Case Study Examples

**Case Study Example 1** - awarded Pass with Merit

Very well written essay with evidence of wider reading and critical thinking. Very good reflection and demonstrates application of learning. Demonstrates holistic care and good referencing.

**Case Study Example 2** – awarded Pass

A good essay with use of evidence and demonstration of understanding of pathologies. It would benefit from consistent referencing and use of a more academic language.

**Case Study Example 3** – awarded Pass

The essay was written logically, with some evidence of reading, however the different approaches are listed with no explanation to which one was used and why. So further reflection is needed. Also ‘etc.’ was used a lot and further explanation was required.

**Case Study Example 4** - Failed

The essay was very basic and descriptive with no evidence of reading or reflection. It was poorly presented with short sentences and poor grammar and punctuation.
The purpose of this essay is to present a case study of a paediatric patient after having attended a three day Introduction to Paediatrics course. Firstly it will report on the findings of a physiotherapy assessment of a child who presented with the condition of genu varum (bow legs). It will then go on to discuss the physiological and pathological reasons for genu varum in order to demonstrate clinical reasoning and justify why the child did not require physiotherapy intervention. However, in order to fulfil the criteria of the essay the condition of Blount’s disease will be introduced to allow the author to discuss an appropriate treatment plan, set goals and critique an outcome measure. The author will attempt to show application of learning and use of evidence based practice throughout the essay.

Child A was referred to the community paediatric physiotherapy team by a health visitor as the parents were concerned that their 16 month old child has bow legs. In addition the mother expressed concern that the biological father from Nigeria had bow legs as a child but it resolved by the time he had reached adulthood.

Mum reported her daughter did not appear to be in pain and was content and highly active little girl. She was born via normal delivery at full term and had no past medical history. Mum did not report any other concerns about her daughter. She moved through her developmental milestones with no problems. She began to walk unaided at 12 months and she remains very active. Mum felt that she was developing quickly by comparison to her peers. No medical investigations, X-ray or blood tests had been carried out. There were no dietary problems or vitamin D deficiency issues when questioned.

The neurological assessment was unremarkable and tone was normal throughout. Range of movement was full and pain free in all limbs and her spine was straight. There was no obvious leg length difference. In supine with knees fully extended and medial malleoli together there was a slight genu varum but this was within normal
limits for her age. She was very active using a wide variety of movement patterns. No abnormal movement patterns were evident. She was observed trying to climb onto chairs and only needed light hand held support to safely climb up and down steps.

Bow legs, knock knees, flat feet, in-toeing and out-toeing presentations in a child can be a cause for concern for parents which often leads to a referral to the paediatric physiotherapy service. (Jacobs 2010). These presentations are infrequently due to a pathological condition but rather as part of normal variants of lower limb development. (Jones et al 2013). It is essential for the physiotherapist to have an understanding of the common variations of normal development in order to perform a valid clinical assessment and exclude pathological conditions.

Children with motor disorders may present with positive signs (for example increased tone) or negative signs (weakness, reduced selective motor control), (Sanger et al 2006). Child A showed no signs of a specific motor disorder. Her muscle tone was normal, there were no visible areas of muscle wasting, there were no abnormal movement patterns and her motor skills were appropriate for her age.

A child is born with approximately 15 degrees of genu varum and this will gradually improve to become straight, usually by around 18 months. A genu valgum (knock-knee) will develop between the ages of 3 to 4 years. The angle of genu valgum usually corrects itself by the age of 7 to 8 years and the normal adult alignment is 5 degrees to minus 7 degrees. (Staheli 1987). Therefore it may be assumed that symmetrical bowing or genu varum of the lower limbs in a child up to the age of 2 years is due to normal skeletal development.

Pathological varum may be suspected if the child presents with unilateral or asymmetrical bowing, a rapid worsening deformity, associated obesity, shortening of one leg or if the child is small for their age. (Fergusson and Wainwright 2013).
Nutritional rickets can cause abnormal genu varum due to a deficiency of vitamin D and dietary calcium. Risk factors include children with darkly pigmented skin, lack of sunlight exposure and living in a temperate climate (Nield 2006) so it was important to exclude this condition as a differential diagnosis.

The degree of genu varum can be determined by measuring the intercondylar or intermalleolar distances. The author measured the intercondylar distance. This should be measured with the legs positioned straight and the medial malleoli touching (Sass and Hassan 2003). Since researching for the purpose of this essay the author became aware of the ‘cover up test’ to assess for bow legs (Davids et al 2000) concluded that this test was reliable as a screening tool for children aged 1 to 3 with bow legs to determine a physiological or pathological varum. The author was not previously aware of this test but will now endeavour to include it in future assessments of children presenting with genu varum.

It can be challenging to obtain accurate and reliable measurements when assessing a child under the age of 2 but as the author is new to the speciality of paediatrics it is hoped that experience gained from an increasing caseload will result in a more proficient assessment.

Child A had not had an X-ray of her lower limbs but considering the research shows the majority of children presenting with genu varum have physiological varum (Staheli 1987, Jacquemier et al 2008) it would not be appropriate to perform routine radiological screening. This would expose children to unnecessary radiation and may not be deemed a cost effective strategy.

As child A presented with symmetrical bowing, pain free, full range of movements, and had no neurological signs I concluded that she had physiological bowing, in keeping with the normal stage of lower limb development for her age. No specific physiotherapy intervention was indicated but it was essential to justify to the parent
why this was the case and to provide reassurance there is no pathological condition. Poutney 2007 recommends using ‘The five S’s’ (symmetry, symptoms, stiffness, systemic and skeletal dysplasia) as a way of explaining to parents how a therapist clinically reasons whether intervention is indicated or not. The mother was reassured that her child’s bow legs were symmetrical, asymptomatic, with no pain or stiffness, and showed no evidence of a systemic condition or skeletal dysplasia.

Shoe orthoses, braces and physiotherapy exercises are not clinically indicated if a child has physiological varum (Fergusson and Wainwright 2013, Jones et al, Staheli 1987). These appliances may have a detrimental effect on the psychological well-being of the child as it makes them self-conscious and lowers their self-esteem. The appliances can cause discomfort and interfere with their ability to play. Physiotherapy exercises are ineffective and time consuming (Pountney 2007) and therefore the mother was advised to encourage her child to be as active as possible and participate in a variety of activities with her family and friends. Reassurance and education of the presenting complaint is essential to alleviate parental concern.

Understanding that the majority of children go through a predictable change in the shape of their legs (and feet) and these are normal variations of their growth and development will reassure the concerned parent and help them accept that their child just needs time to continue their skeletal development. Physiological varum usually corrects itself spontaneously by the age of 4 (Jones et al 2013). However Fergusson and Wainright 2013 recommend a referral to an orthopaedic consultant if a child presents with worsening genu varum by the age of three.

Although physiotherapy intervention is not clinically indicated for physiological varum it is important to monitor the skeletal development of children presenting with bow legs to ensure that lower limb alignment continues to progress with in a normal spectrum. (Davids et al 2000, Espandar et al 2010). Therefore it was arranged to review child A in 6 months.
For the purpose of this essay in order to fulfil the criteria, the condition of Blount’s disease will be discussed with reference to treatment planning, goal setting and outcome measures used.

Blount’s disease is a pathological form of bow legs. The persistent varum deformity is due to growth disturbance of the medial tibial physis. It is defined as juvenile Blount’s disease if it has an onset at 4 to 10 years (Sabharwal 2013) therefore the remainder of the essay will consider a patient in this age range. Treatment of Blount’s disease may be managed with a hip-knee-ankle-foot orthosis (HKAFO) which must be worn for 23 hours a day to realign the lower limbs. The orthosis will be reviewed every 2 months as the varum angle decreases (Alsancak et al 2013).

The physiotherapy treatment plan for a child who has this condition will be discussed. The parents will need to be educated about the condition and its management which may be via a multi-disciplinary team meeting with the parents to advise and reassure them. As the author works in a community setting it would be essential to liaise with the physiotherapists from the referring hospital to ensure appropriate handover of information with regards to any specific patient management plan. This would ensure a smooth transition from acute hospital based care to community based care which form part of the core standards for the physiotherapist as defined by the Chartered Society of Physiotherapy 2005.

The parents will be shown how to put on and take off the HKAFO orthotic and how to inspect and care for the skin to maintain integrity of the skin as well as ensuring it fits as comfortably as practicably possible for their child.

Treatment will also include a progressive strengthening programme for the lower limb and core muscles to address potential muscle imbalance from the previous mal-alignment. As the child’s varum deformity is gradually corrected, gait re-education, including the use of walking aids will be essential to promote optimal alignment and
efficiency of gait pattern (Alsancak et al 2013). Maintaining range of movement of the hip, knee and ankle will also be necessary via active and passive stretches dependent on the child’s ability.

The child and family should be considered when planning treatment interventions to enable a holistic and child-centred approach in accordance with The Association of Paediatric Chartered Physiotherapists 2007. Physiotherapy can be incorporated into functional abilities for example, dressing, putting on shoes, managing steps or stairs and can be practised during joint sessions with the Occupational therapist for collaborative working.

Hydrotherapy may be useful to improve muscle strength via the properties of buoyancy and turbulence. A lower limb exercise programme working against buoyancy and turbulence will improve muscle strength, whereas working with buoyancy will promote muscle length and joint range of movement (Cole and Becker 2004). This is also a fun activity for the child and elements of the programme could be practised with the parents if they are able their child to a public pool.

As the child with Blount’s disease may be of school age the school environment will need to be considered to ensure the child can be integrated into the school activities and can access classrooms and toilets, especially if they require walking aids. Treatment interventions should be incorporated into daily play activities so the child is able to participate with friends and family members and not be excluded.

Goals of treatment will include;
To educate the child and parents on the condition and its management during and after the wearing of the HKAFO orthotic
To achieve and maintain full range of movement of the hips, knees and ankles
To reduce stiffness of the lower spine and lower limbs
To address muscle imbalance of the pelvis and lower limbs
To re-educate gait pattern to optimise efficiency of walking
To increase muscle strength of the lower limbs
To achieve good balance and proprioception
To address any difficulties with functional activities
To promote and encourage interaction and participation in play activities

The use of outcome measures allows the physiotherapist to evaluate the change in a child’s health status. This will determine if the intervention has been effective or not. The chosen outcome measure should be appropriate, accurate, and timely (Chartered Society of Physiotherapy 2005).

Muscle strength can be assessed using the Oxford scale, whereby the physiotherapist manually assesses the full range and grades it according to a scale of zero to five. The author would have chosen the Oxford scale as an outcome measure for this case study. However I have found there to be limitations with using this as an outcome measure. Although frequently used by physiotherapists as an assessment tool this scale is also used as an outcome measure. It is difficult to interpret how the scale relates to functional activities and therefore its relevance may be questionable. It may be more appropriate to choose a functional task as the basis of the assessment of the child and it could also be used as an outcome measure. Examples could include; the ability to climb steps, sit to stand, stand up from the floor, balance on one leg. The oxford scale requires the muscle to be assessed through its full range. However, if the underlying condition of the patient impedes the full joint range of motion the muscle strength cannot be assessed through its full range. The accuracy of the assessment will therefore be limited. It also has poor intra-rater reliability due to the subjective nature of performing the assessment and judging the outcome against the scale. It is difficult for therapists to quantify the amount of resistance they apply to the patient during assessment for grades 4 and 5.
This essay has discussed a case study of a child who presented with genu varum. It has discussed the pathological and physiological presentations of genu varum and concluded that the patient presented with a normal variance of lower limb skeletal development, in keeping with her age. It justified why physiotherapy intervention was not clinically indicated and highlighted the importance of reassurance and education to relieve parental concern. To fulfil the criteria for the essay it then discussed the condition of Blount’s disease in order to design a treatment plan, set goals and critique an outcome measure. Throughout the essay the author has endeavoured to demonstrate how learning has been applied and show evidence of analysis and critical thinking and evidence base practice.
References


Case study on Osgood – Schlatter

Introduction

I have selected the following case study after attending the APCP Introduction to paediatrics course. I currently work within an adult setting but have a specialist interest in children and therefore treat many of the children.

The case study is based on a fourteen year old boy who was referred from the G.P with left knee pain, following an incident at football.

Assessment

A subjective assessment is an important part of helping towards the diagnostic process. The patient attended the department with his mother. Between himself and his mother they reported that the knee pain had about a three month onset. He reported that the knee had always ached over the last few years, however the pain had recently increased after playing football during the school holidays. The patient hadn’t stopped playing football and was managing about four to five times a week of training. He was still attending school and his mother reported he had recently grown out of his trousers!

On the Subjective and objective assessment (see appendix 1) it was noted that the patient pointed to below his knee for where the pain was. (Easton 2013).

Clinical Diagnosis/Reasoning

From both the subjective and objective assessment it is possible to try and formulate an idea of a diagnosis.

As a person grows there are certain pressures that are placed on our bodies. A high percentage of orthopaedic problems develop during the early and rapid periods of growth. (Peter Beirne 2013). There are increased forces that are placed through our growth plates (ref). A growth plate has been described as the ‘weakest link’ and that ‘an electrical impulse across a growth plate looks the same as a fracture site’ (Watson Tim 2010). One of the reasons that children develop pain can be because of the forces placed repeatedly through a growth plate. This can produce an apophysitis-‘traction at a growth plate’. Children can also develop avasularity of the femoral head known as Perthes disease. It is also possible to get a displacement at these growth plates, also likely to affect the femoral head. It is unknown why this occurs but there are some theories of a possible endocrine link.

Due to the fact the patient had knee pain it was important to rule out Hip Pathologies. Firstly, it was unlikely to be Perthes because of the patient’s age, demographic pattern, and the fact no limp was noted on the patient’s gait pattern (Hay et al 1999). Also the patient didn’t have limitations into abduction which (if present) can sometimes be seen at onset of Perthes disease. Due to the patients age it was unlikely to be a slipped upper femoral epiphysis. The patient showed no signs of a limp within his gait pattern. There also seemed to be no limitation with his hip range of movement, including hip flexion and internal rotation, (Staheli, 2008) these are often associated with this condition.
It could possibly have been irritable hip, however this is often associated with a patient reporting that they have recently been unwell. It can also be linked with a hip held in flexion, a limp, groin pain and limited internal rotation and this patient showed no signs of any of these symptoms. So it is felt with the above that the patient probably doesn’t have a hip pathology. (Hay et al 1999 & Staheli 2008)

Now, it was important to get a differential diagnosis at the knee. From the objective assessment it was unlikely to be Osteochondritis dessicans (OCD) as the patient was slightly out of the age group where this is more common and the patient’s symptoms were already well defined. OCD is often associated with poorly defined pain but can follow trauma which my patient had reported. In recent experiences it has been found that OCD often presents as anterior knee pain (Wall 2007), therefore it wasn’t something that could be entirely rule out at this stage. It was unlikely to be a ligamentous or meniscus injury as during the subjective assessment the patient didn’t report giving away or locking (Hay et al 1999). During the objective assessment there was no effusion noted, and all the ligamentous tests were clear with a “good end feel” (Hay et al 1999). The patient hadn’t reported pain during rest or severe pain at any point so it was possible to rule out a fracture. He was able to perform a straight leg raise (Benson et al 2002) so by now the symptoms were fitting into the category of an apophysitis. This category now needed to be broken down to try and differentiate between Sinding Larsens and Osgood Schlatters. Sinding Larsens often happens in children aged 9-13 years old and is often associated with pain at the pole of the patella. An important point is the patient was able to show and point to where their main pain was; this was around their Tibial Tuberosity. The patient was in the right age group (normally 11-15 years old) for Osgood Schlatters and they also reported they had recently gone through a growth spurt (Keading et al 1998). It was felt that other potential diagnoses had been ruled out and it was now possible to treat this orthopaedic condition as Osgood-Schlatters.

So what is Osgood Schlatters? It is defined by Wall 1998 as one of the most common causes of knee pain in adolescents. Debate remains around the pathophysiology of Osgood Schlatters however the current thinking is that it is an apophysitis of the tibial Tuberosity.

It is thought by Demirag et al 2004 that if the tendon attaches more proximally and within a broader area then this is more likely to cause Osgood-schlatters. The tibial tuberosity consists of cartilaginous tissue during skeletal development. A secondary ossification centre or apophysis is said to develop, around about the ages of 8-13 dependent on male or females. It is thought that if the apophysis is not able to withstand the potential repetitive extensor mechanism contractions on the quadriceps muscle, then Osgood Schlatters can develop. This is partially because of the traction forces that are then placed onto the tibial tuberosity causing what is described as microtrauma at the site (Bhatia &Ertl 2006).

Lazerte 2000 report that because the quadriceps muscle (rectus femoris) inserts into such a small area there will be high forces that act through this. Chang et al 2008 and Ikeda et al all thought that muscle tightness may affect Osgood Schlatters. Muscle tightness is said to increase during a growth spurt as bone increases more rapidly than muscle.

Treatment

So, it was very important now to discuss my findings and thoughts with my patient and his mother (Simmonds and Kerr 2007). After discussing the diagnosis, it was felt that perhaps a
“football diet” may be appropriate. Hussain and Hagroo 1996 did a study that supported a reduction in sporting activity to aid recovery.

It was agreed that the patient reduced his sporting activities to include football three times a week. It is important to think about the guidelines from the Department of Health where it is recommended that children do a minimum of sixty minutes of moderate-intensity physical activity each day. It was discussed therefore to include lower impact activities within his daily routine. Both swimming and cycling were proposed and the patient seemed keen on these.

To help with pain control only Non-steroidal anti-inflammatory drugs were advised. It was discussed with the patient that at present there is no evidence to support that the usage will shorten the disease length (Hussain and Hagroo 1996).

From the objective assessment it was noted his hamstring length had decreased to below the considered normal range. Magee 2006 stated below 80 degrees was considered a loss of hamstring length. It was felt that an appropriate outcome measure could be used here, so by measuring his Popliteal angle to assess his hamstring flexibility this was able to be achieved. White et al 2009 report that this outcome measure has good reliability. It is important to have good hamstring flexibility to ensure no increased traction pressure is placed through the knee area (Kaya et al 2012).

It was also noted that he had a poor control of his single leg squat on that left hand side. It was felt that this to could be used as a reliable outcome measure (Benjamin et al 2012) and (Crossley et al 2011). An increase in knee valgus angle during functional tasks for example, is recognised as an important risk factor for assessing the likely of knee pain and injury. An increase in the knee valgus angle during weight-bearing tasks is capable of separating individuals with and without patellofemoral pain. It is noted that perhaps further studies related to single leg squat and Osgood-schlatters would possibly aid outcome predictors.

The visual analogue scale (VAS) was also used as an outcome measure. Schofield et al 2007 described the tool as ‘simple tool with wide application’ I sometimes use an adapted vision of this even for older children (see appendix 3). It is thought by Shield et al that the VAS is appropriate to use above the age of nine. Either of these are tools seem to be useful within the clinic setting (Webb, S 2013).

Therefore, for his home exercises he was provided with hamstring stretches and advised to do this every day and also after every football game. Page 2012 stated it might also be beneficial to try dynamic stretching before a game so this was also shown to the patient.

He was also provided with Quadriiceps work in the form of a control step down from height to encourage his eccentric load (C R Purdam 2004). It was felt due to the patients age its possible to effect his muscle mass as the inhibition of growth hormone is stopped at post pubescent stage. This patient hasn’t quite reached this stage but is by no means in the pre pubescent stage (Beirne 2013). It was felt that the two exercises were set at an age appropriate stage. (Rowland et al 2013).

It was advised the patient the condition can continue for anywhere between 6-18 months. This can depend on how quickly the growth plate fuses at the proximal tibia, as once this occurs the pain normally subsides (Bhatia 2006).
Knee pain associated with Osgood-schlatters normally resolves completely once this fusion has taken place (Bhatia et al et al 1998) however there are a few people that still have problems with Kneeling or activity related pain during adulthood. Some people once skeletally mature can go on to having a surgical excision of the ossicle if this is still causing symptoms (Purushottam et al 2007).

The patient was reviewed in about four weeks. It was felt that this was a significant amount of time for him to perform the exercises but also enough time to look into alternative sources of fitness. The patient felt able to perform the exercises at home and commented that he felt reassured and much happier now he understood why his knee was painful.

It was felt that appropriate treatment and advice for the patient had been provided in line with the current pathways and research guidelines. These pathways include suggesting rest/activity modification, stretches (where appropriate) and looking at muscular imbalance and treating as pain allows.

After reading further research it may also be appropriate to treat this young man by utilising an eccentric decline board. Purdam et al 2004 conducted research where they found the use of a decline board whilst squatting produced better results in pain and functional levels of patients with knee problems. This was a small study and would perhaps now need further research to see if this can be related to the outcomes of patients with Osgood-schlatters.

The patient has since returned for a follow up appointment with his father. The patient himself had improved with his quadriceps control as his single leg squat had an increase in his patella-femoral alignment.

His hamstring length was similar to his last visit, but a significant change wouldn’t be expected in the time the patient has had. His father raised concerns about Osgood schlatters, and whether this would affect his sons’ ability to play football. Reassurance was given regarding sport activities and the patient even said that the sports diet had helped with his knee. He reported his knee pain as now 5/10 (a medium smile on the VAS score) with activity). The patient felt confident enough to continue independently and it was agreed he was to be discharged with an emphasis on his continual hard work on his exercises!

Conclusion

It is important to think about differential diagnosis and ruling out other orthopaedic conditions when treating children with knee pain. There are many different aspects of Osgood-Schlatters that have been researched, and therefore it would be useful to look at writing pathways and guidelines for these patients.

Following on from these guidelines it may even be helpful to look at producing leaflets to provide to the children and their parents for a variety of orthopaedic conditions including Osgood-Schlatters. There are still many areas that require further research including looking at the different exercises prescribed and the possible functional outcomes. These pathways and guidelines will help treatment of these orthopaedic conditions be provided with research based treatment or best practice.
References

Beirne P (2013) Paediatric Orthopaedics study day HE Seminars


Benson 2002 Clinical Orthopedics-Fractures in Children (395) 234-240


Magee DJ. Orthopedic physical assessment. 5th ed. St. Louis: Saunders Elsevier; 2006


Appendix 1

HPC
- 3-4 mm onset
- Pain been 7+/10
- Football related → TP
- Pain achy/pain with activity esp impact

SH
- At school - Neurone off
- Football 4-5 - team
- IX - PLAY
- Still doing games

SQ
- Sleeping /
- Locking /
- Gung away /
- Other /
Objective assessment

Hip Range of Movement-Normal Left equal to Right

Gait-Normal gait pattern noted No Limp

Knee Observations: No Heat, No Swelling, No Effusion, No Redness

Knee Range of movement-Normal L=R no pain

Muscle Length Hamstrings R 65    L 55*

Quadriiceps R=L Normal

Calf Complex R=L Normal

Ligament tests-all normal including ACL,PCL,MCL,LCL

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<thead>
<tr>
<th>Muscle strength (oxford scale)</th>
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<th>Left</th>
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<tr>
<td>Hamstrings</td>
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<tr>
<td>Quadriiceps</td>
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<td>3</td>
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<tr>
<td>Gluteal muscles</td>
<td>4</td>
<td>4</td>
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<td>Calf Complex</td>
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<th>Balance/Proprioception (1 leg)</th>
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Single leg Squat                  Normal       Poor Control Pain*

Palpation to knee                 Normal       Pain over Tibial Tuberosity

(No lump noted)
Appendix 3
K is a four year old girl with cerebral palsy who has just started attending a special needs school. She has an asymmetrical spastic diplegia which affects mainly the lower limbs though the left side of her body is more severely affected than the right.

She was born pre-term at 23 weeks + 4 days after an unremarkable pregnancy and with no family history of any medical conditions. During the birth she suffered a level 4 intraventricular haemorrhage in the right side of her brain which resulted in weakness in the left side of her body. This usually occurs in the early part of the third trimester so in a premature baby like K, the blood supply is still immature. The fastest growth of the human brain development is in utero and up to 20 weeks post natal so this is the most dangerous time for damage to occur. The area of damage affects whether the child will be diplegic with only lower limbs affected or quadraplegic where all four limbs are affected.

This child also suffered from chronic lung disease with recurrent chest infections and a cortical visual impairment and by the age of two, it was evident that she was not reaching the appropriate milestones. At age 2, K was unable to stand unless both hands were held, though up to age 3 children depend on their visual system for balance so this could have impeded her. After age 3 we use somatosensory information - touch, proprioception etc. (Sutherland 1997) also said

"In addition to growth there is a neuromuscular maturation process that brings about gait stabilisation between 3 1/2 - 4 years"

She was reluctant to drink and refused solid food, slept very little and was delayed in her speech leading to a diagnosis of global developmental delay initially. She displayed extremely aggressive challenging behaviour, biting, smacking, rocking and head banging particularly at night. She also appeared to have a low awareness of temperature and pain.

At this time, she was referred for a sensory assessment based on the Sensory Integration Theory of Dr A Jean Ayres, an Occupational therapist with a training in neuroscience. This explored all sensory systems ie tactile (touch), proprioception (feedback from muscles and joints making us aware of the location of our body position) and the vestibular system (located in the inner ear, affecting balance and detected through head movement).

The results of this were, as she was not walking or bending, the vestibular input was delayed which she attempted to rectify by head banging and rocking in her cot. To prevent this, she was given melatonin to make her sleep before the vestibular activities began. She was also found to have difficulty processing information from her tactile protective touch which lowered her awareness of pain and temperature. Calming techniques were suggested to modify the behaviour issues such as weighted blankets etc and deep pressure to shoulders, hands etc. Also, massaging around her mouth was advised to help her proprioceptive feedback previously achieved by biting and orally exploring objects. She was also advised to get a "Safe Space" padded bed which would help lessen parents anxiety at night.

She was also encouraged to learn to crawl as this uses both sides of the body. These ideas were to help her to have a more balanced sensory input which would make her more willing to play and improve her grasp of new skills.

Cerebral Palsy is defined (Rosenbaum et al 2001) as
"A group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication and behaviour, by epilepsy and by secondary musculoskeletal problems."

K was assessed by the G.M.F.C.S. outcome measure to classify the severity of her motor disability which showed her to be level 2. This indicates that it is unlikely that she would be able to run or jump, she could use a walking frame but would sometimes need a wheelchair, would have difficulty mobilizing on uneven ground and would need the assistance of a handrail on stairs.

There are also secondary problems for a child with c.p. such as that it takes more energy to walk with an inefficient walking pattern due to an asymmetrical gait which makes it very tiring. Also, it could cause weakness and muscle imbalance and make the child more prone to osteoporosis, fractures and contractures. Often there are functional problems like incontinence, drooling, poor fine motor skills and perceptual difficulties.

There are several other assessment tools available for children with cerebral palsy including Chailey, ABC, Bruininks, Pedi, GMFM and spasticity assessments.

At the age of 3, K was low toned and hypermobile, was able to sit from standing, leading with her right leg, she was cruising around the furniture although her ankles were in plantarflexion equinos (left more than right). She had full passive range of movement in her arms and legs and could stand independently for a few seconds. She had a tonal catch in her achilles tendon at plantargrade and an intermittent catch in her hamstrings.

There was no restriction in hip abduction. It is essential to monitor the hips of a child with cerebral palsy as there is evidence that hip dislocation is a common problem with this condition.

Dobson et al (2002) stated that the incidence of spastic hip displacement is 1% in children with spastic hemiplegia, 5% in those with spastic diplegic and up to 50% in those with spastic quadriplegia.

She had been issued with bilateral fixed a.f.o.'s set at 10 degree plantarflexion but was reluctant to wear them. When wearing them, she balanced on the edge of the a.f.o. up on her toes and was very unsteady. She also persisted with the walker but was quite erratic due to her eyesight weakness.

She went on to have botulinum toxin injections in her left calf which eased the stiffness and made the splints easier to wear. At this time, it was considered that hinged a.f.o.'s set at plantargrade may facilitate movement further. She still had good passive range of movement in her ankles (10 degree dorsiflexion on right and 5 degree on left) with knee straight.

Parents were still anxious about her lack of sleep, even with medication, and also about her refusing to eat or drink much at all. They requested a gastrostomy but this was refused due to the child looking well and not dehydrated. Her behaviour was still challenging though as her speech had improved she could communicate better which would probably lessen her frustration.
We have recently assessed K now she is settled into school to check her progress. She was found to not be wearing her splints at all and was tiptoe walking on both feet though the right seemed mainly for balance, on the left she was weightbearing through her 1st toe. This also made it very difficult to get her left foot into her shoe. Although very unstable, she is still using the rollator frame to mobilise despite having developed a squint. A padded helmet was issued to protect her head when outdoors. She still had an active range of movement (both +10 degree dorsiflexion) but was unable to put her left heel down and had increased dynamic tone in her left gastrocnemius muscle. This was assessed using the Modified Ashworth scale, a method of measuring tone. Stretching exercises were given to parents and school staff to try to minimise the tightness and help prevent contractures. It was considered that the best option would be to make an appointment for the Paediatric Movement Clinic at the hospital which is attended by a paediatrician, consultant etc alongside the physiotherapist. At these clinics, the child could be videoed walking and assessed to determine whether more Botox would be beneficial. This could weaken the left gastrocnemius muscle to enable the foot to be stretched and serial plastering could hold it in a better position so that splints could be worn again. A tricycle assessment was also organised to perhaps offer an alternative mode of mobility and a referral was made to a sleep specialist in London.

There are several alternative treatment approaches for children with cerebral palsy as well as Sensory Integration. One of these is Vojta which is a dynamic neuromuscular stimulation therapy to coordinate muscle activity and facilitate the automatic control of the body's position.

There is also Conductive Education which is a whole motivational learning and therapy system for children with C.P. This uses simple furniture and a conductor who carries out a programme of small movements to improve motor/cognitive skills and speech.

Less common is Spider Therapy from Poland which uses elastic ropes to support the child while they carry out the exercises. This helps develop balance through experiencing touch and motion.

Strength Training for spastic muscles has recently been used, Mc Née et al (2004) showed that PF muscle volume could be increased with strength training, though there is still no proof that function is improved.

The Bobath concept and neurodevelopmental therapy aim to encourage the child to function as normally as possible and use positioning, handling and key points of control to influence postural control. The child, family and carers are all involved and the aim is to improve the child's self-esteem as well as their function. Wwww. Bobath.org.uk say " There is no definite evidence to support one intervention for children with cerebral palsy more than another. The principles of Bobath (NDT) have bought acceptance worldwide. Like all other interventions for children with cerebral palsy, more research is needed to demonstrate what works best for whom."

It is important that things are made accessible to children with cerebral palsy and equipment supplied to help them function at their best. These include supportive seating, sleep systems, standing frames, etc but it is essential that these fit in with their personality and way of life and that of their family. In this way, they will be more compliant and keen to work with their therapists. A multiple-disciplinary team are often involved in the care of the child i.e. physiotherapists, speech therapists, occupational therapists, orthotists, sometimes play therapists and others. Early
intervention for good positioning like the BodyShape system can prevent contractures and deformities developing but if surgery is necessary, hydrotherapy soon afterwards is often a good method of rehabilitation.

I have chosen a child with cerebral palsy to study as I feel that I have learned so much from the course on this subject, clarifying the causes of the condition, how the condition presents, the many different treatments available, how outcomes can be measured etc. Above all, it is good to be reminded that the most important thing is seeing the child first and not the condition, and to understand that all children deserve to have as much help as possible to reach their full potential.

References:

1. Dr A. Jean Ayres (1972)
2. [Www.bobath.org.uk](http://Www.bobath.org.uk)
CASE STUDY - EXAMPLE 4

**Patient:**

He is a pleasant 5 year old boy. He was diagnosed with Cerebral Palsy when he was one year old. He is one of a Triplet born at 27 weeks. He has a brother and a sister. He had an Intraventricular haemorrhage. Mid hydrocephalus. He has a several developmental delay.

**Other Conditions:** Gastroesophageal reflux  
**Medication:** Omprazole, Diazepam

**Objectives / Appointment 1**

Patient communicates usually through a range of facial expressions ie, if he is happy, he smiles and when in pain or upset, he cries. He has a bit high muscle tone in upper and lower limbs. He has slightly tight Achilles tendons and has a bit weak head control. He presents poor movements during all activities. He has poor dissociation between his shoulders and pelvic girdles need to be improved.

He suffers with gastroesophageal reflux. He takes Omprazole on a daily basis. The parent's report he is good with it but after stopping this medication, the reflux returns. No respiratory changes. Patient does not want to participate in the therapy.

**Parental concerns:**
- His muscles tone  
- Gastroesophageal reflux

**Physiotherapy Goals:**
- Improve muscles tone  
- Improve reflux  
- Improve head control  
- Language and speech therapy advised
Physiotherapy Plan:

Exercises improving the physical independence. His physiotherapy program follows the sequence of normal child development from rolling, sitting etc. Whole weight bearing on the upper and lower extremity in 4 position and in sitting position. Improve the head control.

Family advised to adapt the arrangements within the patient flat, so it will be more save for him and parents. Physiotherapy exercises advised.

Appointment 2

Patient after a two weeks is coming back. Parent has been following given advice and exercising regularly. Parents are very happy about the improvement the 4 position and sitting position. He still needs assistance but he feels more stable and secure.

Parents agrees to start the hydrotherapy sessions. Parents are very happy after therapy in the swimming pool. He was able to stand up, he responds very well in the water environment. Upper extremity shows greater range of movements, especially in the wrist flexion and extension.

Arm cycling exercises and hand therapy training advised.

Catching the ball exercises are good for the patient. He is getting nervous and dissatisfied when fails to catch.

Additional therapy applied: mobilization techniques of the wrist, PNF patterns and stretching. Advised a group physiotherapy.

Patient continues to present with limitation of active movement of the upper and lower extremities. Patient enjoys sessions of the group physiotherapy.
New set of exercises proposed, advise given.

**Recommendation:**

First attempts of walking with support, forward and sideways. Base of support can be reduced slowly. Review of the feet and knee position during weight bearing.

Patient has to continue exercises the stability of the shoulders and elbows joints in the upper extremity weight bearing positions. Hands therapy focused at the activities of daily living, more precise movements.

Review the exercises and add new set in the outside environment (i.e. park).

**Appointment 3**

Patient enjoys the group physiotherapy, continue swimming sessions and gait training with assistance. I can still feel the upper extremity limitations and balance problem while patient standing.

He is still anxious in the standing position with assistance. His head control improved. His stepping sideways is clearly improved, and stepping forward improved as well, noticeable leg rising with ankle dorsiflexion during gait. He can start first exercises of walking on the incline with assistance. Patient does better with catching the ball if concentrated. Patient has problem with opening the bottle and holding small, narrow objects, cylindrical grip weak. Thera-Bands tapes used for the first time in the strengthening exercises.

Good range of motion of the upper and lower extremities. Patients presents problems with precise movements of the hands, which need to be improved.

Introducing climbing on the stairs.
Continue stairs climbing training and hand therapy sessions. Hand therapeutic exercises advised daily, especially exercises improving control of movement and strengthening the grip. Adaptation of the spoon or pen might be necessary.

New therapies advised: playing ball games in the group, massage therapy, walking exercises