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Purpose of this document

To provide a physiotherapy guideline for Physiotherapists working with children, teenagers and young adults (CTYA) with Bone Tumours across Scotland.

Who should use this document

Acute Physiotherapists
Community Physiotherapists
Oncology Multidisciplinary Team
Orthopaedic Multidisciplinary Team

To whom this document applies

All AHP, Medical and Nursing staff involved in the care of Children and Young People with Bone Tumours across Scotland.

Contact point

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Review group

Scottish Oncology and Orthopaedic Physiotherapy Group, MSN CYPC

Review Date

November 2022
Objectives

This guideline is written for Physiotherapists looking after children, teenagers and young adults (CTYA) with bone tumours within / as part of the Sarcoma Team. The objective of the guideline is to support clinical assessment and reasoning skills and facilitate formulation of management plans to maximise patient participation. It aims to:

- Describe the incidence and clinical presentation of bone tumours in this patient population
- Provide an overview of treatment of bone tumours
- Outline the physiotherapy management before and after surgery
- Support transition of patients from Acute physiotherapy management to Community based rehabilitation
References:


National Cancer Institute (NCI) [www.cancer.gov] [accessed Sept 2018]


Section 1 – Introduction

Osteosarcoma (OS) and Ewing’s sarcoma (ES) are the two most common primary bone tumours in CTYA (under 25 years old) accounting for 3-5% of paediatric and 8% of adolescent cancers. The annual incidence is around 5 per 1,000,000 for children (0-14 years) and 13.7 and 7.6 for 15-19 and 20-24 year olds respectively. Malignant bone tumours rarely present in children under five years of age and incidence increases with age, peaking in adolescence. OS is the more common of the two types and has a bimodal age distribution with a second peak in older adults (NCI 2018). In children, the incidence is similar in males and females for osteosarcoma and slightly higher in males for ES. In adolescence, bone tumours are more likely to affect males than females. Incidence rates vary between different populations, particularly for osteosarcoma, with lowest rates in Asian and some African countries. The vast majority (around 80%) of OS arise in the long bones, especially around the knee, in contrast to the skeletal distribution of ES, which affects the long bones of the legs (~40%), arms (~17%), pelvis (18%) and ribs (17%). ES may also affect the soft tissues (extra-osseous Ewings) and behaves and acts like ES of bone and is treated in the same way. Metastases are clinically detectable in around 20% of patients, although the incidence of metastases felt to be higher as new detection methods are developed (NCI 2018).

The aetiology of bone tumours in CTYA is largely unknown but is likely to be multifactorial and involve genetic and environmental factors and to be distinct for each type. OS is thought to be derived from primitive bone-forming mesenchymal stem cells and is histologically characterised by the production of osteoid. The origin of the ES cell is elusive but it is uniquely characterised by the presence of a chromosomal translocation between the EWS gene on chromosomes 22 and most commonly, the FLI-1 transcription gene on chromosome 11, occasionally chromosome 21 (Grimer et al 2016).

In a small proportion of cases, genetic risk factors have been identified for OS. Patients with heritable retinoblastoma (germ line mutations of key tumour suppressor gene RB1 on chromosome 13q14), Li Fraumeni cancer family syndrome (germ-line p53 mutation), Rothmund-Thomson and Bloom syndrome (germ-line mutations in helicase genes) are all associated with significantly increase risk of developing OS. There is also an increased risk of bone sarcoma in first degree relatives of breast cancer patients, which may occur as part of the Li-Fraumeni syndrome within families. The predominance of bone tumours in the second decade, a time of maximum bone growth may herald link between cellular growth and cell regulatory pathways. A number of putative risk factors such as history of hernias, residence on a farm, exposure to fluoride, radium and infections, have been studied in cohort and case control studies but conclusions are difficult to draw in rare diseases. (Gianferante et al. 2017).

Signs and symptoms of bone tumours

Pain

Pain in the affected bone is the most common symptom

- Increasing severity – not usually constant initially
- Frequently dismissed as a sports injury or minor trauma. Persistent pain, especially at night and (less so but may be neuropathic (numbness, tingling or even weakness) in nature.

Swelling

- May occur over time and may be palpable
Fractures

- Pathological fractures are not uncommon.

Systemic symptoms

Fever, poor appetite and weight loss may be associated with ES

Pro-longed

- Many patients have symptoms for 6 months to 1 year before diagnosis.

(Bailey and Skinner 2010)

Diagnosis and staging

Plain X-ray may suggest diagnosis. Further to this an MRI scan is required of the affected region and a biopsy.

MRI scan of the lesion and later the whole limb will characterise the lesion.

CT scans to look for spread (usually) to lungs, and may help to exclude lymph node, liver and other organ involvement. MRI is more likely used to stage children if metastatic diseases is suspected for sites other than lungs.

Radionucleotide bone scans to detect spread of bone cancer to other bones.

PET scan, this uses radioactively labelled glucose to identify sites of disease throughout the body maybe used in some cases to assist in treatment planning but is not routinely used in children and teenagers with sarcomas (White et al. 2017).

Incisional or core-needle biopsy of the lesion is essential to establish the diagnosis. It is usually done by the Orthopaedic surgeon but may be done by the intervention Radiologist.

Bone marrow biopsy is performed for ES.

Patients with a suspected primary bone tumour should be referred to the sarcoma team. In young people (16-24 years) this is likely to be the Orthopaedic Surgeon and then the Oncologist. In paediatrics, referral may be to either specialist.

(Gerrard et al. 2016)

Management

Treatment involves aggressive systemic combination chemotherapy followed by surgical resection of the primary tumour and all clinically detectable metastatic sites. This has been the standard of care since the 1980s and long term overall survival has remained stable at 60-65%, falling to less than 20% for patients with metastatic or relapsed disease. Survival is also dependent on the primary site of disease, and is poor for patients with non-extremity tumours. Radiation has a role in adjuvant local therapy for ES, inoperable OS and palliative care. (NCI 2018)
Neo-adjuvant chemotherapy and delayed surgery enables assessment of histological response, which has been shown to be an important prognostic indicator in OS, with poor response (<90% tumour necrosis) associated with poorer outcomes. (NCI 2018)

Management of CTYA with bone tumours is made at Paediatric and Sarcoma Multi-Disciplinary Team Meetings (currently National meeting Monday 5pm with VC access at most sites). Diagnostic and staging investigations are reviewed in the context of the clinical picture and treatment recommendations made. The responsibility for treatment lies with the lead Consultant.

Bone Sarcoma is a curable disease and despite a lack of new treatments over time, outcomes have improved due to the use of more aggressive multimodal treatments and advances in surgery for sites previously considered inoperable (Grimer et al 2016). The following outlines current treatment protocol for both OS and ES, however dependent on individual patient management their course of treatment may alter, e.g. due to poor response to first line chemo.

**Osteosarcoma**

There is no open clinical trial for first line treatment of OS. The EURAMOS-1 trial closed to recruitment in 2011 and remains the standard of care. (Appendix A)

The aim of surgery is to excise the tumour with oncological margin and to retain function. Limb salvage therapy will be practised where possible.

Adjuvant therapy the EURAMOS-1 protocol (Appendix A) is followed for the management of osteosarcoma. This involves two 5-week cycles of chemotherapy including high dose Methotrexate, doxorubicin (Adriamycin) and cisPlatin (MAP), with the aim to reduce the tumour size, improve the surgical outcome and identify the pathology response. Following chemotherapy, surgery, which is crucial for cure, takes place under the care of the Orthopaedic Consultant. The surgery needs to have adequate surgical margins, and if possible, limb preserving surgery is used. This is on the basis of leaving a functional limb post-op, with surgery progressing over the years due to advances in endoprostheses. The proximity of the tumour to neurovascular structures is considered and if required the patient may require or progress to an amputation (Grimer et al 2016).

It is out with the scope of this guideline to detail the specialist rehabilitation required for a patient undergoing a primary amputation or progressing to an amputation. However a timely referral to the specialist Amputee Therapy team should be made to ensure advice and recommendations are carried out by the treating therapy team (Gerrard et al 2013).

Patients with lung metastases at presentation may have these surgically removed if they do not resolve following primary chemotherapy (NCI 2018).

**Ewing's sarcoma**

As per the EURO-EWING 2012 Clinical Trial (Appendix B), Ewing's sarcoma management may include all or a combination of surgery, chemotherapy and radiotherapy. (Appendix B)

Induction chemotherapy is given for 6 cycles and includes vincristine, ifosfamide, etoposide and doxorubicin. Other agents used include cyclophosphamide, actinomycin D, melphalan and busulfan.
Local therapy options include surgery and radiotherapy, with surgery preferred if it can be achieved with good surgical margins. Following surgical resection, the histological response is identified and further management is subject to the patient's response to pre-operative chemotherapy. Radiotherapy may be used alone, where a tumour is inoperable, or in combination with surgery where the surgical margins are insufficient or a poor histological response is identified. In patients with adequate surgical margins with good histological response, radiotherapy is not indicated (Gerrard 2016).

Extracorporeal irradiation and re-implantation is usually applied to sarcomas of the bone to enable large doses of Radiotherapy to be delivered to the bone out with the body to kill any sarcoma cells and prevent recurrence (Edinburgh Cancer Centre 2018). The site of the tumour is surgically removed, irradiated then re-implanting with structural grafting. This highly specialist technique may be considered in some cases (Puri et al 2010). Possible side effects include bone infections, osteopenia of the affected bone which can lead to fractures, and poor growth longer term if used in a paediatric patient (Edinburgh Cancer Centre 2018).

**Prognosis**

The following are prognostic factors for childhood OS and ES

**Osteosarcoma**

- **Metastasis** – if the cancer has spread at the time of diagnosis, this is linked with a poorer prognosis. CTYA that have metastatic disease spread to a lung have a more favourable prognosis than those with spread to other parts of the body.

- **Tumour Location** – tumours more distally located have a better prognosis, which may be because they are more amenable to surgery. A negative prognostic indicator is a tumour that cannot be removed surgically or only achieves an incomplete surgery.

- **Response to chemotherapy** – following surgery the histological response to pre-op chemotherapy is determined. A good histological response are those that display >90% necrosis of tumour cells. It therefore follows that a poor prognostic indicator are those tumours that do not respond well to pre-op chemotherapy.

**Ewing’s Sarcoma**

- **Metastasis**, if the cancer has spread at the time of diagnosis, this is linked with a poorer prognosis. CTYA that have metastatic disease spread to a lung have a more favourable prognosis than those with spread to other parts of the body.

- **Tumour Location** – tumours more distally located have a better prognosis, followed by tumours in the proximal extremities showing an intermediate prognosis. Ewing’s sarcoma of the pelvis has the worst prognosis compared with other parts of the body.

- **Tumour Size/Volume** – smaller tumours have better outcomes. Tumours greater than 8cm in a single dimension tend to have a poorer prognosis.

- **Age** – younger children tend to have a better prognosis than older teenagers and young adults. Patients older than 18 years old have poorer outcomes.
• Response to chemotherapy – minimal or no residual viable tumour following pre-op chemotherapy is considered an indicator for a more positive outcome.

(Bailey and Skinner 2010, Grimer et al 2016)

Section 2 – Pre-Surgery and Surgical Intervention

This is a highly emotive time for the patient and their family as they are given the diagnosis of a bone tumour. The patients’ physical ability should be assessed and documented using appropriate outcome measures and guided rehabilitation is paramount throughout all stages of the disease (Shehadeh et al 2013, Siegel et al 2015).

At Diagnosis:

Often it will be the Oncology or Orthopaedic Consultant who will break the news following imaging. A tumour biopsy, performed by Orthopaedics, is required to confirm diagnosis and determine the tumours’ histology. Depending on the extent of the lesion, the patient may have some restrictions in their mobility. The Physiotherapist should be well informed of the potential diagnosis prior to input. A suitable walking aid should be provided, as required, for the age and needs of the patient at this stage.

Following Biopsy:

Following the tumour biopsy the patient may have an altered weight-bearing status. Orthopaedic post-op notes should be checked with any precautions and changes in weight-bearing status noted. Provision of a walking aid may be indicated post-biopsy dependent on the post-op instructions. Where appropriate, patients/parents should be given advice on AROM and exercises (as permitted by the orthopaedic surgeon) for both the affected and unaffected limbs. The aim is to optimize joint range and muscle strength during chemotherapy and prior to further surgery, without putting unnecessary strain onto structures affected by tumour.

Pre-Op Chemotherapy:

Soon after diagnosis the patient will commence treatment with chemotherapy. During this time the Physiotherapist should assess and monitor the patient, provide advice and input around mobility and exercises as appropriate. Patients receiving alkaloid chemotherapy products, such as Vincristine, should be monitored for signs and symptoms of peripheral neuropathy, with input to address this as required. This can be monitored through assessment of sensation (both subjective and objective), muscle strength, reflexes and neuropathic pain. Standardised assessment including the Vincristine Induced Peripheral Neuropathy Assessment (Appendix C) may be useful. The MDT may carry out a holistic needs assessment which the therapists should contribute to ensure the patient’s individual needs are taken into considered.

Pre-Surgery

For bone tumour patients that are undergoing Orthopaedic surgery for their condition there are several considerations for treatment that apply irrespective of the location of the tumour or planned surgery. Effective communication within the MDT is paramount to facilitate the patients’ rehabilitation
during and after treatment. It is useful for the Therapists involved in the patients care to be included in the patients MDT meetings, especially when the Orthopaedic intervention is being considered. It may also be beneficial to access the patients’ clinic letters or request to be included in the cc list if shared notes are not accessible.

In the sections relating to pre-operative physiotherapy assessment and the section on surgery the following points are considered; all will follow the same order but please be aware they are not in order of importance:

A. Chest care
B. Walking/Weight bearing
C. Joints to be immobilised/mobilised
D. Any orthotic intervention or equipment to be used for immobilising/mobilising joints
E. Rehabilitation of power/specific exercises
F. How long restrictions will be imposed - *please note the operating surgeon should clarify on restrictions on an individual basis.

**Pre-operative Physiotherapy Assessment**

A clear picture of the patient’s pre-op condition must be gained from thorough assessment; this may be best done as a joint session between the oncology and orthopaedic Physiotherapists. It will also be useful to liaise with the patient’s community Physiotherapist if they have one.

Please always consider the following:

A. Assess chest and begin treatment as required. If the patient has/will have prolonged periods of bed rest consider prophylactic interventions appropriate for age.

B. Weight bearing instructions for all patients should be advised by their Orthopaedic Consultant. Early walking aid should be considered for protection from fracture and to prepare the patient for a walking aid they will need to use post-operatively. The need for a wheelchair (including elevating leg rest as required) should be assessed and referred for in a timely manner prior to surgery. Home set-up should be considered with a request for assistance from the Occupational Therapy Team to consider provision of appropriate equipment at home, dependent on need.

C. Monitor AROM for unaffected joints in the limb, for example, with proximal humeral resection ensure elbow/wrist/hand movements are maintained preventing contracture or other complications. Please also consider positioning for the patient and the affected area with a focus on ensuring attention to pressure care.

D. Review guideline for planned procedure and ensure that any splint/orthotic required for the patient post-operatively is measured for and ordered, as per local agreement, to be available for day of surgery.
E. Any exercises for the affected limb should be in agreement with the Orthopaedic Consultant. Commencing any pre-op strengthening exercises for the affected limb could put the patient at risk of pathological fracture. An assessment +/- exercise program as indicated for unaffected limbs can be commenced if the patient is able.

F. Review guideline for individual surgery restrictions and how long these would normally be imposed. It is unlikely that any of the patients with an endoprosthesis would be allowed back to contact sports but this must be confirmed directly with consultant on an individual basis.

Please be aware that timescales for surgical review post-operatively will be decided by the operating surgeon, and will be case specific.

The most appropriate Physiotherapist to continue rehabilitation post-discharge must be decided based on local availability/suitability.

**Surgery**

The most common surgeries for patients with bone tumours are below:

1. Distal femoral resection/replacement
2. Proximal femoral resection/replacement
3. Proximal tibial resection/replacement
4. Proximal humeral resection/replacement
5. Hemipelvic resection/reconstruction
6. Partial/total scapulectomy

Amputation – this is considered out with this guideline. Please refer to current SPARG (www.knowledge.scot.nhs.uk/sparg.aspx) and BACPAR (https://bacpar.csp.org.uk/content/about-bacpar) guidelines if you have a patient attending for amputation.
1 - Distal Femoral Resection / Replacement

**Indication**
Bone tumour of the distal femur

**Splints / orthotics required post-op**
Knee Immobiliser (Appendix D)

**Acute post-op Therapy**
A. Assess chest and Rx as appropriate.
B. Review weight-bearing status /walking instructions from Orthopaedic Consultant and assess for walking aid as required. Can be up as soon as able post-operatively
C. Knee to be fixed in extension with immobiliser when walking. Can commence AROM knee exercises when in bed immediately post-op. Only to commence knee flexion with hip in neutral rotation (starting this exercise may be delayed if muscle resections performed).
D. Knee Immobiliser to be fitted by Physiotherapist, for wear when walking - can be removed for comfort when in bed but monitor closely to ensure the patient is not developing a knee flexion contracture.
E. Static quads, IRQ, SLR - progress these as able.
F. Once achieve SLR can cease use of immobiliser for walking.

**Ongoing Therapy**
A. N/A
B. Continue to progress walking to achieve independence as able
C. Continue with AROM exercises. Continue with knee immobiliser for walking unless SLR has been achieved. Continue with knee immobiliser when at rest if knee contracture a concern.
D. Continue knee immobiliser unless SLR achieved
E. Focus on regaining SLR, Strengthening all LL once this achieved
F. Driving* can be considered after three months once full weight bearing and extension lag of less than 10 degrees and an emergency stop can be achieved; swimming after 4-6 months if SLR recovered; dancing/running after 6 months dependent on progress.

*In conjunction with individuals’ insurance cover.
2 - Proximal Femoral Resection / Replacement

Indication
Bone tumour of the proximal femur

Splints / orthotics required post-op
None

Acute post-op Therapy
A. Assess chest and Rx as appropriate.
B. Review weight-bearing status/ walking instructions from Orthopaedic Consultant and assess for walking aid as required. Can be up as soon as able post-operatively.
C. Must avoid hip flexion beyond 90 degrees, hip internal rotation or adduction beyond midline.
D. N/A
E. Can strengthen all affected LL from immediately post-operatively as long as observe ROM precautions in C. Also complete all exercises with hip in neutral rotation.
F. Follow above precautions for 12/52. No twisting on operated leg.

Ongoing Therapy
A. N/A
B. Continue to progress walking to achieve independence as able
C. Continue with AROM exercises while observing precautions until 12/52
D. N/A
E. Continue to progress strengthening of all LL muscles of affected limb while observing precautions. After 12/52 introduce exercises to improve core stability, especially gluts. Introduce exercises to improve weight transfer and proprioception from 12/52.
F. Observe ROM precautions (as ‘C’ above) for 12/52. Patient should not lie prone for 12/52. Driving* can normally commence after 12/52 once reasonable leg control has been achieved, mobilising with a single stick and an emergency stop can be achieved.

*In conjunction with individuals’ insurance cover.

Hydrotherapy can commence at 12/52 with consideration given to ongoing treatment. Non-contact activities (such as swimming, dancing, running) can commence after 6 months dependent on progress.
3 - Proximal Tibial Resection / Replacement

Indication
Bone tumour of the proximal tibia

Splints / orthotics required post-op
Hinged knee ROM brace (Appendix D)

Acute post-op Therapy

A. Assess chest and Rx as appropriate.

B. Review weight-bearing status/walking instructions from Orthopaedic Consultant and assess for walking aid as required. Can be up as soon as able post-operatively.

C. For first 6/52 knee must not be flexed beyond 30 degrees, active movement only. Follow Orthopaedic Consultant instructions regarding commencement of active quads strengthening (to protect the extensor mechanism they may request no active quads exercises for 6/52). Once past 6/52 AND has regained SLR can then be allowed to flex beyond that limit. Full active ankle movement should be encouraged from immediately post-op.

D. Hinged knee ROM brace to be fitted by Physiotherapist, wear at all times locked to 0-30 degrees. For mobilising knee brace is to be locked into extension until patient regains SLR with less than 10 degrees extension lag.

E. Immediately post-op commence static quads, IRQ, SLR - progress these as able.

F. Must wear brace for 6/52 and after can cease wear, provided SLR has been recovered with no more than 10 degree lag.

Ongoing Therapy

A. N/A

B. Continue to progress walking to achieve independence as able

C. Once past 6/52 and SLR regained no restrictions

D. Hinged knee ROM brace

E. Continue progressing towards SLR, all LL muscles can be strengthened as able. Consider stability of knee with quads, VMO work from 6/52. Work on balance/proprioception of operated leg after 6/52.

F. Continue with knee brace until after 6/52 and SLR recovered

Driving* can be considered after three months once full weight bearing and extension lag of less than 10 degrees and an emergency stop can be achieved; swimming after 4-6 months if lag less than 10 degrees; dancing/running after 6 months dependent on progress.

*In conjunction with individuals’ insurance cover.
4 - Proximal Humeral Resection/ Replacement

Indication
Bone tumour of the humerus

Splints / orthotics required post-op
Shoulder Immobiliser (Appendix D)

Acute post-op Therapy
A. Assess chest and Rx as appropriate.
B. No LL WB restriction
D. Shoulder immobiliser - to be fitted by Physiotherapist on first day post-op.
E. Nil at this stage.
F. No shoulder movement for 6/52 (other than for hygiene). Should wear shoulder immobiliser when walking for 6/52, can remove in bed or when arm resting on a pillow in sitting.

Ongoing Therapy
A. N/A
B. N/A
C. After 6/52 begin active shoulder movement within limits of patients comfort. Shoulder girdle exercises should also be commenced at this stage.
D. Monitor for subluxation and consider for orthotic support if required.
E. Progress strength gently for all Upper Limb - expect poor power. Hydro after 12/52 within comfort.
F. Restrictions as detailed above.

Commence Active Assisted ROM at 6/52 restricted to 90degree shoulder flexion/abduction
Return to non-contact activities such as swimming, dance, running after 4/12 as comfort allows
Return to driving* when gained adequate upper limb control/function
*In conjunction with individuals’ insurance cover.

NOTE – May require a request for assistance from Occupational Therapist post 6/52
5 - Hemipelvic resection / reconstruction

NOTE – General guidance below is the same as for 2 – Proximal Femoral Resection/Replacement. Please be aware that as this is a very variable operation you must review every individual case with the surgeon pre and post-operatively to ascertain if the case will be expected to follow these guidelines.

Indication
Bone tumour of the distal ilium. Carried out to avoid hindquarter amputation

Splints / orthotics required post-op
Nothing routinely required – very variable operation

Acute post-op Therapy
A. Assess chest and Rx as appropriate.
B. Review weight-bearing status /walking instructions from Orthopaedic Consultant and assess for walking aid as required. Can be up as soon as able post-operatively
C. Must avoid hip flexion beyond 90 degrees, hip internal rotation or adduction (with endoprothesis) otherwise be guided by patients comfort
D. N/A
   Can strengthen all affected LL from immediately post-operatively as long as observe ROM precautions in C)
E. Follow above precautions for 12/52

Ongoing Therapy
A. N/A
B. Continue to progress walking to achieve independence as able
C. Continue with AROM exercises while observing precautions until 12/52
D. N/A
E. Continue to progress strengthening of all LL muscles of affected limb while observing precautions
F. Observe ROM precautions for 12/52
G. Observe ROM precautions (as ‘C’ above) for 12/52. Patient should not lie prone for 12/52 with endoprosthesis insitu. Driving* can normally commence after 12/52 once good leg control, mobilising with a single stick and can achieve an emergency stop.

   *In conjunction with individuals’ insurance cover.

Hydrotherapy can commence at 12/52 with consideration given to ongoing treatment. Non-contact activities (such as swimming, dancing, running) can commence after 6 months dependent on progress.
**6 - Partial/Total Scapulectomy**

**Indication**
Bone tumour of the scapula

**Splints / orthotics required post-op**
Shoulder immobiliser (Appendix D)

**Acute post-op Therapy**

A. Assess chest and Rx as appropriate.

B. No WB restriction - Review and assess for walking aid as required. Can be up as soon as able post-operatively.


D. Shoulder immobiliser - to be fitted by Physiotherapist on first day post-op.

E. Nil at this stage.

F. No shoulder movement for 6/52 (other than for hygiene), Should wear shoulder immobiliser when walking for 6/52, can remove in bed or when arm resting on a pillow in sitting.

**Ongoing Therapy**

A. N/A

B. N/A

C. After 6/52 begin active shoulder movement within limits of patients comfort.

D. Monitor for subluxation and consider for orthotic support if required.

E. Progress strength gently for all Upper Limb - expect poor power. May start hydro at this stage within levels of comfort

F. Restrictions as detailed above.

Commence Active-assisted ROM exercises limiting to 90 degrees shoulder flexion/abduction at 6/52

Return to non-contact activities such as swimming, dance, running after 6months is prosthesis insitu or as comfort allows.

Return to driving* when gained adequate upper limb control/function

*In conjunction with individuals’ insurance cover.

**NOTE** – May require a request for assistance from Occupational Therapist post 6/52
Section 4 – Post-Op and Long Term Management

Post-op chemotherapy will commence approximately two weeks after surgery, however this will vary depending on a number of factors including how aggressive the cancer is or post-surgical complications. Following surgery the histological response to pre-op chemotherapy is determined, a good histological response are those that display the greatest necrosis of tumour cells. This response may determine what post operative treatment the patient receives (see Appendix A and B).

MDT rehabilitation and assessment will continue during and after treatment and may take place in an in-patient or out-patient setting. Regular communication with the wider MDT team, including the Key-worker, who may be their Oncology Outreach Nurse or TYA Nurse Specialist, is essential. Particularly when facilitating discharge home. Individual equipment needs should be considered with early requests for assistance made to local professionals and equipment services.

Depending on proximity to the treatment hospital, Community Physiotherapy will normally commence once treatment has finished. If the treatment hospital is far from home, Community rehabilitation may start sooner and care will be shared with the Acute Physiotherapy team. There is a large element of education throughout the short and long term rehabilitation of a patient with a bone tumour and empowering the patient and family to self manage ongoing functional problems can be helpful. The Sarcoma Charity have a useful webpage on Rehabilitation (https://sarcoma.org.uk/about-sarcoma/rehabilitation). Onward referrals may include supported gym programmes such as Macmillan MOVE More, Can Do Edinburgh and utilising Cyclist Fighting Cancer resources. There may be other local services the patient could benefit from.

Once the patient has completed treatment, it is the responsibility of all professionals involved with the patient to input appropriately to the End of Treatment Summary document. This will facilitate their transition into the Aftercare Service and is usually co-ordinated by the Aftercare Nurse Specialist. Frequency of follow up at the Aftercare Clinic will be determined by the team and this is usually organised in conjunction with radiological surveillance. It may be helpful for the Community Physiotherapist to provide a report and to be included in any clinic correspondence. This can be organised through the Aftercare Team.

Relapse

Unfortunately with all malignancies there is a risk of relapse with bone tumour patients. OS usually recur in the lungs or kidney and multiple site recurrence suggests a poorer prognosis. In ES recurrence is most frequent in the lung, bone, bone marrow or primary site and early recurrence is associated with a very poor prognosis (Bailey and Skinner 2010).

Patients who have relapsed may require Physiotherapy input during second line treatments or during the palliative stage of their disease. This should be provided in a sensitive and co-ordinated way with involvement of the Key-worker, the TYA Nurse Specialist or the Paediatric Oncology Outreach Nurse and other appropriate teams such as CHAS, Palliative Care Team etc. Guidance and support can be sought from the principle treatment centres and Physiotherapists should ensure they safe guard their own wellbeing.
Appendix A – EURAMOS 1 Protocol

Figure 2.
EURAMOS-1 treatment schedule.

(Whelan et al 2015)
Appendix B – Euro Ewings Protocol

Appendix C- Vincristine Induced Peripheral Neuropathy Assessment
UKALL 2011  Vincristine Physiotherapy Assessment Form

Patient Initials □□□□ Take FIRST and SECOND Initials only  Trial No. □□□□

Date of Birth: __/____/____  Randomising Hospital: _______________________________________

Neuropathy Score Form

1A. SUBJECTIVE SENSORY SYMPTOMS (PROXIMAL EXTENSION)
If symptoms are asymmetrical, the worse of the two sides will be used for grading.
Score

i. Paraesthesia (tingling) □

ii. Numbness □

iii. Neuropathic pain (burning, aching, stabbing) □

Sensory Scale:
0 = no symptoms
1 = symptoms limited to the tips of fingers or toes
2 = symptoms extend to ankle or wrist
3 = symptoms extend from above ankle or wrist to the level of knee or elbow
4 = symptoms above knee or elbow and/or severe disabling symptoms that affect normal functioning and/or neuropathic pain that requires narcotic analgesis
99 = Unable to assess

2A. & 3A. TEMPERATURE AND VIBRATION SENSIBILITY
Score each limb.
If symptoms are asymmetrical, the worse of the two sides will be used for grading.

Right  Left
A. Temperature Level
B. Vibration level (128 Hz tuning fork)

Scale:
0 = normal
1 = absent/ decreased in fingers or toes
2 = absent/ decreased up to wrist or ankle
3 = absent/ decreased up to elbow or knee
4 = absent/ decreased above the level of elbow or knee
99 = Unable to assess

2A. TEMPERATURE SENSIBILITY SCORE (0-4) □

3A. VIBRATION SENSIBILITY SCORE (0-4) □
UKALL 2011  Vincristine Physiotherapy Assessment Form

Patient: Initials □□□□ (FIRST name, SURNAME initials only)  
Trial No: □□□□

Date of Birth:  □□□□  
Randomising Hospital:  

4A. STRENGTH
Score each limb.
If symptoms are asymmetrical, the worse of the two sides will be used for grading.

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<tbody>
<tr>
<td>A</td>
<td></td>
<td>Toe extension</td>
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<td>B</td>
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<td>Toe flexion</td>
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<td>C</td>
<td></td>
<td>Ankle Dorsiflexion</td>
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<td>D</td>
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<td>Hip flexion</td>
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<td>E</td>
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<td>Handgrip</td>
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<td>F</td>
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<td>Thumb abduction</td>
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<tr>
<td>G</td>
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<td>Wrist extension</td>
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<tr>
<td>H</td>
<td></td>
<td>Arm abduction</td>
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Scale:
0 = normal (MRC = 5)
1 = mild weakness, but can overcome resistance (MRC = 4)
2 = moderate weakness, can overcome gravity but not resistance (MRC = 3)
3 = severe weakness, cannot overcome gravity (MRC = 2)
4 = paralysis (MRC = 0 or 1)
59 = Unable to assess

4A. STRENGTH SCORE (0–4)  
(Use worst score from A–H or use parental scoring) □□
UKALL 2011  Vincristine Physiotherapy Assessment Form

Patient Initials □□□□ (Use FIRST and SECOND initials only)  Trial No. □□□□

Date of Birth:  /  /  Randomising Hospital:  

5A. TENDON REFLEXES
Score each individual reflex as:
A = absent, R = reduced, N = normal

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<tr>
<td>A.</td>
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<td>E.</td>
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<td>Biceps</td>
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<td>Triceps</td>
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<td>Supinator/Brachioradialis</td>
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<tr>
<td>Knee</td>
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<td>Ankle</td>
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Once the above assessment is complete, determine Tendon Reflex Score based upon the criteria below:
Scale:
0 = All reflexes normal
1 = Ankle reflex reduced
2 = Ankle reflex absent
3 = All reduced
4 = All reflexes absent
99 = Unable to assess

5A. TENDON REFLEX SCORE (0-4) □ □

6A. AUTONOMIC SYMPTOMS (Constipation)
Constipation grading
Scale:
0 = Normal
1 = Requiring stool softeners or dietary modification
2 = Requiring laxatives
3 = Obstipation requiring enemas or manual evacuation
4 = Life-threatening consequences (e.g. toxic megacolon, obstruction) including death
99 = Unable to assess

6A. AUTONOMIC SCORE (0-4) □ □
Appendix D

Examples of Splints/Orthotics

Knee Immobiliser

Shoulder Immobiliser

Hinged knee ROM brace