The Sydney children's Hospitals Network
care, advocacy, research, education

ORTHOPAEDIC EXTERNAL FIXATION DEVICE: MANAGEMENT & CARE

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- Definition of an external fixation device and orthopaedic conditions that can be treated with the use of external fixation.
- Pre-operative requirements for the child and family.
- The general principles required when caring for a child with an external fixation device post-operatively.
- Pin site management and wound management.
- Distraction or leg lengthening management.
- Potential complications that may occur following application of an external fixation device.
- Requirement necessary before discharging a child with an external fixation device.
- Evidence to support guideline on managing an external fixation device.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st October 2014	**Review Period**: 3 years
Team Leader:	Clinical Nurse Consultant	**Area/Dept**: Orthopaedics

CHANGE SUMMARY

- New SCHN document based on the CHW guideline of the same title. The CHW guideline has been rescinded.
- No major changes. Updated references and dressing procedure.
- Add new device Circular Hexapod Frame: (TL-HEX)
- Physiotherapy: Hydrotherapy

READ ACKNOWLEDGEMENT

- RN and EN staff require training and/or assessment for post-operative management.
- All clinical staff caring for patients with an orthopaedic external fixation device are to read and acknowledge they understand the contents of this document.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

TABLE OF CONTENTS

Definition **4**
General Principles **4**
Pre-Operative Preparation 4
Post-operative Management **5**
Observations 5
Hydration 5
Pain management 5
Wound Management 5
1. Pin site Management *6*
2. Osteotomy Wound Management *7*
Distraction (turning regime) 7
Ilizarov Device *7*
Hexapod Frame (TL-HEX or TSF) *7*
Personal Hygiene/Clothing 8
Physiotherapy 8
Optimal Outcome **9**
Self- care 9
Mobilisation 9
Potential Complications **9**
Neurovascular impairment 9
Pin site infections 9
Joint and muscle contractures 9
Requirements for Discharge **10**
Related Homecare Guideline (at CHW) *10*
Education/Evidence Based Practice **11**
References **11**

Definition

An External Fixation device involves a system of pins and wires connected to an external frame. The device has been described as an instrument designed to stabilise and maintain the position of a bone. These devices can also be used to lengthen and correct rotational deformities of the bone. Fixation devices are frequently used for patients with fractures, non-union or mal-union, limb length discrepancies and limb deformities[1, 2]. There are a number of devices used for external fixation, such as the:

- Ilizarov Frame
- Hoffman Fixator
- Circular Hexapod Frame (TL-HEX or TSF)

The use of these devices depends on the type of condition being treated.

General Principles

Pre-Operative Preparation

1. Parent and child receive appropriate information in relation to procedure and after care by medical and nursing staff. It is important that the family and health professionals outline the desired goals and outcomes associated with the procedure.
2. Discuss approximate length of hospital stay with family.
3. Commence organisation of community supports if home care is required after discharge.
4. If child is of school age, liaise with CNC in relation to re-integration back to school following procedure.
5. Check skin integrity.
6. Check vital signs, temperature, pulse, respirations, and blood pressure.
7. Check consent form.
8. Fasting times and premedication to be ordered by anaesthetist.

Post-operative Management

Registered nurses and Enrolled nurses who have been educated and can demonstrate the appropriate skill and knowledge required to perform the dressings and distraction (turning regime) are able to care for a child with an external fixation device.

Observations

- Elevate the limb on pillows and raise the appropriate end of the bed. The affected limb should be maintained at heart level. This will reduce swelling and enhance the neurovascular status to the affected limb[3].
- Neurovascular observations are to be recorded hourly for a minimum of 24 hours, or until stability of the extremity is attained. Be aware of possible complications such as nerve impairment and compartment syndrome[3]. A foot-plate maybe required if the device is applied to the tibia.
- Record vital signs hourly. When narcotic infusion is ceased, 4/24 temperature, pulse, respirations and blood pressure until discharged.

Hydration

- Intravenous therapy as ordered, as per:
  - **CHW** Intravenous Fluid Management Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2009-8070.pdf or
  - **SCH** Intravenous Fluid and Electrolyte Therapy Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2013-7033.pdf .
- Monitor input and output on fluid balance.
- Commence clear fluids as desired. If tolerating oral intake grade to normal diet.

Pain management

- Pain team consultation.
- Opiate infusion, as per:
  - **CHW** Pain Management Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/homecare/2006-8253.pdf or
  - **SCH** Opioid Intravenous Infusions Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2012-7011.pdf
- Regular Paracetamol as ordered.
- Oral Opiate when tolerating oral diet and infusion is ceased.

Wound Management

- Leave dressings intact for 4 days post-surgery.
- Commence daily dressings to pin sites day 4 post surgery.

1. Pin site Management

Equipment required for cleaning pin sites:

- Dressing pack
- Sterile Gloves
- Normal Saline
- Sterile Scissors
- Sterile Cotton Buds
- Allevyn® Non adhesive dressing

Procedure:

1. Organize equipment. Cut sheets of Allevyn® Non adhesive dressing into the required number of pieces eg 1 sheet of Allevyn can be cut into 12 pieces for pins and 16 pieces for wires. Cut a keyhole into each piece of Allevyn
2. Take the child to the shower and provide a shower chair.
3. Saturate dressings with warm water in the shower to dissolve dried blood and enable easy removal. This will prevent soft tissue damage. Slide clips up pin/wires and remove Allevyn dressings. Discard all Allevyn pieces ready to replace with new ones. Wash limb with warm soapy water, then rinse and dry leg and device[4]. It is important not to pull or tear the skin around the pin sites. **Baths are not recommended** for child with external fixation devices, as bath water might contaminate the wounds[4,5,6].
4. Position child in bed, clean pin/wire sites with Normal Saline using a sterile cotton bud. Always clean away from the pin/wire in one direction to prevent microbial transfer into the pin[5]. Use a new sterile cotton bud for each pin or wire. Remove any crusts from around the pin or wire site, this promotes free drainage and prevents skin from adhering to the pin or wire[3]. However it is important to note that scabs should never be removed as they are an essential part of the healing process[5, 6].
5. Apply Allevyn around pin or wire (pink coloured side up). Place stopper/clip on pin or wire to hold the Allevyn against the skin with enough pressure to make a slight indentation. This helps to prevent movement of the skin which will reduce the risk of infection[4 - 7]. See below.

Note:

- Allevyn dressings are only required for the first two weeks following surgery. After this time Allevyn is only used for persistent pin site infections.
- Hydrogen Peroxide 3% can be useful on necrotic tissue and crusts around pin sites but it must be diluted to half strength with normal saline[7]. It is not recommended for clean

wounds or deep wounds as it has been associated with air embolism formation and can be caustic[6].

- Chlorhexidine 0.1% can be used for persistent pin site infections[2,6]

Parents are taught how to perform pin site dressings, written instructions and guidelines are available and need to be given to the parents.

2. Osteotomy Wound Management

- An Osteotomy may also have been performed when the fixator was applied.
- Change dressing when commencing pin site care.
- Swab with normal saline and apply a prima pore dressing, cover with a water proof dressing.
- Remove sutures or staples as instructed by orthopaedic consultant.
- Dressing needs only be covered for 5 days.

Distraction (turning regime)

- Not all children who have an external fixation device applied need to undergo distraction/gradual correction. Distraction /lengthening/ correction is commenced 5-8 days post-operation. Instructions on when to commence clicks/turns will be documented in the child's post-operative notes.

Ilizarov Device

- The surgeon determines the method, rate and direction of turning. The surgeon marks the device to indicate the direction of the turn. The turns may be painful initially; give appropriate analgesia before commencing.
- A chart/booklet is provided for the parents to record the turns. Ensure that the booklet is given to the family and is brought to each clinic appointment.
- To perform the turns two 10mm spanners are required (or 8mm spanners for smaller devices), one spanner is used to loosen the bolt and hold it in position and the other spanner is used to turn the marked bolt. When the marked bolt is turned to the prescribed position, tighten the other bolt. Some devices have clickers to turn rather than bolts.

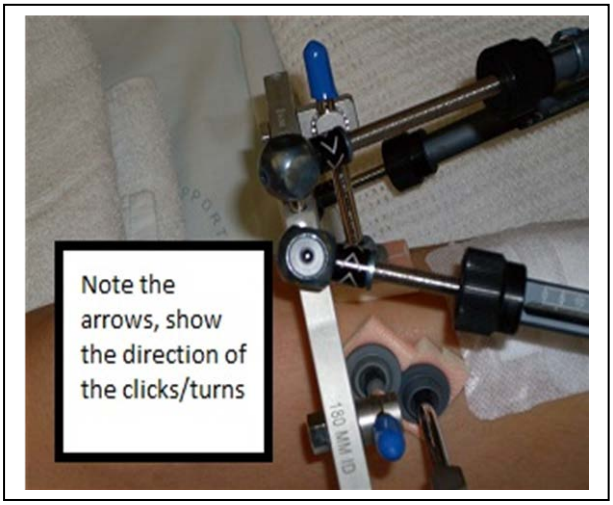
Hexapod Frame (TL-HEX or TSF)

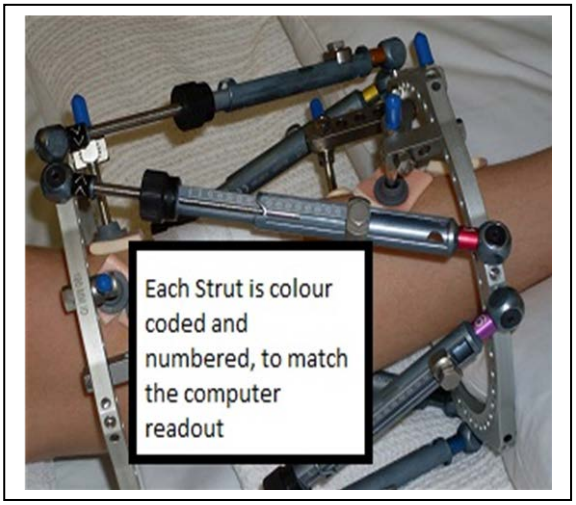
- The rate of turning is determined by a computer program. A post-operative x-ray is required before turning commences. The surgeon will deliver the computer readout to the unit. This readout outlines the required daily clicks/turns.
- Each strut is colour coded and numbered to coincide with the computer readout/prescription.
- TLHEX: Do the amount of 'clicks' recorded on the prescription in the direction of the arrow on the strut. (+) clicks go to the left and (-)clicks go to the right

- TSF: Turn each strut to the number that is recorded on the computer readout, which coincides with the appropriate date
- Document the completion of each days clicks/turns in the child's medical records and on the computer readout.

The parents need to be taught how to do the clicks/turns by the nurse, the nurses role is one of education, supervision, observation and support.

TL-Hex Frame





Personal Hygiene/Clothing

- Daily showers when pin site care commences, assistance is needed to get in and out of the shower.
- Track pants with an added panel and hook and loop tape fastening are ideal for tibial or femoral fixation devices. Girls may prefer long skirts. **At CHW**, the Ilizarov coordinator has a collection of clothes, which may be used. Contact by page 6339.

Physiotherapy

- Physiotherapy is an important part of the child's post-operative recovery.
- The goal of physiotherapy is:
  - To help the child maintain functional movement of the joint above and below the fixation device.
  - To promote and assist the child to be as independent as possible with his/ her exercise program (weight bearing fully promotes bone healing).
  - To prevent contractures and mobility.
- A Physiotherapist will see the child day 1 post operatively to commence bed exercises, to maintain leg strength and range of motion of the joints and muscles above and below the fixation device.
- When requested by the orthopaedic surgeon, the physiotherapist will commence mobilizing the child. Weight bearing status must be specified by the surgeon prior to mobilizing the child. Some children require assistive devices such as a walking frame or crutches to mobilize that will be taught by your physiotherapist.

- Prior to discharge the physiotherapist on the orthopaedic ward will have a home program for the patient to continue with at home and will ensure that an outpatient physiotherapy referral is in place for follow up therapy as needed either at this hospital, or one near the patient's home. Contact the orthopaedic physiotherapist or *if at CHW*, page 6385.
- Hydrotherapy is recommended 3 weeks post-surgery, (if able to be resourced). Hydrotherapy does not increase the risk of wound infections, in fact it helps keep the pin sites clean and free of crusts whilst improving range of motion of joints.[8]

Optimal Outcome

Self- care

Promote maximum self- care for the child and family. Frustration with mobilisation and problems associated with body image need to be acknowledged and discussed openly. Encouragement and support for both the family and child is necessary in relation to pin site care and the turning regime[9].

Mobilisation

Prior to discharge the child should be able to mobilise safely with the use of walking aids, such as crutches or a frame. If the fixator is in place for lengthening full weight bearing is encouraged and is essential for the development and consolidation of new bone[3].

Potential Complications

Neurovascular impairment

- Neurovascular assessment in the first 24 to 48 hours is essential, if a child has extreme pain, loss of active and passive motion, loss of sensation and swelling it may indicate compartment syndrome. The orthopaedic registrar should be called immediately[3].
- The wires and pins inserted are sometimes close to the nerve and blood supply of a limb; a bruised nerve can alter sensation and movement of a limb. Foot drop can be a result of a nerve damaged by a pin or wire[3, 5].

Pin site infections

- Inflammation of a pin site is a common complication and many children experience pin site infections. Parents should be taught how to identify a pin site infection and know what action to take. An Action Plan is provided with the pin site care instructions[1, 7].
  At CHW: Refer to Pin Site Care Homecare Guideline.

Joint and muscle contractures

- Stiff joints, especially around the ankle and the knee can lead to muscle contractures. Regular physiotherapy and passive/active exercises performed by the parents can prevent this from occurring. A Physiotherapy plan should be developed and parents

instructed on exercises before discharge[5]. Foot plates may be required for children with a device applied to the tibia; the Orthotic Department will provide and fit the foot plate.

Requirements for Discharge

- Parents/child can demonstrate confidence with pin site care and clicks/ turning regime.
- Parents have 2x10mm or 2x8mm spanners (for Ilizarov frames)
- Parents have pin care instructions and action plan.
- Parents have booklet to record clicks/turns.
- Child is mobilising safely.
- Dressing equipment at **Westmead Campus:** Appliance Centre (Level 2 Galleria)

  Randwick Campus: Help Centre (Foyer front of Hospital)

  Items that are needed at home for a two week period include:
  - Sterile Cotton buds (only for 2 weeks then able to use supermarket supplies)
  - Allevyn non adhesive Dressing
  - Suction Packs (used instead of a dressing pack) by parent/carer
- Instruct parents to obtain normal saline from local chemist.
- Mobilisation aids arranged.
- Splints or foot plates arranged through Orthotic department.
- Parents instructed to check device weekly for loose bolts and screws.
- Outside Prescription for oral antibiotics given to parents (to be used only if child develops a pin site infection).
- Follow-up appointments arranged in Limb Lengthening Clinic.
- Physiotherapy outpatient appointments arranged and Hydro-Therapy pre-arranged to commence once osteotomy wound healed (3 weeks post-op)
- Contact phone numbers of health professionals given to parents.

Note: Normal saline to be used at home as the cleaning solution.

Related Homecare Guideline (at CHW)

- **Pin Site Care**: http://chw.schn.health.nsw.gov.au/o/documents/policies/homecare/2006-8253.pdf

Education/Evidence Based Practice

There are many different pin site care protocols documented in the literature, no one protocol emerges as superior to any other in reducing the potential for pin site infections. Sample sizes and variables in research studies tend to limit some of the results.

In 2013 a Cochrane review on pin site care for preventing infections associated with external bone fixators and pins was undertaken and in 2005 the American National Association of Orthopaedics Nursers (NAON) developed guidelines for pin site care. The guidelines developed at The Children's Hospital at Westmead reflect those made by NOAN and the Cochrane review.

The hospital recommends the use of Normal saline and Chlorhexidine as a result of a Continuous Improvement Project[10] undertaken in October 2000 and April 2002 comparing three different management protocols for pin site care. The report concluded that there were no significant differences between the three groups. Group III did show a decrease in the severity of the infections, reflected in the decrease number of readmissions for pin/wire removal or Intravenous Antibiotics. This may have been due to the more detailed instructions and a more thorough description of signs of infections provided to the families.

We recommend the use of normal saline within the home as it is less expensive and easier to obtain for families. The rate of pin site infections requiring admission to hospital for intravenous antibiotics or pin removal has remained consistently low for the past 10 years. There is at the moment not sufficient evidence to change the home regimen.

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