

Local Guideline



Health
Hunter New England
Local Health District

Medical Leech Therapy

| | |
|--|---|
| Sites where Local Guideline applies | John Hunter Children's Hospital |
| This Local Guideline applies to: | |
| 1. Adults | No |
| 2. Children up to 16 years | Yes |
| 3. Neonates – less than 29 days | Yes |
| Target audience | Clinicians in acute care settings |
| Description | A guideline for the use of paediatric medicinal leech therapy |

[Hyperlink to Guideline](#)

| | |
|---|---|
| Keywords | Leech, <i>Hirudo medicinalis</i> , venous congestion, digital replantation, hand surgery, finger surgery, flap, graft, microsurgery |
| Document registration number | JHCH 10.7 |
| Replaces existing document? | Yes |
| Registration number and dates of superseded documents | 10.7 |
| Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics: | |
| <ul style="list-style-type: none"> • Leech Therapy Learning Package • Neurovascular assessment guideline • Sepsis pathway http://www.cec.health.nsw.gov.au/programs/sepsis/sepsis-tools#Pathways • Recognition and Management of Patients who are Clinically Deteriorating http://www0.health.nsw.gov.au/policies/pd/2013/pdf/PD2013_049.pdf • NSW Ministry of Health Infection Control Policy PD2007 036 • NSW Health Policy Directive 2014_036 Clinical Procedure Safety http://www0.health.nsw.gov.au/policies/pd/2014/pdf/PD2014_036.pdf | |
| Prerequisites (if required) | Prescription for treatment |
| Local Guideline note | This document reflects what is currently regarded as safe and appropriate practice. The guideline section does not replace the need for the application of clinical judgment in respect to each individual patient but the procedure requires mandatory compliance . If staff believes that the procedure should not apply in a particular clinical situation they must seek advice from their unit manager/delegate and document the variance in the patient's health record. |
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| Date authorised | |
| This document contains advice on therapeutics | Yes Approval gained from Local Quality Use of Medicines Committee on 9 th March 2016 |
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1. CLINICAL RISKS

| RISK | EXPLANATION | CONTROL OF RISK |
|---|---|---|
| <i>Aeromonas hydrophila</i> infection presenting as cellulitis, localised abscess or sepsis | Normal bacterial flora in a leech gut. It has a symbiotic relationship with the leech, aiding the leech in digestion. The bacteria is a potential source of infection if it is introduced into a human host (Sartor, et al 2013:1686) | <ul style="list-style-type: none"> ▪ Prophylactic antibiotic therapy ▪ It should be noted that antibiotic therapy may fail if resistance develops (Whitaker, et al, 2011) ▪ The leeches should be single patient, single use only |
| Allergy | A hypersensitivity reaction initiated by specific immunologic mechanisms. May be localised with eczema, hives or systemic anaphylaxis. Also consider allergy to prophylactic antibiotics | <ul style="list-style-type: none"> ▪ Remove leech ▪ CERS criteria (clinical review/rapid response) ▪ Team to review therapy requirement |
| Anaemia | A decrease in the normal quantity of haemoglobin in the blood as a result of chronic and sustained blood loss | <ul style="list-style-type: none"> ▪ Monitor blood loss. ▪ 2nd daily haemoglobin checks ▪ Clinical assessment by nursing staff at commencement of each shift ▪ Clinical examination by a medical officer daily |
| Blood exposure to patient | Leech is re-used on another patient increasing risk of blood-borne infection | <ul style="list-style-type: none"> ▪ Keep the leeches in the patient's room and in their bedside locker. Do not remove leeches from patient area unless disposing of dead leeches. ▪ Label the containers with patient ID |
| Blood exposure to staff | Leech is squeezed or purged and staff are exposed to purged patient blood | <ul style="list-style-type: none"> ▪ Use standard precautions ▪ Wear personal protective equipment. Avoid over-handling and squeezing leeches. ▪ Dispose of used and non-viable leeches as soon as possible according to infection control guidelines. |
| Haemorrhage | Loss of blood from the circulatory system of more than 15%. Disrupting homeostasis, via external chronic loss as the direct result of the chemicals released into the body by the leech | <ul style="list-style-type: none"> ▪ Monitor blood loss ▪ Monitor vital signs 4th hourly ▪ 2nd daily haematocrit checks ▪ Daily clinical examination by medical officer ▪ Recognise signs of haemorrhage, i.e. hypovolaemia, tachycardia, decreased oxygenation, hypotension |

Risk Category: *Clinical Care & Patient Safety*

2. GLOSSARY

| Acronym or Term | Definition |
|------------------------------------|--|
| <i>Aeromonas hydrophilia</i> | Normal bacterial flora in a leech gut. It has a symbiotic relationship with the leech, aiding the leech in digestion. The bacterium is a potential source of infection if it is introduced into a human host (Sartor, et al 2013:1686) |
| Attachment | The leech is adhered to the patient appropriately, with a therapeutic effect |
| Detachment | The leech has removed itself or has been removed from the patient appropriately |
| Disengorgement | The leech is purged of its blood gut contents by contact with a noxious material |
| <i>Hirudo medicinalis</i> | The scientific name for the particular species of medicinal leech |
| Medicinal leech | A freshwater annelid used for clinical bloodletting |
| Senior orthopaedic medical officer | An accredited orthopaedic registrar, fellow or consultant |
| Venous congestion | A post-operative complication of microvascular surgery. It is demonstrated by purple or blue colouration to the operative site. The venous outflow of tissue is blocked, while the arterial input remains viable |

GUIDELINE

This Guideline does not replace the need for the application of clinical judgment in respect to each individual patient.

1. INTENDED OUTCOMES:

To provide a standardised guideline for the use of medicinal leech therapy on paediatric patients. The aim is to:

- Obtain leeches using a standardised ordering system
- Decrease venous congestion after replantation or reconstructive surgery
- Improve local perfusion
- Provide consistent care, maintenance and disposal of medicinal leeches
- Standardise practice, based on evidence
- Standardise documentation

2. PROTOCOL

Medical practitioner responsibilities:

- Venous congestion **must** be diagnosed by a senior orthopaedic medical officer
- Informed medical consent **must** be obtained and documented in the patient's notes
- Leech treatment **must** be prescribed by a senior orthopaedic medical officer in the patient's health care record. The prescription should state:
 - the site of the therapy
 - the estimated time required
 - whether the treatment is to be continuous or intermittent
- The orthopaedic consultant **must** be aware of the treatment

- The paediatric patient **must** be prescribed the current recommended prophylactic antibiotic therapy prior to initiation of medicinal leech therapy
- The paediatric patient **must** have an IV cannula inserted prior to leech therapy
- A senior orthopaedic medical officer **must** evaluate each set of treatments before more are initiated
- The patient **must** have a clinical review, including haemoglobin and haematocrit check between each set of treatments (Michalsen et al, 2006)

Registered nurse responsibilities:

- Due to the nature of the therapy and for the comfort and privacy of the patient, the patient should be placed in a single room
- Leeches **must** be obtained from Liverpool Hospital
- The Registered nurse caring for the patient is responsible for the care, application, maintenance and disposal of the leeches (Michalsen et al, 2006)
- The Nursing Unit Manager/Team Leader is to be notified by the orthopaedic team as soon as the decision for leech therapy is made
- The paediatric patient **must** have a patent IV cannula maintained during the period of therapy
- The paediatric patient **must** be commenced on the current recommended prophylactic antibiotic therapy **before** leech therapy
- The paediatric patient **must** have a thorough clinical nursing review at the commencement of every shift during leech therapy, monitoring for signs of complications
- Leeches **must** be disposed of in accordance with this guideline and current infection control practices

3. BACKGROUND INFORMATION

During micro-vascular surgery, anastomosis of arteries is more readily achievable than with the thinner, more collapsible veins. Arterial walls are thicker and easier to repair. This can result in adequate arterial flow and impaired venous flow. In replanted digits and grafts, this results in **venous congestion**. This can lead to increased intravascular pressure, restricting arterial flow and leading to ischaemia (Yantis et al, 2009).

Leeches are used to reduce the venous congestion by assisting in the removal of blood that is unable to exit the venous system (Yantis et al, 2009).

The Stages of Leech Therapy

1. The initial bite from the leech
2. First stage (attachment period) of 15-90 minutes (during which the leech removes between 1-5ml of blood)
3. Second stage (post-attachment) period during which the site continues and is encouraged to bleed

It is the second stage that provides the primary therapeutic benefit (Conforti et al, 2002).

Leech Saliva

Leech saliva contains over 100 bioactive substances that contain bacteriostatic, analgesic and anticoagulant components (Soengkar et al, 2012:546). These include:

- **Calin** – a protein that induces secondary bleeding by inhibiting platelet aggregation. This may last up to 12 hours
- **Enzymes** – including collagenase, apyrase and hyaluronidase; that assist in diffusing substances into the tissues
- **Hirudin** – a protein that inhibits thrombin in the clotting cascade. It prolongs bleeding and enables blood to flow
- **Histamine-like substances** – induce vasodilation and increase the inflow of blood to the bite site (Soengkar et al, 2012:546)

4. INDICATIONS

Leech therapy is indicated for relief of venous compromise after microvascular replantation and flap transplantation surgery.

- Skin colour will be dusky, blue or purple
- Capillary return may be brisker than normal
- Pinprick response test will result in bleeding that is rapid with dark-coloured blood (Soengkar et al, 2012; 546).

5. PRECAUTIONS AND CONTRAINDICATIONS

Precautions

Leeches have the bacteria *Aeromonas hydrophila* in their gut to aid in digestion. These bacteria may cause an infection if they are injected into the patient. Prophylactic antibiotic therapy must be initiated prior to the use of leech therapy (Sartor: 2002).

RECOMMENDED PROPHYLACTIC ANTIBIOTIC THERAPY

The recommended prophylactic antibiotic for paediatric leech therapy is sulfamethoxazole + trimethoprim (Bactrim, Septrim) given in a standard therapeutic dosage.

The recommended dosage for children 1 month – 18years is:

sulfamethoxazole + trimethoprim (Bactrim, Septrim)

4 + 20 mg/kg (maximum dose is 160 + 800mg) orally 12-hourly

Where sulfamethoxazole + trimethoprim (Bactrim, Septrim) is contra-indicated, for example, allergy to Sulphur, ciprofloxacin may be used, given in a standard therapeutic dosage.

The recommended dosage for children 1 month – 18years is:

Ciprofloxacin 12.5 mg/kg (maximum dose is 500mg) orally 12-hourly

Each leech bite can cause blood ooze in excess of 50ml. This varies with the age and size of each child and young person. Regular haemoglobin and haematocrit checks are required, especially for younger children.

Haemoglobin and haematocrit must be checked at least 2nd daily.

Contraindications

Leech therapy must not be used on patients with the following:

- Known bleeding disorders, such as haemophilia
- Immune-compromised patients, for example, neutropaenia
- Children and / or parents that refuse prophylactic antibiotic therapy
- Pre-existing arterial insufficiency
- Known allergy to leeches (Yantis et al, 2009)

6. COMPLICATIONS

- Mild reactions may occur, such as pruritis, hives or blisters (Whitaker, 2012)
- Infection caused by the bacteria *Aeromonas hydrophila* (Whitaker, 2012)
- Foreign body reaction where part of the leech jaw has remained in the patient (this may occur where a leech has been forcibly removed)
- Anaphylaxis an allergy to the leeches

7. PROCEDURE

7.1. Prior to Ordering Leeches

- **Informed verbal consent** - the prescribing medical officer must explain the treatment and its purpose to the parents and the child. The family should be given the parent fact sheet to read. Where patients show concern, anxiety or fear, the Child Life Therapy team should be contacted. **Patient consent must be documented in the health care record.**
- **Prescription in the health care record** – this must include:
 - Patient's weight
 - Estimated length of time the therapy is required
 - The digits and / or the sites requiring therapy

Note: Typically – a treatment consists of 1-4 leeches per area daily until venous congestion has resolved (Ward et al, 2008).

7.2. Obtaining Leeches

- The ward team leader is responsible for obtaining the leeches
- Allow six (6) hours for the preparation and delivery of leeches
- The leeches are obtained from Liverpool Hospital Ward 5D
- Phone number is 02 87387540
- The leeches come in one size only
- The cost is \$25 each
- 15 leeches will provide therapy for approximately 5 days for a healthy child between 17-40kg
- The consultant, fellow or registrar will need to prescribe the number of leeches required
- Liverpool Hospital requires a purchase order prior to the preparation and delivery of the leeches. Approval can be sought through the Kaleidoscope Business Manager or the after-hours Nurse Manager
- The order can be written on a General Request form and must be faxed to 02 98283109
- The John Hunter Children's Hospital is responsible for arranging transport (hire car from Newcastle is usual)

(This information was current on 20th July 2015)

7.3. The Leech Kit

- The leeches will arrive in a box. Each leech is in its own container in fresh water solution.
- The 'Tips for Leech Care' instructions are in the box with the leeches
- The leeches have been starved and are ready for attachment

7.4. Care of the Leeches

- The kit must be stored in a cool, dark place. The top drawer of the patient locker is the most appropriate place if it is safe to do so under the circumstances
- The leeches are not to be stored in the treatment room, especially if more than one patient is having therapy
- Leeches are kept in the water supplied in their jars. The jar must only be half full or the leech will drown
- No other solution must be used for the leeches, including tap water
- Ensure small holes are present in the lid of the container
- Do not place leeches together in jars – they are cannibals

Leeches should be protected from sunlight, heat and chlorinated tap water

7.5. Preparing for Attachment

- Daily clinical photography is recommended to follow the progress of decongestion and promote consistency in care. Ensure the policy PD2005 593:PCP 1 for photographing and recording patients is followed.
- Read the instructions for attachment **before** handling the leech. The less time handling the leech the better
- Leech therapy should be painless. The leech provides analgesia and the area is generally denervated
- A full set of neurovascular and general observations must be completed prior to the attachment
- If the patient / parent is anxious, contact the Child Life Therapy team. A pillow may be placed to block the view (Michaelson et al, 2006)

Suggested equipment

- 1 x bluey
- 1 x foam cup - this is recommended to be placed over the digit during therapy
- 5 or 10ml syringe (depending on size of fingers)
- 2 packets of gauze squares
- 10ml sterile water for injection

Have the equipment ready and within reach

- Clean the attachment site with sterile water for injection

Normal saline, iodine and alcohol are noxious chemicals to leeches and will prevent attachment

A clean technique **must** be used for attachment

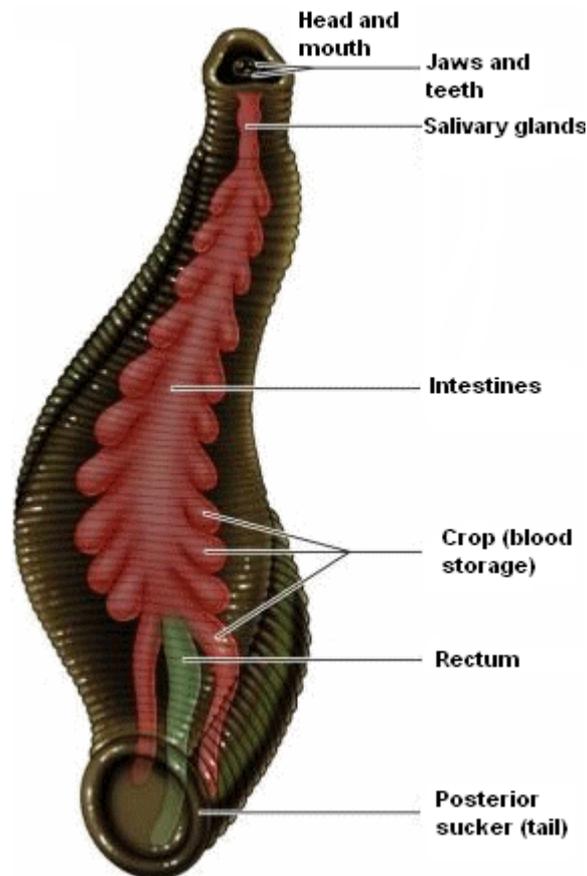


Figure 1. Leech anatomy.¹

7.6. Attachment

- Pick up the leech with gloved hands, taking care not to squeeze the leech. Do not use forceps because they can damage the leech (Ward et al, 2008)
- Familiarize yourself with the correct 'head' end of the leech (see Figure 1 above)
- Lay the mouth of the leech over the desired site – the mouth will become round (like a suction cup). The neck will arch slightly at attachment. Many leeches prefer to attach in a U-shape for stability (see Figure 2 below).
- The leech will slowly begin to swell and will not disengage with gentle movement (Ward et al, 2008)
- Rhythmic contractile movements (peristalsis) should be observable while the leech is feeding
- The leech must be monitored by staff after attachment for 5 minutes to ensure an adequate 'latch' has been achieved.



Figure 2. Attached leech²**Extra Tips to Assist with Attachment**

- Remove the plunger from a 5 or 10ml syringe. Place the leech inside with the mouth end out. Invert the syringe over the site. After attachment, remove the syringe
- The head of the leech is pointed and narrow. It performs searching movements. The tail has suction for holding the leech in place for stability (Ward et al, 2008)
- Have a piece of dry gauze to remove the leech from your glove if it attaches. A wet leech can be difficult to handle in gloves (Yantis et al, 2009)

Difficult Attachments

- If the leech will not attach after the area has been cleaned, a smear of 5% dextrose on the site can attract the leech.
- If the leech shows an ongoing reluctance to attach, a small needle prick to the patient's skin with a diabetic lancet device can be used to entice the leech
- If the leech refuses to attach, place it back into its container and use another leech

Note: Parents and children should be informed that smoking and large amounts of caffeine, including soft drinks and chocolate during the therapy will limit the benefit of the therapy (Yantis et al, 2009).

No Leech Will Attach

If you have tried several leeches and none will attach to the site after using all the suggested methods, and you are certain the site is not contaminated with a noxious substance, call the CNC or the Registrar.

Persistent refusal to attach is a sign of one of the following:

- **Arterial insufficiency** – there is no blood supply to the finger – check the neurovascular observations and initiate an urgent clinical review
- **Lazy leech syndrome** – post-operative anaesthetic is affecting the leeches
- **Poor tissue viability** – leeches will not attach to non-viable tissue
- **Low skin temperature** – leeches like to feed at a comfortable temperature of 35-40°C. This could be a sign of arterial insufficiency or you may need to warm the patient

7.7. Containment and Maintenance of the Site and Leech

- The affected limb should be elevated to alleviate venous congestion
- Attachment times are variable between 15-90 minutes. The leech should remain attached for at least 15 minutes. It will become engorged with blood during this time (Conforti et al, 2002)
- The surrounding area could be dressed with some gauze and some normal saline applied to it to keep the leech corralled at the site
- For digits, a foam cup is an effective barrier (Yantis et al, 2009)
- A responsible, competent and compliant carer / parent may sit with the child during the attachment phase if they want to. If not, the Registered nurse must stay with the patient for the time the leech is attached

- The Registered nurse must check the site every 5 minutes while the leech is attached. When it is full, the leech will drop off (Yantis et al, 2009)

7.8. After the Leech Drops Off

- When the leech has detached itself, pick it up with gloves and a dry gauze square (it is now contaminated waste) and place it in its container
- Leeches are not to be disgorged
- The site must be monitored hourly (Ward et al, 2008)
- Individual sites may drip or ooze blood for up to 12 hours
- It is recommended gauze or combines be loosely placed over the site to absorb the blood and changed PRN

Note: Bleeding is to be encouraged. Loose clots should be removed from the site. The registrar, fellow or consultant may order the site to be wiped with heparinized saline gauze

7.9. Removing Leeches

- If the leech is not feeding but is attached (i.e., no peristalsis is observed) or the leech has been attached for longer than 90 minutes, it will require manual removal
- If you need to remove a leech while it is actively feeding, do not forcibly pull it off the skin. The teeth can tear off and remain in the patient. This can cause infection. The leech can also regurgitate blood and bacteria into the patient.
- Gently touch the back of the leech's head with a cotton bud dipped in normal saline. The head will detach (Ward et al, 2008).

7.10. Documentation and Observations

- Neurovascular observations are hourly unless prescribed otherwise
- Information must be recorded on the relevant observation chart hourly

Note: Old sites must be monitored for signs of infection (Conforti et al, 2002)

7.11. Cessation of Treatment

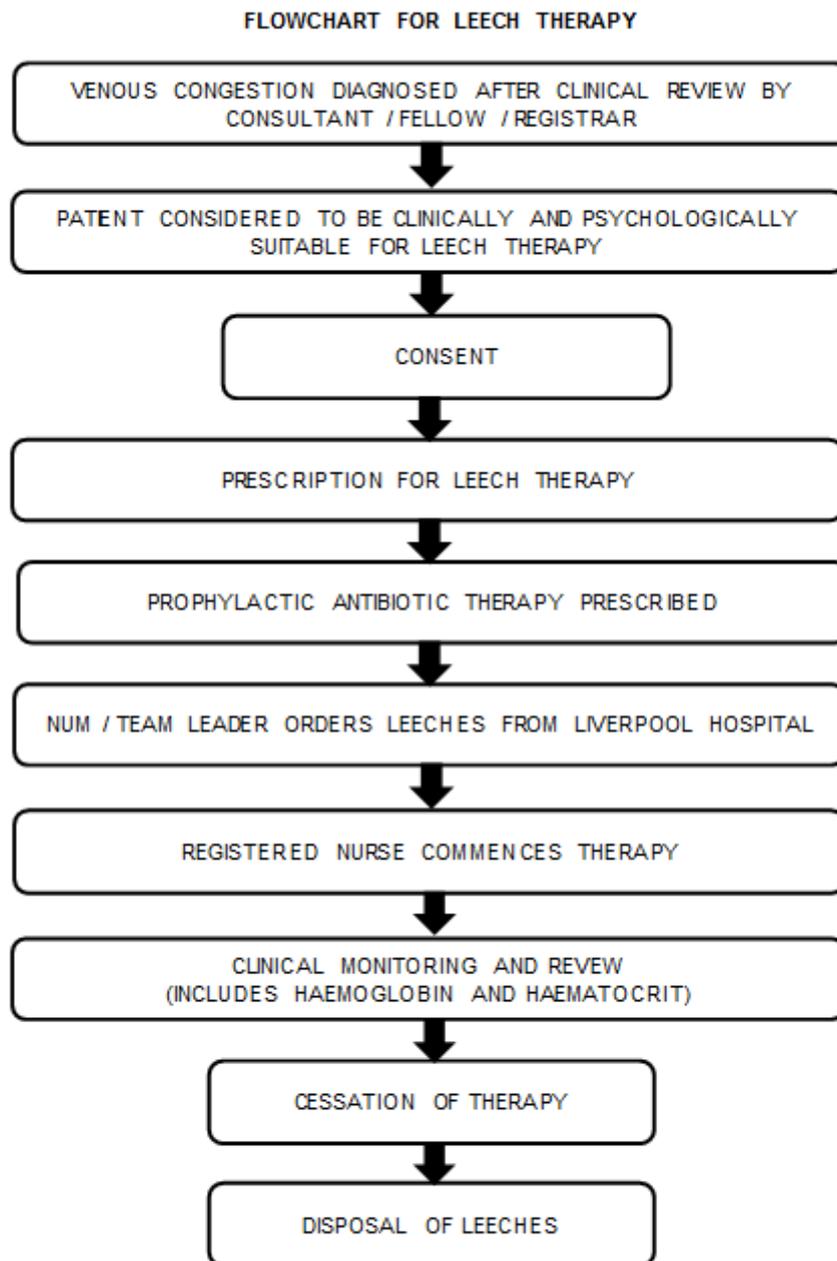
Therapy will be considered successful when sufficient venous drainage has been achieved. This will be when:

- The digit / flap returns to a typical skin colour for that patient, that is comparable to non-injured tissue
- Capillary return slows to approximately 2 seconds
- The tissues are less engorged (Yantis et al, 2009).
- The orthopaedic consultant, fellow or registrar will assess the site prior to cessation of therapy and document that therapy is to be ceased.

8. DISPOSAL OF LEECHES

- Leeches must be placed in methylated spirit or 70% alcohol solution in their jar and disposed of as contaminated waste.
- Leeches are to be used for medical therapy only. They are to be disposed of quickly and humanely. **NEVER** squeeze or tamper with the leeches.

9. FLOWCHART



10. IMPLEMENTATION AND MONITORING COMPLIANCE

1. The guideline will be placed on the HNE guideline website.
2. A copy of the guideline will be sent to all the relevant stakeholders, such as hand surgeons and registrars
3. The nursing staff on the wards will be given an in-service regarding the updated guideline, including the changes within one month of ratification
4. The nursing educators will be directed toward the updated guideline and the learning package
5. A clinical audit tool is available at Appendix One
6. Compliance will be monitored with annual audits and an associated action plan, where required, will be sent to the JHCH Clinical Quality and Patient Care Committee

11. APPENDICES

1. Clinical Audit Tool

12. REFERENCES

Conforti, M., Connor, N., Heisey, M., & King, G. (2002) Evaluation of Performance Characteristics of the Medicinal Leech (*Hirudo medicinalis*) for the Treatment of Venous Congestion *Plastic and Reconstructive Surgery* 109(1):228-235.

Liverpool Health Service, Trauma, Orthopaedic and Plastics Unit (No date) Leech Care Tips (Draft)

Michalsen, A., Roth, M., & Dobos, G. (2006) *Medicinal Leech Therapy* Thieme, Stuttgart.

Sartor C., Limouzin-Perotti F., Legre R., Casanova D., Bongrand M., Sambuc R. & Drancourt M. (2002). Nosocomial infections with *Aeromonas hydrophila* from leeches. *Clinical Infectious Diseases*. Vol. 35 <http://cid.oxfordjournals.org/content/35/1/e1.full> accessed Dec 2014

Soengkar A, Kusumastuti N, Haryanti K & Adib A (2012) Microsurgery and Flap Medicinal Leech Therapy as an Alternative Treatment for Vein Problems after Free Flap Surgery: A Case Report *Jurnal Plastik Rekonstruksi* 1(6) 543-547.

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13. CONSULTATION

This guideline was sent to the following stakeholders for approval:

| | |
|---------------------|------------------|
| Dr Andrew Myers | A Prof Eric Ho |
| Dr Gary Avery | Dr John Ferguson |
| Dr Bryce Meads | Dr Rob Pickles |
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| Margaret Allwood | |

APPROVAL

CPGAG – 15th February 2016

JHH QUM – 9th March 2016

JHCH CQ&PCC – 24th May 2016

Clinical Audit Tool –(National Standard 1: 1.7.2 The use of agreed clinical guidelines by the clinical workforce is monitored)

| Criterion no. | Criterion | Exceptions | Definition of terms and/or general guidance | Data source | Frequency | Position Responsible |
|---------------|--|------------|---|------------------------|--------------------|----------------------------|
| 1 | Children undergoing leech therapy will have an audit at the end of their medical treatment, prior to discharge | None. | The aim is to ensure: <ul style="list-style-type: none"> - Staff adhered to the guideline - The therapy was initiated and managed appropriately and safely - Children and their families were satisfied with the therapy process | Patient health record. | Prior to discharge | Paediatric Orthopaedic CNC |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |

Reference: *Electronic audit tool - National Institute for Health and Clinical Excellence (NICE): www.nice.org.uk/nicemedia/live/10996/56372/56372.xls*

¹ Adapted from <http://www.ukessays.com/essays/biology/the-effects-of-other-substances-in-the-leech-saliva.php>.

² Adapted from <https://www.studyblue.com/notes/n/biosc-04-114-study-guide-2012-13-adam/deck/9713379>.