can provide dramatic reversal of the presenting signs and symptoms for some young people [19]. The aim is accelerated mobilization, but this is hindered if the diagnosis is delayed and access to appropriate physical and psychological rehabilitation is limited. Increase of activity should be gradual and consistent. With musculoskeletal pains the more active the musculoskeletal system becomes, the more likely the muscle spasms and tightening are to reduce. Proprioception improves and any autonomic changes subside. Where possible the AYA should work to devise his or her own 'fitness plan'. Using a local gym rather than a hospital physiotherapy gym allows them to start to return to a more normal environment. Working in this consistent and paced manner can be extremely hard for the AYA and their parents. The pain invariably continues at the beginning (if not throughout), and motivation is poor. Parental anxiety is high and there is a fear that damage will be done. Psychological support during this time is important.

Natural History and Long-Term Outcomes

The natural history of chronic MSK pain in AYA shows that, in many cases, functional and psychosocial outcomes are improved when compared with adults. Early multidisciplinary input (including CBT) has been associated with improved outcomes. CRPS in young people generally has a favourable prognosis if early physiotherapy is initiated and with psychological support. This is improved if the parents are involved in the rehabilitation process. In all AYA MSK pain states, a prolonged time to treatment, presentation with multiple sites, older age, low-income families and female sex are associated with poorer outcome.

Key Management Points

- Untreated complex AYA MSK pain is common and personally, socially and financially burdensome for individuals, families and societies.
- Ensure an early, thorough history and physical musculoskeletal examination to rule out new or suboptimally treated pathology in children with chronic musculoskeletal pain.
- Evaluate the impact of the pain on the AYA and family (not just the level of pain) so that rehabilitation can be tailored.
- Involve a multidisciplinary team early (ideally in joint clinics) to facilitate cohesive working and the introduction of psychological and physical therapies.
- Evidence shows that early dedicated therapy can significantly improve the outcome of chronic musculoskeletal pain during adolescence and young adulthood.
- Key areas for further research include evaluating the physiology of adolescent musculoskeletal pain, the role of parents and the efficacy of pharmacological interventions in young people.

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Chapter 13
Autoinflammatory Conditions in Adolescence and Young Adulthood

Eileen Baildam

Introduction

The rarity of AIC can lead to delayed recognition throughout adolescence and into adulthood [1, 2]. Some resolve in childhood but more require long-term care into adult life.

The Eurofever project [2] has recruited patients from 28 countries with an age range of 0–67 allowing assessment of long-term outcomes and responses to modern treatment. However, the range of diseases and overlaps in presentation make it difficult to apply specific labels at times. Table 13.1 highlights the number of genetic variants for four well-characterized phenotypes of AIC (with more being identified all the time). The age range at diagnosis means that AYA with AIC are an important group to consider.

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Table 13.1 Demographic characteristics of patients from Eurofever project [2]

Disease	Familial Mediterranean fever (FMF)	Mevalonate kinase deficiency (MKD)	TNF receptor-associated periodic fever syndrome (TRAPS)	Cryopyrin-associated periodic fever syndrome (CAPS)
No of patients	346	114	158	133
No of countries	28	12	18	16
No of variants	28	48	46	27
No of combinations	33	50		
Heterozygous	26	46		
Homozygous	7	4		
Age at onset (years median and range)	3 (0–67)	0.5 (0–11)	4.3 (0–63)	0.8 (0–45)

Presenting Features of AIC

Key features suggesting possible AIC are recurrent febrile episodes, sometimes with predictable timing, associated with stereotypical and repeated symptoms of multi-organ inflammation. These include skin rashes that can be urticarial or neutrophilic, periorbital or perioral swelling, inflammation of mucosal and serous membranes, or serositis. Myalgia and arthralgia with intermittent muscle, joint, and fascial inflammation may mimic other rheumatological conditions like dermatomyositis. Gastrointestinal symptoms including vomiting and mouth ulcers are common with hepatosplenomegaly with or without lymphadenopathy. The central nervous system, hearing, and eye features all vary in severity. Acute phase reactants are raised, and neutrophilia is common with episodes, such that infections are rightly considered and ruled out with significant flares.

Pathogenesis

Many AIC are caused by defined mutations affecting function of the innate immune system. Some are clear monogenic autoinflammatory disorders (see Table 13.2). Other disorders, now considered to be related to autoinflammatory conditions (e.g., systemic onset juvenile idiopathic arthritis, chronic multifocal osteomyelitis, Behcet's disease, and the crystal arthritides), appear to be more polygenic. In these cases the autoinflammatory label is based more on interleukin 1 (IL1) overproduction or responses to anti-IL1 receptor blockade rather than genetics.

There is disordered control of the inflammasome and of apoptotic processes because of the genetic abnormalities [1] and cells have an abnormal way of sensing danger. The inflammasome is the part of the cell where caspase-1 and production of pro-inflammatory cytokines like IL1beta are activated and prepared for defending against infection. In AIC this response is apparently triggered spontaneously and

Table 13.2 Summary of autoinflammatory conditions

Name	Inheritance and associated gene	Mutated protein	Clinical features and treatment	AYA specifics
FMF	AR *MEFV* (16p13.3)	Pyrin	Attacks last 1–3 days with recurrent fever, serositis (abdominal and chest pain), arthralgias or arthritides, and severe headaches; boys get testicular pain and swelling and erysipelas-like skin eruption on legs. Amyloidosis complicates untreated, resistant, and non-compliant patients Increased CRP and WCC during attacks Treatment with colchicine	Fever is often the only presenting symptom in children. The symptoms tend to accumulate and progress toward adult life in this most common autoinflammatory disorder

TRAPS	AD *TNFRSF1A* (12p13)	Tumor necrosis factor 1	Recurrent fever, migrating muscle and joint involvement, abdominal pain, serosal inflammation, headache, chest pain, red swollen eyes, lymphadenopathy, steroid responsiveness of febrile attacks, conjunctivitis, periorbital edema, and amyloidosis Increased CRP and WCC during attacks Febrile episodes last for weeks; symptoms can be continuous Treatment with steroids and anakinra (IL1 blockade)	Differences between pediatric and adult-onset attacks in TRAPS associated with the R92Q mutation [3]. Attacks last longer in adult patients (mean/median from 7 to 21 days) than in children (from 4 to 9 days). Clinically features are similar, but adults had more chest pain and headaches than children, while children had more abdominal pain and pharyngitis [2]

(continued)

Table 13.2 (continued)

Name	Inheritance and associated gene	Mutated protein	Clinical features and treatment	AYA specifics
MKD Hyper-IgD syndrome (HIDS)	AR *MVK* (12q24)	Mevalonate kinase	Recurrent fever, polymorphous rash, arthralgias, abdominal pain, vomiting and diarrhea, lymph node enlargement, headache, splenomegaly, oral and genital aphthosis, large joint arthritis, and high rate of self-resolution during adulthood. Increased CRP and WCC during attacks Attacks last 3–7 days Treatment with anakinra (IL1 blockade) or anti-TNF	Attacks may decrease in frequency and severity in young adult life in some patients, but remission is unlikely. Menstruation can precipitate attacks
DADA2	AR CECR1 (Cat Eye Syndrome Chromosome Region 1) gene	Adenosine deaminase 2	Early-onset vasculopathy livedoid skin rash, systemic manifestations with fever, CNS involvement and mild immunodeficiency, hemorrhagic and ischemic strokes Treatment possible anti-TNFs or stem cell transplant 3,4	

FCAS	AD *NLRP3/CIAS1*	Cryopyrin	Recurrent fever, cold-induced urticaria-like rash, conjunctivitis, and arthralgias Treatment with anakinra (IL1 blocker)
MWS	AD *NLRP3/CIAS (1q44)*		Recurrent fever, urticaria-like rash, conjunctivitis, arthralgias, sensorineural deafness, and amyloidosis Treatment with anakinra (IL1 blocker)
NOMID/ CINCA	AD/sporadic *NLRP3/CIAS1*		Sub-continuous fever, chronic urticaria-like rash, uveitis, papilledema, deforming arthritides involving large joints (patellar), aseptic chronic meningopathy, sensorineural deafness, and amyloidosis Treatment with anakinra (IL1 blocker)

(continued)

Table 13.2 (continued)

Name	Inheritance and associated gene	Mutated protein	Clinical features and treatment	AYA specifics
NLRP12	AD *NLRP12 (19q13.42)*	NLRP12 (monarch-1)	Recurrent fever after cold exposure, arthralgias, and cold-induced urticaria-like rash	
Schnitzler's syndrome	Unknown		Fever, urticarial rash, joint pain and swelling, swollen glands, increased plasma cells, and monoclonal gammopathy Treatment IL1 blockade (anakinra or canakinumab)	Rare onset in late adolescence, usually presents in middle age
Blau syndrome	AD *NOD2/ CARD15* (16q12)	NOD2	Intermittent fever, granulomatous dermatitis with ichthyosis-like changes, granulomatous polyarthritis, recurrent panuveitis, and onset before 5 years	Usually a diagnosis of young children, NOD2-associated autoinflammatory disease associated with *CARD15/ NOD2* polymorphisms and with phenotypic resemblance to BS has been reported in adults also

Early-onset sarcoidosis	Sporadic		
PAPA	*AD* *PSTPIP1* (15q24–q25.1)	CD2 antigen-binding protein 1	Pyoderma gangrenosum, cystic acne, and sterile pyogenic oligoarthritis after minor knocks or damage
MS	AR *LPIN2* (18p11.31)	Lipin	Recurrent multifocal osteomyelitis, dyserythropoietic anemia, and chronic dermatosis
DIRA	AR *IL1RN* (2q14)	Interleukin-1 Receptor antagonist	Neonatal onset-multifocal osteomyelitis, periostitis of ribs and long bones, joint swellings neonatal onset-pustular rash, and dramatic response to anakinra

(continued)

Table 13.2 (continued)

Name	Inheritance and associated gene	Mutated protein	Clinical features and treatment	AYA specifics
PFAPA	Unclear, likely polygenic	No defined abnormal protein	Periodicity with a fever element Symptoms usually start age 2–5 with attacks of fever lasting 3–6 days. Corticosteroids can abort attacks, colchicine can be helpful, and adenotonsillectomy can cure the syndrome in many patients	Attacks are often outgrown within a decade, but some may require transition of care
CNO	Unclear, likely polygenic	No defined abnormal protein	Wide range of severity – see Chap. 17	See Chap. 17

FMF familial Mediterranean fever, *TRAPS* tumor necrosis factor receptor-associated periodic syndrome, *FCAS* familial cold autoinflammatory syndrome, *MWS* Muckle-Wells syndrome, *NOMID* neonatal onset multisystem inflammatory disease, *MKD* mevalonate kinase deficiency syndrome, *NLRP12AD* NLRP12-associated autoinflammatory disorder, *DADA2* deficiency of adenosine deaminase 2, *BS* Blau syndrome, *EOS* early-onset sarcoidosis, *MS* Majeed syndrome, *PAPAs* pyogenic arthritis, pyoderma gangrenosum, acne, syndrome, *DIRA* deficiency of interleukin-1 receptor antagonist, *PFAPA* periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis, *CNO* Chronic non-bacterial osteomyelitis, *PFAPA* periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis, *AR* autosomal recessive, *AD* autosomal dominant

is exaggerated with vast overproduction of pro-inflammatory cytokines (especially IL1). In contrast to autoimmune diseases, there is no autoantibody production and no antigen-specific T lymphocyte response.

This leads to recurrent episodes of infection-like, inflammatory symptoms with raised inflammatory cytokines but without a specific infective or disease-driven trigger. Flares can occur with stress including psychological stress, menstruation, physical exercise, immunizations, minor trauma, surgery, or viral infections but more usually without any specific trigger.

AICs have variable genetic penetrance and may only be diagnosed in adult life [4, 5]. As relatively recently described conditions, still considered to be incredibly rare, they may not appear in adolescent or adult differential diagnoses lists. Any late diagnosis really does matter, however, as treatment is needed as early as possible to avoid complications such as life-threatening systemic secondary amyloidosis, reported in up to 25% of patients.

Labelling the genetically negative cases is difficult in practice. It is important for teams to have access to a diagnostic chart of classical features to aid the acquisition of clinical skill from the experience of diagnosing these conditions. The NOMID Alliance (www.autoinflammatory.org) have helpful information for young people and professionals alike for this aspect of care.

Types of Autoinflammatory Conditions

A summary summarizing current knowledge AIC is given in Table 13.2.

AYA-Specific Features of AIC

These rare conditions are usually diagnosed in childhood in specialist services, but late diagnoses still occur in AYAs due to lack of awareness. The implications of a late diagnosis in

young adult life are significant especially as, for example, NOMID/CINCA can cause developmental delay if untreated early in childhood [6, 7]. It is also potentially devastating to face the fact of a lifelong genetic disorder being diagnosed for the first time as an AYA. A crucial long-term outcome of AIC if untreated is amyloidosis, and therefore keeping AYA engaged with treatment for AIC is key (see Chap. 19). Specific AYA considerations for AIC are summarized in Table 13.2.

Principles of Treatment in AICs

Three treatment objectives are (i) controlling symptoms, (ii) improving quality of life, and (iii) preventing long-term complications. Colchicine is still the mainstay of treatment in FMF. But for most of the other conditions, IL1 blockade has proved to be effective where other treatments including treatment with steroids have failed to bring lasting control [4].

Transition and Practical Care Considerations

There are no specific publications prepared for transition in AIC, and principles for support of psychological well-being and coping strategies are therefore extrapolated from work on other genetic conditions that cause chronic health problems (see Chap. 21).

Treatment with very expensive biologic therapies such as canakinumab has led to national schemes, e.g., through the National Amyloidosis Centre in the UK. In this care pathway, there is the benefit of major expertise in rare conditions focused in one place but with the drawback of the need to travel for medical care.

There is always the need to balance short-term well-being with known long-term risks of untreated conditions in terms of potential neurological impairment in CAPS or the development of amyloidosis in later life. In young people the concept

of long-term preventive treatment versus screening for amyloidosis with treatment at a later date also needs to be discussed. There is the possibility of episodic flare aborting treatment for acute flares versus long-term regular treatment to maintain symptom control. The counselling for each of these aspects of care is now to be assisted by data from disease registries and their potential to answer the questions of long-term or lifelong treatment.

Psychological Well-Being and Coping Strategies

Having a rare disease that no one knows much about during adolescence can prove a real challenge for the AYA especially during transition [8]. However, this is also an opportunity for them to become real experts in their own condition and to take self-advocacy to a new level as in reality they can easily know more about the condition than many of the HCPs that they will encounter. It is empowering to have clear links to good sources of up-to-date information that the AYA could refer the HCP to and again the NOMID Alliance (www.autoinflammatory.org) can prove invaluable.

Key Management Points

1. Bouts of illness in TRAPS may last longer in older young people and adults.
2. Amyloidosis risk may be higher in childhood-onset patients, longer disease duration, and higher penetrance, e.g., in R92Q-related disease [3].
3. Canakinumab supply issues require centralized referral.
4. Neurological involvement in CAPS is frequent, and most patients have difficulties with school performance and consequences for adult life chances [6].

5. Care should be by combined inter-specialty teams that have a focused special interest in the conditions combining rheumatology and immunology.
6. Long-term outcome studies are vital including scoring for the autoinflammatory disease activity and damage indices (ADDI).

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Chapter 14
Back Pain in Adolescence and Young Adulthood

Verna Cuthbert

Introduction

Back pain in adolescence is more prevalent than previously thought. A systematic review of back pain found lifetime prevalence ranged from 4.7% to 74.4% adolescents and was thought to be due to the wide variation in how this was defined and reported [1]. Adolescents are less likely to have a disc prolapse, suffer from spondylotic changes in the spine or be affected by spinal stenosis, compared with adults. Back pain in Adolescence and young adults (AYA) is less likely to be due to serious pathology compared to children below age of 12. Adolescents report both thoracic and lumbosacral back pain equally, whilst adults tend to report more lumbosacral back pain, and younger children report thoracic pain. Adolescents are more likely to suffer back pain related to overuse and injury, particularly if they participate in sports.

Studies have shown links between adolescent back pain and chronic pain in adults [2]. Similar to findings in adults,

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Table 14.1 Potential risk factors for back pain in young people [3]

Gender – Adolescent girls report spinal pain more frequently than boys.
Age – The prevalence of spinal pain increases from childhood to adolescence from 10 to 12 years onwards.
Family history of back pain.
Mechanical load, e.g. heavy bags and asymmetrical load such as heavy school bags may play a role especially in taller young people though evidence is unclear.
Smoking – Linked to an increase in risk of back pain.
Physical activity and sports.
Psychosocial factors – Anxiety, emotional and behavioural problems, depressive symptoms and sleep problems more likely. Negative psychosocial experiences, e.g. parental divorce.
Co-occurrence of other somatic symptoms, e.g. headaches, abdominal pain.

studies have shown an association between multi-site musculoskeletal (MSK) pain, of which back pain is a common site, and with psychological problems in adolescents, specifically anxiety and low mood. The latter may commonly present as physical symptoms and therefore vital for Health Care Professionals (HCPs) to provide holistic developmentally appropriate care, including psychosocial assessment to provide early and effective intervention and thus reduce disability and the likelihood of symptoms becoming a chronic problem into adulthood. Factors to address during this assessment are detailed in Table 14.1.

Causes of Adolescent and Young Adult Back Pain

The differential diagnosis of back pain in adolescents and young adults is listed in Table 14.2.

Table 14.2 Causes of AYA back pain

Non-specific – Majority
Mechanical – Hypermobility (see Chap. 11), postural, mechanical load, Scheuermann's, spondylosis, spondylolisthesis, idiopathic scoliosis, disc related
Inflammatory – Enthesitis-related JIA (ERA), ankylosing spondylitis (if onset >16 years) (see Chap. 7)
Metabolic – Osteoporosis both idiopathic and secondary, e.g. eating disorders (see Chap. 16)
Vascular – sickle cell, arteriovenous malformation,spinal infarct
Infectious – osteomyelitis, discitis, epidural abscess
Tumour – Benign (osteoid osteoma), malignant (Ewing's sarcoma, osteosarcoma and lymphoma), spinal cord
Referred pain – Hip, sacroiliac, abdomen, pelvis, thorax (pneumonia, pleuritis), gynaecological (pelvic inflammatory disease or ovarian pathology)
Idiopathic pain syndromes (see Chap. 12)

National UK guidelines [4, 5] suggest the importance of risk stratification using assessment tools, e.g. STarT Back Risk Assessment Tool which helps in the identification of young people over 16 years at risk of their back pain becoming chronic. A comprehensive history including relevant psychosocial assessment in young people, such as the HEADSSS assessment [6] (see Chap. 4) and general and physical examination (see Chap. 6), should reveal more serious aetiologies and guide the HCP towards appropriate investigation and management.

Clinical Presentation of Back Pain in Young People

Symptom pattern recognition is the key to diagnosis in any age group, and AYAs are no different. Key points will be highlighted here as extensively reviewed elsewhere [7–10].

Symptom Pattern and Spinal Red Flags

Spinal red flags are listed in Table 14.3. These symptoms may be characteristic of serious conditions such as infection, tumours, inflammatory bowel disease IBD or rheumatic diagnoses. Bone-related pain tends to occur centrally in the spine, is usually exacerbated by extension and can be aggravated by percussing the spinous processes. Malignant tumours are more likely to present with neurological signs and symptoms. Scoliosis associated with severe pain, a very rigid scoliosis, rapid progression and lack of compensatory curves above or below should be regarded as worrying and investigated as possible serious pathology. The most common benign tumour in adolescence is osteoid osteoma and may be reported in the history to be relieved by NSAIDS. Chronic recurrent multifocal osteomyelitis can rarely present as back pain (see Chap. 17). Common infectious causes include vertebral osteomyelitis (most common in the lumbosacral spine), discitis and epidural abscess (more common in adolescent males). Discitis is less common in adolescence compared with younger children and less severe than the adult-onset form. Discitis most frequently affects the thoracic and lumbar spine, and usually only one disc space is affected. If more than one level is affected, TB should be excluded. Exposure to TB and recent

Table 14.3 Spinal red flags

Constant severe back pain
Nocturnal pain
Systemic symptoms such as fever, weight loss, malaise, or night sweats,
Limping or refusal to mobilize
Muscle spasm
Cauda equina symptoms
Severe or rapidly progressing neurological deficit

foreign travel should be elicited in the history taking. A history of intravenous drug use increases the risk in this age group. Young people with sickle-cell anaemia may develop a vaso-occlusive crisis in their spine, may be more prone to osteomyelitis and may present acutely with red flag features. Fractures due to primary (idiopathic juvenile osteoporosis) or secondary osteoporosis (see Chap. 16) may present with localized bony pain.

Investigations

Subjective and objective examination suggesting serious pathology warrants concern and further investigation. This is likely to include bloods, MRI, CT and DEXA bone scan (if osteoporosis suspected). If infection or systemic disease suspected, a sepsis screen including blood cultures, blood film, inflammatory markers and HLA-B27 may be useful. MRI does not require radiation exposure and provides better visualization of soft tissue and spinal canal and thus indicated when disc pathology or neural compromise suspected. Computed tomography (CT) has superior depiction of cortical bone than MRI. Thus, when bony anatomy is critical, CT is preferable. Isotope bone scans are less often used nowadays and are used mainly to detect occult fractures, stress fractures or bony metastases. A drawback of lumbar radiography (including CT and isotope bone scans) is gonadal exposure to ionizing radiation, especially with oblique view or multiple exposures.

Adolescent Mechanical Back Pain

"Mechanical" back pain (see Table 14.2) is related to movement, positions and forces. It is usually intermittent in nature. Symptoms are usually related to postures, positions or movement. Pain is usually worse later in the day or after activity.

Scheuermann's Disease

Scheuermann's commonly affects males aged 12–18 years. Abnormal growth of different parts of the young person's vertebrae during the growth spurt causes some of the vertebrae to become wedge shaped. Scheuermann's is associated with Schmorl's nodes: protrusions of the intervertebral disc into the cancellous bones of the vertebral body. The aetiology is unknown. Prevalence is between 0.4% and 8% of the population. There is commonly between 20° and 45° kyphosis. Scheuermann's is known to be associated with a higher incidence of disc degeneration, and one third typically have a degree of scoliosis.

Young people may present with thoracic pain and a thoracic kyphotic deformity (about which they may feel very self-conscious) and complain of intermittent back aching and/or fatigue particularly at the end of the day or after activity. Clinical features include altered posture – a forward head position, lumbar lordosis, rounded shoulders, possible contractures of the shoulder and hip joint, a protruded abdomen and tight hamstrings. A structural kyphosis will still be present in prone lying; a postural kyphosis on sitting will disappear in a prone position. Forward Adams Test will reveal the presence of a scoliosis. The adolescent is asked to bend forward until back in horizontal plane with arms hanging and knees in extension, and the HCP then looks for abnormalities of the spinal curve and/or asymmetry of the trunk. In severe but rare cases, there may be cardiopulmonary compromise or neurological symptoms. Further investigations include lateral X-ray and/or MR scan if disc degeneration or neurological compromise suspected. The management of young people with Scheuermann's includes physiotherapy, bracing and in the most severe cases, surgery.

Spondylolysis or Pars Defect

Spondylolysis is a condition in which there is a defect in the pars interarticularis of the vertebra which may be unilateral or bilateral commonly found at the L5/S1 level and can occur at L4/L5 but rarely higher. It has been proposed that pars

defects are due to stress fractures and there is thought to be a genetic predisposition. This commonly affects sporty teenagers participating in extension-type activities, e.g. gymnastics, cricket (particularly bowling), basketball, football, dancing and swimming. If spondylolysis occurs bilaterally, this can give rise to a slip either anteriorly of one vertebra on the one below – spondylolisthesis – or, less commonly, posteriorly (retrospondylolisthesis). Progression of a spondylolysis to a spondylolisthesis occurs in approximately 15% of cases, and this generally occurs during the teenage growth spurt and rarely changes after age 16.

A high-grade spondylolisthesis (slip >50% of the anteroposterior vertebral body width) may present with symptoms commonly at the lumbosacral level, particularly worse after sport/activity and extension movements and relieved by rest. Clinical signs may reveal a palpable step from the sacrum to the spinous process of L5 if a spondylolisthesis is present at this level. Back pain may be reproduced with spinal extension movement. Hamstrings may be restricted. Management of spondylolysis in young people includes rest, bracing, physiotherapy and for some, surgery.

Postural Back Pain

Muscular back pain is thought to be commonly caused by asymmetrical forces acting through the spine such as carrying a heavy school bag over one shoulder; poor sustained posture/positions, e.g. "I-pad neck"; or heavy use of gaming consoles. The evidence base however remains unclear [11]. A pelvic tilt caused by a leg length discrepancy can contribute to mechanical back pain. Symptoms are often reported to come on after a time delay. There is often little to see on clinical examination. Reassurance and education re prevention with advice on simple pain relief measures, postural correction exercises and core strengthening/endurance can help. Referral for consideration of leg length correction with a shoe raise may be indicated.

There may be an association with psychosocial factors such as anxiety and depression (see above), and developmentally

appropriate psychosocial assessment and referrals to the multidisciplinary team MDT if appropriate should be considered.

Disc-/Nerve Root-Related Pathology

Approximately 10% persistent adolescent back pain is thought to be due to a disc-related problem and is much less common than in adults. The risk is higher in adolescent males; sporty adolescents, especially activities such as weight lifting, wrestling, gymnastics and impact sports; and those with a history of disc-related back pain in the family. It may commonly occur following trauma. Symptomatic disc degeneration may start in adolescence and is best detected on MR scan.

Back pain caused by a disc-related problem is usually exacerbated by forward flexion and may radiate and even change sides. Disc pathology can be accompanied by acute deformities of the spine.

Advice with regard to self-management, keeping active, continuing with daily tasks as possible and/or referral to a musculoskeletal adolescent physiotherapist for advice, pain management and treatment should be considered. Referrals to wider MDT may be indicated if psychosocial factors present.

Adolescent Idiopathic Scoliosis

Scoliosis is common during adolescence. Studies suggest prevalence of a detectable scoliosis is approximately 10% of adolescents and AYA. Scoliosis is a lateral deviation from the midline of the spine of at least 10°, and most cases are idiopathic and do not cause pain. Postural scoliosis may be due to leg length discrepancy, muscle weakness and/or unilateral tightness causing pelvic tilt, and management will need to be directed accordingly. A structural scoliosis has a rotational component and is the most common type in adolescence. If unsure whether a scoliosis is postural or structural, sit the young person on a plinth – postural scoliosis will disappear when sitting.

The time of peak progression of a curve is at the beginning of puberty. The older the adolescent becomes, the less likely a curve will progress. The greater the curve at presentation, the more likely it is to progress, and adolescent girls have a much greater chance of their scoliosis progressing to be clinically significant. A curve in the thoracic spine is more likely to progress than a lumbar curve.

In order to screen for scoliosis, then the young person should be adequately undressed so the clinician can see the spine from the waist up. The examiner looks for signs such as asymmetry of shoulder levels, asymmetry of scapulae, tilting of the hips or unequal waist creases and then asks the young person to bend forwards with knees extended (Forward Adams Test) to examine for a rib hump and/or a lateral curve of the spine.

Knowledge of the factors likely to predict a worsening of a scoliosis will guide management. Female adolescents who are early in puberty and who have an obvious scoliosis on presentation be referred to a paediatric spinal surgeon for monitoring or possible treatments including bracing or instrumented correction.

In summary, a young person presenting with back pain needs a developmentally appropriate assessment with particular reference to any red flags. Management will depend on the underlying cause [12], but a multidisciplinary approach is the ideal.

Key Management Points

1. Most back pain in adolescents is non-specific and non-serious with no demonstrable cause.
2. Comprehensive developmentally appropriate history taking is important, asking about possible lifestyle, mechanical loading, family history, sporting and leisure activities.
3. Awareness of psychosocial factors linked with musculoskeletal symptoms and back pain presentations is important in order to offer early intervention.

4. Prepubertal children are more likely to have serious pathology. Recognition of spinal red flags and appropriate targeted investigation to rule out serious pathology is imperative.
5. Pubertal assessment is important to determine risks from structural abnormalities during growth spurt.
6. Recognition of need for holistic management and referral to wider MDT is important.

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Chapter 15
Sports Medicine in the Adolescent and Young Adult Athlete

Rebecca Robinson

Introduction

Physical activity (PA) in adolescence can optimise musculoskeletal development and help maintain healthy weight. Optimal physical health positively impacts neuromuscular, cardiovascular and cognitive development, as well as benefitting mood, sleep, academic attainment and social behaviour [1].

Despite ultimately increased musculoskeletal and aerobic capacity to undertake physical activity through maturation, many AYA stop sport during adolescence. Reasons are multifactorial including competing social and educational pressures and self-inhibition during puberty. Physical inactivity (PIA) during formative years is increasing: higher adiposity and lower aerobic fitness in AYA map to higher risk of morbidity from non-communicable chronic disease in adulthood [2]. Conversely, higher rates of aerobic fitness and muscular strength are linked to lower morbidity, lifelong [3]. Every healthcare consultation represents an opportunity to promote physical activity for the health of AYAs.

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Sports-Related Injury in Young People

Most musculoskeletal injuries in AYA are minor, relating to muscle, ligament and tendon. Boys are more active than girls at all ages and more likely to participate in high impact and contact sport, sustaining higher injury rates [4]. Contact and jumping sports have the highest injury rates, and early specialisation is linked to overuse injuries (see below). Elite young athletes' training programmes may be protective with relatively lower injury rates seen [5].

Management of minor muscular injury, e.g. a contusion or muscle strain, should follow the principle of rest, ice, elevation and compression. Whilst recovery is usually straightforward, there may be a need to review training, technique or equipment errors.

Bony Sport-Related Injuries

Physeal Fracture

In the older child and adolescent, 30% of acute fractures involve the developing growth plate (*physis*). This is a common site in impact injury, such as a fall following a rugby tackle. The growth plate is vulnerable to injury at the junction between calcified and uncalcified hypertrophying cells, where turnover is rapid.

Investigations

X-rays taken in two planes, with oblique views and with classification made according to the Salter-Harris system.

Management

Cast immobilisation and reduction to reduce the risks of growth disturbance at the affected site.

Spondylolysis and Spondylolisthesis

Spondylosis and spondylolisthesis occur more frequently in the young sporting population repetitively loading into extension, with rotation of the spine (e.g. cricket, gymnastics).

Spondylolysis

Spondylosis is a defect of the vertebral arch at the pars interarticularis. The pars elongates during growth and is susceptible to stress from excessive repetitive loading and torsion. An underlying dysplastic pars is often found, with a genetic link to the condition. Ninety percent of cases occur at L5.

Presentation

Unilateral back pain can be pathognomonic, although symptoms of non-specific persistent back pain in the AYA should raise suspicion. Injury affects may be bilateral.

Investigations

X-ray may demonstrate acute fracture; however, sensitivity is limited, and stress reactions will not usually be seen. Both computed tomography (CT) and magnetic resonance imaging (MRI) can identify signs including deviation of the spinous process and sclerosis of the contralateral pedicle.

MRI and single-photon emission computed tomography (SPECT) scintigraphy can usefully elucidate bony oedema where stress reaction, but not a cortical breach, has occurred.

Management

Rest for 4–6 weeks is guided by pain resolution, with aim for osseous union and to prevent progression to spondylolisthesis.

Spondylolisthesis

Spondylolisthesis refers to displacement of the vertebra in relation to the vertebra below. In the AYA population, this can occur secondary to bilateral pars fractures and usually presents with bilateral, localised back pain with potential nerve root compromise. Full neurological assessment should be performed. Imaging is as for spondylosis.

Management

Spondylolisthesis is graded according to the degree of slippage. Less than 50% displacement is managed conservatively, with rest, analgesia and bracing used in combination with rehabilitation. Once pain settles, a comprehensive approach to posture, strengthening and movement patterns is required before specific return to sport. Less than 5% of patients have more significant slippage and require surgery (e.g. fusion, decompressive laminectomy).

Avulsion Fractures

Sudden muscular force upon immature bone can cause bony avulsion at the tendinous attachment. Presentation is typically sudden pain, difficulty weight bearing and point tenderness after explosive activity. Chronic microtrauma from repetitive overload may lead to avulsion injury. Common bony sites for avulsion fractures are shown in Table 15.1.

Investigations

Radiographs demonstrate the bony injury. Ultrasound is increasingly available and can delineate the muscle insertion, and MRI can evaluate bony oedema. CT is not recommended first line in view of radiation exposure however may be considered if diagnosis is unclear or a surgical approach is considered.

Table 15.1 Common sites of avulsion injury

Bony avulsion	Muscle origin/ insertion	Mechanism	Sporting
Ischial tuberosity	Hamstrings (origin)	Passive hamstring lengthening (gymnastics) Explosive passive lengthening of habitually contracted hamstrings	Gymnastics, running
Anterior-inferior iliac spine	Rectus femoris (origin)	Forceful hip-flexion, knee extension	Football, athletics, tennis
Anterior superior iliac spine	Sartorius (origin)	Forceful hip-flexion, knee extension	Football, athletics, gymnastics
Pubic symphysis	Rectus abdominis (insertion)	High-velocity forces through trunk	Football, fencing
Iliac crest	Abdominal muscles (insertion)	High-velocity rotation through trunk; change of direction	Football, gymnastics, tennis
Lesser trochanter	Iliopsoas (insertion)	Excessive passive stretch of chronically shortened muscles	Athletics

Management

Rest from aggravating activity with appropriate analgesia with rehabilitative physiotherapy.

Recovery can be prolonged. Surgical opinion should be sought for a significantly displaced fragment.

Overload Injury

Chronic Growth Plate Injury

Overuse injury can be sustained in AYA who specialise early in a sport or overtrain, relative to the body's ability to grow and repair.

Presentation

Pain is initially confined to sports practice, becoming pervasive if aggravating activity is continued. On examination, decreased range of active and passive movement at the joint is typical. Pain persisting at rest and reduced range of movement may indicate a stress fracture.

Investigations

Early radiographs may be normal. Widening at the growth plate indicates a failed healing response and repetitive microtrauma to the developing bone. A fracture at the growth plate requires orthopaedic review.

Management

Initial rest from sport is usually required for 3–6 months.

Successful rehabilitation and return to sport should involve a graded programme, modifying excessive training practices.

Traction Apophysitis

The cartilaginous apophysis contributes to circumferential growth. In repetitive sport, repetitive traction forces through tendon, and ligamentous attachments can cause osteochondral

stress. Presentations peak between ages 8 and 15, and this injury occurs more frequently in males.

Common sites are summarised in Table 15.2 below.

Presentation

Pain associated with impact, local tenderness over the apophyseal prominence.

Table 15.2 Common sites of traction apophysitis in adolescents

Common traction apophysitis site		**Name**	**Enthesis**	**Insertion**
Upper limb	Elbow	Medial epicondylar apophysitis	Ulnar collateral ligament	Medial epicondyle
Lower limb	Hip region		Gluteus medius minimus Sartorius Rectus femoris Hamstring	Greater trochanter ASIS AIIS Ischial tuberosity
	Knee	Osgood-Schlatters	Patella tendon	Tibial tubercle
	Knee	Sinding-Larsen-Johansson	Patella tendon	Distal pole patella
	Heel	Severs calcaneal apophysitis	Achilles tendon	Calcaneum
	Foot	Iselin's disease	Peroneus brevis and tertius	5th metatarsal

Investigations

Apophysitis can be diagnosed clinically; however, differentials include inflammation, epiphysitis or, rarely, soft-tissue tumour. A thorough history is required, and radiological imaging may be justified to exclude underlying disease.

Management

Conservative management succeeds in 90% cases with rest from aggravating activity and local ice treatment. Topical or systemic non-steroidal anti-inflammatory medication may be useful although lacks evidence for efficacy. Alternative PA (e.g. cycling, swimming) should be encouraged, to maintain cardiorespiratory fitness. In some cases, symptoms persist for 2–3 years until growth plate fusion.

Bone Stress Injury

High-impact, multidirectional loading of bone during adolescence leads to remodeling, strengthening the bone during skeletal maturation. However, excessive bone loading with suboptimal recovery can exceed bone capacity for adaptation. Micro-fractures in the cortex propagate with accelerated osteoclast remodeling. Periosteal oedema, local hypoxia and chemical stimuli can lead to progression of injury (Fig. 15.1) resulting in stress fracture. The tibia is the most frequent site of stress fracture (40%) followed by the metatarsal (25%). Sports-specific stress fracture patterns are seen, such as the rib in rowers and the lower back in cricketers (see above). The young athlete who continues to train through pain can develop a frank cortical fracture. Complete fracture at a high-risk site can be catastrophic, for example, at the neck of femur.

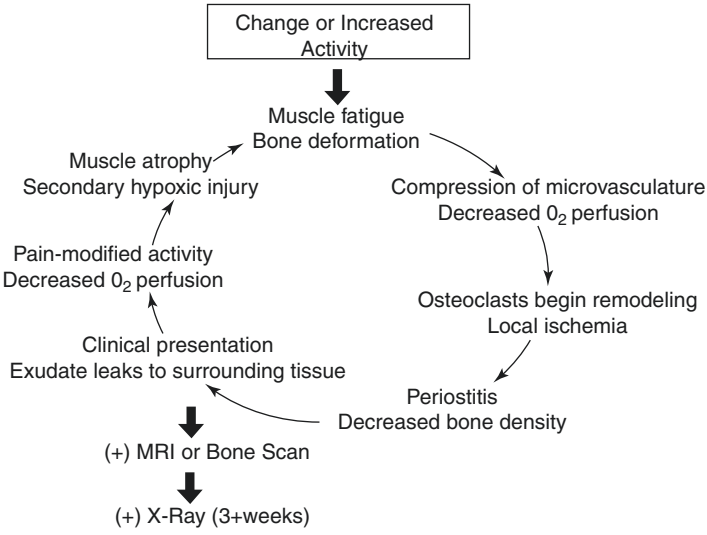

FIGURE 15.1 Cyclic aetiology of stress fracture formation. Changes or increases in activity intensity cause muscle fatigue, bone deformation and compression of the bone's microvasculature. (Reproduced with permission: from Romani et al. [6]

Presentation

Insidious pain during sporting activity becomes more persistent with continued training.

Acute presentation may be with inability to weight bear with localised bony tenderness. There may be increased tone in surrounding musculature.

A history of sudden increment in training load, change in footwear or training surface should raise concerns for bone stress injury.

Investigations

Plain radiographs are frequently negative in a stress reaction, although delayed X-ray may reveal callus formation on long

bones. MRI is the gold standard in diagnosis. Classification systems have been developed according to the degree of oedema identified [7]. Bone integrity should be assessed (see Chap. 16). All young athletes presenting with bone stress injuries should be assessed for extrinsic (e.g. training errors) and intrinsic risks (e.g. metabolic bone disease, overtraining or RED-S (see below) should be addressed).

Management

High-risk sites (see Table 15.3) should be referred for orthopaedic opinion. An isolated stress fracture in a young athlete should be treated with offloading with progress from non-weight bearing to weight bearing once pain-free. Rehabilitation can include cross-training and graded return to sport, usually at a minimum of 8 weeks.

Hip Pain in AYA

Femoroacetabular impingement (FAI) describes abnormal contact between the proximal femur and acetabulum and can be a source of pain in the young, non-arthritic hip. It may

Table 15.3 High-risk stress fracture sites

Neck of femur (superolateral-tension side)
5th metatarsal
Patella
Anterior tibia
Talus
Navicular
Sesamoids

predispose to osteoarthritis. FAI subtypes are 'pincer' lesions, acetabular overcoverage and 'cam' deformity (aspherical change in the femoral head that can lead to chondrolabral damage).

Aetiology is incompletely understood, with both genetic and acquired factors known.

High-impact repetitive loading to the proximal femoral physis during adolescence may predispose to 'cam' lesion formation [8].

Investigation

X-ray can measure asphericity, femoral head coverage and the alpha angle (the degree to which the femoral head deviates from spherical).

MR arthrography is most sensitive to diagnose cartilage damage and labral tears closely associated with FAI.

Management

Nonoperative management includes lumbopelvic strength and movement pattern training.

Surgical management may be arthroscopic or open hip surgery.

Adolescent Overtraining Syndrome and Relative Energy Deficiency

The *relative energy deficiency syndrome* (RED-S) describes low energy availability, calculated as energy intake minus the energetic cost of exercise relative to fat-free mass.

Excessive training and disordered eating are leading causes [9].

Presentation

RED-S may present as fatigue, overuse injury (see above), illness or unexplained underperformance. Training history should identify recent increases in volume or training type. The adolescent athlete should have lower training volumes than adult counterparts, and coaching support is advised.

Sensitive enquiry regarding history of disordered eating, pubertal development and female menstrual history should be made.

As shown in Fig. 15.2, RED-S is now known to have multisystem and long-term effects, highlighting the need for early identification in the young athlete.

Mechanism

Low energy availability causes hormonal and metabolic abnormalities and may result in nutritional deficiencies. Suppression of IGF-1, growth hormone and endogenous sex hormones occurs. Hypothalamic hypogonadism can occur in response to the body's attempts at energy conservation. Adolescent female athletes with primary or secondary hypothalamic amenorrhoea during the ages of peak bone mass attainment are at risk for osteoporosis, and low testosterone in males also negatively impacts bone mineral density (see Chap. 16).

Initial Investigations

Screen for other causes of low body weight and hormonal disruption or metabolic bone disease as well as pregnancy. Amenorrhoeic athletes should be referred to gynaecology.

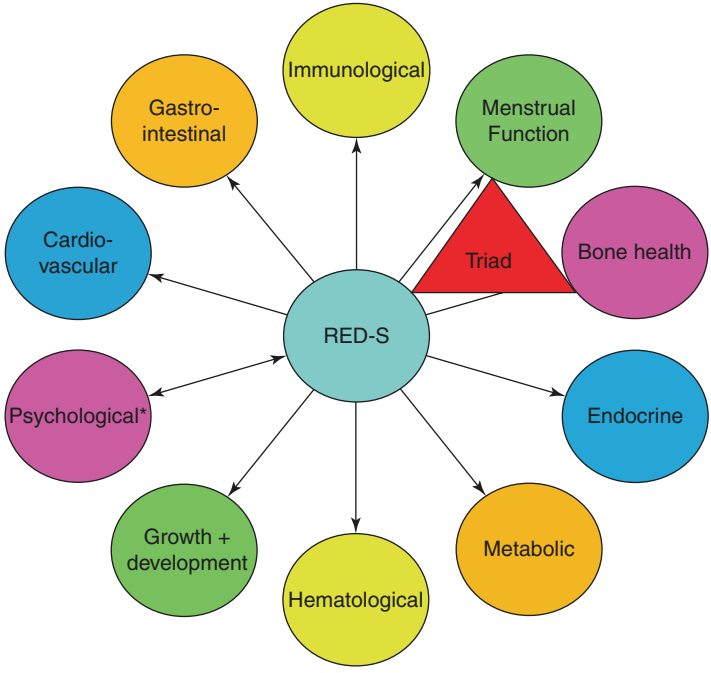

FIGURE 15.2 Health consequences of relative energy deficiency in sport (RED-S) (*Psychological consequences can either precede RED-S or be the result of RED-S). (Reproduced from The IOC consensus statement: Beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S), Mountjoy et al. (2014), with permission from BMJ Publishing Group Ltd [9])

Management

A multidisciplinary approach is recommended, including medicine, nutrition and psychology. First line management for an athlete with REDS is cessation of sports training until

positive energy balance is attained; in females it is best demonstrated by resumption of menses. Consequences of impaired bone health should be managed with metabolic bone and gynaecology input. In some cases, hormone replacement therapy may be instigated, but expert guidance is advised. For females, oral contraceptives may be detrimental to bone health and can mask the absence of periods. Concerns about disordered eating should prompt referral to specialist mental health and nutrition support. The RED-S protocol endorsed by the IOC recognises a 'traffic light' return to training protocol [9].

Summary

This chapter has covered the importance of physical activity in the young person and common patterns of injury presentation and management.

It is recommended that discussing physical activity is part of every consultation, from brief advice to signposting to specialist services. In this way, the healthcare professional can support the young person from the least active to the sportsperson, to attain the optimal benefits from PA which can be sustained into adulthood.

Key Management Points

- Physical activity in adolescence is important for development of a healthy musculoskeletal system and has beneficial effects on physical, cognitive and social development.
- Physical inactivity and obesity are increasing in adolescence and incur lifelong health-risks. The HCP working with adolescents can offer support to promote sustained participation in physical activity.
- Early specialisation in sport is linked to a higher risk of overuse injury with particular vulnerability around the growth centres in bones and joints.

- Whilst musculoskeletal injuries are relatively common in the active adolescent, a thorough work-up is required to recognise less common but serious conditions such as tumours of bone or inflammatory conditions which may present similarly.

Meeting the energy demands of sport can be challenging in the adolescent sporting population and an understanding of the principles of overtraining, overuse injury and the relative energy deficiency can help HCPs identify at-risk individuals.

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Chapter 16
Adolescent and Young Adult Bone Health

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Introduction

Childhood, adolescence and early adulthood are critical developmental stages for skeletal mineralisation. Optimal bone mass is defined as "the maximum amount of bone mineral content present at the end of skeletal maturation [1]". As the vast majority of optimal bone mass is accrued in the first two decades of life, chronic diseases during this period can leave a lifelong legacy. The effect can be further exacerbated by overexposure to glucocorticoids, a common treatment for a range of RMD. Up to 50% of individuals affected by juvenile idiopathic arthritis (JIA) have a decreased BMD [2].

The International Society for Clinical Densitometry (ISCD**)** consensus was that osteoporosis is said to be present in the context of ">1 vertebral compression fracture in the absence of local disease or high-energy trauma". As such in AYA, the diagnosis of osteoporosis requires the presence of a "clinically significant fracture history (≥2 long bone fractures by the age of 10 or ≥3 long bone fractures at any age up to 19)" in addition to reduced BMD [3]. Suboptimal bone mass obviously increases risk of early-onset osteoporosis. With osteoporosis being a major cause of morbidity and mortality in adults [4], it is clear that prevention begins by optimising bone health at a young age.

Normal Bone Modelling

Bone structure is determined by bone modelling during childhood and remodelling throughout the life course. Modelling involves adaptation to mechanical loading, and bone remodelling refers to the constant replacement of bone during life. This involves coordinated interaction of osteoclast-mediated bone resorption with osteoblast-mediated bone (re)formation. Bone remodelling occurs most often in areas high in trabecular (cancellous) bone such as the vertebrae, whilst cortical bone comprises the majority of the skeleton. In early adult life, endosteal apposition and trabecular thickening are

crucial for optimum bone mass [5]. Trabecular bone is susceptible to deleterious effects of supraphysiological glucocorticoids, particularly during adolescence [6].

Furthermore, during puberty, there are significant differences between males and females with regard to bone growth, especially in terms of bone size and mass. The development of adequate bone strength and the ability to respond to skeletal stress requires optimisation of numerous biochemical and physical factors at a young age. Genetic polymorphisms in the vitamin D, IGF-1 and oestrogen receptor genes may influence bone phenotype [7]. Aside from these heritable influences, modifiable factors include diet, physical activity, lifestyle, BMI and hormonal status [8].

Assessment of Bone Health in Adolescence and Young Adulthood

Assessing areal BMD (aBMD) and fracture risk in clinical practice is a challenge in adolescence and young adulthood. In general, aBMD accelerates in puberty and peaks between the ages of 25 and 35 [9]. The acceleration is associated with the period of rapid growth velocity and increased stature. The "gold standard" technique involves using dual-energy X-ray absorptiometry (DXA) at skeletal sites including the lumbar spine, hip or occasionally the forearm [10]. For children and adolescents, "posterior-anterior" (PA) spine and "total body less head" (TBLH) are the preferred skeletal sites [11]. For children, adolescents, men under the age of 50 and premenopausal women, the *Z*-score is used to evaluate fracture risk, as expressed in the equation below. Manufacturer-specific reference data is available to calculate gender- and ethnicity-specific aBMD *Z*-scores.

$$Z\text{-score} = \frac{(\text{BMD}) - (\text{Age matched mean BMD})}{(\text{Standard deviation})}$$

*BMD values expressed as g/cm^2

Due to the technical limitation of DXA, which measures areal bone density (g/cm^2) rather than a true volumetric bone density (g/cm^3), anomalous results are seen when assessing children with reduced stature. This may be of particular relevance in the context of chronic rheumatic disease [12–14]. When assessing a BMD in AYA height, weight and pubertal stage should also be considered. The International Society for Clinical Densitometry (ISCD) [3] states that the term "low bone density or low bone mass" should be used "if the aBMD *Z*-score or BMC is ≤−2.0 S.D". A diagnosis of osteoporosis in younger men, premenopausal women and children should not be solely based on the bone density test result. However, BMD is a useful predictor of fracture risk in an adult; each one standard deviation (SD) decrease below the reference population correlates to approximately double the fracture risk.

ISCD consensus is that the term "osteoporosis" cannot be applied to AYAs without a clinically significant fracture history (see above), whilst the term "osteopenia" should not be used in paediatric DXA reports at all [3]. Additionally, due to the technical limitations of DXA, size adjustments should be made for young people with short stature or growth delay. Spine and TBLH BMC and aBMD should be adjusted. With regard to the spine, either the bone mineral apparent density BMAD or the height for age *Z*-score should be calculated. For the TBLH, the height for age *Z*-score should be used.

DXA reports should also include technical information on scanning hardware and software in addition to patient demographics, weight, height, medical history, bone age and Tanner stage. For AYA with an increased risk of clinically significant fractures, a DXA scan should be conducted as part of a comprehensive health assessment. This is especially the case if the young person may benefit from intervention to decrease their fracture risk or if the results of the scan may affect the management plan.

General Approaches to Optimise Management and Promote Bone Health

Screening

Routine screening of healthy young people for osteoporosis is not advised. However, those with RMD or any other condition associated with increased bone fragility should undergo baseline bone densitometry testing in addition to assessment of vitamin D status. BMD should be monitored at a minimum interval of 1 year [15]. Cimaz and Ward [16] outlined screening criteria for osteoporosis in children and adolescents with chronic rheumatic disorders. Screening criteria are outlined in Table 16.1 [17]. Vertebral fractures may be occult and represent a severe failure of bone strength. As many as 7% of children had vertebral fractures at baseline (within 30 days) on commencing glucocorticoids for rheumatic diseases, and 6% had incident fractures over 12 months follow-up in the Steroid-associated Osteoporosis in the Pediatric Population (STOPP) study [18, 19]. Thornton and colleagues [20] advocate measuring baseline BMD with surveillance every 2 years in adults with a background of JIA.

Glucocorticoid Therapy

Adults have increased fracture risk with doses as low as 2.5–7.5 mg of oral prednisolone per day [21]. Effects on BMD are correlated with the cumulative glucocorticoid dose. Alternate-day rotations have been found to maintain growth in adolescents; however, the effects of glucocorticoid therapy on bone may not be reduced [22, 23]. When long-term therapy is indicated or predicted, steroid-sparing medications such as azathioprine should be used where possible [24]. Exposure to glucocorticoids should be minimised with the use of lowest effective treatment dose and duration to prevent decreased bone accrual.

Table 16.1 Summary of Key Clinical Points

History	Underlying diagnoses Fractures (mechanism of injury, site, number, age; NB ≥2 long bone fractures by the age of 10; or ≥ 3 long bone fractures at any age up to 19 in presence of low BMD required for diagnosis of osteoporosis in young people) Glucocorticoid use (dose, duration) Bisphosphonate use
Investigations	DXA (low BMD indicated by size adjusted BMD or BMC ≤−2.0 S.D) Screening (suggested in the context of confirmed fractures, back pain; glucocorticoid therapy for more than 3 months, weight gain whilst on steroid treatment, active inflammation, and decreased *Z*-scores of the spine)
General advice and management	Glucocorticoids should be prescribed at the lowest effective treatment dose Steroid-sparing medications should be considered Physical activity – weight bearing where possible, low-force activities if disease is active Ensure optimal vitamin D status and calcium intake

Physical Activity

Physical activity during child and adolescent development is a determinant of peak bone mass via effects on mechanical loading and osteocyte function. Exercise is deemed an essential component of long-term management for young people with RMD. Weight-bearing physical activities such as walking, running, jumping and dancing are more effective at optimising bone health than swimming or cycling. However during periods of inflammation of their underlying disease, low-force activities are recommended [2]. Furthermore, resistance training may be introduced if tolerated [25]. Nichols and colleagues [26] found that resistance training in growing

subjects increased BMD at the femoral neck. High-impact activities that of short duration with multiple rests are most effective in promoting bone metabolism. These maximal force activities enhance bone integrity [27]. Conversely sedentary behaviour is associated with reduced BMD in the lower limbs as confirmed in a recent systematic review. The authors stated however that the review was limited by the quality of included studies with heterogeneous samples, study design, lack of longitudinal and clinical outcome data [28].

Vitamin D and Calcium Supplementation

Vitamin D deficiency is highly prevalent worldwide. Severe deficiency results in rickets and osteomalacia. Risk factors relate to reduced exposure to UVB light, low dietary intake and medication use (including glucocorticoids) [29]. There are also associations with chronic disease states. There is general agreement that calcium and vitamin D supplementation can improve skeletal outcomes as evidenced by epidemiological and a number of RCTs [29]. There is some controversy as to the optimum thresholds of vitamin D for the general population. The Institute of Medicine and UK National Osteoporosis Society advise deficiency as serum 25OHD <30 nmol/L, insufficiency between 30 and 50 nmol/L and sufficiency as >50 nmol/L. The Endocrine Society set higher thresholds of 50 nmol/L for deficiency and up to 72.5 nmol/L for insufficiency [30–32]. The latter advocate an induction dose of a vitamin D supplement (e.g. 300,000 IU total over 6–10 weeks) followed by maintenance dosing (e.g. 800 IU/day). The Institute of Medicine (IOM) endorses routine screening for vitamin D deficiency and higher recommended dietary allowances (RDA) for vitamin D supplements in AYAs with chronic rheumatic diseases treated with glucocorticoids. Others have suggested an RDA for adolescents with chronic inflammatory diseases should be at least twice the RDA of healthy controls [33]. It is clear that there is a need for high-quality vitamin D supplementation studies in adolescent and young adults to refine clinical protocols.

Diet and Nutrition

Clinicians are encouraged to promote healthy nutrition and enquire about the diet of their AYA patients with RMD. During health maintenance visits, specifically ask about the use of calcium and vitamin D supplements, dairy intake, non-dairy sources of calcium or vitamin D and fizzy drinks consumption. Increased intake of foods and drinks that contain calcium and vitamin D should be encouraged. Dairy products are the major source of calcium in the diet, whilst cereals and beverages may be fortified [29]. A recent cross-sectional study in healthy children reported positive correlations between dairy intake and BMD [34]. Randomised controlled trial evidence indicates that intake equivalent to two glasses of milk is sufficient for normal bone development between the ages of 8 and 16 years [35], with no additional benefit with increased intake. Reduced fat alternatives of dairy products such as reduced-fat milk and yoghurt also provide a good source of calcium. Misconceptions as to the caloric content of dairy products should be addressed and rectified in health maintenance visits. There is growing recognition that nutritional factors can act synergistically with exercise to impact on bone health [36].

Bisphosphonates

Bisphosphonates are widely used in osteoporosis in older adults. Their mechanism of action involves inhibition of osteoclast-mediated bone resorption. They are used to impact on BMD and fracture risk in children and adolescents with osteogenesis imperfecta (OI) [37]. A Cochrane review in this area confirmed that both oral and intravenous bisphosphonates increase BMD in such patients. The authors stated that further study to establish effects on quality of life and long-term safety and fracture reduction outcomes. As a rare disease, optimal outcomes would be expected if the patient is managed in a dedicated clinical service. Outside of this context, the use of bisphosphonates in children and AYAs remains controversial due to safety concerns.

These agents are not licensed in premenopausal women and are contraindicated in pregnancy. Many specialists advocate that bisphosphonates should be limited to men with low-trauma fractures and postmenopausal women [14]. However, there is recent evidence that young people receiving steroids for RMD may benefit from prophylactic treatment with bisphosphonates to increase lumbar spine BMD, although the effect on fracture risk is uncertain [38]. At present their role is limited to use in OI and other diseases associated with frequent fractures, vertebral collapse or critical pain.

Conclusions

Careful consideration of bone health in AYA with RMD is critical to ensure optimal long-term outcomes. Young people with RMD may be exposed to a number of risk factors for low BMD including active inflammation, glucocorticoid use and reduced activity. Osteoporosis in young people is defined by clinically significant fracture history and confirmed low BMD. Young people with RMD should undergo baseline assessment of BMD by DXA. Principles of management as outlined in Table 16.1 include minimising glucocorticoid exposure to that which is required for disease control, encouraging weight-bearing physical activity where appropriate and ensuring optimal vitamin D and calcium status.

Key Management Points

1. RMD is associated with a number of factors which result in reduced bone accrual. This may result in an increased fracture risk throughout life.
2. Bone health screening is recommended for AYA diagnosed with RMD. This should include assessment of BMD and vitamin D status.
3. Weight-bearing exercise and ensuring adequate vitamin D and calcium intake and use of steroid-sparing agents are useful preventative measures.

4. The use of bisphosphonates in AYA with RMD remains controversial. At present, there is evidence for their use in AYA diagnosed with OI or other conditions associated with fragility fractures.

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Chapter 17
Chronic Non-Bacterial Osteitis in Adolescence and Young Adulthood

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Chronic Non-bacterial Osteitis

Chronic non-bacterial osteitis (CNO) or chronic recurrent multifocal osteomyelitis (CRMO) is a disorder of early adolescence characterised by sterile bone lesions with periods of exacerbation and remission. Over the last decade, there has been greater understanding of the underlying pathophysiology of this condition, and it is now recognised as an autoinflammatory disorder (see Chap. 13) [1].

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Epidemiology

The prevalence of CNO has been estimated approximately between 1/160,000 and 1/2,000,000 and incidence between 1/250,000 and 1/1,000,000 [2]. It occurs mainly in older children and adolescents. The disease is predominantly seen in young girls between 9 and 12 years of age with a median age of onset ~10 years [3]. It has been reported worldwide across all continents.

Nomenclature

As the disease is not always multifocal and recurrent, the term 'chronic non-bacterial osteitis (CNO)' is more appropriate than CRMO [4, 5]. It has also been suggested that CNO could be the paediatric presentation of SAPHO syndrome (synovitis, acne, pustulosis, hyperostosis, osteitis). SAPHO is seldom seen in children and adolescents but is a well-recognised condition in adults. The differentiating clinical feature is mainly the location of involvement. Extremities are more often involved in paediatric CNO and the axial skeleton especially the costosternoclavicular region in SAPHO.

Clinical Features

CNO is characterised by insidious onset bone pain with or without soft tissue swelling. It can involve any bone in the body apart from the neurocranium which has not been reported as yet. The metaphyses of long bones especially in the lower limbs are most often involved followed by the pelvis, clavicle and vertebrae. The disease is usually multifocal and recurrent. However, unifocal and nonrecurrent forms have also been described. There are three phenotypic variants of CNO [3]:

1. Mild: affects predominantly females with a unifocal form of CNO.
2. Intermediate: affects predominantly females with multifocal pattern.
3. Severe: predominantly affecting males with multifocal form of CNO.

Systemic symptoms are uncommon. Low-grade fever and malaise may be reported. The presence of high-grade fever and overwhelming systemic symptoms should prompt alternate and more sinister diagnoses. Extraosseous manifestations include palmoplantar pustulosis, psoriasis, severe acne and inflammatory bowel disease (IBD) [6, 7]. There may be a family history of CNO, psoriasis, IBD or other spondyloarthritides. The clinical course is usually chronic with periods of exacerbation and remission. In some patients inflammation can be self-limited with no recurrences. Complications and sequelae are not uncommon in CNO. When a lesion involves the growth plate, growth abnormalities may result due to premature fusion resulting in limb length discrepancies. Other complications including vertebral collapse, kyphosis, gibbus formation and growth arrests have been described. A small subset of patients may evolve to a spondyloarthropathy [8].

Pathogenesis

The pathophysiology of CNO remains unclear. Being an autoinflammatory disorder (see Chap. 13), it is characterised by systemic inflammation in the absence of high titre autoantibodies, autoreactive T cells or infection. Infection seems to be an unlikely cause as pathogens are rarely cultured from patients with CNO. Girschick et al. in their study of 25 patients with CNO failed to demonstrate clinical or serological signs of acute or chronic infection. However, infections with *Propionibacterium acnes* or other bacterial pathogens like *Bartonella* have been associated with CNO [9].

CNO can also be associated with synovitis, acne, pustulosis and hyperostosis (SAPHO syndrome) in adolescents and adults [8, 10].

Two monogenic syndromic forms of CNO have been identified. The autosomal recessive Majeed syndrome characterised by a triad of CNO, congenital dyserythropoietic anaemia and inflammatory dermatosis is caused due to a mutation in LPIN2 gene encoding for the Lipin 2 protein [11, 12]. The course of Majeed syndrome is more severe compared to the sporadic form. DIRA (deficiency if IL1-receptor antagonist) is an autosomal recessive condition caused by mutations in the IL1RN gene. It presents in the neonatal period with generalised pustulosis, osteitis, periostitis and systemic inflammation [13, 14].

Diagnosis

Sporadic CNO is a diagnosis of exclusion. Clinical features and laboratory investigations are not disease-specific. Several criteria have been proposed to expedite diagnosis and avoid unnecessary investigation. Roderick et al. have suggested clinically relevant criteria as outlined in Table 17.1 [15].

Laboratory investigations can show elevated inflammatory markers such as C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), interleukin 6 (IL-6) and leukocytosis. The elevations are usually moderate and return to normal when the disease is in remission. Imaging forms an important tool in the detection of inflammatory lesions. Sites affected may demonstrate radiolucent, osteolytic or sclerotic lesions on a plain film depending upon the stage of the disease [16]. Computed tomography (CT) scans are effective in delineating bone structure. However, the hazards of radiation exposure make it a diagnostic modality only in highly doubtful cases. Whole-body MRI is widely used in the evaluation of CNO. It enables detection of multiple lesions, some of which maybe asymptomatic at presentation. Inflammation usually manifests as marrow oedema in the metaphyses, adjacent

Table 17.1 Bristol diagnostic criteria for CNO [15]

Presence of typical clinical[a] and radiological findings[b] in more than one bone (or clavicle alone) without significantly raised inflammatory markers OR
Typical clinical and radiological findings in one bone plus inflammatory changes (plasma cells, osteoclasts, fibrosis or sclerosis) on bone biopsy with no bacterial growth

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[a]Typical clinical findings include bony pain with or without localised swelling and the absence of significant local or systemic features of inflammation or infection

[b]Typical radiological findings constitute plain x-rays showing a combination of lytic areas, sclerosis and new bone formation, preferably Short T1 Inversion Recovery Sequence (STIR) Magnetic Resonance Imaging (MRI) showing bone marrow oedema, bone expansion, lytic areas and periosteal reaction

Table 17.2 Differential diagnoses for CNO

Infections
Malignancies
Benign bone tumours
Osteonecrosis
Osteopetrosis

epiphyses and soft tissue. They are hypointense on T1 and hyperintense on T2-weighted imaging. Gadolinium-enhanced T1 or strongly T2-weighted sequences with fat saturation can be used at the time of diagnosis. Nonenhancer scans are sufficient during the phase of follow-up [17–19].

Differential diagnoses are outlined in Table 17.2. A tissue biopsy may be needed to exclude infection or malignancy. CNO is characterised by cellular infiltrates that are dependent on the stage of the disease. Neutrophils are seen in early stages; monocytes, macrophages, lymphocytes and plasma cells are seen during later stages, and osteolyses, sclerosis and/or fibrosis are seen in late stages. Cultures of the blood and bone are usually negative for infectious processes [20].

Management

The treatment of CNO is mainly empiric. There are currently no randomised controlled trials published in literature relating to treatment of CNO. Evidence from case series and case reports forms the basis for current practices. A multidisciplinary approach in the treatment of CNO is essential with particular attention to pain management strategies.

Non-steroidal anti-inflammatory drugs (NSAID) are first line and mainstay in the treatment of CNO. Naproxen is the only NSAID to have been evaluated prospectively. NSAIDs provide pain control and may also alter disease course since prostaglandins are involved in osteoclast activity and bone remodelling. Symptom-free status has been reported to be achievable after 12 months in 50% of patients, but clinical remission with the absence of radiological changes was only achieved in 27% of patients [21]. Presences of arthritis and/or vertebral involvement were predictors of poor outcome of treatment. The action of NSAIDs usually sets in after 4 weeks of initiation of the drug. Treatment should be continued for at least 1 month before deciding upon treatment failure [2].

Second-line options include corticosteroids, methotrexate, sulfasalazine, bisphosphonates and anti-TNF agents. Corticosteroids suppress inflammation by inhibiting chemokines, cytokines, arachidonic acid metabolites and adhesion molecules implicated in the pathogenesis of CNO. Regimens used with variable success include oral prednisolone at high doses (up to 2 mg/kg/day) for 2 weeks or low doses (0.1–0.2 mg/kg/day) continuously [22].

Methotrexate has been used in a small subset of patients with limited success. A North American case series has reported an efficacy of 20% in their cohort. Sulfasalazine is not routinely used in the treatment of CNO. It is usually reserved for patients with CNO and inflammatory bowel disease [23].

Bisphosphonates are increasingly being used widely as second-line agent after NSAIDs and with good effect.

Although the precise mechanism of action is unclear, it has been suggested that they induce osteoclast apoptosis and suppress bone resorption. Suppression of bone resorption occurs approximately within 3 months of initiation of therapy and remains roughly constant throughout. Clinical benefit can be seen in the form of reduced pain and symptomatic improvement. The onset of action is more rapid after intravenous than oral therapy. Pamidronate is the preferred bisphosphonate, and treatment regimens can be daily, weekly or monthly. Cyclical regimens are usually used in children. Intravenous pamidronate given in 3-day cycles every 3 months for 1 year has been used most successfully. Apart from acute infusion reactions and hypocalcaemia, they are relatively safe in the paediatric population. They have a long skeletal half-life and can be found in urine specimens' up to 8 years after administration. AYAs should be counselled regarding contraception appropriately prior to treatment as pamidronate may pose a risk to the foetus/newborn child through its pharmacological action on calcium homeostasis. Calcium and vitamin D levels need to be checked before initiation of treatment. If low, supplementation of both is warranted. Bisphosphonates should be used in patients who have failed a trial of NSAIDs and potentially as first line in those with vertebral involvement [24].

TNF-α plays a key role in the pathogenesis of inflammation in CNO. It mediates bone resorption, activates osteoclasts and promotes osteoclastogenesis. Anti-TNF therapies infliximab, etanercept and adalimumab have been used in patients' refractory to conventional treatment and in those with overwhelming systemic features [25].

Prognosis

The clinical course of CNO into adulthood is not well known. In one study, only 43% of the patients were in remission in the last visit; 26% experienced sequelae like localised deformation, vertebral fractures and growth retardation [3]. In another study wherein 34 patients were followed over a

period of 9 years, episodic disease was seen in 79%; clinical remission occurred in 94% of the children with prolonged remission seen only in 17% of their cohort [26]. There are studies indicating some impairment in almost all domains of quality of life. In fact, one study reported 26% of their cohort continued to have pain on long-term follow-up [27].

Conclusion

CNO is characterised by bone swelling and pain. There are no specific tests to diagnose this condition, but a whole-body MRI can be a useful tool in detecting lesions. Treatment options include NSAIDs, bisphosphonates or TNF blockers. Despite treatment, significant long-term morbidity is not uncommon.

Key Management Points

- Whole-body MRI
- Bone biopsy
- Microbiological cultures to exclude infection
- NSAIDs, bisphosphonates and TNF blockers
- Physiotherapy and psychology

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Part III
General Principles of Management of AYA with Rheumatic and Musculoskeletal Disease

Chapter 18
Supporting Self-Management Skill Development Among Adolescents and Young Adults with Rheumatic Musculoskeletal Disease

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Disease self-management has been defined as "the interaction of health behaviors and related processes that patients and families engage in to care for a chronic condition" [1]. This conceptualization of self-management acknowledges that strictly adult-focused self-management models are not designed to account for influences of the larger family system (e.g., caregivers, siblings) on self-management behaviors. Specifically, in their young person model, Modi and colleagues define three interdependent components of self-management: [1] self-management behaviors, [2] the contextual variables across four domains (i.e., influences of individual, family, healthcare system, and community) that impact the execution of those behaviors, and [3] the processes that link influences with behaviors [1]. Self-management behaviors are performed in the context of attempting to care for a chronic condition (e.g., an adolescent with arthritis who swims regularly to improve their aerobic fitness). However, it is important to note that self-management itself is a neutral concept and specific efforts to manage a condition may ultimately positively or negatively affect health outcomes.

The management of rheumatic musculoskeletal disease (RMD) during adolescence and young adulthood is often complex, requiring diverse multifaceted therapies over long periods of time that necessitate frequent monitoring. As they grow older, adolescents and young adults (AYA) are expected to become more self-sufficient and independent in the management of their condition. In developmental terms, AYA are characterized by identity explorations, instability, self-focus, and continued development of executive cognitive functioning [2]. It is known that executive functioning is critical for the development of self-management skills [1] (see Chap. 1).

Many AYAs with RMD have ongoing disease into adulthood [3]. The self-management decisions made during adolescence and young adulthood can have lasting impacts later in the disease trajectory [4]. Overall, poor mastery of self-management skills by AYA is associated with an increased risk of treatment nonadherence and lack of follow-up, with subsequent negative consequences in terms of morbidity and

mortality as well as in social, educational, and vocational outcomes [5, 6]. Therefore, the provision and practice of positive self-management skills by young people with RMD is critically important.

The period of adolescence and young adulthood represents a window of opportunity to optimize and solidify positive health behaviors in order to minimize future disease-related disability [1, 7]. Unfortunately, evidence shows that many young people with RMD do not successfully transfer to adult care (i.e., they are not followed by an adult rheumatologist) and/or develop the self-management skills that are necessary to thrive in the adult setting [6, 8]. Notably, there is evidence that young people who choose to attend pediatric appointments alone may be more likely to be followed appropriately in adult centers [9]. By demonstrating independence and self-advocacy during clinic appointments, these young people may be described as "activated patients" (see Box 18.1).

Box 18.1 Patient activation
What is patient activation?

- Defined as "the degree to which the individual understands they must play an active role in managing their own health and health care, and the extent to which they feel able to fulfill that role" [10].
- Concept first operationalized through a rigorous process involving literature review, expert consensus, and patient focus groups [10].

How can I measure patient activation?

- Patient Activation Measure (PAM-13) is a widely used 13-item self-report tool to assess level of empowerment and self-management in individuals living with chronic illness [11].

- Extensively validated for use across diverse adult populations [12] and used in children as young as age 12 with chronic health conditions [13], although no studies specific for RMD.
- Parent-Patient Activation Measure (P-PAM), a disease-agnostic version of PAM, is available to measure activation among the caregivers of young patients [14].

Engaging Young People in Their Healthcare

The term "patient activation" is often used interchangeably with "patient engagement." However, Hibbard and Greene (2013) clarify that patient engagement refers to a broader umbrella concept that includes activation [15]. An assessment of patient engagement in young people must take into account the individual's developmental state, knowledge base, and emerging abilities to advocate for their own needs [16].

Promoting patient engagement with their clinical care can be enabled through accessible, youth-friendly rheumatology services and supportive staff. Clinicians can encourage adolescents to gradually attend medical appointments independently and work with them to develop goals for their treatment based on their values. They can also use decision aids to help patients to make informed choices about their care (see Box 18.2). If feasible, clinics could also set up young person advisory councils to advise on other ways to support engagement based on the patient perspective (see Chaps. 4 and 20).

Promoting Shared Decision-Making with AYAs and Providers

Some clinicians have been shown to deliver care that matches their own preferences rather than those of the patient [17].

This approach may lead to clinician-centered decisions and hinder patient engagement in following their disease management plan. "Shared decision-making" refers to an approach to care that enables patients and healthcare providers to make joint decisions that take into account the best available evidence of treatment options and the patient's individual values and preferences [18]. The use of decision support interventions can help to optimize this process [19, 20] (see Box 18.2).

Box 18.2 Resources to support clinicians in promoting shared decision-making

Pediatric Rheumatology Care and Outcomes Improvement Network (PR-COIN)

- Shared decision-making tools for youth with RMD and their caregivers
- Freely available for download on the Cincinnati Children's Hospital website: https://www.cincinnatichildrens.org/service/j/anderson-center/evidence-based-care/decision-aids

Dartmouth-Hitchcock Decision Support Toolkit

- Stepped framework for clinicians to implement patient decision-making into practice
- Freely available at the Dartmouth School of Medicine website: http://med.dartmouth-hitchcock.org/csdm_toolkits/primary_care_toolkit.html

Supporting Self-Management in the Clinic Setting

Specific self-management strategies identified as important by adolescents with RMD included the process of "letting go" from their caregivers as essential to gaining control over their

disease management [7]. Specific skills that were reported to facilitate this empowerment were:

(i) Listening to and challenging healthcare providers
(ii) Acquiring skills to communicate with doctors
(iii) Managing pain and discomfort
(iv) Managing emotions
(v) Acquiring knowledge and awareness about arthritis

Study results also emphasized the importance of providing adolescents with communication skills and assertiveness training to enhance their ability to be more active and decisive participants in their care [7].

Overall, it is recommended that all rheumatology clinics should implement strategies to support self-management of AYA. These strategies should particularly focus on supporting mastery of the specific self-management skills that AYA have identified as important. See Box 18.3 for clinical resources to measure and support self-management efforts as well as strategies for clinicians to use in daily practice.

Box 18.3 Resources to support clinicians in promoting AYA self-management
Institute for Healthcare Improvement, Cambridge, Massachusetts

- Toolkits to aid busy clinical practices to support AYA and families in day-to-day self-management activities. For example, help AYA to understand their central role in managing their condition, collaboratively develop visit agenda and care plan, support patient goal generation, and organize follow-up support to help AYA to sustain positive behavior change.
- Link: http://www.ihi.org/resources/Pages/Tools/SelfManagementToolkitforClinicians.aspx

How can I measure self-management skills in my patients?

- The Self-Management Skills Assessment Guide is a 21-item tool designed to measure AYA's ability to make decisions relevant to their healthcare needs [21].

Strategies for clinicians to support self-management in daily practice

- Work with AYAs to develop a plan of care based on their values.
- Discuss the pros and cons of different therapeutic strategies and listen to the AYA's views.
- Encourage AYAs to set personalized functional goals that are specific, measurable, achievable, realistic, and time bound (i.e., SMART). Discuss strategies for AYAs to work toward their goals and support them to problem-solve solutions to potential barriers.

Digital Strategies to Address Self-Management

There are a growing number of self-management programs designed for AYA with RMD including a movement toward using digital technologies such as web-based interventions and mobile apps to reduce care disparities related to geographical, financial, and health literacy barriers [22–24]. An advantage of these digitally mediated programs is that they can enable nonspecialists and peers to be trained to provide self-management support, thereby improving accessibility for AYAs living in remote and rural areas [25].

Teens Taking Charge: Managing Arthritis Online

Stinson et al. developed a web-based self-management program for adolescents with JIA using a phased approach including a scoping review and qualitative needs assessment [25]. A pilot randomized control trial was then completed with the intervention (Teens Taking Charge website and weekly health coach calls) and attention control (educational websites and weekly control calls) [25]. Participants in the intervention group demonstrated significant improvements in JIA knowledge and exercise adherence as well as a reduction in pain intensity compared to the control group. Both groups exhibited high compliance with weekly calls (91% and 90% for intervention and control groups, respectively). The results of the full-scale randomized controlled trial will be updated on ClinicalTrials.Gov when available. The Teens Taking Charge program is now freely available: http://teens.aboutkidshealth.ca/sites/jia/en/Pages/default.aspx

The website is divided into 12 interactive modules and covers topics such as managing symptoms and emotions, relaxation, physical therapies, communication with doctors and teachers, lifestyle issues such as nutrition and sexuality, and self-advocacy skills. Two parent modules are designed to help caregivers to encourage self-management skills in their children and learn how to "let go" control over disease management. Individual modules can be "prescribed" to young people and families based on identified clinical need.

iPeer2Peer: A Skype-Based Peer Mentoring Program for Youth with JIA

Peer support interventions have been reported to improve behavioral and emotional symptoms of young people [26]. iPeer2Peer is a peer-mentorship program for youth that provides modeling and reinforcement by older peers. Participants are matched with a trained peer mentor with the same condition, and together they complete ten Skype-based mentoring

sessions over an 8-week period [27]. In a waitlist pilot randomized controlled trial, trained peer mentors with arthritis (aged 16–25 years) were matched to participants (12–18 years) and randomized to the intervention group to provide peer support and education for effective self-management of arthritis. Participants reported high program satisfaction, and all reported that they would recommend it to their peers. Participants who completed the iPeer2Peer program demonstrated improvements in their perceived ability to manage JIA ($p < 0.04$), compared to controls [27]. The iPeer2Peer program has been licensed to the Arthritis Foundation (http://blog.arthritis.org/juvenile-arthritis/arthritis-foundation-pilot-peer-mentorship-program-juvenile-arthritis/). Young people who wish to become mentees or mentors in the iPeer2Peer program can apply through the Arthritis Foundation.

Challenge Your Arthritis

Challenge Your Arthritis is a Dutch web-based self-management program for 16–25-year-olds with arthritis based on Bandura's theory of self-efficacy [28]. The program is led by peer trainers who are young adults with arthritis (20–30 years). The program has three core components: (i) a weekly group chat on self-management topics, (ii) home exercises related to personal goals and weekly themes, and (ii) a social support discussion board used by trainers and participants. Information on accessing the program (Dutch language) is available here: www.reumauitgedaagd.nl/jongeren.

Conclusion

In summary, the development and practice of self-management skills are integral to the successful management of RMD during adolescence and young adulthood. This developmental

period represents a critical window of opportunity to introduce and establish positive self-management behaviors in order to promote continued practice of healthy self-management strategies as adults and minimize future disease-related disability. Clinicians have an important role to play in supporting AYA with RMD in health and disease self-management and should consider taking advantage of existing resources to support these efforts.

Key Management Points

- Develop an early therapeutic alliance with AYA and their families in order to support them to develop into independent, functioning adults.
- Emphasize the gradual shift in responsibility from you (the clinician) to the parent, and ultimately to the AYA.
- As the AYA ages, encourage them to actively participate in different aspects of their disease management (e.g., setting up appointments, taking responsibility for prescription renewals, learning to self-administer injections, generating a list of questions for discussion at appointments).
- Remember that the roles of AYA, families, and the healthcare team should change over time with the clinician eventually moving into a consultant role and the young person eventually becoming the primary supervisor for their own health.
- Set clear expectations with AYAs regarding responsibility for specific disease management activities.

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Chapter 19
Can't Do or Won't Do? Adherence in Adolescent and Young Adult Rheumatology

Janet E. McDonagh and N. J. Gray

Introduction

Learning to manage treatment and therapies is important to young people with jRMD [1] and core to self-management training (see Chap. 18) and transitional care (see Chap. 21). Although the terminology in this area is continually debated,

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Table 19.1 Terms and definitions [2]

Terms	Definitions
Compliance	The extent to which the patient's behaviour matches the prescriber's recommendations Implies lack of or passivity of the patient; therefore, other terms preferred
Concordance	*The active process* by which the patient and prescriber form a therapeutic contract. Cannot be measured unlike adherence and compliance
Adherence	The extent to which the patient's behaviour matches agreed recommendations from the prescriber

the term adherence will be used in this chapter as – unlike concordance – it can be measured and lacks the implied passivity of the term compliance (Table 19.1). Adherence is often considered in the context of medication, but it is also relevant to self-management activities like blood test monitoring, hospital appointments, therapy exercises and healthy lifestyle advice. Adherence also may vary according to the task, e.g. young people may take medicines but not do blood tests or may attend clinics but not take their medicines. Adherence is associated with better health outcomes, but it is a challenging area for young person, family and professional alike.

Types of Nonadherence

Nonadherence can be divided into two types – unintentional and intentional. This division is somewhat simplistic as there is also likely to be overlap between the two types, e.g. forgetfulness can potentially be both intentional and non-intentional. It is important to distinguish between these, however, as the strategies to address them will differ (Table 19.2).

When considering risk factors for nonadherence, it is important to consider what aspects can be changed and which will be more challenging to change, but professionals still need to be aware of them (Table 19.3, with personal

Table 19.2 Types of Nonadherence

Unintentional nonadherence ("can't do") may occur because of practical or cognitive difficulties in taking medications, e.g.:
Forgetfulness
Problems with dexterity, e.g. getting tabs out of blister packs
Difficulties carrying/taking meds in certain settings, e.g. during school day, privacy
Complexity of regimes
Understanding of the repeat prescription/refill system
Understanding how to access an emergency supply
Ability to pay for prescriptions
Intentional nonadherence ("won't do") to medication may be the result of:
A lack of information about the advantages and disadvantages of the treatment
When the benefits of treatment are not obviously apparent
The psychological adaptation required to see oneself as in need of treatment
Fear of visible side effects
Unwilling to disclose to others

communication from Professor Rachel Elliott, University of Manchester, 11 December 2017).

Challenges to Adherence for Young People with Rheumatic Disease

The frequently reported barriers to adherence are not unique to specific diseases, with the top five in a recent review being physical well-being, forgetting by coincidence, strive for normality, relationship with peers and relationship with parents [3]. Examples of these challenges are detailed in Table 19.4.

Table 19.3 Risk factors for nonadherence and ability to change

Things we can't change, but must be aware of:	Things that we might be able to change:
Milder illness	Forgetting
Having the illness for a long time	Parents worrying about side effects
Having side effects	Not knowing about the illness and medicines
Problems with relationship with parents	Not sure whether the medicine works/is needed
No stable family structure	Not feeling in control or able to change things
One adult only in the house	Not feeling "normal" or looking forward to the future
No family routine	Number of medicines/doses per day
Problems with school access to medicines	Not convenient or pleasant to use
	Inability to use medicines, e.g. size of asthma inhaler device
	Poor relationship with the doctor

As with all aspects of healthcare for young people, acknowledging the impact of adolescent and young adult development on adherence is imperative (see Chaps. 1, 2, and 3). Of particular relevance is the stage of cognitive development.

Formal operational thinking (or abstract thought) develops in early to mid-adolescence but can be delayed by chronic illness. Even in young adulthood, young people may have logical competencies similar to adults but will exhibit differences in decision and risk-taking due to the different social and emotional factors at this life stage (see Chap. 2). Moreover, even in those young people who have moved into abstract thought, a traumatic event – such as the diagnosis of a long-term condition in adolescence – could make them revert to concrete thought (see Chap. 1). Cognitive developmental stage has therefore an impact on adherence due to a reduced ability to plan and prepare using abstract concepts. For example, using

Table 19.4 Challenges to adherence for young people with rheumatic disease

AYA development
Cognitive
Psychological
Social development
Medicine/therapy
Intermittent dosing
Delay of therapeutic effect, e.g. methotrexate
Have to take when well and in remission, e.g. methotrexate and biologics
Reminder of ill health
Side effects – Nausea (including anticipatory)
Cosmetic issues, e.g. steroid side effects
Complexity of regimen
Need for planning, e.g. parenteral administration
Organisation
Taste
Pill size
Treatment perceptions – Understanding of risk benefit [if risk outweighs benefit, then there is risk of nonadherence]
Interference with normal activities – e.g. methotrexate and alcohol
Privacy issues for administration
System barriers including supply disruption, cost and complex repeat prescription systems
The condition
Chronic nature

(continued)

Table 19.4 (continued)

Relapsing nature
Unpredictability of flares, symptoms
Relative visibility of condition
Acceptance of condition (risk if in denial)
Interference of activities particularly peer and leisure activities

future motivators ("if you don't take your etanercept, you will end up with joint damage") with a concrete thinker is likely to prove less effective when trying to improve adherence rather than the preferable immediate motivators ("if you don't take your etanercept, you are unlikely to be able to play football this summer"). This is particularly pertinent when there is a delay before improvement is seen following commencement of medication and/or when medication with significant side effects has to be continued even when the actual disease is in remission as is the case with methotrexate ("I forgot to take my methotrexate and my arthritis was fine so I'm not going to take it anymore").

Psychological development during adolescence encompasses the development of a sense of self, and during mid-adolescence, this often is expressed as a sense of being invulnerable "bullet-proof" – "I know all the risks Doctor, but it won't happen to me." During adolescence, young people will strive for normality, and young people with rheumatic disease are no different. If therapeutic regimens interfere with their normal activities, then there is a risk to adherence. The goal of medicine-taking in rheumatic disease should be to maximise both physical and emotional well-being; addressing the physical symptoms should reduce anxiety and low mood about their impact [4].

Social development may similarly be impacted if such regimens interfere with relationships with peers, siblings and/or parents. During adolescence there is a gradual increase in peer influence that may come into conflict with parental influence. Likewise, there is a shift in responsibility

for health management as young people grow up and become more autonomous in looking after their own health and, in the case of young people with rheumatic disease, their treatment. This can prove a challenging time for all concerned – the young person and their parent/carer, as well as the health professional – and needs to be negotiated carefully and sensitively (see Chap. 4). When considering the social context of young people with rheumatic disease, disclosure of their condition can be challenging, particularly to peers. Nondisclosure could be a marker of nonadherence as the young person may be unable or unwilling to create the private space needed during school, college or other work to manage their therapies.

In addition to taking the stage of adolescent-young adult development into consideration, coexisting learning difficulties/disability/cognitive impairment also need to be acknowledged. It is important to realise that although some of these young people may never be truly independent in self-managing their condition, they may be able to do certain components with appropriate supervision. This should be explored with both the young person and their caregivers if age and developmentally appropriate. Strategies to increase independence in medicine-taking, particularly when young people have learning challenges, require sufficient time in the consultation to elicit their medicine-related concerns and those of their carers. Young people with learning challenges may also be taking psychotropic medicines; joint working across medical teams may improve their holistic care.

In addition to AYA development, the actual medicine/therapy and the rheumatic condition present particular challenges to young people, examples of which are listed in Table 19.4.

Assessment of Adherence

Assessment of adherence is a core component of reviews with young people, particularly once a management plan is in

place after diagnosis. As with all encounters with young people, assessment of what stage of development (see Chaps. 1, 2, and 3) they are at is vital whilst acknowledging the potential for delay and regression in chronic illnesses. An underlying learning disability and/or secondary cognitive impairment may also be present – the latter may occur in such conditions as SLE (see Chap. 8).

The most important task for the health professional is to normalise nonadherence. So rather than ask *"Do you take your meds regularly?",* it is preferable to ask *"When was the last time you forgot?"* Questions to help understand the context of their lives are important: *"How do you manage to fit taking your medicine into a typical day?" "What makes it difficult to take your meds?"* Using the HEADSSS approach [5] (see Chaps. 3 and 4) is useful in this regard. As well as being a strategy to engage young people, it can help identify risk as well as resilient/protective factors and furthermore provide information which will assist the formulation of adherence-improving strategies.

Once nonadherence is identified, it is important to assess their motivation to change, if any. Motivational interviewing techniques (see Chap. 4) are extremely useful in the AYA rheumatology clinics [6, 7], as well as addressing resistance and ambivalence to change; they also emphasise self-responsibility in changing or modifying one's behaviour. Trigger questions to assess motivation to change are detailed in Table 19.5. Once gathered, subsequent questioning can include *"what will it take to move you from a 5 to a 7 in confidence?"* and over time at subsequent reviews "*are you still at a 5/10 in confidence?"*

Strategies for Optimising Adherence

As mentioned before, information collected during HEADSSS screening [5] (see Chaps. 3 and 4) is useful in the

Table 19.5 Trigger questions to assess motivation to change

Trigger question	**Exemplar responses with strategies**	
"*On a scale of 0–10,*	Example A	Example B
How much of a **priority** is it that you *start to take your meds regularly?*	10	7
How **important** is it that you *start taking your meds regularly?*	10	4
How **confident** are you that you could succeed *to take your meds regularly*?"	5	10
Possible strategies	No need to address knowledge but rather address why lacking in confidence; use confidence building techniques	Assess their knowledge of the medication including risk and benefit and also what is of greater priority

development of AYA-centred strategies with the young person in question, taking into account the life and developmental context of the AYA. Examples of such strategies are detailed in Table 19.6.

Table 19.6 Strategies for optimising adherence

Education – Accurate and individualised
Knowledge includes:
Diagnosis and its acceptance
Honest explanations
Anticipation of common side effects and provision of advice about what to do if these happen
Risk/benefit
Treatment goals
Future effects on fertility
What if I miss it?
What if I can't take it?
Clear instructions about dosing – Check understanding, including that of parent
Address impact on activities – Vocational, social, leisure, etc.
Address beliefs – This includes the priority that young people assign to both the positive and negative effects of their therapy
Address disclosure issues
Therapeutic relationship
HONESTY
Attention to their lived experience
Enable venting of their thoughts, beliefs and feelings, retherapy, hospital attendance, blood monitoring, etc.
Encourage their own questions
Encourage problem-solving
Participatory
Support lone consulting, i.e. young person seen independently of parent/caregiver for part/all of visit

Table 19.6 (continued)

Behaviours
Positive reinforcement
Link with daily routines
Need to use immediate more than future motivators, particularly if at concrete stage of cognitive development
Cueing
Aids, e.g. mHealth interventions [8–10], dosette boxes
Time out, e.g. drug holiday
Simplify regime
Any regimen should be built around the life context of the AYA [11], acknowledging that this is likely to change as the young person grows up – Particularly at the points of transition whether health, social or vocational
Ideally once or twice daily regimes
Try to avoid dosing during school/college/university/work hours when possible
Encourage development of problem-solving skills (e.g. they work out a way to get into a dosing routine and remember each dose)
Ensure uninterrupted supplies
Support from others
(i) Parent/carer
Act as operational and long-term memory
Tend to collect prescriptions on the young person's behalf
Move from shared to self-management during adolescent development (see Chap. 18)
Likely to still be involved to some degree in young adulthood

(continued)

Table 19.6 (continued)

(ii) school, e.g. teachers, school nurse, university disability support services, etc.
(iii) peers – Requires discussion with young person as this involvement will vary according to developmental stage and disclosure issues
(iv) health professionals
All members of the rheumatology multidisciplinary team
Pharmacists – Hospital and community pharmacists are an underused resource in the rheumatology multidisciplinary team. In particular, a youth-friendly community pharmacist should be identified during adolescence as a useful and easily accessible resource for the young person as they become more autonomous regarding their medicine management [12]
General practitioner – Of increasing importance as the young person becomes more autonomous and particularly at the time of transfer to adult rheumatology care
(v) Credible online resources

Key Management Points

- Education and skills training in adherence to therapy and healthcare is core to AYA rheumatology service provision.
- Adherence is not just about taking medication but also encompasses other therapies and attendance at appointments.
- Nonadherence should not be perceived as always intentional on the part of the young person.
- Some risk factors for nonadherence are more amenable to change than others.
- During adolescence and young adulthood, young people with rheumatic disease face particular challenges in adhering to therapies and care provision.

- Health professionals require developmentally appropriate communication skills and a range of strategies to engage and motivate young people to optimise adherence during adolescence and young adulthood.

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Chapter 20
Youth-Friendly Rheumatology Services

Martin Lee and Kerry Jobling

Introduction

Adolescence and young adulthood is a major developmental stage covering a wide age range (10–24 years) and several key developmental stages – early, mid- and late adolescence and emerging adulthood. Adolescence and young adulthood also encompasses major life transitions such as entering secondary education, puberty, finishing mandatory education, moving away from home, moving into higher education or the workplace, making friends beyond the family, engaging in romantic relationships, the development of greater autonomy and independence in addition to moving from child- to adult-centred services including health (see Chaps. 1, 2, 3, 4, 5, and 21). These factors add complexity to the requirements that AYAs with long-term conditions have of a health service and

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are a key reason why any AYA service, whether located in adult or paediatric services, should recognise AYAs as a distinct patient group with unique healthcare and psychosocial needs. Furthermore, these needs change as the young people move through adolescence and young adulthood, thus requiring a health service which can be responsive to these changes.

Characteristics of Youth-Friendly Services

Recently, there has been a growing interest in, and recognition of, AYA healthcare services. Several documents have been published in this area including the World Health Organization (WHO) global standards for quality healthcare services for adolescents [1] and, in England, the Department of Health (DOH) quality criteria for young people-friendly health services [2]. Furthermore, the WHO is calling for policy makers to move from adolescent-friendly service delivery towards systems that can respond to the health and developmental needs of adolescents [3].

In 2013, Ambresin et al. published a systematic review of youth-friendly healthcare based upon the literature from young people's perspectives [4]. This review identified eight core indicators of a youth-friendly service (Table 20.1).

Further work has progressed this area to not just consider youth friendliness in service delivery but also the impact of the biopsychosocial development. The focus then becomes how developmentally appropriate a service (and indeed the system it exists in) might be [5]. Five conceptual dimensions of such care as perceived by practitioners have been identified which potentially provide a framework for developmentally appropriate healthcare provision and are detailed in Table 20.2. They in turn echo the core indicators of such services as perceived by the young people (Table 20.1).

In addition to reports of AYA rheumatology services [6], several toolkits have been developed to assist practitioners in the promotion of the implementation of such

Table 20.1 Summary of core indicators of a youth-friendly service from the young person's perspective [4]

Indicator	Example
Accessibility	Is the location of the healthcare service accessible and affordable for young people?
Staff attitude	Are staff respectful, supportive, honest, trustworthy, friendly and caring towards young people?
Communication	Do staff provide clear, age-appropriate information to young people? Do staff engage in active listening?
Medical competency	Are staff competent at medical procedures?
Guideline-driven care	Do staff provide comprehensive, guideline-driven care that respects the confidentiality and autonomy of young people?
Age-appropriate environment	Are appointment times flexible? Are waiting times reasonable? Do young people have access to separate physical space with age-appropriate health information?
Involvement in healthcare	Are young people actively involved in their healthcare?
Health outcomes	Pain management, quality of life

developmentally appropriate health services whether it be at the consultation level or at an organisational or institutional level [2, 7, 8].

Young people with rheumatic musculoskeletal disease (RMD) should have access to a high-quality developmentally appropriate healthcare service throughout adolescence and young adulthood (10–24 years of age). This is a key stage of life as many health-promoting and self-management behaviours are becoming established. This healthcare should be structured around the indicators as discussed above. The service should address not only management of the young person's RMD but also psychological, sexual, social and

Table 20.2 Dimensions of developmentally appropriate healthcare [5]

1. Holistic care addressing biological, psychological and social development
2. Acknowledgement of AYA as distinct from children and older adults
3. Adjustment of care as the AYA develops
4. Empowering the AYA by integrating health education and health promotion into their care
5. Interdisciplinary and interorganisational work

educational/vocational aspects of their care. Many professionals involved in AYA care use psychosocial screening tools such as the HEEADSSS assessment tool [9] (see Chap. 4) to engage young people and identify both health-risk behaviours and resilience factors in AYAs. This has been further adapted into a smartphone app for trainees [10] and a further iteration of the screening tool – THRxEADSSS – to cover transitional issues [11] (developmentally appropriate approaches to young people including the importance of assuring confidentiality are detailed in Chap. 4). Learning to navigate the health system beyond the rheumatology clinic is also important for young people, and learning which service to access and when and how is core to the knowledge and skills framework underpinning a youth-friendly rheumatology AYA service.

The Importance of Training Healthcare Professionals in AYA Care

In order to run a successful youth-friendly rheumatology service, it is vital that all members of the healthcare team involved in that service should be interested, engaged and adequately qualified [12]. Healthcare professionals should be aware of how RMD present in childhood and how they are

managed, as well as the impact of adolescence and young adulthood development itself on RMD and vice versa. Training in communication skills specific for AYA care is essential as the ability to discuss areas of health such as emotional well-being, social, sexuality and reproductive health issues with AYAs is necessary (see Chap. 4). Healthcare professionals are required to be respectful, supporting and caring towards AYAs as well as be willing to actively involve AYAs themselves in decisions about their healthcare. Training programmes and curricula are available in adolescent care that cover some of these specific issues [13–15].

Summary

As young people grow up, they seek active involvement and decision-making opportunities in their healthcare and condition management [4, 16, 17]. They report a need to "strive for normality" and a desire for respect and involvement in their own healthcare [16]. Young people feel well looked after in a context that acknowledges their lived experience and provides them with guidance to make their own healthcare-related choices.

AYA rheumatology clinics should be developmentally appropriate and recognise AYA as a unique patient group, treating them holistically within their wider psychosocial context, taking into account the life changes and transitions that shape this stage of development. Flexible, person-centred healthcare in this group of individuals will help to foster independence and increase their confidence in self-management. The potential impact of AYA care may have significant benefits both in terms of the health of AYAs with chronic RMDs and also health economics. Providing a good quality, well-resourced service for AYAs is likely to reduce rates of non-attendance and the potential for AYAs to become lost in the transition process, as well as improve patient adherence and outcomes [17].

Key Management Points

- Healthcare services should recognise AYAs as a distinct patient group with unique healthcare and psychosocial needs.
- AYAs want a service that provides flexibility, the potential for peer support and developmentally appropriate information.

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Chapter 21
Transitional Care

Lucy Gossens and Judy Ammerlaan

Transitional Care for Young People

Living with a rheumatic disease is challenging at any age but particularly difficult for AYA with RMD since their chronic condition and treatment affect both physical and psychosocial development [1, 2]. Whilst treatment has improved, it is still not possible to cure RMD [3], and many AYA grow into adulthood with RMD. In the context of these challenges, moving from paediatric to adult healthcare is an essential process for AYA and their parents/caregivers. Transitional care, as defined by the Society for Adolescent Medicine in the USA, is "a purposeful, planned process that addresses the medical, psychosocial and educational/vocational (holistic) needs of adolescents and young people with chronic physical and medical conditions as they move from child-centred to adult-oriented healthcare systems" [4]. Health transition is just one part of the wider set of educational, personal, family and social transitions young people make during adolescence and young adulthood.

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The importance of transitional care for young people with RMD has been increasingly acknowledged, due to the experiences of healthcare professionals, AYA and their families [5–8]. A number of factors have been identified as barriers to the smooth transition of care from child-oriented to adult care systems. A postal survey among health professionals [9] revealed that inadequate resources, problems of institutional support, poor inter/intra-agency coordination and lack of physician education were recognized as the major barriers to providing optimal transitional care. The health professionals also expressed some risk factors for transitional difficulties including family dynamics, adolescent intrapersonal characteristics and disease severity [10, 11]. From the perspective of AYA with RMD, there are daily challenges in decision making about managing the consequences of having a chronic disease in the context of ongoing medical treatment and issues such as disability [3, 12]. As all young people, they have to develop their own identity and independence (see Chaps. 1, 2, and 3) but also become more responsible for their health. In this period of change, AYA also make the transition from child care to adult care systems. Often, they are quite unprepared for and inexperienced in assuming all the adult roles [12–14]. Consequently this may lead to major problems including treatment dropout or passive-resistant behaviour towards health professional and/or parents [9, 13, 14]. Reflections on redeveloping healthcare to accommodate the diversity of the AYA needs and preferences for care and support [8, 15, 16] revealed that an essential part of the transition is about integrating the young person's individual situation, his or her experiences, questions and needs in daily healthcare and providing tailored service provision [5, 15, 16]. These results are also underlined in a qualitative study on the living experiences of transition [8].

Comparing the perspectives on goals and priorities in transitional care reveals a gap between "what healthcare professionals want and their priorities" and "what young people want and their priorities". In Boxes 21.1 and 21.2, the personal experiences of a health professional in transitional care are described [15].

Box 21.1 Anne [1]: A Patient Story

The paediatrician introduced the next patient on the outpatient clinic as a "vulnerable young girl", with no friends and severe systemic juvenile arthritis. The door opened and there was Anne, a young girl of 17 years, sitting in a wheelchair. Her mother pushed the wheelchair into the consultation room. Her father came along too. He walked with the coats and the bags of Anne and her mother, and in a second, the consultation room was filled with collateral besides the girl: the paediatrician, a family, a wheelchair and me. The paediatrician started the consultation and asked: "How are you today, Anne?" Anne replied, quietly, as she looked at the ground, "good", whilst her father and mother looked worried. I looked at Anne's nose and lips where impressive piercings were placed. I also noticed a bracelet on her arm with the name of a popular festival on it, a sign that Anne had been there. Mother took the floor and expressed her concerns. She had tried not interfering with the medication regime and to leave it to Anne, as last time had been agreed during the consultation. But it didn't work. Anne did not take any pill and mother felt helpless. Father also took the floor: he was worried about Anne. She did go to school but seemed to have no interest in her future. Discussions about this subject gave a lot of stress, and since 2 weeks, her father and daughter were not on speaking terms, due to this situation. Anne gave her father the silent treatment. The paediatrician nodded understandably and tried to make eye contact with Anne. He cleared his throat and stressed the importance of taking the drugs and of focusing on the future. Anne nodded too and murmured that she understood what he was saying. The parents still looked worried. Anne looked at the ground.

Box 21.2 Anne [2]: A Patient Story

Due to a technical problem with the computer, the paediatrician took Anne's parents to another room to discuss the X-rays of Anne's hands. Anne did not want to go. I asked her why she was not interested in her X-rays. From her point of view, she knew already the results: "ugly hands and painful hands". So Anne and I stayed behind. It was suddenly strangely silent and Anne sighed. I smiled at her, she smiled back. "You're a nurse, right?" she asked. I nodded. Some tears dripped from her eyes and she squeezed her hands forcefully.

"Can I ask you something?" she said. I gave her an encouraging nod and moved my chair closer to her wheelchair. "A few weeks ago, I had sex at a party and did not use condoms. I think I am pregnant".

I nodded and swallowed. It became somewhat hotter in the consultation room.

Key Components of Transition

No model of transition has been proven to be more effective than others; nevertheless there is a growing evidence on key components of the process of transitional care. Suris and Akre [16] investigated in their Delphi study among 30 health experts what key elements should be part of a transition programme and what elements could be used to assess its success. Sattoe et al. [17] explored the results from this study further among young people with a chronic disease with a cohort study and a review of their medical files. The European League of Arthritis and Rheumatism (EULAR) has recently produced standards and recommendations for transitional care of AYA with RMD, based on available evidence and opinions of both patients and multidisciplinary teams (MDTs) in paediatric and adult rheumatology [18]. In Box 21.3, the EULAR standards [18] with additional information from the studies of Suris and Akre [16] and Sattoe et al. [17] are summarized.

Box 21.3 Key Components of Transition [16–18]

(a) AYA with RMD should have access to high-quality, coordinated transitional care, based on their individual needs and questions, delivered through partnership with healthcare professionals, young people and their families.

(b) The transition process should start as early as possible, in early adolescence (preferably by age 12) or directly after the diagnosis in adolescent-onset disease. Transition starts within paediatrics but continues on into adult services and is therefore, by definition, a paediatric and adult concern.

(c) Transition should never be considered as the event of transfer between paediatrics and adult care but must be considered as an age- and developmentally appropriate process, addressing the psychosocial and educational/vocational aspects of care in addition to the traditional medical areas. Transition services must be young person focused and address the complexity of young adult development.

(d) There must be direct communication between the key participants (as a minimum, the young person, parent/carer and a member of paediatric and adult teams) during the process of transition. Before and after transfer, there should be "direct" contacts between paediatric and adult rheumatology teams.

(e) Individual transitional processes and progress should be carefully documented in the medical records and planned with the young person and his/her family/caregivers to optimize and facilitate each young person towards self-management.

(f) Every rheumatology service and clinical network (paediatric and adult) must have a written, agreed and regularly updated transition policy. In this transition policy, there should be a clear written description of the multidisciplinary team (MDT)

involvement in transitional care, locally and in the clinical network. The MDT should preferably include a designated transition coordinator.

(g) Healthcare teams involved in transition and AYA care must have appropriate knowledge and skills to support and treat the individual young person, based on his or her needs and problems. Therefore, healthcare teams need continuously training in communication skills, generic adolescent care and childhood-onset RMDs.

(h) There must be secure funding for dedicated resources to provide uninterrupted clinical care and youth-friendly services for young people entering adult care.

(i) Increased research is needed to improve evidence-based knowledge and practice to improve outcomes for AYA with RMD.

The Role of the Multidisciplinary Team

Transitional care is the responsibility of the whole team [18–20]. Collaboration and shared responsibility of professionals in child- and adult care is the key. In addition to a shared vision, protocols and working methods must be relevant, documented and where possible coordinated. By means of a transition clinic with associated "multidisciplinary consultations", joint care is offered for at least 1 year to offer the young person the opportunity to learn to know the new care providers prior to the transfer, which contributes to a successful transfer [18, 19]. Certain roles within transition may be addressed by different members of the MDT [21]. The composition of the MDT may be variable and some members might have more than one role. Ideally, there should be continuity in care of the health professionals within the MDT [22]. A nominated and identified

member of the MDT team to be a transition coordinator is essential. They may be from any professional background and should liaise between adult and paediatric teams to ensure sufficient facilitation of communication, coordination of care and implementation of the transitional care plan including transfer [6, 18, 23]. For young people with multisystem disease such as SLE or vasculitis, coordination of the transfer of care of all the disciplines involved in an individual young person's care will be vital. In addition to multidisciplinary and interdisciplinary collaboration, effective interaction with primary care practitioners and other professionals and institutions should be guaranteed [19].

Strategies for Implementing Transitional Care in Clinical Practice

New innovations usually do not work automatically, especially if the innovation requires complex changes in clinical practice, such as interdisciplinary cooperation, some change in patient behaviour or changes in the organization of care [24]. Implementing transitional care in an organization and daily care requires complex changes of all these facets [18], and so an implementation strategy is key. As a thorough and generally accepted implementation strategy is lacking [25], the following steps are important to take into account whilst actively involving AYA themselves in all these steps [6, 19]:

- *Assessment and dissemination*: identify barriers and facilitators for implementation [25]. Examples of these facilitators can be identifying key individuals, the integral role of young people and families, agreed policy, written communication, training and clarity of roles within teams [18, 26]. All these interventions will require sufficient funding or reimbursement to integrate transitional care services as a normal part of healthcare [18]. Funding is also needed for the implementation itself.

- *Adoption*: all major stakeholders, including AYA, families, healthcare professionals and institutional managers, should develop and approve the transition policies, as equal partners [23, 27, 28], and they must be approved by hospital or institutional managers to facilitate appropriate resources to support the implementation within the clinical departments [18].
- *Implementation*: implementing transitional pathways requires a motivated healthcare team, able to reorganize their existing work practice, with access to available resources [20, 23, 29]. The multidisciplinary transitional care team also requires adequate training in AYA health and transitional care and capacity to enable the transition care coordinator role to function [7, 18].
- *Evaluation* of the implementation strategies used as well as the success of the implemented transition programmes [24] enables service improvement. Standardized indicators to evaluate the success of transition need to be developed [23].

An example of an implementation strategy of a transition outpatient clinic in the Netherlands [15] is outlined in Box 21.4.

Box 21.4 Implementation of a Transition Outpatient Clinic in the Netherlands

Due to health policy in the Netherlands, young peoples make the transition at the age of 18 years from child to adult care. In the University Medical Center Utrecht, every year, up to 40 young people make this transition where the children and adult departments are housed in different buildings. In the past, continuity of care was depending on a summary of the disease history within the medical record of the young person. In spite of good intentions, communication between the children and adult team was scarce where at the same time, both

teams were experiencing significant problems during the transition. These problems were mostly caused by mutual prejudices and high rates of treatment dropout, non-adherence to medical treatment and rebellious behaviour of young peoples. Gradually, paediatricians and rheumatologists realized that their mutual mistrust and lack of communication and coordination interfered with optimal care. They concluded that sharing responsibility and working together on developing knowledge and supporting the young person were needed.

In order to bridge the distance between the children and the adult departments, to improve understanding and coordination between paediatricians and rheumatologist and to support parents and the young people towards adolescence, young people were invited to share their experiences on growing up with a rheumatic disease and to reflect on their experiences, needs and preferences for support from healthcare professionals. Two questions were leading in these conversations: "What is the most important for you?" and "How would you like us to organize your treatment?"

The answers were honest, simple and down to earth. *"Listen more and speak less", "I don't want to be an exception"*, "*your recommendations should fit into my daily life"*, "*information should meet my language*" and "*I want to be prepared and I want to be in charge*" were needs they shared. The young people also shared some solutions like the use of the Internet to contact and provide information targeted to their age and the need for a professional who's main focus is "self-management and dealing with the consequences of rheumatism on daily life". Based on the outcomes of the conversations with the young peoples, an outpatient transition clinic was developed where young people and their parents/caregivers meet their future rheumatologist at an early age and where a transition nurse guides and supports them during the transfer from child to adult care and

self-management. To improve the young persons' knowledge and to meet the needs for information fit to their language and preferences, an informative website www.jong-en-reuma.nl with written and video information was installed. To encourage active involvement and to stimulate the feelings of control, a web-based portal with access to the personal medical record, self-monitoring and eConsult functionalities was developed. Young peoples who used these eHealth tools expressed their needs for a training programme, where they could practice self-management skills. To meet these needs, two versions of a self-management training programme were developed: a face-to-face and a web-based version. The two programmes www.reuma-uitgedaagd.nl (in Dutch) are led by young people themselves.

Although the key components of transition as described here can have a major contribution to the actual daily practice of transition, many different factors influence local services. The implementation of transition programmes needs flexibility and is impacted by the available resources at a local level [23, 25]. The authors are strong believers of understanding the needs and preferences of the young person and using these as a starting point to lead the development and implementation transition programmes in daily practice. However, integrating patients' expertise is not necessarily part of and does not naturally fit in our traditional roles as healthcare professionals; we realize that we still have a way to go.

Key Management Points

- Transition is a long process which starts in early adolescence and continues into young adulthood after transfer of care to adult rheumatology. It requires collaboration and planning.
- Transitional care involves all members of the paediatric and adult rheumatology teams
- Transitional care should be young person focussed, developmentally appropriate and address psychological, social and educational/vocational aspects of care in addition to the traditional medical areas.

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Glossary

Adherence	The extent to which the patient's behaviour matches *agreed* recommendations from the prescriber
Adolescence	10–19 years
Person-centred language	Language which seeks to focus on the person first and then disease second, e.g. "young people with arthritis rather than arthritis patients"
Young adulthood	16–25 years
Young people	10–24 years (WHO)
AYA	Adolescents and young adults
CAPS	Cryopyrin-associated autoinflammatory syndrome
CRMO	Chronic recurrent multifocal osteomyelitis
CNO	Chronic nonbacterial osteomyelitis
DEXA	Dual-energy X-ray absorptiometry
FMF	Familial Mediterranean fever
GPA	Granulomatosis with polyangiitis

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HIDS	Hyper IgD syndrome
HM	Hypermobility
HSD	Hypermobility spectrum disorder
JDM	Juvenile dermatomyositis
JIA	Juvenile idiopathic arthritis
MSK	Musculoskeletal
RMD	Rheumatic and musculoskeletal disease
SLE	Systemic lupus erythematosus
SEM	Sports and exercise medicine
TRAPS	Tumour necrosis factor receptor-associated periodic syndrome
YP	Young people

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